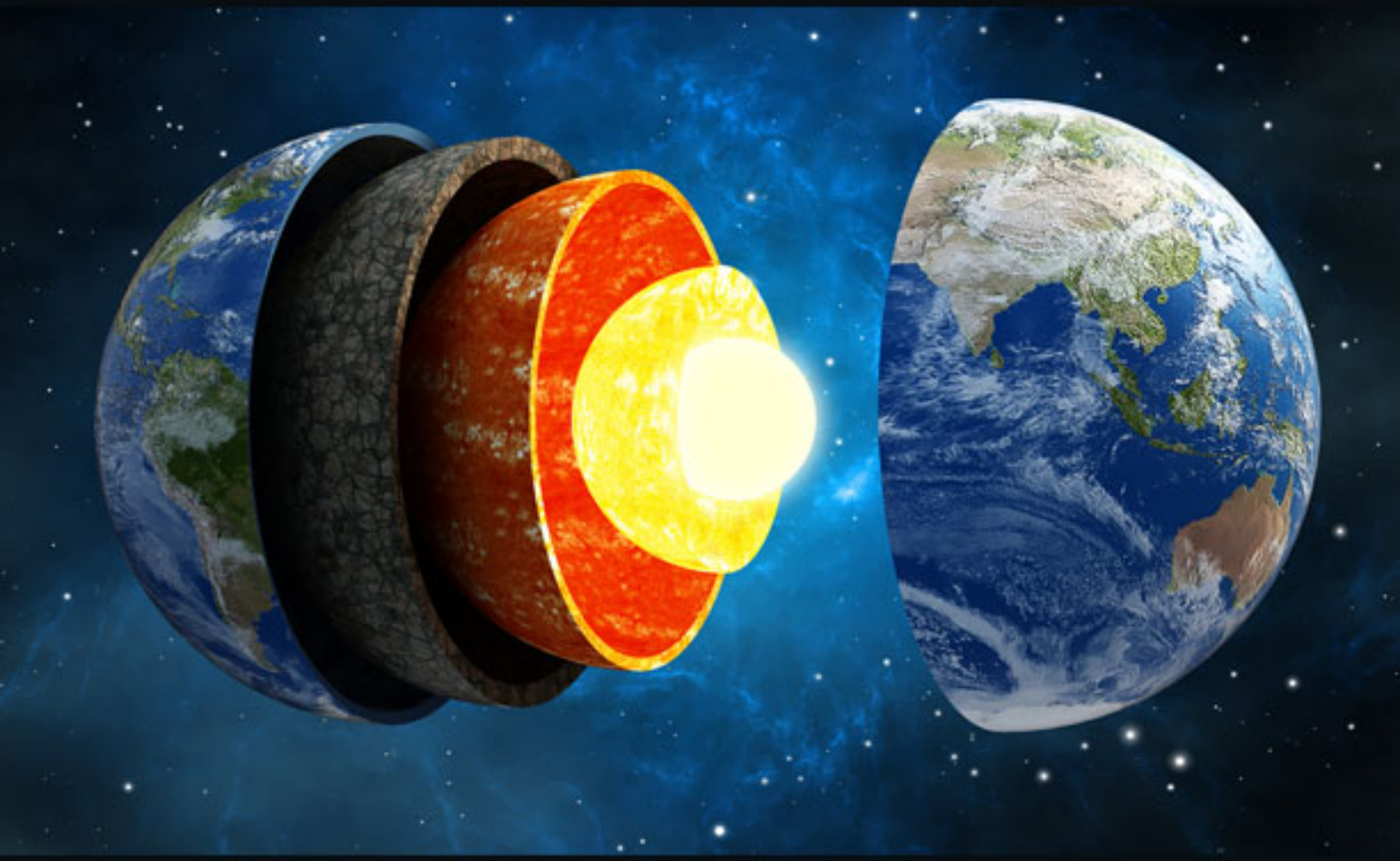
CBSE Board

Class X Science



Previous Year Question Paper With Solutions 2013-2018

CBSE
Class X Science
Board Paper – 2018 (Set 2)

Time allowed: 3 hours **Maximum marks: 80**

General Instructions:

1. The question paper comprises of two **Sections, A** and **B**. You are to attempt both the sections.
2. All questions are compulsory.
3. All questions of **Section A** and **Section B** are to be attempted separately.
4. There is an internal choice in **three** questions of **three** marks each, **two** questions of **five** marks each in Section A and in **one** question of **two** marks in Section B.
5. Question numbers **1** and **2** in **Section A** are **one mark** questions. These are to be answered in one word or in **one** sentence.
6. Question numbers **3** to **5** in **Section A** are **two marks** questions. These are to be answered in about **30 words each**.
7. Question numbers **6** to **15** in **Section A** are **three marks** questions. These are to be answered in about **50 words each**.
8. Question numbers **16** to **21** in **Section A** are **five marks** questions. These are to be answered in about **70 words each**.
9. Question numbers **22** to **27** in **Section B** are based on practical skills. Each question is a **two** marks question. These are to be answered in brief.

SECTION A

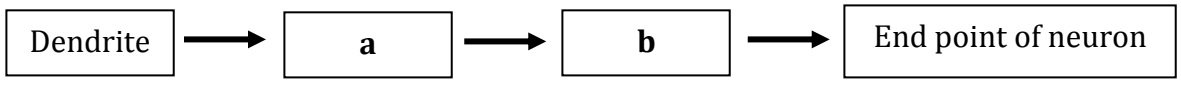
1. Write the energy conversion that takes place in a hydropower plant. [1]

2. A Mendelian experiment consisted of breeding pea plants bearing violet flowers with pea plant bearing white flowers. What will be the result in F_1 progeny? [1]

3. [2]

(a) Name one gustatory receptor and one olfactory receptor present in human beings.

(b) Write a and b in the given flow chart of neuron through which information travels as an electrical impulse.



4. If the image formed by a spherical mirror of all positions of the object placed in front of it is always erect and diminished, what type of mirror is it? Draw a labelled ray diagram to support your answer. [2]

5. A compound 'X' on heating with excess conc. sulphuric acid at 443 K gives an unsaturated compound 'Y'. 'X' also reacts with sodium metal to evolve a colourless gas 'Z'. Identify 'X', 'Y' and 'Z'. Write the equation of the chemical reaction of formation of 'Y' and also write the role of sulphuric acid in the reaction. [2]

6. State the laws of refraction of light. Explain the term 'absolute refractive index of a medium' and write an expression to relate it with the speed of light in vacuum. [3]

OR

What is meant by power of a lens? Write its SI unit. A student uses a lens of focal length 40 cm and another of -20 cm. Write the nature and power of each lens. [3]

7. Write one main difference between asexual and sexual mode of reproduction. Which species is likely to have comparatively better chances of survival – the one reproducing asexually or the one reproducing sexually? Give reason to justify your answer. [3]

8. Show how would you join three resistors. Each of resistance 9 Ω so that the equivalent resistance of the combination is (i) 13.5 Ω (ii) 6 Ω? [3]

OR

(a) Write Joule's law of heating.

(b) Two lamps, one rated 100 W; 220 V, and the other 60 W; 220 V, are connected in parallel to electric mains supply. Find the current drawn by two bulbs from the line, if the supply voltage is 220V.

9. Name the hormones secreted by the following endocrine glands and specify one function of each: [3]
(a) Thyroid (b) Pituitary (c) Pancreas

10. 2 mL of sodium hydroxide solution is added to a few pieces of granulated zinc metal taken in a test tube. When the contents are warmed, a gas evolves which is bubbled through a soap solution before testing. Write the equation of the chemical reaction involved and the test to detect the gas. Name the gas which will be evolved when the same metal reacts with dilute solution of a strong acid. [3]

OR

The pH of a salt used to make tasty and crispy pakoras is 14. Identify the salt and write a chemical equation for its formation. List its two uses.

11. [3]

(a) Why are most carbon compounds poor conductors of electricity?

(b) Write the name and structure of saturated compounds in which the carbon atoms are arranged in a ring. Give the number of single bonds present in this compound.

12. Decomposition reactions require energy either in the form of heat or light of electricity for breaking down the reactants. Write one equation each for decomposition reactions where energy is supplied in the form of heat. Light and electricity. [3]

13. What is a dam? Why do we seek to build large dams? While building large dams, which three main problems should particularly be addressed to maintain peace among local people? Mention them. [3]

14. Students in a school listened to the news read in the morning assembly that the mountain of garbage in Delhi. Suddenly exploded and various vehicles got buried under it. Several people were also injured and there was traffic jam all around. In the brain storming session the teacher also discussed this issue and asked the students to find out a solution to the problem of garbage. Finally they arrived at two main points – one is self-management of the garbage we produce and the second is to generate less garbage at individual level.

(a) Suggest two measures to manage the garbage we produce.

(b) As an individual, what can we do to generate the least garbage? Give two points.

(c) List two values the teacher instilled in his students in this episode.

15. [3]

(a) List the factors on which the resistance of a conductor in the shape of a wire depends.

(b) Why are meals good conductors of electricity whereas glass is a bad conductor of electricity? Give reasons.

(c) Why are alloys commonly used in electrical heating devices? Give reasons.

16. [5]

(a) State Fleming's left hand rule.

(b) Write the principle of working of an electric motor.

(c) Explain the function of the following parts of an electric motor.

(i) Armature (ii) Brushes (iii) Spilt ring

17. [5]

(a) Write the function of following parts in human female reproductive system:

(i) Ovary (ii) Oviduct (iii) Uterus

(b) Describe in brief the structure and function of placenta.

18. [5]

(a) Write the steps involved in the extraction of pure metals in the middle of the activity series from their carbonate ores.

(b) How is copper extracted from its sulphide ore? Explain the various steps supported by chemical equations. Draw labelled diagram for the electrolytic refining of copper.

19. [5]

(a) Mention any two components of blood.

(b) Trace the movement of oxygenated blood in the body.

(c) Write the function of valves present in between atria and ventricles.

(d) Write one structural difference between the composition of artery and veins.

OR

(a) Define excretion.

(b) Name the basic filtration unit present in the kidney.

(c) Draw excretory system in human beings and label the following organs of excretory system which perform following functions :

(i) form urine.

(ii) is a long tube which collects urine from kidney.

(iii) store urine until it is passed out.

20. [5]

(a) The modem periodic table has been evolved through the early attempts of Dobereiner. Newland and Mendeleev. List one advantage and one limitation of all the three attempts.

(b) Name the scientist who first of all showed that atomic number of an element is a more fundamental property than its atomic mass.

(c) State Modern periodic law.

21. [5]

(a) A student is unable to see clearly the words written on the black board placed at a distance of approximately 3 m from him. Name the defect of vision the boy is suffering from. State the possible causes of this defect and explain the method of correcting it.

(b) Why do stars twinkle? Explain.

OR

(a) Write the function of each of the following parts of human eye:

(i) Cornea (ii) Iris (iii) Crystalline lens (iv) Ciliary muscles

(b) Why does the sun appear reddish early in the morning? Will this phenomenon be observed by an astronaut on the Moon? Give reason to justify your answer.

SECTION - B

22. Name the process by which an amoeba reproduces. Draw the various stages of its reproduction in a proper sequence. [2]

OR

A student is viewing under a microscope a permanent slide showing various stages of sexual reproduction by budding in yeast. Draw diagrams of what he observes (in proper sequence).

23. An object of height 4.0 cm is placed at a distance of 30 cm from the optical centre 'O' of a convex lens of focal length 20 cm. Draw a ray diagram to find the position and size of the image formed. Mark optical centre 'O' and principal focus 'F' on the diagram. Also find the approximate ratio of size of the image to the size of the object. [2]

24. A student added few pieces of aluminum metal in two test tubes A and B containing Aqueous solutions of iron sulphate and copper sulphate, In the second part of her experiment, she added iron metal to another test tubes C and D containing aqueous solutions of aluminum sulphate and copper sulphate, In which test tube or test tubes will she observe color change? On the basis of this experiment, state which one is the most reactive metal and why. [2]

25. What is observed when a solution of sodium sulphate is added to a solution of barium chloride taken in a test tube? Write equation for the chemical reaction involved and name the type of reaction in this case. [2]

26. The values of current (I) flowing through a given resistor of resistance (R), for the corresponding values of potential difference (V) across the resistor are as given below:[2]

V (Volts)	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0
I (amperes)	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0

Plot a graph between current (I) and potential difference (V) and determine the resistance (R) of the resistor.

27. List the steps preparation of temporary mount of a leaf peel to observe stomata. [2]

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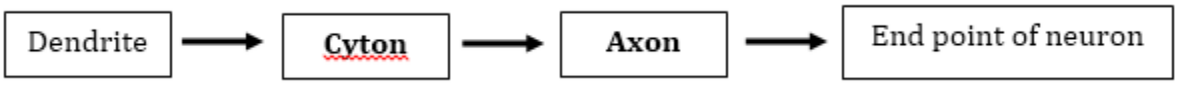
Board Paper – 2018 (Set 2) Solution

Section A

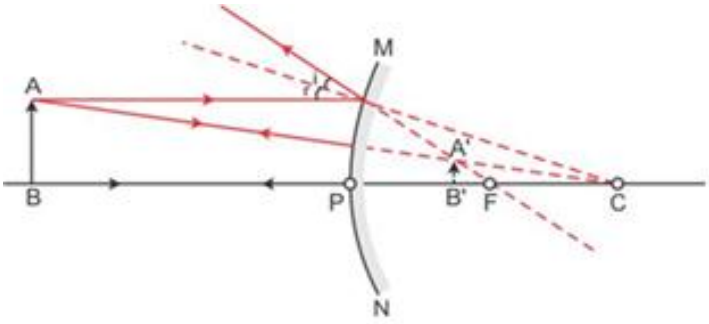
1. Energy conversion at a hydroelectric power plant is as follows:
Kinetic energy of flowing river water → Potential energy of water stored in a reservoir at a height of a dam → Kinetic energy of water flowing from the height on the blades of a turbine → Electrical energy

2. The F_1 progeny would bear violet flowers as violet colour is a dominant character over white colour.

3. (a)
Gustatory receptors are located on the tongue. They help to detect taste.
The olfactory receptors are located in the nose. They help to detect smell.
(b)



4. The image formed by a convex mirror is always virtual, erect and diminished, irrespective of the position of the object. Hence, the mirror is a convex mirror.



Object anywhere between infinity and P

5. X is ethanol.
Y is ethene.
Z is hydrogen gas.
When ethanol is heated with excess amount of concentrated sulphuric acid, it gives an unsaturated compound ethene (C_2H_4).
Conc. H_2SO_4 acts as a dehydrating agent because it ejects water from ethanol.

Reaction:

$$CH_3CH_2OH \xrightarrow{Conc.H_2SO_4} CH_2=CH_2 + H_2O$$

Now, when ethanol reacts with sodium, a colourless gas is evolved, which is hydrogen gas.

Reaction:

$$2CH_3CH_2OH + 2Na \longrightarrow 2CH_3CH_2ONa + H_2$$

6. **<u>Laws of refraction of light</u>:**

a) The incident ray, the refracted ray and the normal to the interface of two media at the point of incidence, all lie in the same plane.

b) The ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant for a given pair of media.

$$\frac{\sin i}{\sin r} = \text{constant} = {}^1n_2 = \frac{n_2}{n_1}$$

This law is also known as **Snell's law**.

The constant, written as ${}^1n_2$, is called the **refractive index** of the second medium with respect to the first medium.

<u>Absolute refractive index of a medium</u>:

When a beam of light is going from vacuum to another medium, the value of the refractive index is called absolute refractive index.

The refractive index of vacuum (air) is always 1. The absolute refractive index is denoted by the symbol n_2.

$$n_2 = \frac{\text{Refractive index of medium}}{\text{Refractive index of vacuum (air)}} = \frac{\text{speed of light in vacuum}}{\text{speed of light in the medium}} = \frac{c}{v}$$

$$\therefore n_2 = \frac{c}{v}$$

OR

<u>Power of lens:</u>

The power of a lens is the measure of degree of convergence or divergence of light rays falling on it.

The SI unit of power of a lens is dioptre denoted by 'D'.

The power of a lens is given by

$$P = \frac{1}{f\ (\text{in metres})}$$

$\therefore$ For lens of focal length 40 cm, f = 0.4 m

$$\therefore P = \frac{1}{0.4} = +2.5\ D$$

The lens is convex lens and is used to correct hypermetropia.

For lens of focal length -20 cm, f = 0.2 m

$$\therefore\ P = \frac{1}{-0.2} = -5.0\ D$$

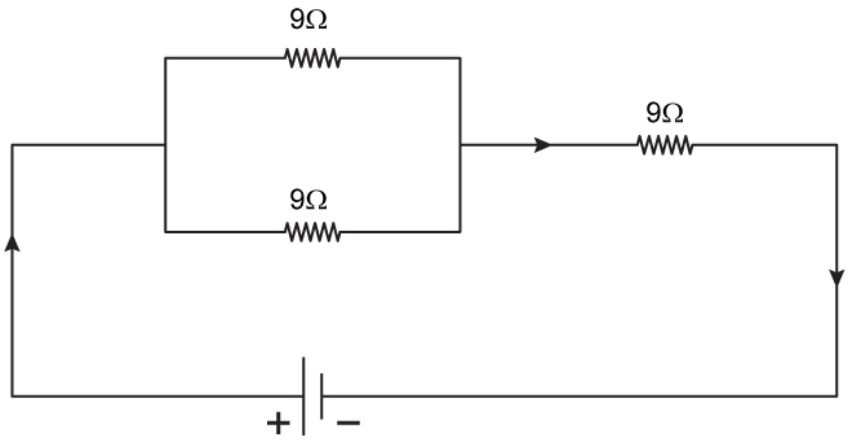
The lens is concave lens and is used to correct myopia.

7.

- In asexual reproduction, only a single parent is involved, which divides and gives rise to new individuals. These individuals are exactly identical to the parent organism, and hence, there is a minimal change in their genetic constitution.
- In sexual reproduction, two different parents are involved. Both parents produce two different kinds of gametes which fuse to give rise to a new individual. Because of the fusion of gametes, the new individual has a different genetic constitution and does not entirely resemble the parents.
- Organisms which reproduce by sexual reproduction comparatively have better chances of survival than those reproducing asexually. This is because sexual reproduction involves the fusion of two different types of gametes obtained from two different individuals. This result in genetic recombination leads to a greater genetic diversity, and thus, better chances to adapt, escape or evolve through selection pressure of nature.

8. Consider the resistors R_1, R_2 and R_3 each of 9 Ω are connected in the circuit.

i) When one resistor is connected in series with the other two resistors which are connected in parallel to each other, the equivalent resistance in the circuit is



$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{9} + \frac{1}{9} = \frac{2}{9} = 0.22$$

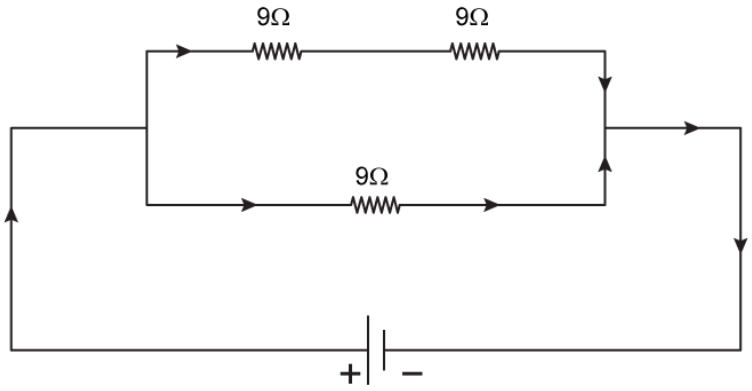
$$\Rightarrow R_p = 4.5\ \Omega$$

$$R_s = R_p + R_3 = 4.5\ \Omega + 9\Omega = 13.5\ \Omega$$

$$\therefore R_{eq} = 13.5\ \Omega$$

Thus, by connecting the resistors in this combination, the equivalent resistance in the circuit, $R_{eq} = 13.5\ \Omega$.

ii) When one resistor is connected in parallel with the other two resistors which are connected in series with each other, the equivalent resistance in the circuit is



$$R_s = R_1 + R_2 = 9\Omega + 9\Omega = 18\Omega$$

$$\frac{1}{R_p} = \frac{1}{R_s} + \frac{1}{R_3} = \frac{1}{18} + \frac{1}{9} = 0.166$$

$$\Rightarrow R_p = 6\Omega$$

$$\therefore R_{eq} = 6\Omega$$

Thus, by connecting the resistors in this combination, the equivalent resistance in the circuit, $R_{eq} = 6\ \Omega$.

OR

i) According to Joule's law of heating, heat produced in a wire is directly proportional to

a) Square of current (I^2)

b) Resistance of wire (R)

c) Time (t), for which current is passed

Thus,

$H = I^2 \times R \times t$ ... (Joule's law of heating)

ii) Current drawn from the first lamp is given by

$P_1 = V \times I_1$

$\therefore I_1 = \frac{P_1}{V} = \frac{100}{220} = 0.45A$

Current drawn from the second lamp is given by,

$P_2 = V \times I_2$

$\therefore I_2 = \frac{P_2}{V} = \frac{60}{220} = 0.27A$

Thus the total current drawn by two lamps from the line which are connected in parallel to each other for supply voltage 220 V is ,

$I = I_1 + I_2 = 0.45 + 0.27 = 0.72$ A

9.

Gland	**Hormones**	**Functions**
Thyroid	Thyroxine	Regulates metabolism of carbohydrates, proteins and fats in the body
Pituitary	Growth hormone	Regulates the growth and development of bones and muscles
	Prolactin	Regulates the functioning of mammary glands in females
	Vasopressin	Regulates the balance of water and electrolytes in the body
	Oxytocin	Regulates the ejection of milk during lactation in females
Pancreas	Glucagon	Helps to increase the sugar level in the body
	Insulin	Helps to decrease the sugar level in the body

10.

(i) Equation of the chemical reaction:

$Zn + 2NaOH \xrightarrow{warm} Na_2ZnO_2 + H_2\uparrow$

(ii) Test to detect the gas:

In the above reaction, H_2 gas is liberated. Its presence can be detected by putting a matchstick at the opening of the test tube. H_2 burns with a pop sound.

(iii) Zn metal reacts with a dilute solution of a strong acid:

Equation of the chemical reaction:

$Zn + 2HCl \longrightarrow ZnCl_2 + H_2\uparrow$

OR

(i) The salt is $NaHCO_3$.

(ii) Chemical equation for salt formation:

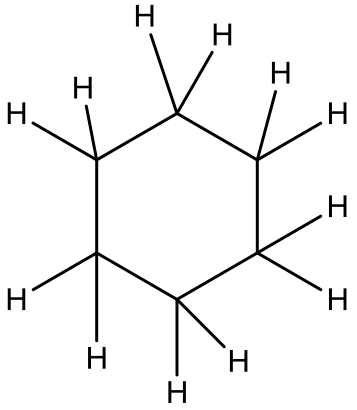
$$Na_2CO_3 + H_2O + CO_2 \longrightarrow 2NaHCO_3$$

(iii) It is used as an antacid and in the bakery industry.

11.

(a) Carbon is a non-metal which is a poor conductor; hence, most of its compounds are poor conductors of electricity.

(b)



6-C RING=Cyclohexane
It has total 18 single bonds

12.

(a) Heat: $2Pb(NO_3)_2 \xrightarrow{\Delta} 2PbO + 4NO_2 + O_2$

(b) Light: $2AgCl \xrightarrow{h\nu} 2Ag + Cl_2$

(c) Electricity: $2NaCl \xrightarrow{\text{electricity}} 2Na + Cl_2$

13. Dams are man-made structures constructed across rivers to control, collect and regulate the flow of water.

Importance and uses of building dams:

- Regulate the flow of water, which can then be supplied to the people in towns and cities for domestic purposes.
- Useful in flood control and collection of water for large irrigation projects.
- Used to harness hydroelectric power.
- Act as reservoirs of water which can be used for supplying water during the lean season.
- Ensure the storage of water for irrigation and for generating electricity.
- Used to carry water over long distances through canal systems.

Main problems to be addressed to maintain peace among local people while building dams:

- Social problems because of displacement of a large number of tribals and peasants who are then rendered homeless.
- No sufficient compensation, rehabilitation or benefits granted from these projects.
- Several environmental problems such as deforestation and loss of biodiversity leading to an ecological imbalance.
- Economic problems due to spending of large amounts of public money without generating proportionate funds.
- Submergence of low-lying adjoining areas of ecological, cultural and social importance for the local population.
- Consideration of local interest and welfare of the people.

14.

(a) **Measures to manage garbage:**

- Throwing the garbage we generate in dustbins
- Separation of wet and dry wastes
- Sorting of waste materials as biodegradable and non-biodegradable
- Composting of biodegradable materials
- Recycling of non-biodegradable materials

(b) **We can adopt the following practices to generate less garbage:**

- Avoid using plastic bags, instead use bags made of cloth and paper.
- Avoid the use of tissue paper, instead use your own cloth napkin.
- Make use of washable cups, mugs and plates instead of disposables.
- Use kitchen wastes to make compost for increasing soil fertility.

(c) **Values instilled by the teacher in students:**

- Sense of responsibility towards the environment
- Social awareness

15.

(a) Factors affecting the resistance of a conductor:

i) Length of the conductor

ii) Area of cross-section of the conductor

iii) Nature of material of the conductor

iv) Temperature of the conductor

(b) Metals have low resistivity and glass has high resistivity. So, all the metals are good conductors, while glass is a bad conductor of electricity.

(c) The heating elements of electrical appliances are made of alloys because

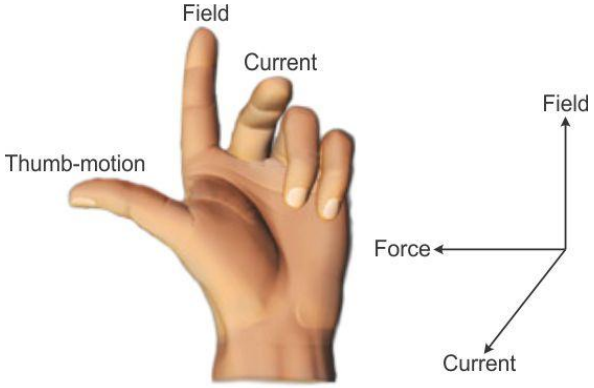
i) The resistivity of an alloy is much higher than the metal.

ii) An alloy does not undergo oxidation or burn easily even if heated up to higher temperature.

16.

(a) **Fleming's left hand rule:**

Stretch the thumb, forefinger and middle finger of the left hand such that they are mutually perpendicular to each other. If the forefinger points in the direction of the field and the middle finger in the direction of the current, then the thumb gives the direction of motion or the force acting on the conductor.



(b) **Principle of working of electric motor**:

A motor works on the principle that when a rectangular coil is placed in a magnetic field and current is passed through it, a force acts on a coil which rotates it continuously.

(c) i) **Armature:**

To convert the electrical energy supplied to the motor to mechanical energy and produce a magnetic field.

ii) **Brushes:**

To make contact with rotating split rings and through them to supply current to the coil.

iii) **Split rings:**

To reverse the direction of current flowing through the coil.

17.

(a) **Functions**:

(i) Ovary:

- Produces ova or female gametes.
- Secretes the female hormones oestrogen and progesterone which are responsible for changes in the female body at the time of puberty.

(ii) Oviduct:

- Acts as the site for the fertilisation of male and female gametes.
- After fertilisation, the ovum travels down to the uterus through the oviduct.

(iii) Uterus:

- Protects and nourishes the developing embryo with the help of placenta.

(b) **Structure and function of placenta:**

- Placenta is embedded in the uterine wall and serves as a connecting link between the mother's body and the baby.
- It is a disc of specialised tissue which provides food and oxygen to the foetus.
- It contains blood spaces on the mother's side and small projections called villi on the foetal side. Here, the mother's blood and foetal blood come in contact with each other.
- It provides a large surface area for the exchange of nutrients and oxygen between the mother and the foetus.
- The foetus gives away waste products and carbon dioxide to the mother's blood for excretion.
- It also functions as an endocrine gland and secretes the hormones necessary to maintain pregnancy.

18.

(a) Extraction of Zn from its carbonate ore:

(i) Concentration: Concentration is done by the gravity separation method.

(ii) Calcination: The ore is calcinated in the absence of air and gets converted to its oxide, i.e. ZnO. $ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2\uparrow$

(iii) Reduction: Carbon is used as a reducing agent to reduce ZnO to Zn.

$$ZnO + C \xrightarrow{\Delta} Zn + CO\uparrow$$

(iv) Electrolytic refining: The impure Zn metal is then purified by electrolysis.

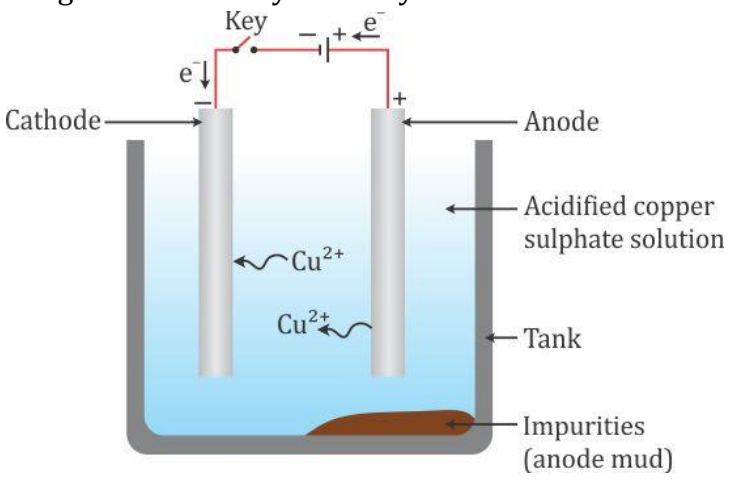
(b) Extraction of Cu from its sulphide ore:

(i) Copper from its sulphide ore can be extracted by heating in air.

$$2Cu_2S + 3O_2 \xrightarrow{\Delta} 2Cu_2O + 2SO_2$$

$$2Cu_2O + Cu_2S \xrightarrow{\Delta} 6Cu + SO_2$$

(ii) Refining is then done by electrolysis:



19.

(a) **<u>Components of blood:</u>** Plasma and blood cells (corpuscles)

(b) **<u>Movement of oxygenated blood in the body:</u>**

Pulmonary vein → Left atrium → Left ventricle → Aorta → Rest of the body

(c) Valves present in between atria and ventricles help to restrict the backflow of the blood from the ventricle to the atrium when the ventricle contracts.

(d) **<u>Differences between artery and vein:</u>**

Artery	Vein
1. It has thick elastic muscular walls.	1. It has thin, non-elastic walls.
2. It does not contain valves.	2. It contains valves to prevent the backflow of blood.
3. Blood flows under high pressure.	3. Blood flows under low pressure.

OR

(a) Excretion is the process of removal of harmful and unwanted substances, especially nitrogenous wastes, from the body.

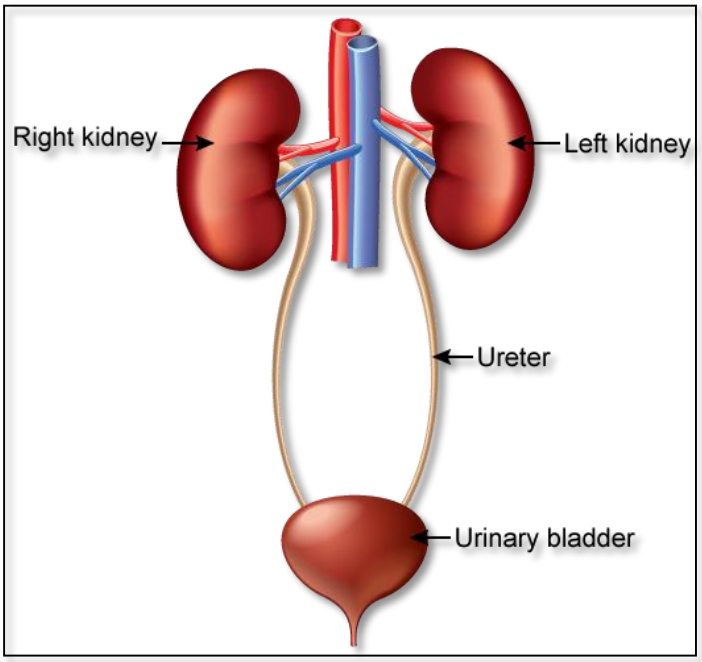
(b) Nephron is the basic filtration unit of the kidneys.

(c)

(i) <u>Kidneys:</u> Form urine

(ii) <u>Ureter:</u> Long tube which collects urine from the kidney

(iii) <u>Urinary bladder:</u> Stores urine until it is passed out



20.

(a)

(i) **Dobereiner's triad**:

Advantage: The three elements of the triad possess similar properties.

Limitation: Some elements which are not similar were grouped into a triad.

(ii) **Newland's octave**:

Advantage: The properties of every eighth element are similar to the properties of the first element.

Limitation: To fit the existing element arrangement, Newlands placed two elements in the same position which differed in their properties.

(iii) **Mendeleev's Periodic Table**

Advantage: The properties of elements in a particular period show regular gradation from left to right.

Limitation: The position of isotopes could not be explained. Isotopes are atoms of the same element having similar chemical properties but different atomic masses. If elements are arranged according to atomic masses, then isotopes should be placed in different groups of the periodic table.

(b) **Mendeleev** showed that atomic number of an element is a more fundamental property than its atomic mass.

(c) Modern periodic law:

Properties of elements are a periodic function of their atomic number.

21.a) The boy is unable to see the board which is 3 m away from him.
So, the boy is unable to see distant objects.
This means he is suffering from **myopia or near-sightedness**.

Causes of myopia:

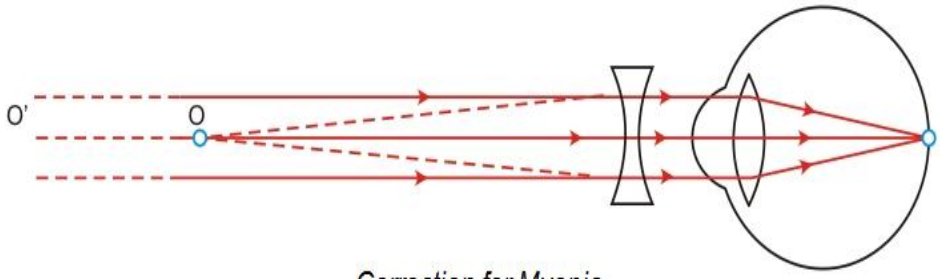
i) Due to a high converging power of lens

ii) Due to an eyeball being too long

Methods of correcting myopia:

i) Myopia is corrected by using a concave lens.

ii) The concave lens used to correct myopia is of such a power that it produces a virtual image of the distant objects on the far point of the myopic eye.



Correction for Myopia

b)

i) Stars are luminous objects, and hence, they shine in the night sky.

ii) If we observe stars in the clear night sky, they appear to change their intensity continuously.

iii) This change in the intensity occurs due to atmospheric refraction.

iv) When the light coming from a star enters the earth's atmosphere, it undergoes refraction due to the varying optical densities of air at different altitudes.

v) So, the intensity of star light entering our eyes increases and decreases.

vi) Thus, stars twinkle.

OR

a)

i) Cornea: Protective layer of the eye; refraction of light rays entering the eye

ii) Iris: Controls the size of the pupil

iii) Crystalline lens: Adjusts the focal length and forms an inverted image of the object on the retina

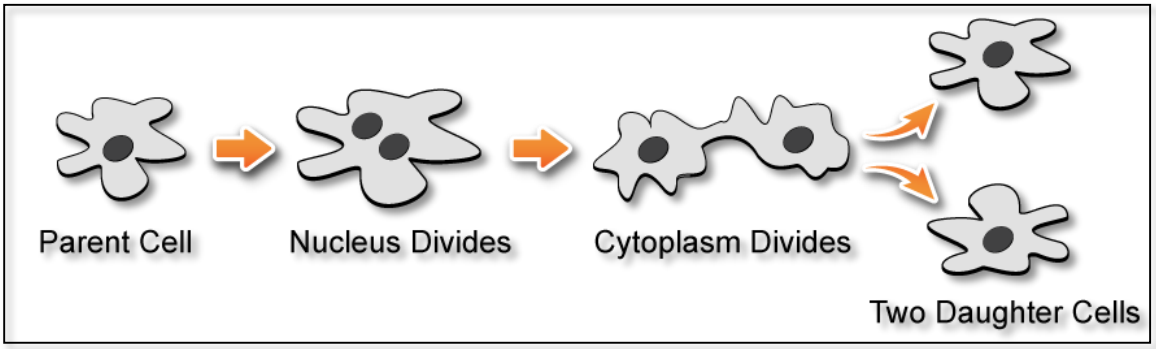
iv) Ciliary muscles: Adjust the thickness of the lens

b)

i) During sunrise and sunset, sunlight travels a greater distance through the atmosphere.
ii) Because of this, blue light is scattered more than red light and it directly enters our eyes.
iii) Hence, the sky and Sun appear red during sunrise and sunset.
iv) Atmospheric refraction is the phenomenon of bending of light on passing through the Earth's atmosphere. The reason for this occurrence is that the upper layers of the Earth's atmosphere are rarer compared to the lower layers.
The astronaut who is on the Moon cannot see the Sun reddish during sunrise because the sunlight going towards the Moon does not undergo refraction.

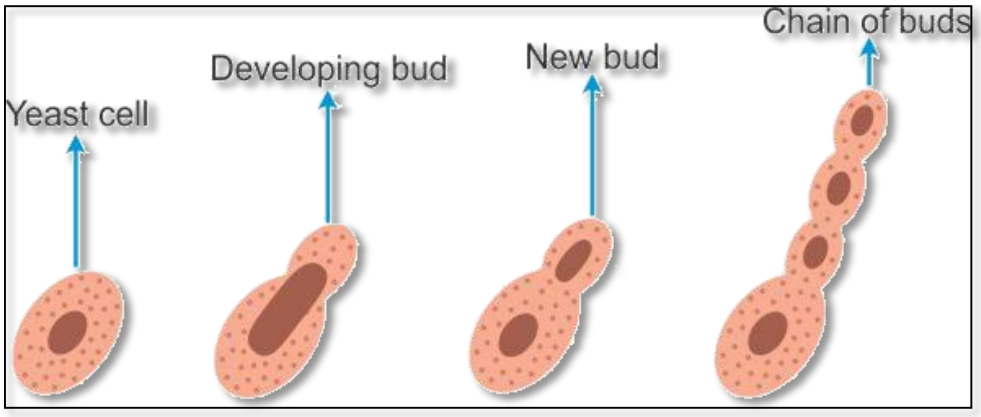
Section B

22. *Amoeba* reproduces by the process of binary fission. In this method, a single parent cell splits and gets divided into two daughter cells.

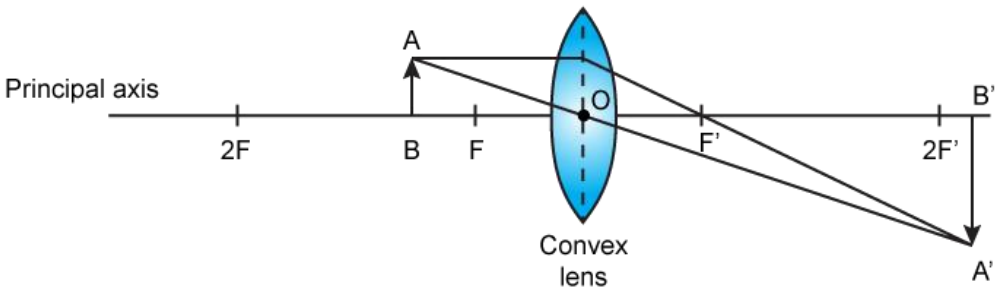


OR

Yeast reproduces asexually by the process of budding. In this method, a bud develops from the body of yeast which gives rise to a new organism.



23.



Object size (h_1) = 4 cm

Object distance (u) = −30 cm

Focal length (f) = 20 cm

$$\frac{1}{f}=\frac{1}{v}-\frac{1}{u}$$

$$\frac{1}{+20}=\frac{1}{v}-\frac{1}{-30}$$

$$\frac{1}{v}=\frac{1}{20}-\frac{1}{30}=0.016$$

$\Rightarrow$ Image distance (v)= 62 cm

We know that,

$$m=\frac{\text{height of image } (h_2)}{\text{height of object}(h_1)}=\frac{v}{u}=\frac{62}{-30}=-2.0$$

Thus the approximate ratio of height of image to height of object is -2cm

negative sign denotes that image formed is inverted and real

as the value of magnification is 2, the image is magnified

thus nature of image is real, inverted and magnified

24. Differences in chemical properties:

Test tube A: $2Al+3FeSO_4 \longrightarrow Al_2(SO_4)_3+3Fe$

Test tube B: $2Al+3CuSO_4 \longrightarrow Al_2(SO_4)_3+3Cu$

Test tube C: $2Fe+Al_2(SO_4)_3 \longrightarrow FeSO_4+2Al$

Test tube D: $Fe+CuSO_4 \longrightarrow FeSO_4+Cu$

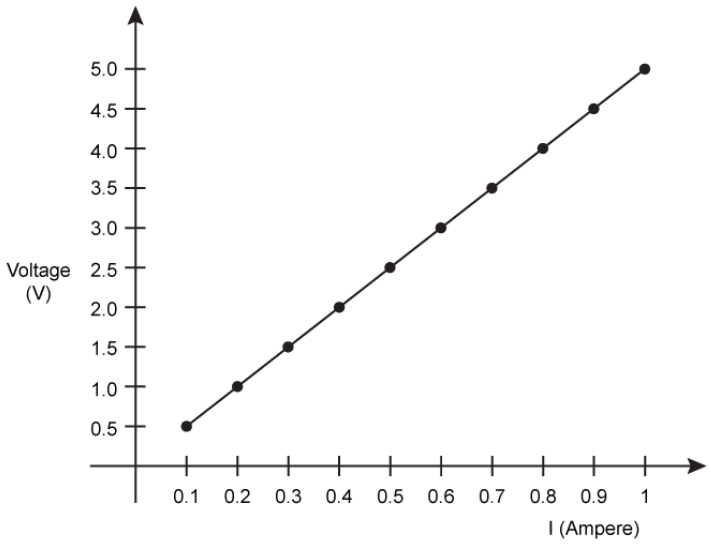
Aluminium is more reactive than iron because aluminium reacts with oxygen in the air to form an oxide which is non-porous. The oxide protects aluminium from further oxidation, so aluminium does not corrode as much as iron.

25. Baking powder ($NaHCO_3$),

When sodium sulphate is added to barium chloride, it gives a white precipitate of barium sulphate (water insoluble) and sodium chloride (water soluble). This is a double displacement reaction.

$Na_2SO_4+BaCl_2 \longrightarrow 2NaCl+BaSO_4\downarrow$

26.



From the graph,

Potential difference (V)= 5 V

Current (I)= 1 A

Resistance (R)= $\frac{V}{I} = 5\Omega$

thus, the resistance of given resistor is 5 ohms.

27.<u>Steps in the preparation of temporary mount of a leaf peel to observe stomata:</u>

- Remove a healthy leaf from a potted plant.
- Remove a part of the peel from the lower surface of the leaf. This can be done by folding the leaf over and gently pulling the peel apart using a pair of forceps.
- Place the peel in a watch glass containing water.
- Put a few drops of safranin stain in the watch glass.
- After 2–3 minutes, place the peel on a clean glass slide.
- Put a drop of glycerine over the peel and place a clean coverslip gently over it with the help of a needle to avoid any kind of air bubbles.
- Remove the excess stain and glycerine with the help of blotting paper.
- Observe the slide first under low power and then under high power of the compound microscope.

CBSE
Class X Science
Board Paper – 2017 (Set 3) Solution
Term II

Time: 3 hrs **Max. Marks: 90**

General Instructions:

- The question paper comprises **two** Sections, A and B. You are to attempt both the sections.
- **All** questions are compulsory.
- There is no choice in any of the questions.
- All questions of Section A and all questions of Section B are to be attempted separately.
- Question numbers **1** to **3** in Section A are one-mark questions. These are to be answered in one word or in one sentence.
- Question numbers **4** to **6** in Section A are two-mark questions. These are to be answered in about 30 words each.
- Question numbers **7** to **18** in Section A are three-mark questions. These are to be answered in about 50 words each.
- Question numbers **19** to **24** in Section A are five-mark questions. These are to be answered in about 70 words each.
- Question numbers **25** to **33** in Section B are multiple choice questions based on practical skills. Each question is a one-mark question. You are to select one most appropriate response out of the four provided to you.
- Question numbers **34** to **36** in Section B are two-marks questions based on practical skills. These are to be answered in brief.

Section A

1. Write the molecular formula of the 2^{nd} and 3^{rd} member of the homologous series where the first member is ethyne. **[1]**

2. Why is variation important for a species? **[1]**

3. In the following food chain, 20,000 J of energy was available to the plants. How much energy would be available to man in this chain?
Plants $\rightarrow$ Sheep $\rightarrow$ Man **[1]**

4. An object is placed at a distance of 15 cm from a concave lens of focal length 30 cm. List four characteristic (nature, position, etc) of the image formed by the lens. **[2]**

5. You being an environmentalist are interested in contributing towards the conservation of nature resources, List four activities that you can do on your own. **[2]**

6. Why are coal and petroleum categorised as natural resources? Given a reason as to why they should be used judiciously. **[2]**

7. Distinguish between esterification and saponification reactions with the help of the chemical equations for each. State one use of each (i) esters, and (ii) saponification process. **[3]**

8. Write the structural formula of ethanol. What happens when it is heated with excess of conc. $H_2 SO_4$ at 443 K? Write the chemical equation for the reaction stating the role of conc. $H_2 SO_4$ in this reaction. **[3]**

9. What is periodicity in properties of elements with reference to the Modern Periodic Table? Why do all the elements of the same group have similar properties? How does the tendency of elements to gain electrons change as we move from left to right in a period? State the reason of this change? **[3]**

10. Write the electronic configuration two elements X and Y whose atomic numbers are 20 and 17 respectively. Write the Molecular formula of the compound formed when element. X reacts with element Y. Draw electron-dot structure of the product and also state the nature of the bond formed between both the elements. **[3]**

11. How did Mendel explain that it is possible that a trait is inherited but not expressed in an organism? **[3]**

12. What is an organic evolution? It cannot be equated with progress. Explain with the help of a suitable example. **[3]**

13. List the two types of reproduction. Which one of the two is responsible for bringing in more variations in its progeny and how? **[3]**

14. What is vegetative propagation? State two advantages and two disadvantages of this method. **[3]**

15. List three techniques that have been developed to prevent pregnancy. Which one of these techniques is not meant for males? How does the use of these techniques have a direct impact on the health and prosperity of a family? **[3]**

16. "A lens can form a magnified erect image as well as magnified inverted image of an object placed in front of it". State the nature of this lens and draw ray diagrams to justify the above statement. Mark the positions of O, F and 2F in the diagram. **[3]**

17. What is "dispersion of white light"? Draw a labelled diagram to illustrate the recombination of the spectrum of white light. Why it is essential that the two prisms used for the purpose should be identical and placed in an inverted position with respect to each other? **[3]**

18. (a)Water is an elixir of life a very important natural resource. Your science teacher wants you to prepare a plan for a formative assessment activity, "How to save water, the vital natural resource". Write any two ways that you will suggest to bring awareness in your neighbourhood, on how to save water'.

(b) Name and explain any one way by which the underground water table does not go down further. **[3]**

19. With the help of one example for each, distinguish between the acquired traits and the inherited traits. Why are the traits/experiences acquired during the entire lifetime of an individual not inherited in the next generation? Explain the reason of this fact with an example. **[5]**

20.

(a)Write the functions of each of the following parts in a human female reproductive system:

(i) Ovary
(ii) Uterus
(iii) Fallopian tube

(b)Write the structure and functions of placenta in a human female. **[5]**

21. Why certain compounds are called hydrocarbons? Write the general formula for homologous series of alkanes, alkenes and alkynes and also draw the structure of the first member of each series. Write the name of the reaction that converts alkenes into alkanes and also write a chemical equation to show the necessary conditions for the reaction to occur. **[5]**

22.

(a) A student suffering from myopia is not able to see distinctly the object placed beyond 5 m. List two possible reasons due to which this defect of vision may have arisen. With the help of ray diagrams explain.
   (i) Why the student is unable to see distinctly the objects placed beyond 5 cm from his eyes.
   (ii) The type of the corrective lens used to restore proper vision and how this defect is corrected by the use of this lens.

(b) If, in this case, the numerical value of the focal length of the corrective lens is 5 m, find the power of the lens as per the new Cartesian sign convention. **[5]**

23. Analyse the following observation table showing variation of image distance (v) with object distance (u) in case of a convex lens and answer the questions that follow without doing any calculations:

S. No	Object Distance u (cm)	Image Distance v (cm)
1	– 100	+ 25
2	– 60	+ 30
3	– 40	+ 40
4	– 30	+ 60
5	– 25	+ 100
6	– 15	+ 120

(a) What is the focal length of the convex lens? Give reason to justify your answer.

(b) Write the serial number of the observation which is not correct. On what basis have you arrived at this conclusion?

(c) Select an appropriate scale and draw a ray diagram for the observation at S. No 2. Also find the approximate value of magnification. **[5]**

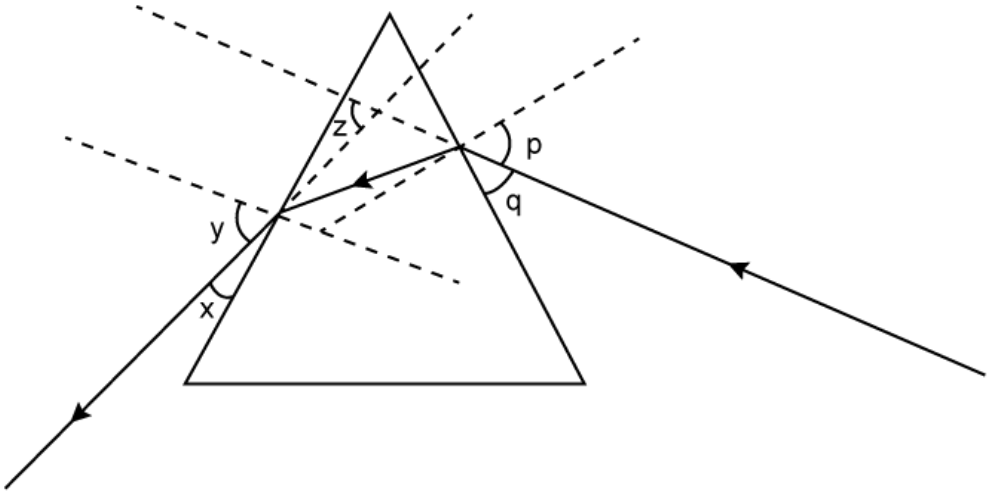
24.

(a) If the image formed by a mirror for all position of the object placed in front of it is always diminished, erect and virtual, state the type of the mirror and also draw a ray diagram to justify your answer. Write one use such mirrors are put to and why.

(b) Define the radius of curvature of spherical mirrors. Find the nature and focal length of a spherical mirror whose radius of curvature is + 24 cm. **[6]**

SECTION B

25. Study the following ray diagram: **[1]**



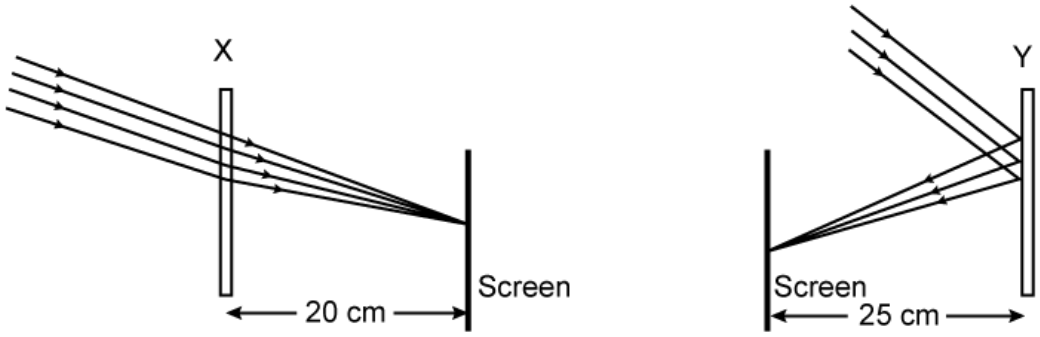
In this diagram, the angle of incidence, the angle of emergence and the angle of deviation respectively have been represented by

(A) y, p , z
(B) x , q , z
(C) p , y , z
(D) P , z , y

26. A student very cautiously traces the path of a ray through a glass slab for different values of the angle of incidence ($\angle$ i). He then measures the corresponding values of the angle of refraction ($\angle$ r) and the angle of emergence ($\angle$ e) for every value of the angle of incidence. On analysing these measurements of angles, his conclusion would be

(A) $\angle i > \angle r > \angle e$
(B) $\angle i = \angle e > \angle r$
(C) $\angle i < \angle r < \angle e$
(D) $\angle i = \angle e < \angle r$ **[1]**

27. Study the given ray diagrams and select the correct statement from the following: **[2]**



(A) Device X is a concave mirror and device Y is a convex lens, whose focal lengths are 20 cm and 25 cm respectively.
(B) Device X is a convex lens and device Y is a concave mirror, whose focal lengths are 10 cm and 25 cm respectively
(C) Device X is a concave lens and device Y is a convex mirror, whose focal lengths are 20 cm and 25 cm respectively.
(D) Device X is a convex lens and device Y is a concave mirror, whose focal lengths are 20 cm and 25 cm respectively.

28. A student obtains a blurred image of a distant object on a screen using a convex lens. To obtain a distinct image on the screen he should move the lens **[1]**
(A) away from the screen
(B) towards the screen
(C) to a position very far away from the screen
(D) either towards or away from the screen depending upon the position of the object.

29. While studying the saponification reaction, what do you observe when you mix an equal amount of colourless vegetable oil and 20% aqueous solution of NaOH in a beaker? **[1]**
(A) The colour of the mixture has become dark brown
(B) A brisk effervescence is taking place in the beaker
(C) The outer surface of the beaker has become hot
(D) The outer surface of the beaker has become cold

30. When you add a few drops of acetic acid to a test-tube containing sodium bicarbonate powder, which one of the following is your observation? **[1]**
(A) No reaction takes place
(B) A colourless gas with pungent smell is released with brisk effervescence
(C) A brown coloured gas is released with brisk effervescence
(D) Formation of bubbles of a colourless and odourless gas

31. A student requires hard water for an experiment in his laboratory which is not available in the neighbouring area. In the laboratory there are some salts, which when dissolved in distilled water can convert it into hard water. Select from the following groups of salts, a group, each salt of which when dissolved in distilled water will make it hard. **[1]**

(A) Sodium chloride, Potassium chloride
(B) Sodium sulphate, Potassium sulphate
(C) Sodium sulphate, Calcium sulphate
(D) Calcium sulphate, Calcium chloride

32. To perform an experiment to identify the different parts of an embryo of a dicot seed, first of all you require a dicot seed. Select dicot seeds from the following group: **[2]**

Wheat, Gram, Maize, Pea, Barley, Ground-nut

(A) Wheat, Gram and Pea
(B) Gram, Pea and Ground-nut
(C) Maize, Pea and Barley
(D) Gram, Maize and Ground-nut

33. The following vegetables are kept in a basket: **[1]**

Potato, Tomato, Radish, Brinjal, Carrot, Bottle-gourd

Which two of these vegetables correctly represent the homologous structures?

(A) Carrot and Tomato
(B) Potato and Brinjal
(C) Radish and Carrot
(D) Radish and Bottle-gourd

34. Draw in sequence (showing the four stages), the process of binary fission in Amoeba. **[2]**

35. A student focuses the image of a candle flame, placed at about 2 m from a convex lens of focal length 10 cm, on a screen. After that he moves gradually the flame towards the lens and each time focuses its image on the screen. **[2]**

(A) In which direction does he move the lens to focus the flame on the screen?
(B) What happens to the size of the image of the flame formed on the screen?
(C) What difference is seen in the intensity (brightness) of the image of the flame on the screen?
(D) What is seen on the screen when the flame is very close (at about 5 cm) to the lens?

36. Mention the essential material (chemicals) to prepare soap in the laboratory. Describe in brief the test of determining the nature (acidic/alkaline) of the reaction mixture of saponification reaction. **[2]**

CBSE
Class X Science
Board Paper – 2017 (Set 3) Solution
Term II

Section A

1. The molecular formula of the 2nd and 3rd members of a homologous series where the first member is ethyne (C_2H_2) is formed by adding $-CH_2-$:

2nd member of alkyne series = propyne (C_3H_4) $CH_3-CH_2-C\equiv CH$

3rd member of alkyne series = butyne (C_4H_6) $CH_3-CH_2-C\equiv CH$

2. Variation increases the chances of survival of a species in a constantly changing environment.

3. According to the 10% law, 2 J of energy will be available for the man in this chain.

4. Given,

$u=-15$ cm $(\text{It is to the left of the lens})$

$f=-30$ cm $(\text{It is a concave lens})$

Using the lens formula $\frac{1}{f}=\frac{1}{v}-\frac{1}{u}$

$$\rightarrow \frac{1}{v}=\frac{1}{f}+\frac{1}{u}=\frac{1}{(-30)}+\frac{1}{(-15)}$$

$$\therefore \frac{1}{v}=-\frac{3}{30}=-\frac{1}{10}$$

$\therefore v=-10$ cm

The negative sign of the image distance shows that the image is formed on the left side of the concave mirror. Thus, the image formed by a mirror is virtual, erect and on the same side as the object.

5. Four activities which can be done as an environmentalist to conserve natural resources are

1) Using public transport for commuting instead of using a personal vehicle.
2) Avoid using clothes, accessories or articles made of animal skin.
3) Using energy-efficient electrical appliances to save electricity.
4) Ensuring no leakage of water taps and pipes at home.

6.

- Coal and petroleum have been formed by natural processes. They have been formed by the degeneration of dead plant and animal biomass buried deep in the earth several million years ago.
- It has taken millions of years for the formation of these fossil fuels, and the present rate of consumption of these fossil fuels far exceeds the rate at which they are formed.
- If exhausted, these resources will not be available for use in the near future, and hence, they should be used judiciously.

7.

Esterification	Saponification
1. Carboxylic acid reacts with alcohols in the presence of a little conc. sulphuric acid to form esters.	**1.** On treating an ester with a base such as NaOH, it is converted back to alcohol and sodium salt of carboxylic acid.
2. Example: Ethanoic acid reacts with ethanol in the presence of a little conc. sulphuric acid to form esters. $C_2H_5OH + CH_3COOH \xrightarrow{\text{Conc.}H_2SO_4} CH_3COOC_2H_5 + H_2O$	**2.** Example: Ethyl ethanoate on reaction with sodium hydroxide gives ethanol and sodium ethanoate. $CH_3COOC_2H_5 + NaOH \rightarrow C_2H_5OH + CH_3COONa$

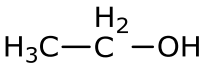
Use of esters:

Esters are used in synthetic flavours, perfumes, cosmetics, lacquers, paints and varnishes.

Use of saponification reaction:

It is used in the preparation of soaps on a commercial basis.

8. Structural formula of ethanol:



On adding conc. sulphuric acid to ethanol and heating the mixture up to 443 K (443 K – 273 = 170°C) gives ethene.

$$C_2H_5OH \xrightarrow[170^\circ C]{\text{Conc.}H_2SO_4} CH_2 = CH_2 + H_2$$

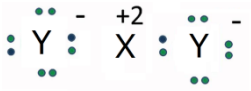
The role of conc. H_2SO_4 in the above reaction is that it is used as a dehydrating agent and causes dehydration of ethanol.

9. Properties which reappear at regular intervals or in which there is gradual variation at regular intervals are called **periodic properties**, and the phenomenon is known as the periodicity of elements.

Elements in the same group or column have the same number of electrons in their outermost shell. Hence, elements of the same group have similar properties.

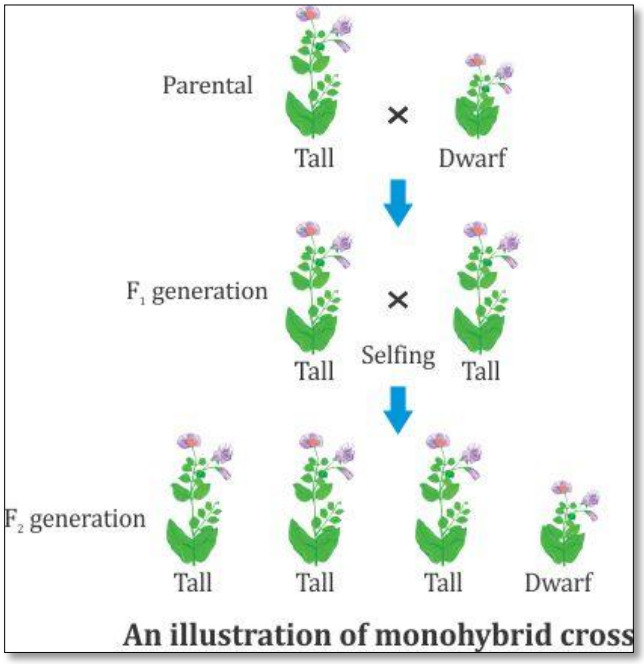
On moving across a period from left to right, the tendency to gain electrons increases. This is due to an increase in the nuclear pull and a decrease in atomic size.

10. Atomic number of X = 20, electronic configuration = 2, 8, 8, 2
Atomic number of Y = 17, electronic configuration = 2, 8, 7
Molecular formula of the compound = XY_2
Electron-dot structure of the compound:



An ionic bond is formed between the two elements.

11. Mendel explained that it is possible that a trait is inherited but not expressed in an organism with the help of a monohybrid cross.



- He crossed pure-bred tall plants (TT) with pure-bred dwarf plants (tt).
- The progeny he received in the first filial generation was tall. The dwarfness did not show up in the F_1 generation.

- He then crossed the tall pea plants of the F_1 generation and found that the dwarf plants were obtained in the second generation. He obtained three tall plants and one dwarf plant.

12. Organic evolution can be defined as the slow, progressive, natural and sequential development in primitive organisms to form more complex organisms or a new species.

13. Two types of reproduction:
  - Sexual reproduction
  - Asexual reproduction
- Sexual reproduction is responsible for bringing in more variations in its progeny.
- It takes place by the combination of male and female gametes.
- Gametes are formed from one cell which involves copying of DNA and the cellular apparatus. DNA copying is not absolutely accurate, and errors result in new variations. With every DNA copied, a new variation is introduced, and this DNA copy may already have several variations accumulated from the previous generations.

14. Vegetative propagation is a type of reproduction in which several plants are capable of producing naturally through their roots, stems and leaves.

<u>Advantages of vegetative propagation</u>:
- Plants not capable of producing sexually are produced by this method.
- It is a fast and certain method to obtain plants with desired features.

<u>Disadvantages of vegetative propagation</u>:
- There is no possibility for variation.
- The new plant grows in the same area as the parent plant which leads to competition for resources.

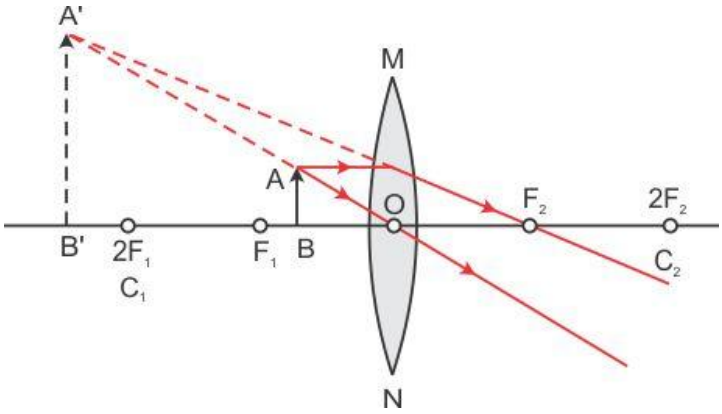
15. <u>Techniques to prevent pregnancy</u>:
- Use of intra-uterine devices such as Lippes loop and Copper T
- Use of condoms
- Surgical methods (e.g. tubectomy)

Use of intra-uterine devices is not meant for males.

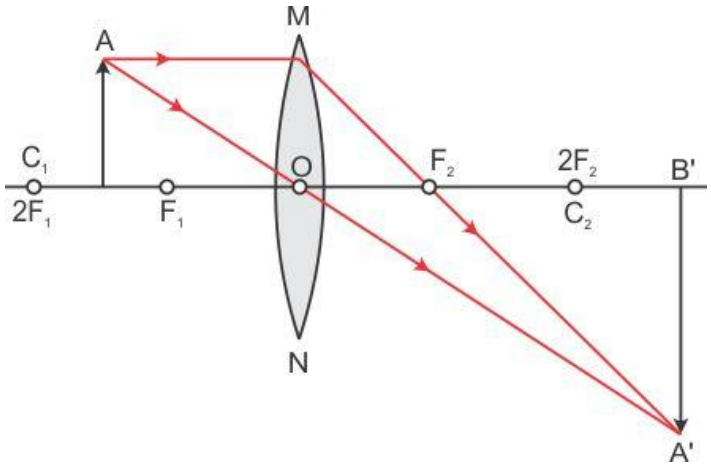
The use of these techniques will keep the mother in good health. With a small family size, parents will be able to provide quality resources to the child such as food, clothes and education. This will improve the overall mental and physical well-being of the family.

16. Convex lens can form a magnified erect image as well as a magnified inverted image of an object placed in front of it.

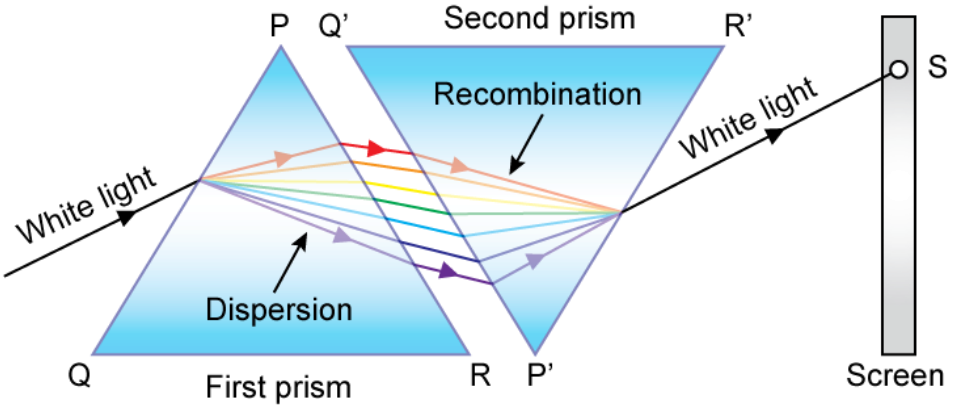
Position of object	Position of image	Size of image	Nature of image
Between focus F_1 and optical centre O	On the same side of the lens as the object	Magnified	Virtual and erect



Position of object	Position of image	Size of image	Nature of image
Between F_1 and $2F_1$	Beyond $2F_2$	Magnified	Real and inverted



17. The phenomenon of splitting of white light into its constituent seven colours on passing through a glass prism is called dispersion of light.



It is essential to place the two identical prisms in an inverted position with respect to each other because the refraction produced by the second prism is equal and opposite to that produced by the first prism.

18. <u>Two ways by which awareness on how to save water can be created in the neighbourhood</u>:

- By bringing to notice the current situation of drought in rural areas and its dreadful effects on humans and animals
- Making people realise the importance of water in life and the shortage of water and its consequences in the near future

- Khadin is one way of recharging groundwater.
- A khadin consists of a 100–300-m long embankment called bund made of earth. The bund is built across the lower edge of the sloping farmland.
- Rainwater from the catchment area flows down the slope and collects in front of the bund forming a reservoir.
- Pathways through the bund allow excess water to flow through and collect in shallow wells dug behind the bund.
- The water which collects in the reservoir and wells seeps into the land and recharges the groundwater.

19.

Acquired Trait	Inherited Trait
• A trait or characteristic which develops in response to the environment and cannot be inherited.	• A characteristic feature inherited from the previous generation.
• Example: A person learns to swim.	• Example: A girl has brown eyes just like her mother.

- Only those traits are inherited which are developed because of changes in genes.
- An acquired trait or experience is developed as a response to the environment; it is not inherited. These are not developed due to the changes in genes.
- Example: Human beings experiencing weight loss due to starvation. There will be reduction in weight as a response to starvation. This will result in the reduction in the number of body cells or overall body–mass ratio of the individual. It will not have any effect on the genetic constitution of the individual. Because there is no change in the gene of the individual, it is not an acquired trait.

20.

(i) Ovary: It produces female gametes. One ovum is released by one ovary every month. It also secretes hormones oestrogen and progesterone.
(ii) Uterus: It protects and nourishes the developing embryo.
(iii) Fallopian tube: It passes down the ovum towards the uterus released by the ovary.

<u>Structure of the placenta in human female</u>:

- The placenta is a disc which is embedded in the uterine wall.
- It contains villi on the embryo side. The mother's end of the placenta has blood spaces which surround the villi.

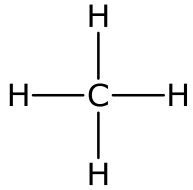
<u>Functions of the placenta in human female</u>:

- Nutrients and oxygen are received by the foetus from the mother's blood.
- The foetus gives away waste products and carbon dioxide to the mother's blood for excretion.

21. Certain compounds contain only carbon and hydrogen. So, these organic compounds are called hydrocarbons.

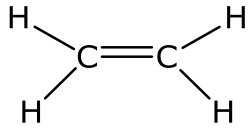
General formula for the homologous series of alkanes = C_nH_{2n+2}

First member of the alkane family is methane.



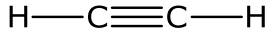
General formula for the homologous series of alkenes = C_nH_{2n}

First member of the alkene family is ethene.



General formula for the homologous series of alkynes = C_nH_{2n-2}

First member of the alkyne family is ethyne.



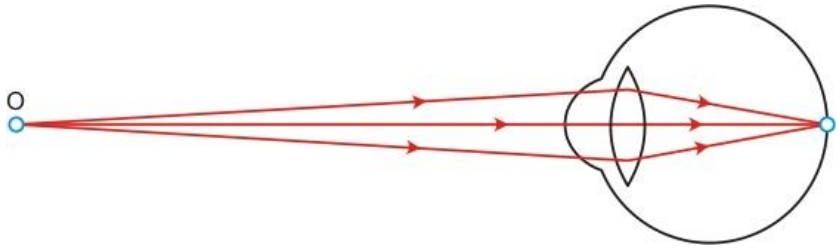
Catalytic hydrogenation is the reaction used to convert alkenes to alkanes.

$$CH_2{=}CH_2 + H_2 \xrightarrow[300^oC]{\text{Nickel}} C_2H_6$$

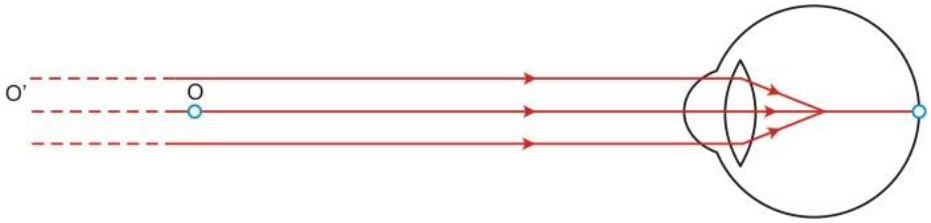
22.

(a) This defect may arise due to excessive curvature of the eye lens or elongation of the eyeball.

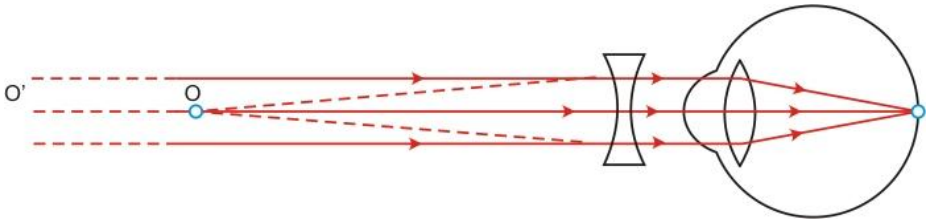
(i) A person with this defect has the far point nearer than infinity. Such a person may see clearly up to a distance of a few metres.



In a myopic eye, the image of a distant object is formed in front of the retina and not at the retina itself.



(ii) This defect can be corrected by using a concave lens of suitable power. A concave lens of suitable power will bring the image back onto the retina and thus the defect is corrected.



(b) Given: Focal length f = –5 m (∵ it is a concave lens)

Power, $P = \frac{1}{f\ (\text{in m})} = \frac{1}{(-5)} = -0.2D$

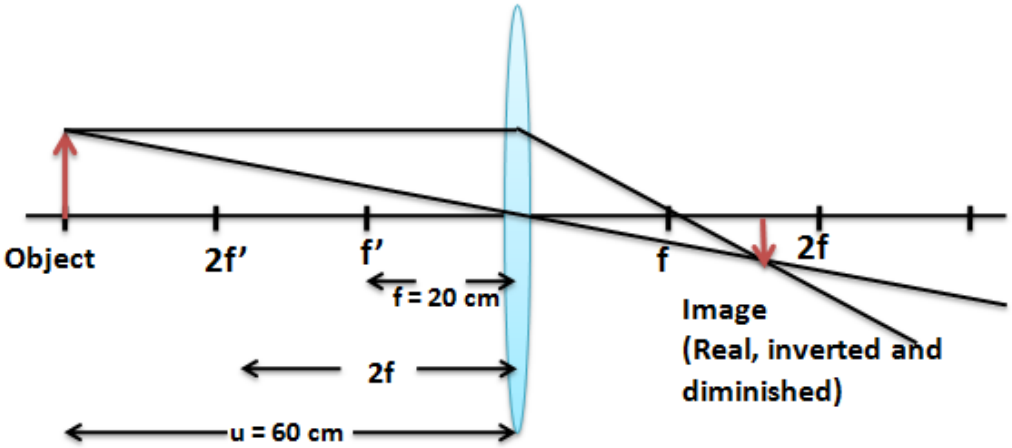
The negative sign indicates that it is a diverging lens or concave lens.

23.

(a) When the object distance and the image distance are the same, it means that the object is placed at 2f or the image is formed at 2f. From the table, it is clear that 2f = 40 cm. Therefore, the focal length of the convex lens is 20 cm.

(b) Serial number 6 is incorrect. Given that the object is placed at 15 cm which is between the focal length and the lens. Thus, the image should be formed on the same side as the object. The data given in the observation serial number 6 does not satisfy the condition.

(c)



Magnification, $m = \frac{v}{u}$

Let us consider the third observation where

u = –40 cm and v = 40 cm

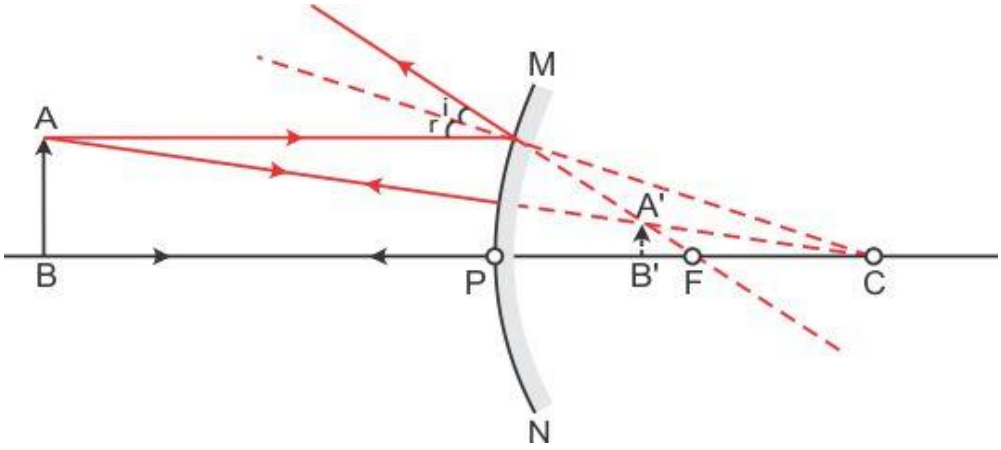
$\therefore m = \frac{v}{u} = \frac{40}{-40}$

$\therefore m = -1$

24.

(a) A convex mirror always forms a diminished, erect and virtual image of the object placed in front of it.

Position of object	Position of image	Size of image	Nature of image
Between infinity and the pole of the mirror	Between P and F behind the mirror	Diminished	Virtual and erect



Use of a convex mirror:

i. Convex mirrors are commonly used as rear view mirrors in vehicles.

ii. They are preferred because they always give an erect image, although diminished. Also, they have a wider field of view as they are curved outwards. Thus, convex mirrors enable the driver to view a much larger area than would be possible with a plane mirror.

(b) The radius of curvature of a spherical mirror is the radius of the sphere of which the reflecting surface of the spherical mirror is a part and represented by R.

Radius of curvature R = 24 cm

Radius of curvature = 2 $\times$ focal length

i.e. R = 2 f

24 = 2 $\times$ f

$f = \frac{24}{2} = 12$

f = 12 cm

Section B

25. (A) y, p, z

The angle between the incident ray and the normal is known as the angle of incidence, and the angle between the emergent ray and the normal is known as the angle of emergence. The emergent ray is bent at an angle with the direction of the incident ray. This angle is called the angle of deviation.

26. (B) $\angle i = \angle e > \angle r$

Because the emergent ray is parallel to the incident ray, the angle of incidence is equal to the angle of emergence. The refracted ray travels from a rarer medium to a denser medium (considering the first refraction); it bends towards the normal. Thus, the angle of incidence is greater than the angle of refraction. If we consider the second refraction, then light travels from a denser medium to a rarer medium, due to which it bends away from the normal after refraction. So, in this case, the angle of refraction is again less than the angle of emergence.

27. (D) Device X is a convex lens and device Y is a concave mirror, whose focal lengths are 20 cm and 25 cm respectively.

Device X is a convex lens and device Y is a concave mirror whose focal lengths are 20 cm and 25 cm, respectively. A parallel ray of light incident on a concave mirror gets reflected, and the image is seen on a screen placed before it. A parallel ray of light incident on a convex lens converges to a point.

28. (B) Inverted and diminished

When the object is at infinity, the distance of the image from the lens will be equal to the focal length of the lens.

29. (C) The outer surface of the beaker has become hot.

When 20% NaOH solution was added to the beaker containing vegetable oil, it was observed that the beaker's surface was warm when touched.

A whitish suspension was formed by heating the mixture of vegetable oil and 20% NaOH solution.

30. (D) Formation of bubbles of a colourless and odourless gas.

$NaHCO_3 + HC_2H_3O_2 \rightarrow NaC_2H_3O_2 + H_2O + CO_2$

There is double displacement in which acetic acid reacts with sodium bicarbonate to form sodium acetate and carbonic acid.

$NaHCO_3 + HC_2H_3O_2 \rightarrow NaC_2H_3O_2 + H_2CO_3$

Carbonic acid is unstable and undergoes a decomposition reaction to produce carbon dioxide gas.

$H_2CO_3 \rightarrow H_2O + CO_2$

Carbon dioxide escapes from the solution as bubbles.

31. (D) Calcium sulphate, calcium chloride

Hard water can be prepared by dissolving sulphates, chlorides or bicarbonate salts of Ca^{2+} or Mg^{2+} ions.

32. (B) Gram, Groundnut, Pea

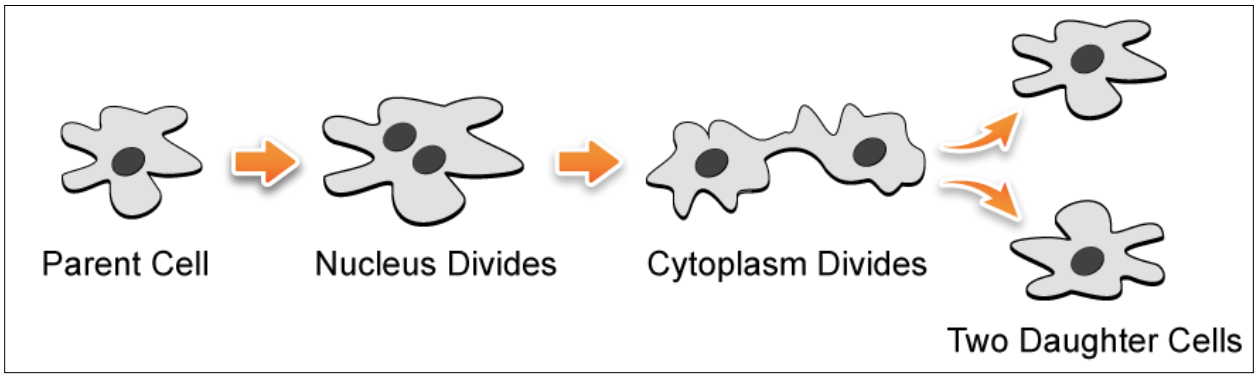
Dicot seeds have two cotyledons.

33. (C) Radish and Carrot

The structures which are same in structure and origin but are modified to perform different functions are called homologous structures.

Although radish and carrot store food and are used as food, the nutrients which each provide are different.

34. Binary fission in amoeba:



35.

(a) As the candle is moved towards the lens, the image distance increases. Thus, the student moves the lens away from the screen to focus the image.

(b) The size of the image increases when the object is moved towards the lens.

(c) Intensity decreases.

(d) When the candle is moved very close to the lens, no image is formed on the screen. A virtual image is formed behind the candle on the same side of the screen.

36. Chemicals required: Vegetable oil, common salt and 20% sodium hydroxide solution

When a red litmus paper is dipped in the reaction mixture, the paper changes its colour to blue. Hence, the reaction mixture of the saponification reaction is basic in nature.

CBSE
Class X Science (All India)
Board Paper – 2016 (Set 3)
Term II

Time allowed: 3 hours **Maximum Marks: 90**

General Instructions:

1. The question paper comprises of **two** Sections**, A and B**. You are to attempt both the sections.
2. All questions are **compulsory**.
3. There is no choice in any of the questions.
4. All questions of **Section A** and all questions of **Section B** are to be attempted separately.
5. Question numbers **1** to **3** in Section A are one-mark questions. These are to be answered in one word or in one sentence.
6. Question numbers **4** to **6** in Section A are two-marks questions. These are to be answered in about 30 words each**.**
7. Question numbers **7** to **18** in Section A are three-marks questions. These are to be answered in about 50 words each**.**
8. Question numbers **19** to **24** in Section A are five-marks questions. These are to be answered in about 70 words each**.**
9. Question numbers **25** to **33** in Section B are multiple choice questions based on practical skills. Each question is a one-mark question. You are to select one most appropriate response out of the four provided to you.
10. Question numbers **34** to **36** in Section B are two-marks questions based on practical skills. These are to be answered in brief.

Section A

1. Write the name and structure of an aldehyde with four carbon atoms in its molecule. [1]

2. List two functions ovary of human female reproductive system. [1]

3. In a food chain of frog, grass, insect and snake, assign trophic level to frog. [1]

4. The refractive indices of glass and water with respect to air are 3/2 and 4/3 respectively. If speed of light in glass is 2×10^8 m/s, find the speed of light in water. [2]

5. List four stakeholders which may be helpful in the conservation of forests. [2]

6. The construction of large dams leads to social and environmental problems. List two problems of each category. [2]

7. The position of eight elements in the Modern Periodic Table is given below where atomic numbers of elements are given in the parenthesis. [3]

Period No.		
2	Li(3)	Be(4)
3	Na(11)	Mg(12)
4	K(19)	Ca(20)
5	Rb(37)	Sr(38)

(i) Write the electronic configuration of Ca.
(ii) Predict the number of valence electrons in Rb.
(iii) What is the number of shells in Sr?
(iv) Predict whether K is a metal or a non – metal.
(v) Which one of these elements has the largest atom in size?
(vi) Arrange Be, Ca, Mg and Rb in the increasing order of the size of their respective atoms.

8. Write three different chemical reactions showing the conversion of ethanoic acid to sodium ethanoate. Write balanced chemical equation in each case. Write the name of the reactants and the products other ethanoic acid and sodium ethanoate in each case. [3]

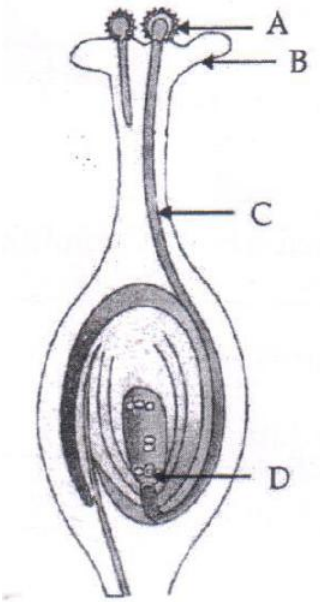
9. An element 'X' belong to 3rd period and group 13 of the Modern Periodic Table. [3]
(a) Determine the valence electrons and the valency of 'X'.
(b) Molecular formula of the compound formed when 'X' reacts with an element 'Y' (atomic number = 8).
(c) Write the name and formula of the compound formed when 'X' combines with chlorine.

10. An element 'X' has mass number 35 and number of neutrons 18. Write atomic number and electronic configuration of 'X'. Also write group number, period number and valency of 'X'. [3]

11. [3]

(a) List two reasons for the appearance of variations among the progeny formed by sexual reproduction.

(b)



(i) Name the part marked 'A' in the diagram.

(ii) How dose 'A' reachese part 'B'?

(iii) State the importance of the part 'C'.

(iv) What happens to the part marked 'D' after fertilisation is over?

12. Define reproduction. How does it help in providing stability to the population of species? [3]

13. Explain the term "Regeneration" as used in relation to reproduction of organisms. Describe briefly how regeneration is carried out in multicellular organisms like Hydra. [3]

14. "Two areas of study namely 'evolution' and 'classification' are interlinked". Justify this statement. [3]

15. How do Mendel's experiment show that traits are inherited independently? [3]

16. The activities of man had adverse effects on all forms of living organisms in the biosphere. Unlimited exploitation of nature by man disturbed the delicate ecological balance between the living and non-living components of the biosphere. The unfavourable conditions created by man himself threatened the survival not only of himself but also of the entire living organisms on the mother earth. One of your classmates is an active member of 'Eco club' of your school which is creating environmental awareness amongst the school

students, spreading the same in the society and also working hard for preventing environmental degradation of the surroundings. [3]

(a) Why is it necessary to conserve our environment?

(b) State the importance of green and blue dust-bins in the safe disposal of the household waste.

(c) List two values exhibited by your classmate who is an active member of Eco-club of your school.

17. The image formed by a spherical mirror is real, inverted and is of magnification -2. If the image is at a distance of 30 cm from the mirror, where is the object placed? Find the focal length of the mirror. List two characteristics of the image formed if the object is moved 10 cm towards the mirror. [3]

18. Describe an activity to show that colours of white light splitted by a glass prism can be recombined to get white light by another identical glass prism. Also draw ray diagram to show the recombination of the spectrum of white light. [3]

19. It is desired to obtain an erect image of an object, using concave mirror of focal length of 12 cm. [5]

(i) What should be the range of distance of an object placed in front of the mirror?

(ii) Will the image be smaller or larger than the object? Draw ray diagram to show the formation of image in this case.

(iii) Where will the image of this object be, if it is placed 24 cm in front of the mirror? Draw ray diagram for this situation also justify your answer.
Show the positions of pole, principal focus and the centre of curvature in the above ray diagrams.

20. Define evolution. How does it occur? Describe how fossils provide us evidences in support of evolution. [5]

21. What is placenta? Describe its structure. State its functions in case of a pregnant human female. [5]

22. A carbon compound 'P' on heating with excess conc. H_2SO_4 forms another carbon compound 'Q' which on addition of hydrogen in the presence of nickel catalyst forms a saturated carbon compound 'R'. One molecule of 'R' on combustion forms two molecules of carbon dioxide and three molecules of water. Identify P, Q and R and write chemical equations for the reactions involved. [5]

23. What is atmospheric refraction? Use this phenomenon to explain the following natural events: [5]

(a) Twinkling of stars

(b) Advanced sun-rise and delayed sun-set.

Draw diagrams to illustrate your answers.

24. [5]

(a) Define focal length of a divergent lens.

(b) A divergent lens of focal length 30 cm forms the image of an object of size 6 cm on the same side as the object at a distance of 15 cm from its optical centre. Use lens formula to determine the distance of the object from the lens and the size of the image formed.

(c) Draw a ray diagram to show the formation of image in the above situation.

Section B

25. A student while observing an embryo of a pea seed in the laboratory listed various parts of the embryo as given below: [1]

Testa, Tegmen, Radicle, Plumule, Micropyle, Cotyledon.

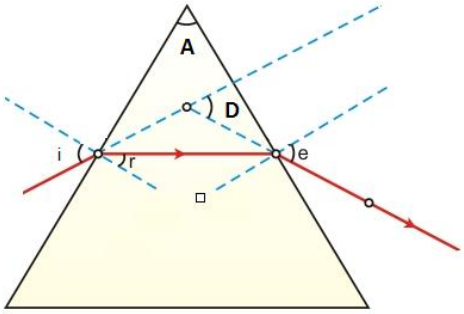
On examining the list the teacher remarked that only three parts are correct. Select three correct parts from the above list:

(a) Testa, Radicle, Cotyleddon
(b) Tegmen, Radicle, Micropyle
(c) Cotyledon, Plumule, Testa
(d) Radicle, Cotyledon, Plumule

26. If you are asked to select a group of two vegetables, out of the following, having homologous structures which one would you select? [1]

(a) Carrot and radish
(b) Potato and sweet potato
(c) Potato and tomato
(d) Lady finger and potato

27. In the following ray diagram the correctly marked angle are: [1]



(a) ∠i and ∠e
(b) ∠A and ∠D
(c) ∠i, ∠e and ∠D
(d) ∠r, ∠A and ∠D

28. In your laboratory you trace the path of light rays through a glass slab for different values of angle of incidence (∠i) and in each case measure the values of the corresponding angle of refraction (∠r) and angle of emergence (∠e). On the basis of your observations your correct conclusion is: [1]

(a) ∠i is more than ∠r, but nearly equal to ∠e
(b) ∠i is less then ∠r, but nearly equal to ∠e
(c) ∠i is more than ∠e, but nearly equal to ∠r
(d) ∠i is less than ∠e, but nearly equal to ∠r

29. To determine the approximate value of the focal length of a given concave mirror, you focus the image of a distant object formed by the mirror on a

screen. The image obtained on the serene, as compared to the object is always: [1]

(a) Laterally inverted and diminished
(b) Inverted and diminished
(c) Erect and diminished
(d) Erect and highly diminished

30. Suppose you have focused on a screen the image of candle flame placed at the farthest end of the laboratory table using a convex lens. If your teacher suggests you to focus the parallel rays of the sun, reaching your laboratory table, on the same screen, what you are expected to do is to move the: [1]

(a) lens slightly towards the screen
(b) lens slightly away from the screen
(c) lens slightly towards the sun
(d) lens and screen both towards the sun

31. For preparing soap in the laboratory we require an oil and a base. Which of the following combinations of an oil and a base would be best suited for the preparation of soap? [1]

(a) Castor oil and calcium hydroxide
(b) Turpentine oil and sodium hydroxide
(c) Castor oil and sodium hydroxide
(d) Mustard oil and calcium hydroxide

32. A student puts a drop of reaction mixture of a saponification reaction first a blue litmus paper and then on a red litmus paper. He may observe that: [1]

(a) There is no change in the blue litmus paper and the red litmus paper turns white.
(b) There is no change in the red litmus paper and the blue litmus paper turns red.
(c) There is no change in the blue litmus paper and the red litmus paper turns blue.
(d) No change in colour is observed in both the litmus papers.

33. In the neighbourhood of your school, hard water required for an experiment is not available. Select from the following group of salts available in your school, a group each member of which, if dissolved in distilled water, will make it hard: [1]

(a) Sodium chloride, calcium chloride
(b) Potassium chloride, sodium chloride
(c) Sodium chloride, magnesium chloride
(d) Calcium chloride, magnesium chloride

34. A student is observing a permanent slide showing sequentially the different stages of asexual reproduction taking place in yeast. Name this process and draw diagrams, of what he observes, in a proper sequence. [2]

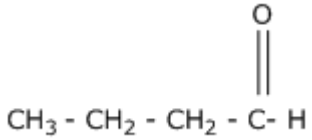
35. An object of height 2.5 cm is placed at a distance of 15 cm from the optical centre 'O' of a convex lens of focal length 10 cm. Draw a ray diagram to find the position and size of the image formed. Mark optical 'O', principal focus F and height of the image on the diagram. [2]

36. A student adds a spoon full of powdered sodium hydrogen carbonate to a flask containing ethanoic acid. List two main observations, he must note in his note book, about the reaction that takes place. Also write chemical equation foe the reaction. [2]

CBSE
Class X Science
Board Paper – 2016 (Set 3) Solution
Term II

SECTION A

1. 1-butanal



2. Two functions of the ovaries of the human female reproductive system are

- To produce ova, which are female gametes
- To secrete the female hormones oestrogen and progesterone

3. Grass ⟶ Insect ⟶ Frog ⟶ Snake

Frog is a secondary consumer.

4.

Given: $n_g = 3/2$ and $n_w = 4/3$

$$\text{Refractive index of glass, } n_g = \frac{\text{Speed of light in air}}{\text{Speed of light in glass}}$$

$$\frac{3}{2} = \frac{\text{Speed of light in air}}{2 \times 10^8}$$

$$\therefore \text{Speed of light in air} = \frac{3}{2} \times 2 \times 10^8 = 3 \times 10^8 \text{m/s}$$

$\therefore$ Thus, the speed of light in air is 3×10^8 m/s.

5. Four stakeholders which may help in the conservation of forests are

- The Forest Department of the Government which owns the forest land and controls the resources from forests
- People who live in and around the forest and are dependent on forest produce to lead their lives
- Industrialists who use various forest products for their factories
- Forest and wildlife activists who want to see forests in their original form

6.

- Social problems arise because the construction of dams causes the displacement of a large number of tribals and peasants who are then rendered homeless. They are neither given sufficient compensation or rehabilitation nor do they get any benefits from these projects.

- Construction of dams leads to several environmental problems such as deforestation and loss of biodiversity because large areas of forest land get submerged in water leading to an ecological imbalance.

7.

(i) Electronic configuration of Ca (20): 2, 8, 8, 2
(ii) Rb belongs to Group 1, and all Group 1 elements have one valence electron.
(iii) Sr belongs to Period 5, and thus, it has five shells.
(iv) K is a metal with electronic configuration 2, 8, 8, 1. Thus, it will donate its one electron to acquire the noble gas configuration.
(v) The atomic size increases down the group and decreases across a period. Rb is the element which has the largest atomic size.
(vi) Be < Mg < Ca < Rb

8. Three different chemical reactions showing the conversion of ethanoic acid to sodium ethanoate:

$$2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$$

$$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$$

$$CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O + CO_2$$

9. Period of X = 3
Group of X = 13
Atomic number of X = 13
Electronic configuration: 2, 8, 3

(a) Number of valence electrons = 3 and valency = 3
(b) Atomic number of Y = 8
Electronic configuration = 2, 6
Valency of Y = 2
Molecular formula of the compound formed when 'X' reacts with an element 'Y' is X_2Y_3.
(c) Atomic number of Cl = 17
Electronic configuration = 2, 8, 7
Valency of Y = 1
Molecular formula of the compound formed when 'X' reacts with an element 'Y' is XCl_3.

10. Mass number of X = 35
Number of neutrons = 18
Atomic number = Mass number – Number of neutrons
= 35 – 18 = 17

Electronic configuration of X = 2, 8, 7

Group of X = 17

Period of X = 3

Valency of X = 1

11.

(a) Two reasons for the appearance of variations among the progeny formed by sexual reproduction are

- Sexual reproduction results in new combinations of genes which are brought together during the formation of gametes.
- Gene combinations are different in gametes.

(b)

(i) Part 'A' labelled is pollen grain.

(ii) Part 'B' is stigma. The pollen grain reaches the stigma during pollination.

(iii) Part 'C' is the pollen tube. The pollen tube carries the gametes to the embryo sac for fertilisation.

(iv) Part 'D' is the egg cell. After fertilisation with the male gametes, the egg cell forms the zygote.

12. Reproduction is the ability of living organisms to produce living beings similar to them.

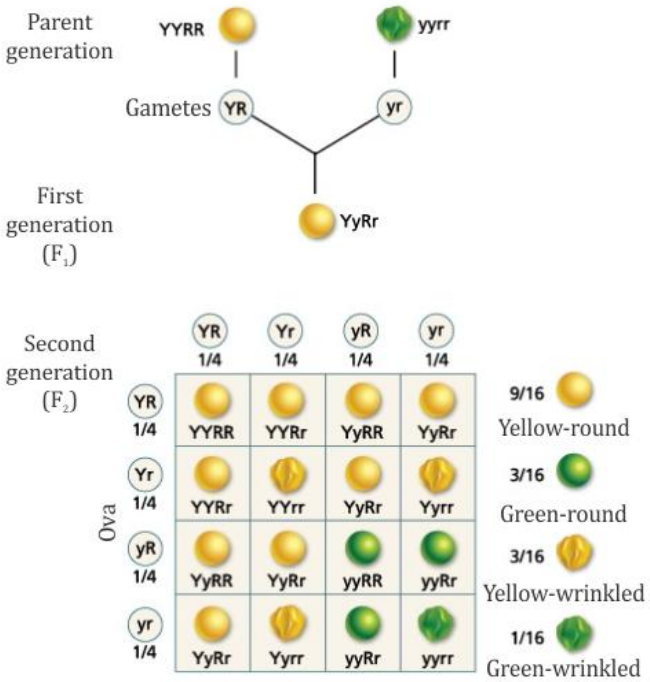
Reproduction maintains the number of chromosomes specific to a species in each generation. Multicellular organisms have specialised cells in their gonads, which have only half the number of chromosomes and half the amount of DNA as compared to non-reproductive body cells. So, when these germ cells from 2 different individuals combine during sexual reproduction to form a new individual, it results in the re-establishment of the number of chromosomes and the DNA content in the new generation. Thus, it provides stability to the population of a species.

13. Regeneration is the ability of organisms to generate lost or damaged parts of the body.

When a hydra is bisected anywhere in the upper 7^{th} or 8^{th} part of the body column, the upper half will regenerate a foot at its basal end and the lower half will regenerate a head at its apical end; each half generates the organ which it is missing. The regeneration is precise, and the head and foot are always formed specifically at the apical and basal ends, respectively.

14. All living things are identified and categorised on the basis of their body design in form and function. After a certain body design comes into existence, it will shape the effects of all other subsequent design changes simply because it already exists. So, characteristics which came into existence earlier are likely to be more basic than characteristics which have come into existence later. This means that the classification of life forms will be closely related to their evolution. On connecting this idea of evolution to classification, it is seen that some groups of organisms with ancient body designs have not changed very much. However, other groups of organisms have acquired their particular body designs relatively recently. Because there is a possibility that complexity in design will increase over evolutionary time, it may not be wrong to say that older organisms are simpler, while younger organisms are more complex.

15. Mendel carried out dihybrid crosses by crossing two pea plants differing in contrasting traits of two characters. For example, he crossed a pea plant having yellow colour and round seed characters with another pea plant bearing green colour and wrinkled seed characters. In the F_2 generation, he obtained pea plants with two parental and two recombinant phenotypes as yellow round and green wrinkled (parental) and yellow wrinkled and green round (recombinant). This indicated that traits separated from their original parental combinations and got inherited independently.



16.

(a) It is necessary to conserve our environment because

- It helps in protecting the ozone layer.
- It helps in maintaining animal and human food chains.
- It provides us with many useful products such as medicines and wood.

(b) Disposal of household waste is carried out in green and blue bins, respectively. It will be very useful in the separate disposal of biodegradable and non-biodegradable wastes. This will also ensure the application of 3Rs—reduce, reuse and recycle.

(c) Two values exhibited are

- Creating environmental awareness among students and society.
- Working hard on prevention of environmental degradation of surroundings.

17.

Given : Magnification, $m = -2$

Distance of the image, $v = -30$ cm

Magnification, $m = -\frac{v}{u}$

$\therefore u = -\frac{v}{m} = -\frac{(-30)}{(-2)}$

$\therefore u = -15$ cm

Substituting these values in the mirror formula

$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

$= \frac{1}{(-30)} + \frac{1}{(-15)}$

$\frac{1}{f} = -\frac{1}{10}$

$\therefore f = -10$ cm

When the object is moved 10 cm towards the mirror the new position of the object is

$u' = -(15 - 10) = -5$ cm

Substituting the new value in the mirror formula

$\frac{1}{f} = \frac{1}{v} + \frac{1}{u'}$

$\frac{1}{v'} = \frac{1}{f} - \frac{1}{u'} = \frac{1}{10} - \frac{1}{(-5)}$

$\frac{1}{v'} = \frac{1}{10}$

$\therefore v' = 10$ cm

Thus, the image is located 10 cm behind the mirror.

And magnification, $m' = -\frac{v'}{u'} = -\frac{10}{(-5)}$

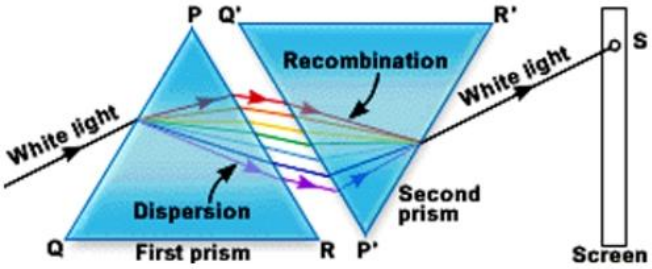
$m' = 2$

Since magnification is positive the image is erect and virtual.

Thus, the image is erect, virtual and magnified in nature.

18. The seven colours of a spectrum can be recombined to give back white light as

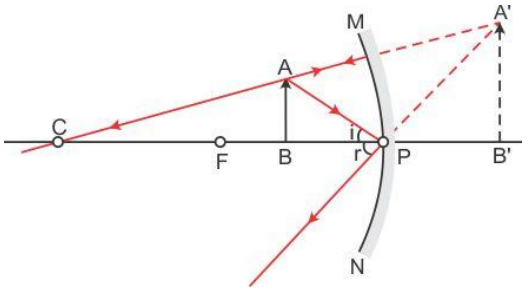
- Two identical glass prisms are placed such that their refracting surfaces are in opposite direction (placed inverted). When a beam of light is allowed to fall on the surface of one prism, a patch of ordinary white light is obtained on a screen placed behind the second prism.
- The first prism disperses the white light into seven coloured rays. The second prism receives all the seven coloured rays from the first prism and recombines them into original white light. This is because the refraction produced by the second prism is equal and opposite to that produced by the first prism. Hence, the light coming out of the second prism will be white.



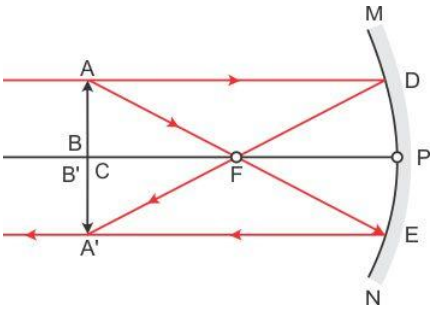
19.

(i) To obtain an erect image, the object should be placed within the focus, i.e. between the pole and the focus. Here, the focal length of the mirror is 12 cm. Hence, the object should be placed at a distance less than 12 cm.

(ii) The image will be larger than the object (enlarged).



(iii) Since f = 12 cm → Centre of curvature = 2f = 24 cm
For an object placed at a distance 24 cm, i.e. at the centre of curvature of a concave mirror, the image formed will be real, inverted and of the same size as that of the object.



20. Evolution is the formation of more complex organisms from pre-existing simpler organisms over a certain period. Accumulation of variation in genetic material forms the basis of evolutionary processes.

Fossils provide a unique view into the history of life by showing the forms and features of life in the past. Fossils tell us how species have changed across long periods of the Earth's history.

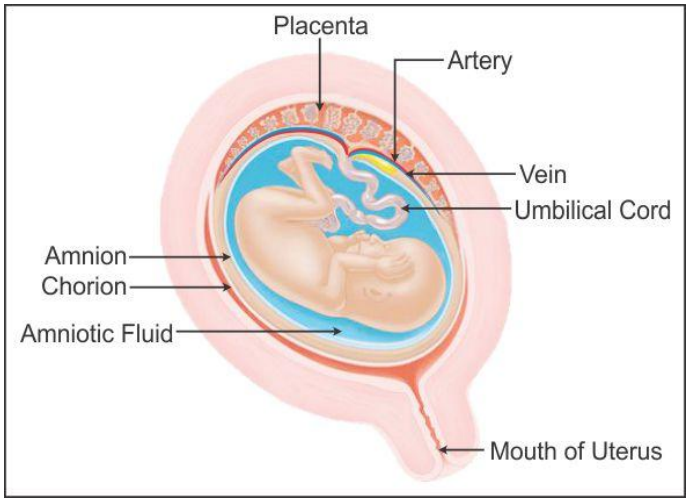
Importance of fossils in the evolutionary process:

- Some invertebrates living on the sea bed died and were buried in the sand.
- More sand was accumulated and formed sandstone under pressure.
- After millions of years, dinosaurs living in the area died and their bodies were buried in the mud.
- The mud got compressed into the rock, just above the rock containing earlier invertebrate fossils.
- Again millions of years later, the bodies of horse-like creatures dying in the area were fossilised in the rocks above the earlier rocks.
- Much later, because of erosion and water flow, some rocks wore out and exposed the horse-like fossils.

21. The placenta is an organ attached to the lining of the womb during pregnancy. The placenta is composed of both maternal tissue and tissue derived from the embryo. It contains blood spaces on the mother's side and villi on the embryo's side.

Functions of the placenta:

- It provides food and oxygen to the foetus.
- The foetus gives away waste products and carbon dioxide to the mother's blood for excretion.



22. $P \xrightarrow{Excess\ H_2SO_4} Q \xrightarrow{H_2/Nickel\ catalyst} R \xrightarrow{O_2} 2CO_2 + 3H_2O$

$P \xrightarrow{Excess\ H_2SO_4} Q$

$CH_3CH_2OH \xrightarrow{Excess\ H_2SO_4} CH_2 = CH_2$

$Q \xrightarrow{H_2/Nickel\ catalyst} R$

$CH_2 = CH_2 \xrightarrow{H_2/Nickel\ catalyst} CH_3 - CH_3$

$R \xrightarrow{O_2} 2CO_2 + 3H_2O$

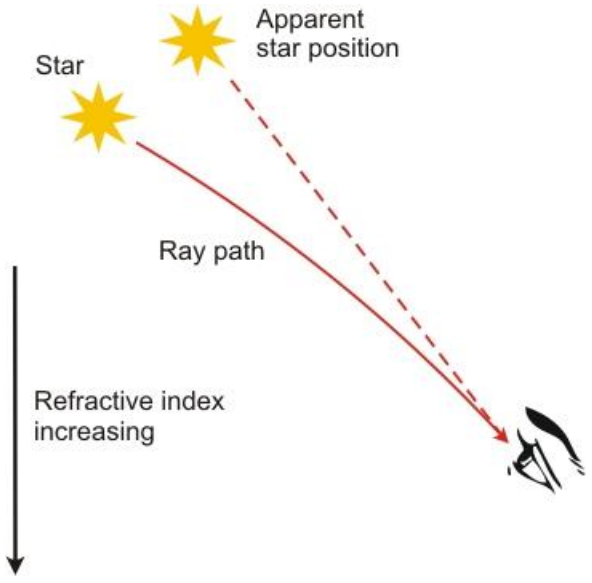
$CH_3 - CH_3 \xrightarrow{O_2} 2CO_2 + 3H_2O$

$CH_3CH_2OH \xrightarrow{Excess\ H_2SO_4} CH_2 = CH_2 \xrightarrow{H_2/Nickel\ catalyst} CH_3 - CH_3 \xrightarrow{O_2} 2CO_2 + 3H_2O$

P	Q	R
Ethanol	Ethene	Ethane

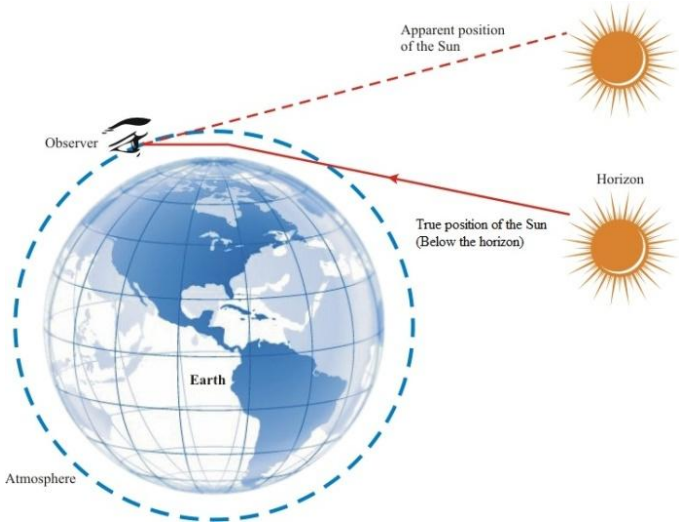
23.

(a) Stars emit light on their own; when this light travels through the Earth's atmosphere which has variable optical density, the continuously changing atmosphere refracts the light from the stars in different amounts from one moment to the next. The light seems to be bright and dim as it keeps changing because of continuous refraction through the different layers of the atmosphere of the Earth. Hence, we say light twinkles at night.



(b) The sunrise is advanced because of the atmospheric refraction of sunlight. An observer on the Earth sees the Sun two minutes before the Sun reaches the horizon. A ray of sunlight entering the Earth's atmosphere follows a curved path because of atmospheric refraction before reaching the Earth. This happens because of a gradual variation in the refractive index of the

atmosphere. For an observer on the Earth, the apparent position of the Sun is slightly higher than the actual position. Hence, the Sun is seen before it reaches the horizon.



The increased atmospheric refraction of sunlight occurs also at sunset. In this case, the observer on the Earth continues to see the setting Sun for two minutes after the Sun has dipped below the horizon, thus delaying the sunset. The advanced sunrise and delayed sunset increase the duration of the day by four minutes.

24.

(a) The focal length of a diverging lens is half the value of its radius of curvature. Conventionally, the sign of the focal length of the diverging lens is taken as negative.

(b) Given:

f = −20 cm (It is a diverging lens.)

v = −15 cm (Image is formed on the same side of the lens.)

Using the lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\rightarrow \frac{1}{u} = \frac{1}{v} + \frac{1}{f}$$

$$= \frac{1}{(-15)} + \frac{1}{(-30)} = -\frac{1}{30}$$

$$\therefore u = -30 \text{ cm}$$

$$\text{Given: Height of the object, } h = 6 \text{ cm}$$

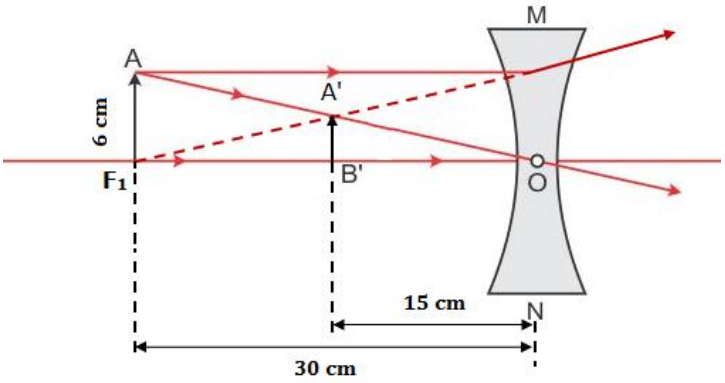
$$\text{Height of the image, } h' = ?$$

$$\text{Magnification, } m = \frac{v}{u} = \frac{h'}{h}$$

$$\therefore h' = h\frac{v}{u} = 6 \times \frac{(-15)}{(-30)}$$

$$\therefore h' = 3 \text{ cm}$$

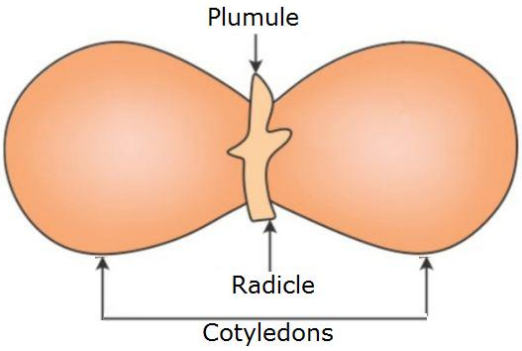
(c)



SECTION B

25. (d)

A dicot embryo consists of radicle, plumule and a pair of cotyledons. Testa, tegmen and micropyle are the parts of the seed coat.



26. (a)

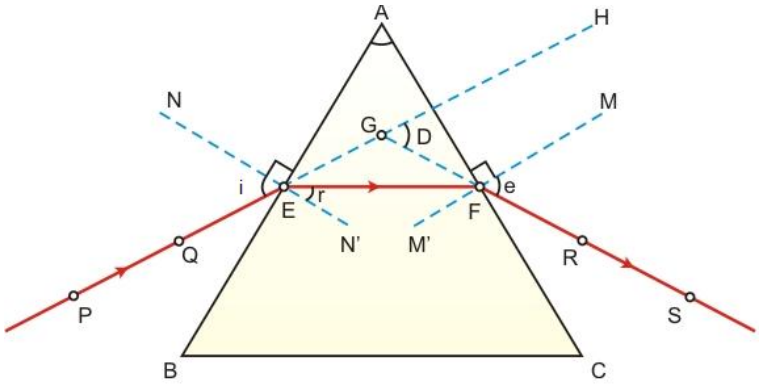
Homologous structures are fundamentally same in structure and origin but are modified to perform different functions in different organisms. They indicate common ancestry. From the given plants, carrot and radish are homologous structures because they both are underground roots. While potato is a stem, sweet potato is a root, tomato is a fruit and lady finger is a vegetable.

27. (d) ∠r, ∠A and ∠D

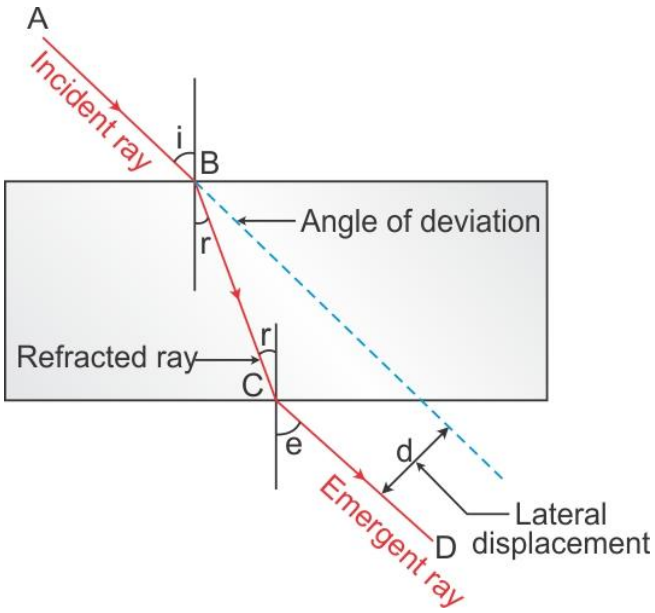
The angle between the normal and the incident ray is the angle of incidence.

The angle between the normal and the emergent ray is the angle of emergence.

The correctly marked angles are shown in the diagram below:



28. (a) $\angle i$ is less than $\angle r$ but nearly equal to $\angle e$.



On entering a glass slab, the incident light gets refracted. According to Snell's law, we get

$$\mu = \frac{\sin i}{\sin r}$$

For glass $\mu > 1$

$\therefore \sin r < \sin i$

or $r < i$

In refraction of light through a glass slab, the emergent ray is parallel to the incident ray. Thus, $\angle i = \angle e$.

29. (b) inverted and diminished

Images obtained on the screen are always diminished and inverted in nature.

30. (a) lens slightly towards the screen

To focus the parallel rays of the Sun, the lens should be slightly moved towards the screen.

31. (a) P and Q

Dissolving chloride salts of calcium or magnesium in distilled water will make the water hard and lather formation will take place with difficulty.

32. (c)

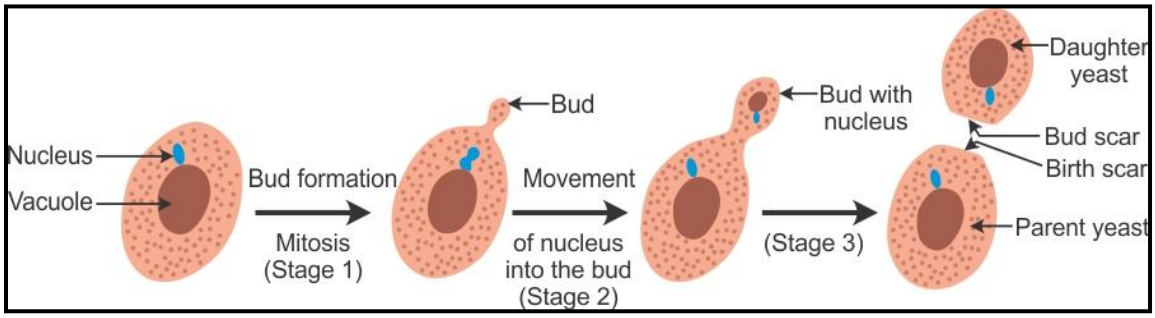
The molecules of soap are sodium or potassium salts of long chain carboxylic acids. So, when a student puts a drop of reaction mixture of a saponification reaction first on a blue litmus paper and then on a red litmus paper, he will

observe that there is no change in the blue litmus paper and the red litmus paper turns blue.

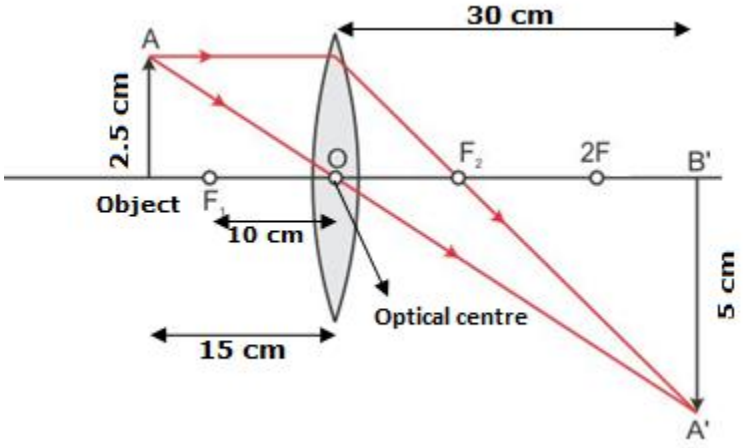
33. (d)

Dissolving chloride salts of calcium or magnesium in distilled water will make the water hard, and lather formation will take place with difficulty.

34. Yeast reproduces asexually by the process of budding. Different stages of budding as observed by the student are depicted below:



35. Ray diagram:



36. Two main observations about the reaction:

(i) Brisk effervescence of carbon dioxide which turns lime water milky.

(ii) It is a neutralisation reaction and heat is released.

$$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$$

CBSE
Class X Science
Board Paper – 2015 (Set 1)
Term II

Time allowed: 3 hours **Maximum Marks: 90**

General Instructions:

1. The question paper comprises of **two sections, A and B**. You are to attempt both the sections.
2. All questions are compulsory.
3. There is no choice in any of the questions.
4. All questions of **Section A** and all questions of **Section B** are to be attempted separately.
5. Question numbers **1** to **3** in **Section A** are **one-mark** questions. These are to be answered in one word or in one sentence.
6. Question numbers **4** to **6** in **Section A** are **two-marks** questions. These are to be answered in about 30 words each**.**
7. Question numbers **7** to **18** in **Section A** are **three-marks** questions. These are to be answered in about 50 words each**.**
8. Question numbers **19** to **24** in **Section A** are **five-marks** questions. These are to be answered in about 70 words each**.**
9. Question numbers **25** to **33** in **Section B** are multiple choice questions based on practical skills. Each question is a **one-mark** question. You are to select one most appropriate response out of the four provided to you.
10. Question numbers **34** to **36** in **Section B** are **two-marks** questions based on practical skills. These are to be answered in brief.

SECTION A

1. Write the number of covalent bonds in the molecule of ethane. [1]

2. Name the life process of an organism that helps in the growth of its population. [1]

3. What will be the amount of energy available to the organisms of the 2^{nd} trophic level of a food chain if the energy available at the first trophic level is 10,000 joules? [1]

4. The absolute refractive indices of glass and water are 4/3 and 3/2, respectively. If the speed of light in glass is 2×10^8 m/s, calculate the speed of light in [2]
(a) vacuum
(b) water

5. List two main causes of the pollution of water of the river Ganga. State how pollution and contamination of river water prove harmful for the health of the people of neighbouring areas. [2]

6. What is biodiversity? What will happen if biodiversity of an area is not preserved? Mention one effect of it. [2]

7. List two tests for experimentally distinguishing between an alcohol and a carboxylic acid and describe how these tests are performed. [3]

8. Draw the electron-dot structure for ethyne. A mixture of ethyne and oxygen is burnt for welding. In your opinion, why cannot we use a mixture of ethyne and air for this purpose? [3]

9. Two elements 'P' and 'Q' belong to the same period of the modern periodic table and are in Group 1 and Group 2, respectively. Compare their following characteristics in tabular form: [3]

(a) The number of electrons in their atoms
(b) The sizes of their atoms
(c) Their metallic character
(d) Their tendencies to lose electrons
(e) The formula of their oxides
(f) The formula of their chlorides

10. Taking the example of an element of atomic number 16, explain how the electronic configuration of the atom of an element relates to its position in the modern periodic table and how valency of an element is calculated on the basis of its atomic number. [3]

11. List six specific characteristics of sexual reproduction. [3]

12. What are chromosomes? Explain how in sexually reproducing organisms the number of chromosomes in the progeny is maintained. [3]

13. List four points of significance of reproductive health in a society. Name any two areas related to the reproductive health which have improved over the past 50 years in our country. [3]

14. Explain with an example for each, how the following provides evidences in favour of evolution in organisms: [3]

(a) Homologous organs
(b) Analogous organs
(c) Fossils

15. Explain the following: [3]

(a) Speciation

(b) Natural Selection

16. If the image formed by a mirror for all positions of the object placed in front of it is always erect and diminished, what type of mirror is it? Draw a ray diagram to justify your answer. Where and why do we generally use this type of mirror? [3]

17. What is meant by scattering of light? Use this phenomenon to explain why the clear sky appears blue or the Sun appears reddish at sunrise. [3]

18. Differentiate between biodegradable and non-biodegradable substances with the help of one example each. List two changes in habit that people must adopt to dispose non-biodegradable waste, for saving the environment. [3]

19. Both soap and detergent are some type of salts. What is the difference between them? Describe in brief the cleansing action of soap. Why do soaps not form lather in hard water? List two problems that arise due to the use of detergents instead of soaps. [5]

20. [5]

(a) Name the human male reproductive organ that produces sperms and also secretes a hormone. Write the functions of the secreted hormone.

(b) Name the parts of the human female reproductive system where

i. fertilisation takes place

ii. implantation of the fertilised egg occurs

Explain how the embryo gets nourishment inside the mother's body.

21. How do Mendel's experiments show that the [5]

(a) traits may be dominant or recessive

(b) traits are inherited independently

22. What is meant by power of a lens? Define its SI unit. [5]

You have two lenses A and B of focal lengths +10 cm and –10 cm, respectively. State the nature and power of each lens. Which of the two lenses will form a virtual and magnified image of an object placed 8 cm from the lens? Draw a ray diagram to justify your answer.

23. One half of a convex lens of focal length 10 cm is covered with a black paper. Can such a lens produce an image of a complete object placed at a distance of 30 cm from the lens? Draw a ray diagram to justify your answer.

A 4 cm tall object is placed perpendicular to its principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 15 cm. Find the nature, position and the size of the image. [5]

24. Write the importance of ciliary muscles in the human eye. Name the defect of vision that arises due to gradual weakening of the ciliary muscles. What types of lenses are required by the person suffering from this defect to see the objects clearly? [5]

Akshay, sitting in the last row in his class, could not see clearly the words write on the blackboard. When the teacher noticed it, he announced if any student sitting in the front row could volunteer to exchange his seat with Akshay. Salman immediately agreed to exchange his seat with Akshay. He could now see the words written on the blackboard clearly. The teacher thought it fit to send the message to Akshay's parents advising them to get his eyesight checked.

In the context of the above event, answer the following questions:

(a) Which defect of vision is Akshay suffering from? Which type of lens is used to correct this defect?

(b) State the values displayed by the teacher and Salman.

(c) In your opinion, in what way can Akshay express his gratitude towards the teacher and Salman?

SECTION B

25. What do we observe on pouring acetic acid on red and blue litmus papers? [1]

(A) Red litmus remains red and blue litmus turns red.
(B) Red litmus turns blue and blue litmus remains blue.
(C) Red litmus turns blue and blue litmus turns red.
(D) Red litmus becomes colourless and blue litmus remains blue.

26. While preparing soap a small quantity of common salt is generally added to the reaction mixture of vegetable oil and sodium hydroxide. Which one of the following may be the purpose of adding common salt? [1]

(A) To reduce the basic nature of the soap
(B) To make the soap neutral
(C) To enhance the cleansing power of the soap
(D) To favour the precipitation of the soap

27. A student takes about 4 ml of distilled water in four test tubes marked P, Q, R and S. He then dissolves in each test tube an equal amount of one salt in one test tube, namely sodium sulphate in P, potassium sulphate in Q, calcium sulphate in R and magnesium sulphate in S. After that he adds an equal amount of soap solution in each test tube. On shaking each of these test tubes well, he observes a good amount of lather (foam) in the test tube marked [1]

(A) P and Q
(B) Q and R
(C) P, Q and S
(D) P, R and S

28. A student was asked to observe and identify the various parts of an embryo of a red kidney bean seed. He identified the parts and listed them as under: [1]

I. Tegmen
II. Testa
III. Cotyledon
IV. Radicle
V. Plumule

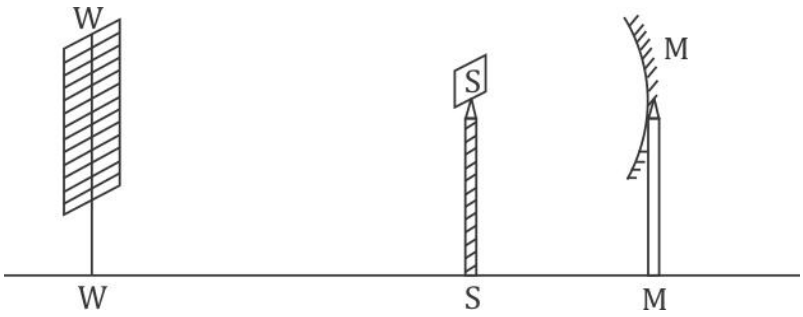
The correctly identified parts among these are

(A) I, II and III
(B) II, III and IV
(C) III, IV and V
(D) I, III, IV and V

29. Given below is the list of vegetables available in the market. Select from these the two vegetables having homologous structures:
Potato, sweet potato, ginger, radish, tomato, carrot, okra (Lady's finger) [1]

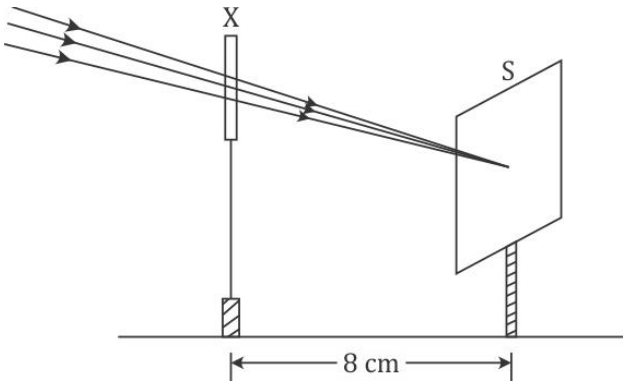
(A) Potato and sweet potato
(B) Radish and carrot
(C) Okra and sweet potato
(D) Potato and tomato

30. A student obtains a sharp image of the distant window (W) of the school laboratory on the screen (*S*) using the given concave mirror (M) to determine its focal length. Which of the following distances should he measure to get the focal length of the mirror? [1]



(A) MW
(B) MS
(C) SW
(D) MW–MS

31. A student used a device (X) to obtain/focus the image of a well illuminated distant building on a screen (*S*) as shown below in the diagram. Select the correct statement about the device (X). [1]



(A) This device is a concave lens of focal length 8 cm.
(B) This device is a convex mirror of focal length 8 cm.
(C) This device is a convex lens of focal length 4 cm.
(D) This device is a convex lens of focal length 8 cm.

32. A student traces the path of a ray of light through a rectangular glass slab for the different values of angle of incidence. He observes all possible precautions at each step of the experiment. At the end of the experiment, on analyzing the measurements, which of the following conclusions is he likely to draw? [1]

(A) $\angle i = \angle e < \angle r$

(B) $\angle i < \angle e < \angle r$

(C) $\angle i > \angle e > \angle r$

(D) $\angle i = \angle e > \angle r$

33. A student traces the path of a ray of light through a triangular glass prism for different values of angle of incidence. On analyzing the ray diagrams, which one of the following conclusions is he likely to draw? [1]

(A) The emergent ray is parallel to the incident ray.

(B) The emergent ray bends at an angle to the direction of the incident ray.

(C) The emergent ray and the refracted ray are at right angles to each other.

(D) The emergent ray is perpendicular to the incident ray.

34. When you add sodium hydrogen carbonate to acetic acid in a test tube, a gas liberates immediately with brisk effervescence. Name this gas. Describe the method of testing this gas. [2]

35. Students were asked to observe the permanent slides showing different stages of budding in yeast under high power of a microscope. [2]

(A) Which adjustment screw (coarse/fine) were you asked to move to focus the slides?

(B) Draw three diagrams in correct sequence showing budding in yeast.

36. A 4 cm tall object is placed on the principal axis of a convex lens. The distance of the object from the optical centre of the lens is 12 cm and its sharp image is formed at a distance of 24 cm from it on a screen on the other side of the lens. If the object is now moved a little away from the lens, in which way (towards the lens or away from the lens) will he have to move the screen to get a sharp image of the object on it again? How will the magnification of the image be affected? [2]

CBSE
Class X Science
Board Paper – 2015 (Set 1) Solution
Term II

SECTION A

1. There are seven covalent bonds—six C–H bonds and one C–C bond present in the molecule of ethane.

2. Reproduction helps in the growth of the population.

3. On applying the 10% law to the food chain, the organisms of the 2nd trophic level of the food chain will have 1000 joules of energy.

4. Refractive index of glass, $\eta_g = \frac{4}{3}$

$\therefore \eta_g = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in glass}}$

$\frac{4}{3} = \frac{\text{Speed of light in vacuum}}{2 \times 10^8}$

Speed of light in vacuum = $\frac{4 \times 2 \times 10^8}{3} = 2.6 \times 10^8$ m/s

Refractive index of water, $\eta_w = \frac{3}{2}$

$\eta_w = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in water}}$

$\frac{3}{2} = \frac{2.6 \times 10^8}{\text{Speed of light in water}}$

Speed of light in water = 1.73×10^8 m/s

Because the information provided is wrong, ideally the speed of light in vacuum is 3×10^8 m/s and the speed of light in water is 2.25×10^8 m/s.
The correct solution is

Refractive index of glass, $\eta_g = \frac{3}{2}$

Refractive index of water, $\eta_w = \frac{4}{3}$

Refractive index of glass, $\eta_g = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in glass}}$

$$\frac{3}{2} = \frac{\text{Speed of light in vacuum}}{2 \times 10^8}$$

$$\text{Speed of light in vacuum} = \frac{3 \times 2 \times 10^8}{2} = 3 \times 10^8 \text{ m/s}$$

$$\text{Refractive index of water, } \eta_w = \frac{4}{3}$$

$$\eta_w = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in water}}$$

$$\frac{4}{3} = \frac{3 \times 10^8}{\text{Speed of light in water}}$$

$$\text{Speed of light in water} = \frac{3 \times 3 \times 10^8}{4}$$

$$\text{Speed of light in water} = 2.25 \times 10^8 \text{ m/s}$$

5. The pollution of water of River Ganga is caused by the dumping of untreated sewage and industrial wastes into it.

Effects of pollution and contamination of river water:

(a) The contamination of river water leads to the growth of disease-causing microorganisms.

(b) The river water also becomes more acidic because of the discharge of chemical effluents by the industries which makes the soil acidic and affects the productivity of crops.

6. The variety of life forms found in a particular region forms its biodiversity.

Consequences if biodiversity of an area is not preserved:

(a) It can result in environmental disasters such as floods, forest fires and hurricanes.

(b) It can bring about soil erosion and desertification as a result of deforestation.

(c) It can bring about large-scale habitat losses and extinction of vulnerable animal and plant species.

(d) It results in sudden climatic changes and instability in the functioning of the ecosystem.

If biodiversity of an area is not preserved, it will lead to extinction of certain organisms from the trophic levels of a food chain which in turn will disturb the balance of the ecosystem.

7. Carboxylic acid can be distinguished from an alcohol by performing the following tests:

i. **Test with $NaHCO_3$ solution in water.**

On adding carboxylic acid to baking soda, carbon dioxide is liberated with brisk effervescence.

On adding a solution of baking soda to alcohol, no brisk effervescence occurs.

ii. **Test with blue litmus solution.**

Carboxylic acid turns blue litmus red.

There is no change in colour when a blue litmus solution is added to alcohol.

8.

Ethyne burns in air with a sooty flame because of incomplete combustion caused by the limited supply of air.

However, ethyne burns in oxygen with a clean flame with a temperature of 3000°C because of complete combustion.

This oxy-acetylene flame is used for welding.

Such a high temperature cannot be achieved without mixing oxygen.

Therefore, a mixture of ethyne and air is not used for welding.

9.

Characteristic	Comparison
(a) The number of electrons in their atoms	The number of electrons in Q is more compared to P (Q > P).
(b) The sizes of their atoms	The size of atom P is more than atom Q (P > Q).
(c) Their metallic character	P is more metallic than Q (P > Q).
(d) Their tendencies to lose electrons	P will lose electrons more easily than Q.
(e) The formula of their oxides	Oxide of P is P_2O. Oxide of Q is QO.
(f) The formula of their chlorides	Chloride of P is PCl. Chloride of Q is QCl_2.

10. Atomic number of the element = 16

Electronic configuration = 2, 8, 6

The period number is equal to the number of shells which starts filling up in it.

The atom of an element has three shells. So, the period number is 3.

The atom of an element has six valence electrons in the outermost shell. So, the group number of the element will be 16 (6 + 10).

The valency of an element is determined by the number of valence electrons present in the outermost shell. The atom of an element has six valence electrons in the outermost shell, so the valency of the element is 2.

11. Characteristics of sexual reproduction:

(a) Sexual reproduction takes place by the combination of special reproductive cells called sex cells.

(b) It is usually biparental and involves two parents.

(c) It involves the formation of sex cells called gametes followed by the fusion of the gametes.

(d) It is comparatively slower as compared to asexual reproduction.

(e) Meiosis and mitosis occur during gamete formation, while mitosis takes place during the development of the zygote.

(f) Variations appear because of a new combination of genes during crossing over.

(g) Fertilisation is internal in human beings.

12. Chromosomes are thread-like structures found in the nucleus at the time of cell division. They are made of proteins and DNA.

In sexually reproducing organisms, the gametes undergo meiosis, and hence, each gamete contains only half a set of chromosomes. When two gametes fuse, the zygote formed contains the full set of chromosomes. Hence, the formation of gametes by meiosis helps to maintain the number of chromosomes in the progeny.

13. Significance of reproductive health in a society:

(a) It prevents the spread of various sexually transmitted diseases such as AIDS, syphilis etc.

(b) Individuals with sound reproductive health produce better offspring which have better chances of survival.

(c) Better sex education and awareness helps to maintain the population and prevent population explosion.

(d) Unwanted and teen pregnancies can be avoided.

The reproductive health in India has improved tremendously over the past 50 years. The areas in which reproductive health have improved include

(a) Family planning: Better family planning has led to reduction in family size.

(b) Mortality rate: Mother and infant mortality rates have drastically reduced because of better health care facilities.

14.

(a) Homologous organs: Organs which have the same basic structure but different functions are called homologous organs.

Example: The forelimbs of a man, lizard, frog, bird and bat have the same basic design of bones, but they perform different functions. The forelimbs of a man are used for grasping, the forelimbs of a lizard are used for running, the forelimbs of a frog are used to prop up the front ends of the body when at rest and the forelimbs of a bird and bat are modified for flying. Hence, all these organisms use their forelimbs for performing different functions, but the forelimbs have originated from the same structural pattern.

(b) Analogous organs: Organs which have different basic structure but similar appearance and perform similar functions are called analogous organs.

Example: The wings of an insect and a bird have different structures, but they perform the same function of flying. Because the wings of insects and birds have different structures but perform similar functions, they are analogous organs.

(c) Fossils: The remains of dead animals or plants which lived in the remote past are known as fossils. The fossils provide evidence for evolution. For example, a fossil bird called *Archaeopteryx* looks like a bird, but it has many other features which are found in reptiles. It has feathered wings like those of birds but teeth and tail like those of reptiles. Therefore, *Archaeopteryx* is a connecting link between the reptiles and birds and hence suggests that birds have evolved from reptiles.

15.

(a) Speciation: The process by which new species develop from the existing species is known as speciation.

The factors which could lead to speciation are

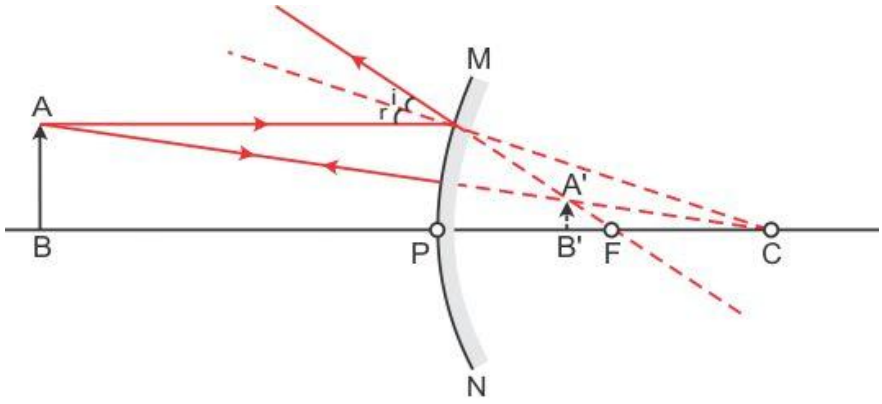
i. Geographical isolation of population caused by various types of barriers such as mountain ranges, rivers and seas. This leads to reproductive isolation because of which there is no flow of genes between separated groups of population.
ii. Genetic drift caused by drastic changes in the frequencies of particular genes by chance alone.
iii. Variations caused in individuals because of natural selection.

(b) Natural Selection: Natural selection is the process of evolution of a species whereby characteristics which help individual organisms to survive and reproduce are passed on to their offspring, and those characteristics which do not help are not passed on.

Charles Darwin proposed the theory of natural selection. According to him, nature selects the fittest.

There are always changes in the progeny when an animal reproduces by sexual reproduction. Example: If one of the progeny of deer is tall and the other is short, then the tall one with long legs will survive. Because the progeny with short height cannot reach the leaves of tall trees and cannot get food, they will starve and hence die. Thus, it proves the theory of natural selection.

16. A convex mirror always produces an erect and diminished image of the object placed in front of it irrespective of the position of the object.
Consider a case in which an object is placed anywhere between pole (P) and infinity in front of a convex mirror. The ray diagram is as shown:



A virtual, erect and diminished image will be formed behind the mirror between the pole (P) and focus (F) of the mirror.
As a convex mirror gives a wide field of view, it is used as a rear view mirror in vehicles. It enables the driver to view a much larger area of the traffic behind. It is also used as shop security mirrors.

17. The phenomenon in which a part of the light incident on a particle is redirected in different directions is called the scattering of light.
The molecules of air and other fine particles in the atmosphere have a size smaller than the wavelength of visible light. So, they are more effective in scattering light of shorter wavelengths at the blue end than light of longer wavelengths at the red end. Thus, when sunlight passes through the atmosphere, the fine particles in the air scatter blue colour (shorter wavelengths) more strongly than red. The scattered blue light enters our eyes, and hence, the clear sky appears blue.

At the time of sunrise and sunset, when the Sun is near the horizon, sunlight travels a greater distance through the atmosphere to reach us. During this, most of the shorter wavelengths present in it are scattered away from our line of sight by the molecules of air and other fine particles in the atmosphere. So, light reaching us directly from the rising or setting Sun consists mainly of the longer wavelength red colour because of which the Sun appears red. Thus, at sunrise and sunset, the Sun as well as the surrounding sky appears red.

18.

Biodegradable wastes	Non-biodegradable wastes
(a) Waste materials which can be broken down to non-poisonous substances in nature in due course of time by the action of microorganisms such as certain bacteria are called biodegradable wastes.	(a) Waste materials which cannot be broken down into non-poisonous or harmless substances in nature are called non-biodegradable wastes.
(b) Examples: Cattle dung, wool, paper, compost	(b) Examples: Plastics, polythene bags, metal articles, glass objects

<u>The changes which people must adopt to dispose non-biodegradable wastes for saving the environment are</u>

(a) Household waste, chemical waste and hospital waste should be disposed of by dumping them in the low-lying areas of the ground called a landfill.

(b) Broken plastic articles such as buckets, bowls, cups, plates etc. should be sent to plastic processing factories.

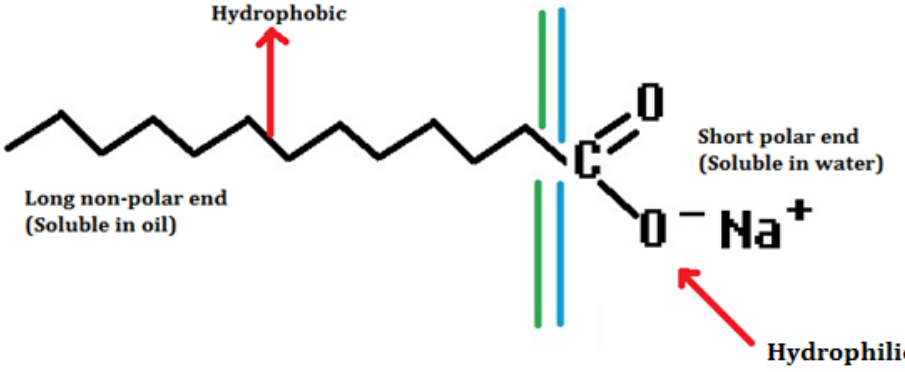
19. Difference between soap and detergent:

The molecules of soap are sodium or potassium salts of long-chain carboxylic acids.

Detergents are generally ammonium or sulphonate salts of long chain carboxylic acids.

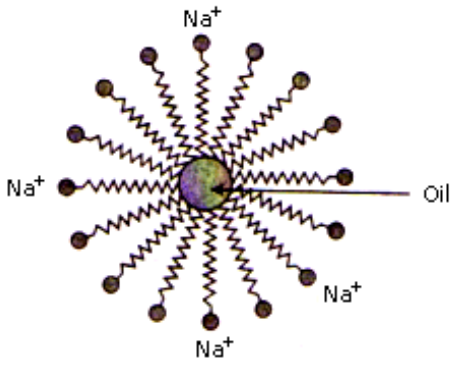
Cleansing action of soap can be described as follows:

- A soap molecule has a tadpole-shaped structure.
- At one end (long non-polar end) of the soap molecule is a hydrocarbon chain which is insoluble in water but soluble in oil.
- At the other end (short polar end) of the soap molecule, there is a carboxylate ion which is hydrophilic, i.e. water soluble but insoluble in oil.



- Soap on mixing with water forms a concentrated solution and causes foaming.
- The long non-polar end of soap gravitates towards and surrounds the dirt and absorbs the dust in it.
- The short polar end with the carboxylate ion repels the water away from the dirt.

- A spherical aggregate of soap molecules is formed in the soap solution in water and is called a micelle.
- Thus, the soap molecule dissolves the dirt and our clothes get clean.



Formation of Micelles

Soaps do not form lather in hard water because
Hard water contains calcium and magnesium salts. Soap molecules react with calcium and magnesium salts to form an insoluble precipitate called scum.
Two problems arise because of the use of detergents instead of soap:

i. Soaps are biodegradable, while detergents are non-biodegradable; hence, detergents accumulate in the environment and cause problems.
ii. Certain phosphate additives are added to detergents. These phosphate additives act as nutrients for algae which form a thick green scum over the river water and upset the animal life in the river.

20.

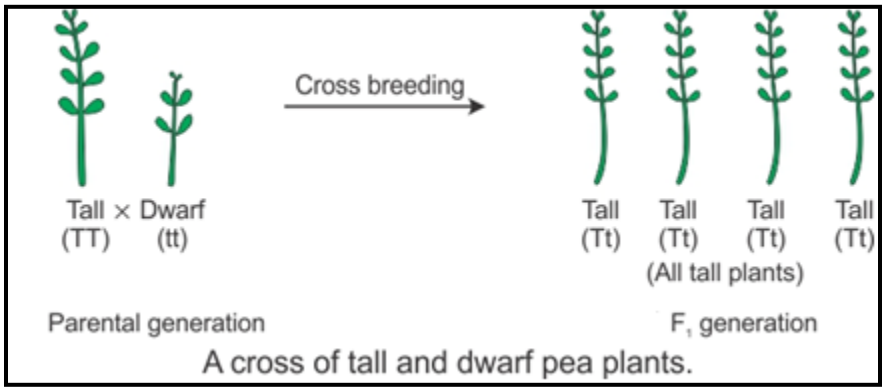
(a) Testes produce sperms and secrete a hormone called testosterone.
The function of testosterone is to control the development of male sex organs and male features such as a deeper voice, moustache, beard and more body hair as compared to females.

(b)

i. Fertilisation takes place in the oviduct or fallopian tubes.
ii. Implantation of the fertilised egg occurs in the uterus.
After implantation, a disc-like special tissue called placenta develops between the uterus wall and the embryo. The placenta helps in the exchange of nutrients, oxygen and waste products between the embryo and the mother. Thus, it provides nourishment to the growing embryo.

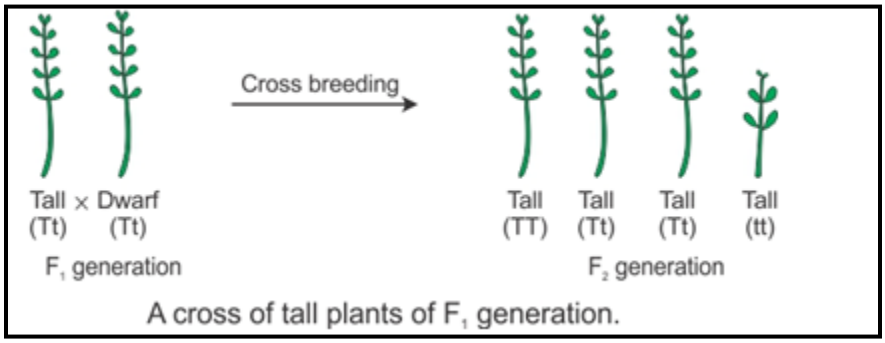
21.

(a) Mendel crossed pure bred tall pea plants with pure bred dwarf pea plants and found that only tall pea plants were produced in the first generation and there were no dwarf pea plants. He concluded that the first generation showed the traits of only one of the parent plants—tallness. The trait of the other parent plant—dwarfness—did not show up in the progeny of the first generation.



A cross of tall and dwarf pea plants.

He then crossed the tall pea plants obtained in the first generation (F_1 generation) and found that both tall plants and dwarf plants were obtained in the second generation (F_2 generation) in the ratio of 3:1. Mendel noted that the dwarf trait of the parent pea plant which disappeared in the first generation progeny reappeared in the second generation. In this way, Mendel's experiments with tall and dwarf pea plants showed that the traits may be dominant and recessive.



A cross of tall plants of F_1 generation.

(b) When Mendel crossed pure-bred tall pea plants with pure-bred dwarf pea plants, he found that only tall pea plants were produced in the F_1 generation. When he further crossed the tall pea plants of the F_1 generation, he found that the tall plants and dwarf plants were obtained in the ratio 3:1 in the F_2 generation. Mendel noted that all the pea plants produced in the F_2 generation were either tall or dwarf. There were no plants with intermediate height (or medium height) in between the tall and dwarf plants. In this way, Mendel's experiment showed that the traits (like tallness and dwarfness) are inherited independently. This is because if the traits of tallness and dwarfness had blended (or mixed up), then medium-sized pea plants would have been produced.

22. The power of a lens is defined as the reciprocal of its focal length. It is represented by the letter P. The power P of a lens of focal length f is given as

$$P = \frac{1}{f}$$

The SI unit of power is dioptre (D).

Given:

Focal length of lens A, $F_A = +10$ cm $= +0.1$ m

Focal length of lens B, $F_B = -10$ cm $= -0.1$ m

To calculate the power of lens A:

The power of lens A, $P = \frac{1}{F_A(\text{in metres})}$

$$P = \frac{1}{+0.1}$$

$\therefore$ P = +10 dioptre or +10 D

The positive sign indicates that it is a converging or convex lens.

To calculate the power of lens B:

The power of lens B, $P = \frac{1}{F_B(\text{in metres})}$

$$P = \frac{1}{-0.1}$$

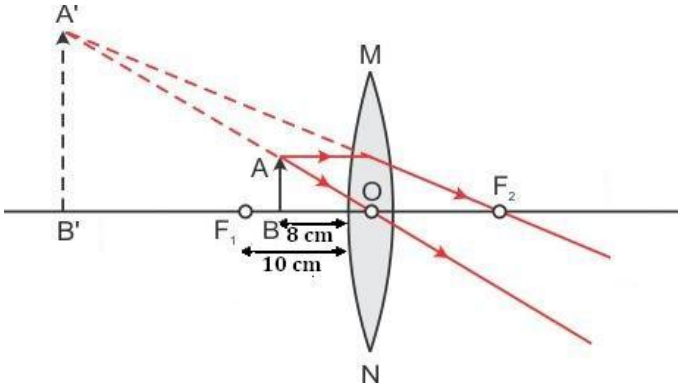
$\therefore$ P = −10 dioptre or −10 D

The negative sign indicates that it is a diverging or concave lens.

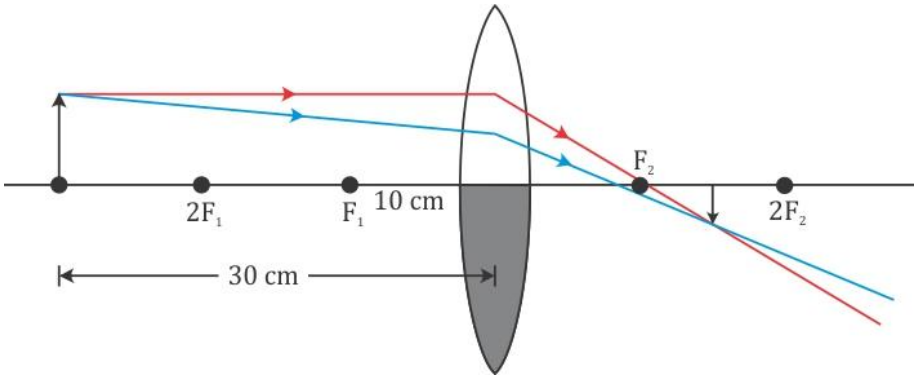
In a convex lens, when the object is placed between the pole and focus, the image formed is always virtual and magnified. On the other hand, a concave lens produces virtual, erect but diminished image.

Here the object is placed 8 cm from the lens which is at a distance less than the focal length, i.e. less than 10 cm. Thus, the 8 cm position of the object placed in front of the convex lens will produce a virtual and magnified image.

The diagram for the same is as shown below:



23. A convex lens can produce the complete image of the object even though half of the lens is covered. This is because light coming from the object can be refracted from the other half of the lens. However, the intensity of light will be reduced.



Given:

Height of the object = h = 4 cm

Focal length of the convex lens = f = 20 cm

Object distance = u = −15 cm

Using the lens formula, we get

$$\frac{1}{f}=\frac{1}{v}-\frac{1}{u}$$

$$\therefore \frac{1}{v}=\frac{1}{f}+\frac{1}{u}=\frac{1}{20}-\frac{1}{15}=\frac{3-4}{60}=\frac{-1}{60}$$

$$\therefore v=-60 \text{ cm}$$

Hence, the image is formed 60 cm in front of the lens on the same side as the object.

Because v is negative, we can say that the image is virtual.

From the magnification formula for the lens, we get

$$m=\frac{h'}{h}=\frac{v}{u}$$

$$\therefore h'=\frac{vh}{u}=\frac{-60\times 4}{-15}=16 \text{ cm}$$

Hence, the size of the image is h′ = 16 cm.

Because the height of the image is positive and greater than the height of the object, the image is erect and magnified.

So, we can conclude that the image is virtual, erect and magnified.

24. The curvature of the eye lens can be adjusted by the ciliary muscles. This changes the focal length of the lens. The defect which arises because of the gradual weakening of the ciliary muscles is known as presbyopia. A bifocal lens can be used to correct presbyopia.
Answers to the context questions:

(a) Akshay is not able to see from a far distance, so he is suffering from myopia or near-sightedness. A concave lens should be used to correct this defect.

(b) The teacher displayed presence of mind and pro-activeness, and she is of a considerate nature.
Salman displayed the virtue of friendship and is caring in nature.

(c) Akshay should thank the teacher and Salman in front of the entire class.

SECTION B

25. (A) Red litmus remains red and blue litmus turns red.

Acids turn blue litmus paper red. They have no effect on red litmus paper.

26. (D) To favour the precipitation of the soap

During saponification, the soap formed remains in a suspended form in the mixture. It is precipitated as a solid from the suspension by adding common salt to the suspension. This process is called salting out of soap.

27. (A) P and Q

Lather (foam) is formed by the reaction of soap solution with sodium sulphate and potassium sulphate in the test tubes P and Q, respectively. They are dissolved in water to give a neutral solution.

Sulphates, chlorides and bicarbonates of calcium and magnesium make the water hard. Thus, the lather is not formed in the test tubes R and S.

28. (C) III, IV and V

An embryo has two large cotyledons and one embryo axis or tigellum. The upper end of the embryo axis is the plumule, and the lower end of the embryo axis which projects beyond the cotyledons is the radical. The testa is the thick outer seed coat, and the tegmen is the inner transparent seed coat of seeds.

29. (B) Radish and carrot

Radish and carrot are homologous structures as these are modifications of the root. Tomato and okra are fruits. Potato is a modification of the stem.

30. (B) MS

The focal length of a concave mirror is the distance between its pole and principal focus. That is, the distance of the image formed (screen) from the concave mirror will be equal to the focal length of the concave mirror.

31. (D) This device is a convex lens of focal length 8 cm.

The incident rays after passing through the lens converge at the focus. So, the device 'X' is a converging or a convex lens. The distance between the lens and the screen gives the focal length of the lens.

32. (A) $\angle i = \angle e < \angle r$

In refraction through a rectangular slab, the angle of incidence is equal to the angle of emergence. Also, the angle of refraction should be smaller than the angle of incidence.

33. **(B)** The emergent ray bends at an angle to the direction of the incident ray.

In refraction of light through a glass prism, there is deviation or change in the path of light passing through the prism.

34. Carbon dioxide gas gets liberated.

When a pinch of sodium hydrogen carbonate is added to acetic acid in a test tube, a brisk effervescence is produced because of the liberation of carbon dioxide gas.

When this gas is passed through the lime water, it turns lime water milky. This shows that the gas liberated is carbon dioxide gas.

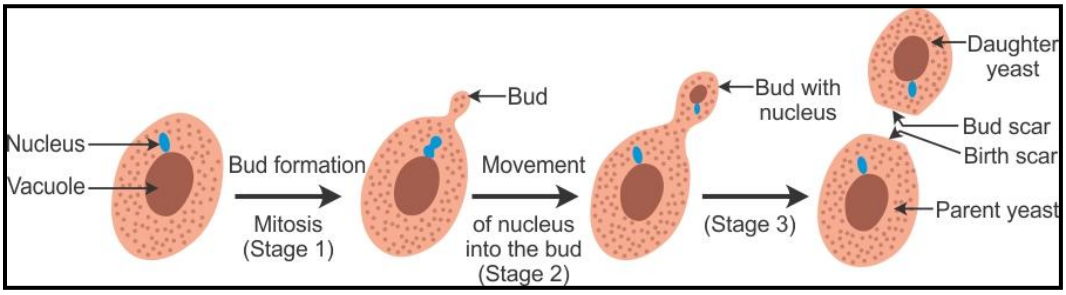
The chemical reaction can be represented as

$CH_3COOH_{(aq)} + NaHCO_{3(S)} \rightarrow CH_3COONa_{(aq)} + H_2O_{(l)} + CO_{2(g)} \uparrow$

35.

(A) A fine screw is used to focus the slides of budding in yeast under high power of a microscope.

(B) Sequence showing budding in yeast:



36. Given that

Object distance, u = −12 cm

Image distance, v = 24 cm

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{24} - \frac{1}{(-12)}$$

$$\frac{1}{f} = \frac{1}{8}$$

$\therefore$ f = 8 cm

The focal length of the lens is 8 cm.

Now if the object is moved away from the lens, the screen has to be moved towards the lens. This is because when we move the object away from the lens, the object distance is increased. Hence, by the lens formula, the image distance decreases.

Magnification is given as

$$m = \frac{v}{u}$$

Because the image distance (v) decreases, the value of magnification also decreases.

CBSE Board

Class X Summative Assessment – II

Science

Board Question Paper 2014 – Set 3

Time: 3 hrs **Max. Marks: 90**

Note:

- Please check that this question paper contains 24 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 42 questions.
- **Please write down the Serial Number of the question before attempting it.**
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

General Instructions:

(i) The question paper comprises of two Sections, A and B. You are to attempt both the sections.

(ii) All questions are compulsory.

(iii) All questions of Section A and all questions of Section B are to be attempted separately.

(iv) Question numbers I to 8 in Section A are one-mark questions. These are to be answered in one word or in one sentence.

(v) Question numbers 4 to 7 in Section A are two-marks questions. These are to be answered in about 30 words each.

(vi) Question numbers 8 to 19 in Section A are three-marks questions. These are to be answered in about 50 words each.

(vii) Question numbers 20 to 24 in Section A are five-marks questions. These are to be answered in about 70 words each.

(viii) Question numbers 25 to 42 in Section B are multiple choice questions based on practical skills. Each question is a one-mark question. You are to select one most appropriate response out of the four provided to you.

SECTION A

1. The atomic numbers of three elements A, B and C are 12, 18 and 20 respectively. State, giving reason, which two elements will show similar properties. (1)

2. No two individuals are absolutely alike in a population. Why? (1)

3. Write one negative effect of affluent lifestyle of few persons on the environment. (1)

4. Draw labelled diagrams to illustrate budding in *Hydra*. (2)

5. "A concave mirror of focal length 15 cm can form a magnified, erect as well as inverted image of an object placed in front of it." Justify this statement stating the position of the object with respect to the pole of the mirror in both the cases for obtaining the images. (2)

6. State with reason any two possible consequences of elimination of decomposers from the Earth. (2)

7. What is water harvesting? How can this technique help in the conservation of water? (2)

8. Study the following table in which positions of six elements A, B, C, D, E and F are shown as they are in the modern periodic table: (3)

Group → / Period ↓	1	2	3-12	13	14	15	16	17	18
2	A					B			C
3				D	E				F

On the basis of the above table, answer the following questions:
(i) Name the element which forms only covalent compounds.
(ii) Name the element which is a metal with valency three.
(iii) Name the element which is a non-metal with valency three.
(iv) Out of D and E, which is bigger in size and why?
(v) Write the common name for the family to which the elements C and F belong.

9. The elements Be, Mg and Ca each having two electrons in their outermost shells are in periods 2, 3, and 4 respectively of the modern periodic table. Answer the following questions, giving justification in each case: (3)
(i) Write the group to which these elements belong.
(ii) Name the least reactive element.
(iii) Name the element having largest atomic radius.

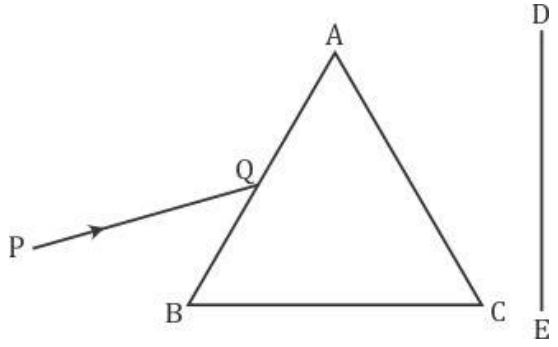
10. A carboxylic acid (molecular formula $C_2H_4O_2$) reacts with an alcohol in the presence of an acid catalyst to form a compound 'X'. The alcohol on oxidation with alkaline $KMnO_4$ followed by acidification gives the same carboxylic acid $C_2H_4O_2$.
Write the name and structure of
(i) carboxylic acid, (ii) alcohol and (iii) the compound 'X'. (3)

11. Define the term 'structural' isomerism'. Explain why propane cannot exhibit this property. Draw the structures of possible isomers of butane, C_4H_{10}. (3)

12. A student wants to project the image of a candle flame on a screen 90 cm in front of a mirror by keeping the flame at a distance of 15 cm from its pole. (3)
    (a) Suggest the type of mirror he should use.
    (b) Determine the linear magnification in this case.
    (c) Find the distance between the object and its image.
    (d) Draw ray diagram to show the image formation in this case.

13. Draw a ray diagram to show the path of the refracted ray in each of the following cases: (3)
    A ray of light incident on a concave lens is
    (i) passing through its optical centre.
    (ii) parallel to its principal axis.
    (iii) directed towards its principal focus.

14. A narrow beam PQ of white light is passing through a glass prism ABC as shown in the diagram. (3)



    Trace it on your answer sheet and show the path of the emergent beam as observed on the screen DE.
    (i) Write the name and cause of the phenomenon observed.
    (ii) Where else in nature is this phenomenon observed?
    (iii) Based on this observation, state the conclusion which can be drawn about the constituents of white light.

15. "Energy flow in a food chain is unidirectional" Justify this statement. Explain how the pesticides enter a food chain and subsequently get into our body. (3)

16. Write one difference between asexual and sexual mode of reproduction. Which species is likely to have better chances of survival - the one reproducing asexually or the one reproducing sexually? Justify your answer. (3)

17. What is the effect of DNA copying, which is not perfectly accurate, on the reproduction process? How does the amount of DNA remain constant though each new generation is a combination of DNA copies of two individuals? (3)

18. List three main factors responsible for the speciation and briefly describe each one of them. (3)

19. "A trait may be inherited, but may not be expressed." Justify this statement with the help of a suitable example. (3)

20. List two reasons for carbon forming a large number of compounds. Name the type of bonding found in most of its compounds. Why does carbon form compounds mainly by this kind of bonding?
Give reason why the carbon compounds- (5)
(i) generally have low melting and boiling points.
(ii) do not conduct electricity in molten state.

21. (a) List the parts of the human eye that control the amount of light entering into it. Explain how they perform this function. $\left(1\frac{1}{2}\right)$

(b) Write the function of retina in human eye. $\left(\frac{1}{2}\right)$

(c) Do you know that the corneal-impairment can be cured by replacing the defective cornea with the cornea of the donated eye? How and why should we organise groups to motivate the community members to donate their eyes after death? (3)

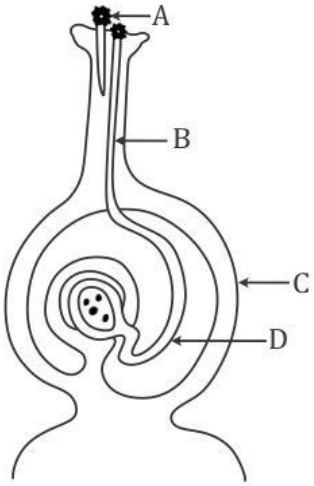
22. (a) Explain the following terms related to spherical lenses:
(i) optical centre
(ii) centres of curvature
(iii) principal axis
(iv) aperture
(v) principal focus
(vi) focal length

(b) A converging lens has focal length of 12 cm. Calculate at what distance the object should be placed from the lens so that it forms an image at 48 cm on the other side of the lens. (5)

23. (a) Draw a sectional view of human female reproductive system and label the part where
(i) eggs develop.
(ii) fertilisation takes place.
(iii) fertilised egg gets implanted.

(b) Describe, in brief, the changes the uterus undergoes
(i) to receive the zygote.
(ii) if zygote is not formed. (5)

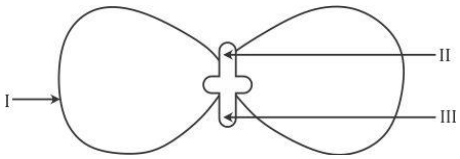
24. (a) Name the parts labelled as A, B, C and D in the diagram given below:



(b) What is pollination? State its significance.
(c) How does fertilisation occur in flowers? Name the parts of the flower that develop into (i) seed, and (ii) fruit after fertilisation. (5)

SECTION B

25. In the following diagram showing the structure of embryo of a dicot seed, what are the parts marked I, II and III sequentially? (1)



(A) Plumule, Cotyledon, Radicle
(B) Plumule, Radicle, Cotyledon
(C) Cotyledon, Plumule, Radicle
(D) Radicle, Plumule, Cotyledon

26. Study the following statements:
I. Wings of birds and wings of bats are homologous organs.
II. Wings of birds and wings of insects are modified forelimbs.
III. Wings of birds and wings of insects are analogous organs.
IV. Wings of birds and forelimbs of horse are homologous organs. (1)

The correct statements are
(A) I and II
(B) II and Ill
(C) III and IV
(D) I and IV

27. Which of the following pairs of two vegetables represent the correct homologous structures? (1)
(A) Sweet potato and potato
(B) Sweet potato and tomato
(C) Carrot and potato
(D) Radish and carrot

28. When you study a slide showing different stages of budding in yeast, you observe the following stages:
I. The bud may get separated from the parent body and develop into a new individual.
II. The body of the bud develops and gives rise to another baby bud.
III. A bud comes out in any direction from the body of the parent cell.
IV. Thus they may form a colony.
The proper sequence of the above stages is (1)
(A) II, I, III, IV
(B) II, III, I, IV
(C) III, II, l, IV
(D) III, I, II, IV

29. A student has to focus his compound microscope to observe a prepared slide showing different stages of binary fission in *Amoeba*. The steps he is likely to follow are listed below in a haphazard manner:

I. Adjust the diaphragm and the mirror of the microscope so that sufficient light may enter to illuminate the slide.
II. Fix the slide on the stage carefully.
III. Adjust the microscope to high power and focus.
IV. Adjust the microscope to low power and focus.

The correct sequence of the above steps to observe the slide under the microscope is (1)

(A) I, II, IV, III
(B) II, I, IV, III
(C) II, IV, I, III
(D) I, IV, II, III

30. A student takes about 2 mL ethanoic acid in a dry test tube and adds a pinch of sodium hydrogen carbonate to it. He reports the following observations:

I. Immediately a colourless and odourless gas evolves with a brisk effervescence.
II. The gas turns lime water milky when passed through it.
III. The gas burns with an explosion when a burning splinter is brought near it.
IV. The gas extinguishes the burning splinter that is brought near it.

The correct observations are (1)

(A) I, II and III
(B) II, III and IV
(C) III, IV and I
(D) I, II and IV

31. In an experiment to study the properties of ethanoic acid, a student takes about 3 mL of ethanoic acid in a dry test tube. He adds an equal amount of distilled water to it and shakes the test tube well. After some time he is likely to observe that (1)

(A) a colloid is formed in the test tube.
(B) the ethanoic acid dissolves readily in water.
(C) the solution becomes light orange.
(D) water floats over the surface of ethanoic acid.

32. We need 20% aqueous solution of sodium hydroxide for the study of saponification reaction. When we open the lid of the bottle containing solid sodium hydroxide we observe it in which form? (1)

(A) Colourless transparent beads
(B) Small white beads
(C) White pellets/flakes
(D) Fine white powder

33. While studying saponification reaction, a student measures the temperature of the reaction mixture and also finds its nature using blue/red litmus paper. On the basis of his observations the correct conclusion would be (1)

(A) the reaction is exothermic and the reaction mixture is acidic.
(B) the reaction is endothermic and the reaction mixture is acidic.
(C) the reaction is endothermic and the reaction mixture is basic.
(D) the reaction is exothermic and the reaction mixture is basic.

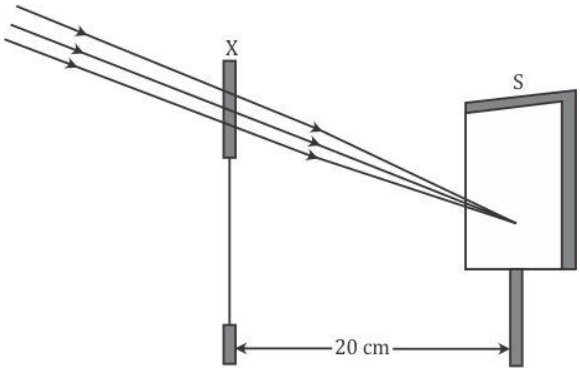
34. In a locality, hard water, required for an experiment, is not available. However, the following salts are available in the school laboratory:

1. Sodium sulphate
2. Calcium sulphate
3. Magnesium chloride
4. Sodium chloride
5. Calcium chloride
6. Potassium sulphate

Which of the above salts may be dissolved in water to obtain hard water for the experiment? (1)

(A) 2, 3 and 5
(B) 1, 2 and 5
(C) 1, 2, 4and 6
(D) 3 and 5 only

35. A student focused the Sun rays using an optical device 'X' on a screen S as shown.



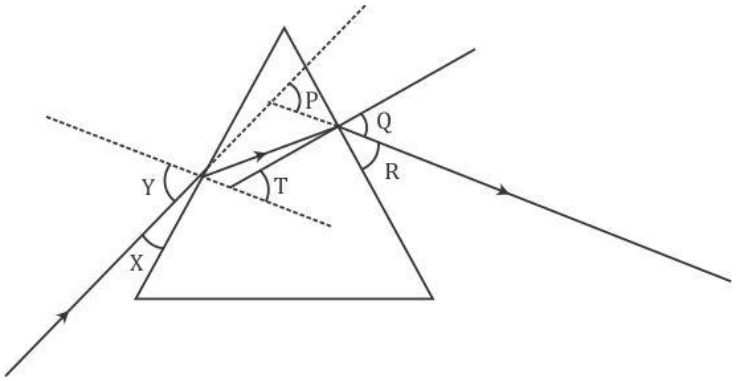
From this it may be concluded that the device 'X' is a (select the correct option) (1)

(A) Convex lens off focal length 10 cm.
(B) Convex lens of radius of curvature 20 cm.
(C) Convex lens of focal length 20 cm.
(D) Concave mirror of focal length 20 cm.

36. A student has obtained an image of a well-illuminated distant object on a screen to determine the focal length, F1of the given spherical mirror. The teacher then gave him another mirror of focal length, F_2 and asked him to obtain a focused image of the same object on the same screen. The student found that in order to focus the same object using the second mirror, he has to move the mirror away from the screen. From this observation, it may be concluded that both the spherical mirrors given to the student were (select the correct option) (1)

(A) Concave and $F_1 < F_2$
(B) Concave and $F_1 > F_2$
(C) Convex and $F_1 < F_2$
(D) Convex and $F_1 > F_2$

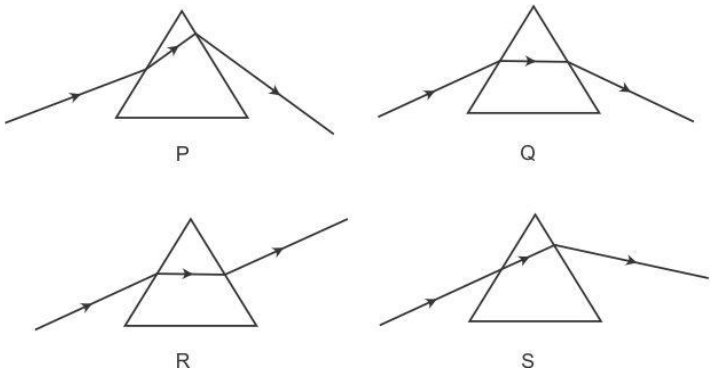
37. In the following diagram, the path of a ray of light passing through a glass prism is shown:



In this diagram the angle of incidence, the angle of emergence and the angle of deviation respectively are (select the correct option): (1)

(A) X, Rand T
(B) Y, Q and T
(C) X, Q and P
(D) Y, Q and P

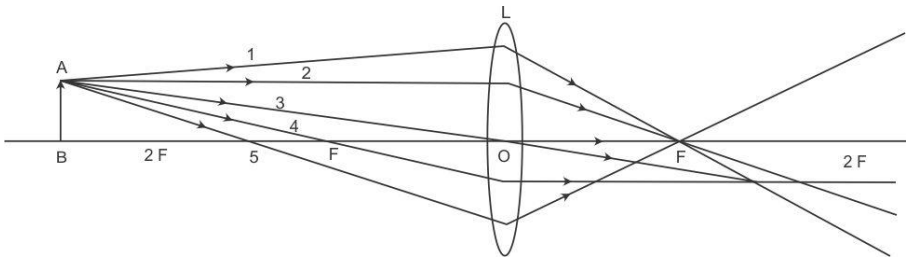
38. Study the following diagrams in which the path of a ray of light passing through a glass prism as traced by four students P, Q, R and S is shown:



The student who has traced the path correctly is (1)

(A) P
(B) Q
(C) R
(D) S

39. A student is using a convex lens of focal length 18 cm to study the image formation by it for the various positions of the object. He observes that when he places the object at 27 cm, the location of the image is at 54 cm on the other side of the lens. Identify from the following diagram the three rays that are obeying the laws of refraction and may be used to draw the corresponding ray diagram. (1)

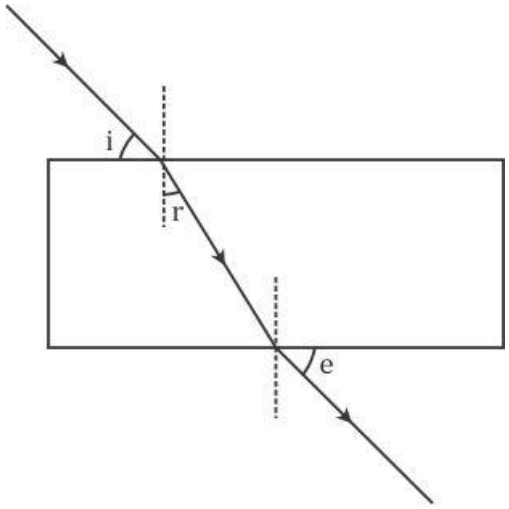


(A) 1, 2 and 4
(B) 1, 3 and 5
(C) 2, 4 and 5
(D) 2, 3 and 4

40. A student is using a convex lens of focal length 10 cm to study the image formation by a convex lens for the various positions of the object. In one of his observations, he may observe that when the object is placed at a distance of 20 cm from the lens, its image is formed at (select the correct option) (1)

(A) 20 cm on the other side of the lens and is of the same size, real and erect.
(B) 40 cm on the other side of the lens and is magnified, real and inverted.
(C) 20 cm on the other side of the lens and is of the same size, real and inverted.
(D) 20 cm on the other side of the lens and is of the same size, virtual and erect.

41. A student traces the path of a ray of light passing through a rectangular glass slab and marks the angle of incidence i, angle of refraction r and angle of emergence e, as shown.



The correctly marked angle(s) is/are (1)

(A) $\angle$ i only
(B) $\angle$ e only
(C) $\angle$ r only
(D) $\angle$ i and $\angle$ e

42. After tracing the path of a ray of light passing through a rectangular glass slab for four different values of the angle of incidence, a student reported his observations in tabular form as given below:

S. No	$\angle$ i	$\angle$ r	$\angle$ e
I	30^0	19^0	29^0
II	40^0	28^0	40^0
III	50^0	36^0	50^0
IV	60^0	40^0	59^0

The best observation is (1)

(A) I
(B) II
(C) III
(D) IV

CBSE Board

Class X Summative Assessment – II

Science

Board Question Paper 2014 – Set 3

Time: 3 hrs **Total Marks: 90**

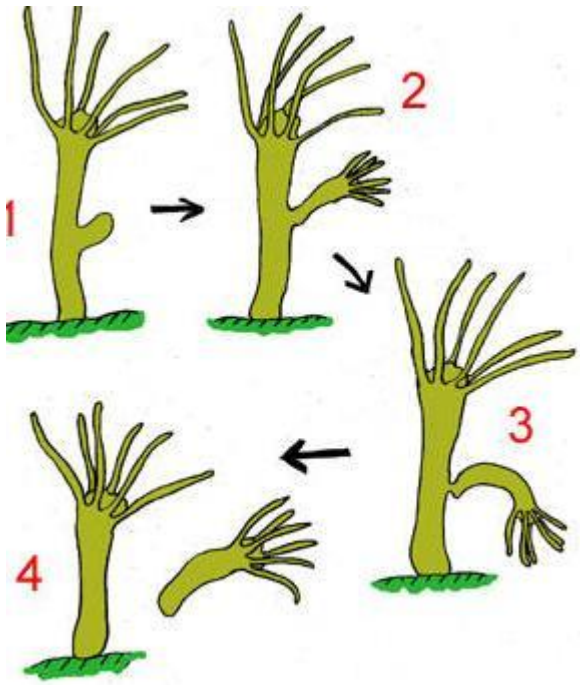
SECTION-A

1. **Ans**. The elements are,
   A-(Atomic number 12) = **Magnesium**
   B-(Atomic number 18) = **Argon**
   C-(Atomic number 20) = **Calcium**
   Element Calcium and magnesium will show similar properties as they belong to same group (Group II) of the periodic table. They have same number of valence electrons and they both are metals. While argon is a noble gas.

2. **Ans.** No two individuals are absolutely alike in a population due to variations taking place during the process of DNA copying.

3. **Ans.** Affluent lifestyle of few persons leads to exploitation and overconsumption of natural resources which ultimately results in their scarcity.

4. **Ans.** Budding in Hydra:



5. **Ans.**
For magnified and erect image the object is placed between pole P and focus F.
For magnified and inverted image the object is placed either at focus or anywhere between F and C.

6. **Ans**. Consequences of elimination of decomposers:

   i. If all the decomposers of earth are eliminated then the dead bodies of plants and animals would not be decomposed into simpler non-polluting substances so whole of the earth in no time would have heaps of dead bodies of plants and animals. They would start giving foul smell and life would become impossible on earth.
   ii. Elimination of decomposers would cause imbalance of nutrients as they break complex organic material into simpler substances in different nutrient cycles.

7. **Ans.** Water harvesting refers to all the processes and steps that are taken for scientific conservation of fresh water.
Water harvesting helps in the conservation of water as:
   i. It increases the ground water resources.
   ii. It reduces storm water discharge, urban floods and overloading of sewage treatment plants.

8. **Ans.**

Group → / Period ↓	1	2	3-12	13	14	15	16	17	18
2	A (Li)					B (N)			C (Ne)
3				D (Al)	E (Si)				F (Ar)

(i) Element E - Silicon forms only covalent compounds.
(ii) Aluminium is a metal with the valency 3.
(iii) Nitrogen is a non-metal with the valency 3.
(iv) Out of D (Aluminium) and E (Silicon), aluminium has a larger size than silicon. This is because atomic size decreases across the period.
(v) Common name for the family to which the elements C (Neon) and F (Argon) belong is 'Noble gas' or 'Inert gas'.

9. Ans.

(i) Elements Be, Mg and Ca belong to Group II.

(ii) Beryllium (Be) is the least reactive element. This is because, as we move down the group, number of shells increases and the effective nuclear charge decreases. Thus, the tendency to lose electrons increases.

(iii) Calcium has the largest atomic radius. Since, number of shells increases down the group atomic radius also increases.

10. Ans. Ethanoic acid reacts with ethanol in the presence of concentrated sulphuric acid as a catalyst to produce the ester, ethyl ethanoate. The reaction is slow and reversible.

$$\underset{\text{Ethanoic acid}}{CH_3-COOH} + \underset{\text{Ethyl alcohol}}{CH_3-CH_2-OH} \underset{KMnO_4}{\overset{H_2SO_4}{\rightleftharpoons}} \underset{\text{Ethyl ethanoate}}{CH_3\overset{O}{\overset{\|}{C}}-O-CH_2CH_3} + \underset{\text{Water}}{H_2O}$$

(i) CH_3-COOH:- Ethanoic acid

(ii) CH_3 - CH_2-OH:- Ethyl alcohol or Ethanol

(iii) Compound X = $CH_3\overset{O}{\overset{\|}{C}}-O-CH_2CH_3$:- Ethyl ethanoate

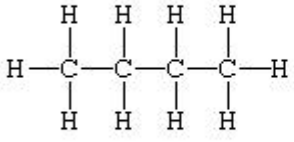
11. Ans.

Structural isomerism: Molecules having same molecular formula but different structure are said to be structural isomers.

Propane has the chemical formula C_3H_8 and it is represented as CH_3-CH_2-CH_3. In alkanes, isomerism arises when a particular compound can be represented in the form of both straight chain and branched chain. Also, the branching cannot be done from the first or the last carbon atom of the structure.

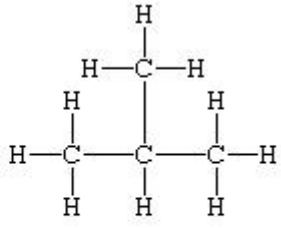
The structural formulae of propane show that they do not have sufficient number of carbon atoms to exist in the form of branched isomer. Hence, they do not exhibit structural isomerism

Isomers of Butane: There are two isomers. N-butane and iso-butane



n-butne

C_4H_{10}



iso-butane

C_4H_{10}

12. Ans.

(a) Concave mirror

(b) Linear magnification of a concave mirror is given by :

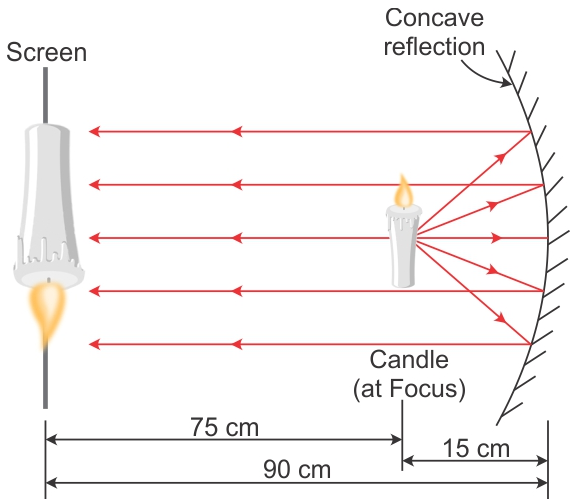
$$m = \frac{-v}{u}$$

$$= \frac{-(-90)}{(-15)}$$

$$= -6$$

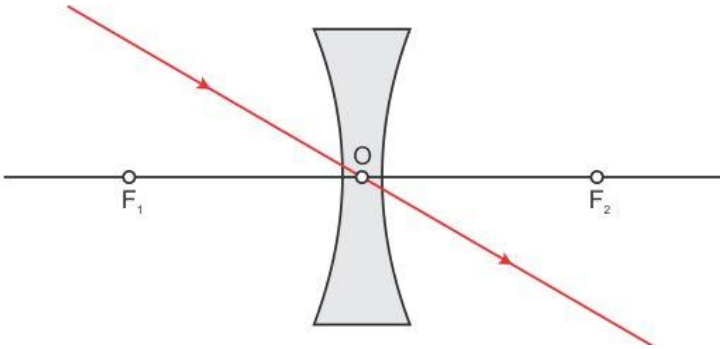
(c) The distance between the object and image = 90 – 15 = 75 cm.

(d) Ray diagram:

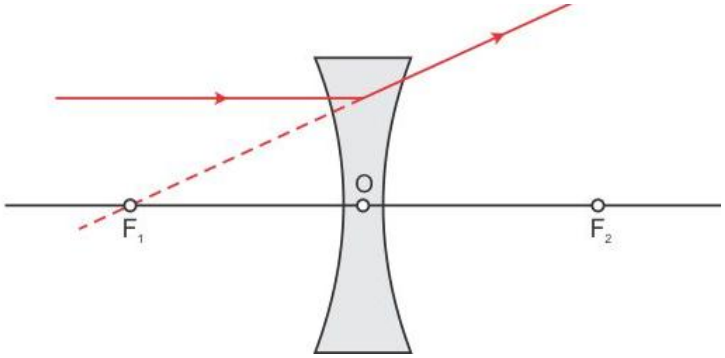


13. Ans.

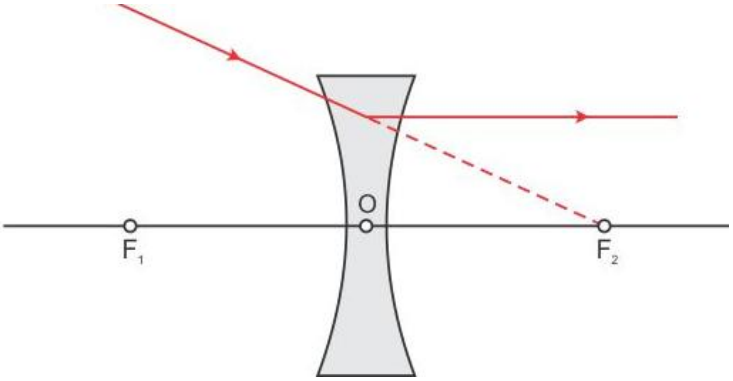
(i) A ray of light passing through the optical centre of the concave lens will emerge without any deviation.



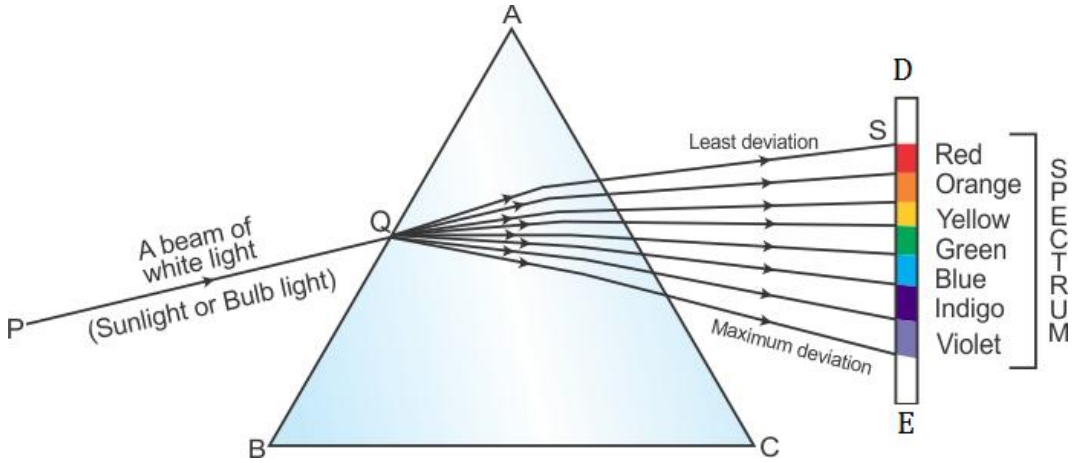
(ii) A ray of light parallel to the principal axis, after refraction from a concave lens, appears to diverge from the principal focus on the same side of the lens.



(iii) A ray of light directed towards the principal focus of a concave lens, becomes parallel to its principal axis after refraction through the lens.



14. Ans.



(i) Dispersion of light

Cause: The dispersion of white light occurs because colors of white light travel at different speeds through glass prism. Different colours undergo different deviations on passing through prism.

(ii) Rainbow is the example of dispersion of light observed in nature.

It is caused due to dispersion of sunlight by water droplets in the atmosphere. It always forms in the direction opposite to the sun.

(iii) White light is a mixture of seven colours. The sequence of colours given by the prism is Violet, Indigo, Blue, Green, Yellow, Orange and Red. **VIBGYOR** is the acronym for this sequence. The red light bends the least and violet light bends the most.

15. Ans. The flow of energy in the ecosystem is said to be unidirectional because the energy lost as heat from the living organisms of a food chain cannot be reused by plants in photosynthesis.

Pesticides are non-biodegradable wastes which pass along the food chain from crops to man or other animals and birds and harm them.

16. Ans. The difference between asexual and sexual reproduction is that only one parent is needed in asexual reproduction whereas two parents are needed in sexual reproduction.
The organisms reproducing sexually have better chances of survival because it promotes diversity of characters in an offspring due to combinations of genes which can lead to variation whereas in asexual reproduction evolutionary change is not possible as only one parent is involved therefore no variation takes place**.**

17. Ans. The DNA copying which is not perfectly accurate in the reproduction process results in variations in populations for the survival of species.
The amount of DNA remains constant because the gametes are special type of cells called reproductive cells which contain only half the amount of DNA as compared to the normal body cells of an organism.

18. Ans. The process by which new species develop from the existing species is known as speciation. The important factors which could lead to speciation are:

i. Geographical isolation of a population caused by various type of barriers such as mountain ranges, rivers and seas.
ii. Genetic drift caused by drastic changes in the frequencies of particular genes by chance alone.
iii. Variations caused in individuals due to natural selection.

19. Ans. Some traits are determined by the combined effect of more than one pair of genes. These are referred to as polygenic or continuous, traits.
An example of this is human stature. The combined size of all of the body parts from head to foot determines the height of an individual. There is an additive effect. The sizes of all of these body parts are, in turn, determined by numerous genes. Human skin, hair, and eye color are also polygenic traits because they are influenced by more than one allele at different loci. The result is the perception of continuous gradation in the expression of these traits.

20. Ans.

- The two characteristic properties of the carbon element which leads to the formation of a very large number of organic compounds are: Catenation and Tetravalency.
  Catenation: Carbon has the unique ability to form bonds with other atoms of carbon, giving rise to large molecules. This property is called catenation.
  Tetravalency: Carbon has a valency of four. So, it is capable of bonding with four other atoms of carbon or atoms of some other mono-valent element.
- **Covalent bonding** is found in most of the carbon compounds.
- Carbon form compounds mainly by covalent bonding because-
  The bonds that carbon forms with most other elements are very strong making these compounds exceptionally stable. One reason for the formation of strong bonds by carbon is its small size. This enables the nucleus to hold on to the shared pairs of electrons strongly. The bonds formed by elements having larger atoms are much weaker.

(i) Carbon compounds generally have low melting points and boiling points because-

The force of attraction between the molecules of carbon compounds is not very strong. These weak intermolecular forces make them very easy to pull apart from each other. Since they are easy to separate, carbon compounds have low melting and boiling points.

(ii) Carbon compounds do not conduct electricity in molten state because bonding in carbon compounds does not involve any formation of ions.

21.Ans.

(a) The iris and pupil are the two parts of human eye that controls the amount of light entering the eyes. The iris automatically adjusts the size of the pupil according to the intensity of light received by the eye.
If the amount of light received by the eye is large (as during the daytime), then the iris contracts the pupil (makes the pupil small) and reduces the amount of light entering the eye. On the other hand, if the amount of light received by the eye is small (as in a dark room or during night), the iris expands the pupil (makes the pupil large) so that more light may enter the eyes. Thus, the iris regulates (or controls) the amount of light entering the eye by changing the size of the pupil.

(b) The retina acts as a screen on which the image is formed in the eye. The retina has a large number of light-sensitive cells. When the image falls on the retina then these light-sensitive cells get activated and generate electrical signals.

(c) Yes.

There is a need for awareness among various communities about eye donation after death as it will help a person suffering from an eye ailment to get the treatment.

The following steps can be taken to organize groups to motivate them:

(i) The person who is taking the initiative can communicate with people and after realizing people who are like minded should gather them and form an awareness group.

(ii) The group should then approach various communities and organizations in their area and promote their campaign.

(iii) They can also approach various hospitals and clinics to promote the campaign.

22. Ans.

(a)

(i) **Optical centre:**

The central point of the lens is known as optical centre. It is represented as O. The optical centre of a lens has a property that a ray of light passing through it does not suffer any deviation and goes straight.

(ii) **Centre of Curvature:**

The centre of sphere of part of which a lens is formed is called the centre of curvature of the lens. Since concave and convex lenses are formed by the combination of two parts of spheres, therefore they have two centres of curvature. One centre of curvature is usually denoted by C1 and second is denoted by C2.

(iii) **Principal Axis:**

The principal axis of a lens is a line passing through the optical centre of the lens and perpendicular to both the faces of the lens.

(iv) **Aperture:**

The diameter of sphere of part of which a lens is formed is called the aperture.

(v) **Principal Focus:**

The convex lens converge the rays incident on it after refraction, to a point on the principal axis. This point is known as principal focus of the convex lens.

The rays incident on concave lens appear to diverge from a point on the principal axis. This point is known as the principal focus of concave lens.

(vi) **Focal Length:**

The focal length of a lens is the distance between optical centre and principal focus of the lens.

(b) Given,

Image distance: v = +48 cm (It is on the other side of the lens)

Focal length: f = +12 cm (It is a converging lens or convex lens)

Object distance: u =? (To be calculated)

Now, putting these values in the lens formula:

$$\frac{1}{f}=\frac{1}{v}-\frac{1}{u}$$

$$\Rightarrow \frac{1}{12}=\frac{1}{48}-\frac{1}{u}$$

$$\Rightarrow \frac{1}{u}=\frac{1}{48}-\frac{1}{12}$$

$$\Rightarrow \frac{1}{u} = \frac{1-3}{48}$$

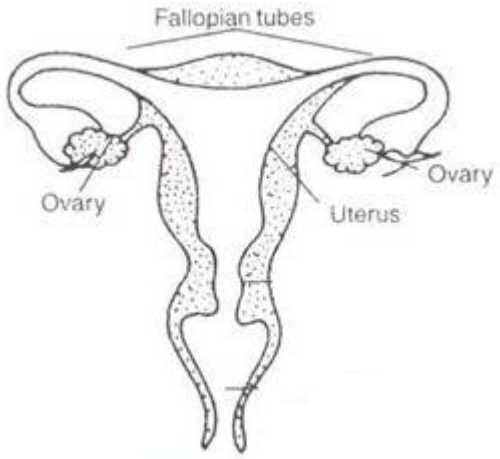
$$\Rightarrow \frac{1}{u} = \frac{-1}{24}$$

$$\Rightarrow u = -24 \text{ cm}$$

Therefore, the object should be placed at a distance of 24 cm from the convex lens. The minus sign with the object distance shows that the object is on its left side.

23. Ans. (a)

(i) Ovary
(ii) Fallopian tubes
(iii) Uterus



Female reproductive system.

(b) (i) If the uterus receives the zygote, the female becomes pregnant. The embryonic development of the zygote starts immediately. The embryo moves down into the uterus forming a thick and soft lining of blood vessels around itself. This process is called implantation. After implantation, a special tissue develops between the uterine wall and the embryo called placenta, where the exchange of nutrients, oxygen and waste products takes place.
(ii) If the egg released by the ovary is not fertilized and the zygote is not formed, then the thick lining of the uterus breaks down and comes out through the vagina in the form of blood and mucous. This is called menstruation.

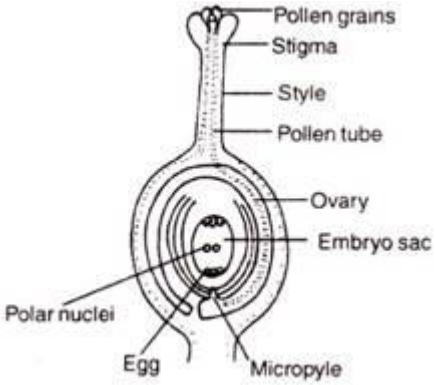
24.Ans. (a) A - Pollen grain
B - Pollen tube
C - Ovary
D - Female germ cell

(b) Pollination is the process of transfer of pollen grains from anther to stigma of the flower.

Significance of pollination: Pollination is a significant event because it precedes fertilization. It brings the two types of gametes closer for the process of fertilization.

Also, cross pollination introduces variations in the plants due to mixing of different genes which increases adaptability towards environment or surroundings.

(c) Fertilization in plants: In plants, pollination is followed by fertilization. Once the pollen grains are deposited on the stigma, they form tubes called pollen tubes. The pollen tubes grow through the ovules and reach the ovary where ovules are located. The pollen tube normally enters the ovule through a small opening called micropyle. Inside the ovule, the pollen tube releases two male gametes into the embryo sac.



The embryo sac of the ovule contains the egg. One male gamete fuses with the egg. This fusion of male and female gamete is called syngamy and its product is called zygote. The other male gamete fuse with two polar bodies and this process is called triple fusion, where three nuclei are involved in the fusion process, one male gamete and two polar nuclei. Thus, inside each embryo sac, two fusions, syngamy and triple fusion, takes place. This mechanism of two fusions occurring in an embryo sac is called double-fertilization.
After fertilization, ovules develop into the seeds and ovary develops into the fruit.

Section B

25. Ans. Correct option: A

In the figure, the part marked I is Plumule, II is Cotyledon and III is Radicle.

26. Ans. Correct option: C
III and IV are the correct statements.

27. Ans. Correct option: D
Radish and carrot are the modifications of roots. Hence, they are the homologous structures.

28. Ans. Correct option: C
This is the correct sequence of budding in yeast.

29. **Ans**. Correct option: B
This is the correct sequence.

30. Ans. Correct option: D
Statements I, II and IV are true. The carbon dioxide gas gets liberated. It is colourless, odourless and turns lime water milky. The gas extinguishes the burning splinter when brought near it. This is because; carbon dioxide does not burn or support combustion.

31. **Ans.** Correct option: B
Ethanoic acid is readily soluble in water.

32. **Ans.** Correct option: C
Sodium hydroxide is present in the form of white flakes or pellets.

33. **Ans**. Correct option: C
The reaction is endothermic and the reaction mixture is basic in nature.
Saponification is defined as the hydrolysis of an ester under basic conditions leading to the formation of sodium salt of fatty acids. It is an endothermic reaction meaning it absorbs surrounding heat.

34. Ans. Correct option: A
Hard water is an impure form of water having high mineral contents like, Calcium, Magnesium, sulphides, chlorides, bicarbonates etc.

35. **Ans**. Correct option: C
Optical device 'X' is a convex lens as sun rays are focused on the screen.

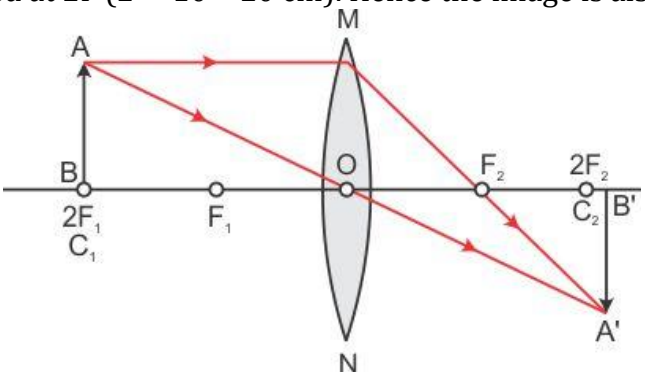
36. **Ans**. Correct option: A
Since the image is focused, the spherical mirror is a concave mirror.
For second mirror the distance is increased to focus the image on the screen. Hence, focal length is more than that of first mirror.

37. **Ans**. Correct option: D

38. **Ans**. Correct option: B

39. **Ans**. Correct option: D
Ray 2, 3 and 4 are obeying the laws of refraction.
Ray 2 is parallel to the principal axis and passes through the principal focus after refraction.
Ray 3 passes from the optical centre of the lens and emerges without any deviation.
Ray 4 is passing through the principal focus and after refraction from a convex lens emerges parallel to the principal axis.
Ray 1 and 5 cannot pass through the focus after refraction as they are not parallel to the principal axis.

40. **Ans.** Correct option: C
Focal length f = 10 cm
The object is placed at 2F (2 × 10 = 20 cm). Hence the image is also formed at 2F.



Position of object	Position of image	Size of image	Nature of image
At $2F_1$	At $2F_2$	Same size	Real and inverted

41. **Ans**. Correct option: C
Other angles are not taken with respect to normal.

42. **Ans**. Correct option: A
For glass slab, $\angle i = \angle e$
Refractive index of glass = 1.5

$$\frac{\sin 30°}{\sin 19°} \approx 1.5$$

$$\angle 30° \approx \angle 29°$$

CBSE
Class X Science
Board Paper – 2013 (Set 1)
Term II

Total time: 3 hrs **Total marks: 90**

General instructions:

1. The question paper comprises of **two sections, A and B**. You are to attempt both the sections.
2. There is no overall choice. However, internal choice has been provided in all the five questions of five marks category. Only one option in such question is to be attempted.
3. All the questions of **Section-A** and **Section-B** are to be attempted separately.
4. Question numbers **1** to **3** in **Section - A** are **one mark** questions. These are to be answered in one word or one sentence.
5. Question numbers **4** to **7** in **Section - A** are **two marks** questions, to be answered in about **30 words each**.
6. Question number **8** to **19** in **Section-A** are **three marks** questions, to be answered in about **50 words**.
7. Question number **20** to **24** in **Section-A** are **five marks** questions, to be answered in about **70 words**.
8. Question numbers **25** to **42** in **Section-B** are multiple choice questions based on practical skills. Each question is a **one mark** question. You are to select one most appropriate response out of the four provided to you.

SECTION A

1. How many horizontal rows are there in the modern periodic table and what are they called? [1]

2. List any two factors that could lead to speciation. [1]

3. Mention one negative effect of our affluent life style on the environment. [1]

4. Mention two functions of the human testis. [2]

5. Every one of us can do something to reduce our consumption of various natural resources. List four such activities based on the 3-R approach. [2]

6. 'A ray of light incident on a rectangular glass slab immersed in any medium emerges parallel to itself.' Draw a labelled ray diagram to justify the statement. [2]

7. We often observe domestic waste decomposing in the bylanes of residential colonies. Suggest ways to make people realise that the improper disposal of waste is harmful to the environment. [2]

8. Name the oxidising agent used for the conversion of ethanol to ethanoic acid. Distinguish between ethanol and ethanoic acid on the basis of (i) litmus test, (ii) reaction with sodium carbonate. [3]

9.

(a) Differentiate between alkanes and alkenes. Name and draw the structure of one member of each.

(b) Alkanes generally burn with clean flame. Why? [3]

10. Given below are some elements of the modern periodic table: [3]

$_{4}Be$, $_{9}Fe$, $_{14}Si$, $_{19}K$, $_{20}Ca$

i. Select the element that has one electron in the outermost shell and write its electronic configuration.

ii. Select two elements that belong to the same group. Give reasons for your answer.

iii. Select two elements that belong to the same period. Which one of the two has bigger atomic size?

11. An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a compound. [3]

(a) Write the position of these elements in the modern periodic table.

(b) Write the formula of the compound formed.

Justify your answer in each case.

12. 'The sex of a newborn child is a matter of chance and none of the parents may be considered responsible for it.' Justify this statement with the help of flow chart showing determination of sex of a newborn. [3]

13. Tabulate two distinguishing features between acquired traits and inherited traits with one example of each. [3]

14. Write two examples each of sexually transmitted diseases caused by (i) virus, (ii) bacteria. Explain how the transmission of such diseases can be prevented? [3]

15. [3]

(a) Explain the process of regeneration in Planaria.

(b) How is regeneration different from reproduction?

16. An object of height 5 cm is placed perpendicular to the principal axis of a concave lens of focal length 10 cm. Use lens formula to determine the position, size and nature of the image, if the distance of the object from the lens is 20 cm. [3]

17. Mention the types of mirrors used as (i) rear view mirrors, (ii) shaving mirrors. List two reasons to justify your answers in each case. [3]

18. State the difference in colours of the Sun observed during sunrise/ sunset and noon. Give explanation for each. [3]

19. [3]

(a) What is an ecosystem? List its two main components.

(b) We do not clean ponds or lakes, but an aquarium needs to be cleaned regularly. Explain.

20. [5]

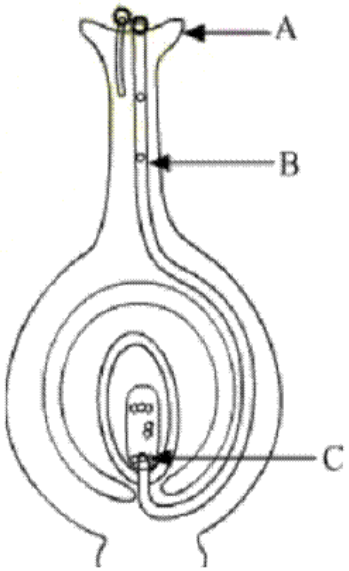
(a) Write the function of placenta in females.

(b) List four ways of preventing pregnancy. State two advantages of using such preventive methods.

21. [5]

(a) Identify A, B and C in the given diagram and write their functions.

(b) Mention the role of gamete and zygote in sexually reproducing organisms.



22.

(a) A person cannot read newspaper placed nearer than 50 cm from his eyes. Name the defect of vision he is suffering from. Draw a ray diagram to illustrate this defect. List its two possible causes. Draw a ray diagram to show how this defect may be corrected using a lens of appropriate focal length.

(b) We see advertisements for eye donation on television or in newspaper. Write the importance of such advertisements. [5]

23. State Snell's law of refraction of light. Write an expression to relate refractive index of a medium with speed to light in vacuum.

The refractive index of a medium 'a' with respect to medium 'b' is 2/3 and the refractive index of medium 'b' with respect to medium 'c' is 4/3. Find the refractive index of medium 'c' with respect to medium 'a'. [5]

24.

(a) Define the term 'isomers'

(b) Draw two possible isomers of the compound with molecular formula C_3H_6O and write their names.

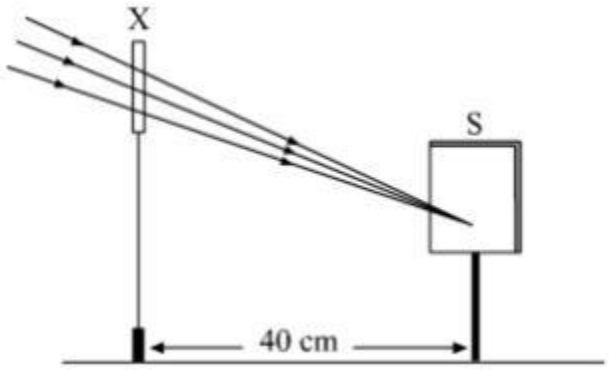
(c) Give the electron dot structures of the above two compounds. [5]

SECTION B

25. A student obtained a sharp image of a burning candle, placed at the farther end of a laboratory table, on a screen using a concave mirror. For getting a better value of focal length of the mirror, what should the student do? [1]

(a) He should move the mirror away from the screen.
(b) He should move the mirror slightly towards the screen.
(c) He should move the mirror as well as the screen towards the newly selected object.
(d) He should move only the screen towards the newly selected object.

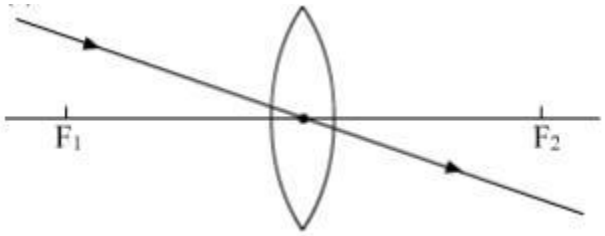
26. A student focused the image of a distant object using a device 'X' on a white screen 'S' as shown in the figure. If the distance of the screen from the device is 40 cm, select the correct statement about the device. [1]



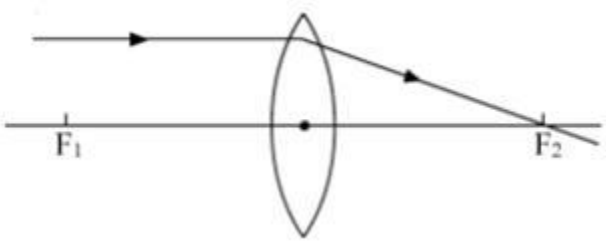
(a) The device X is a convex lens of focal length 20 cm.
(b) The device X is a concave mirror of focal length 40 cm.
(c) The device X is a convex mirror of radius of curvature 40 cm.
(d) The device X is a convex lens of focal length 40 cm.

27. Study the following ray diagrams: [1]

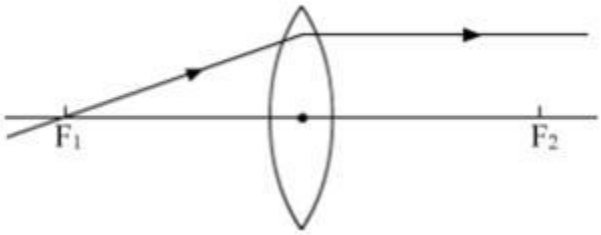
I.



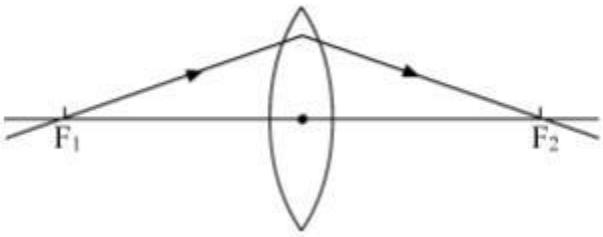
II.



III.



IV.



The diagrams showing the correct path of the ray after passing through the lens are:

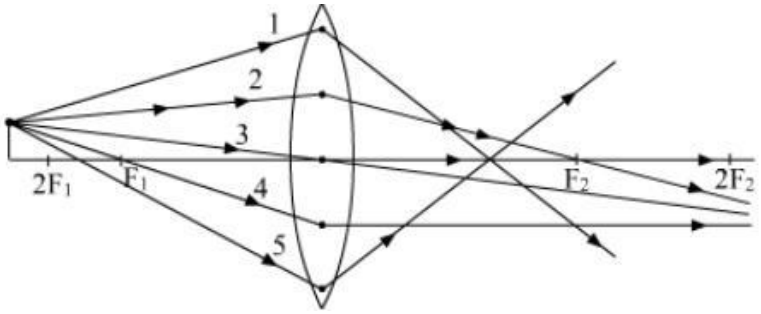
(a) II and III only

(b) I and II only

(c) I, II and III

(d) I, II and IV

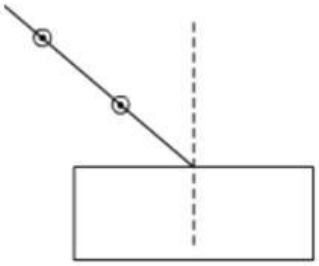
28. Out of the five incident rays shown in the figure find the three rays which are obeying the laws of refraction and may be used for locating the position of the image formed by a convex lens: [1]



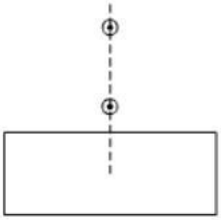
(a) 1, 2 and 3
(b) 2, 3 and 4
(c) 3, 4 and 5
(d) 1, 2 and 4

29. Select from the following the best set-up for tracing the path of a ray of light through a rectangular glass slab: [1]

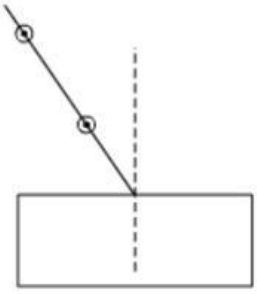
I.



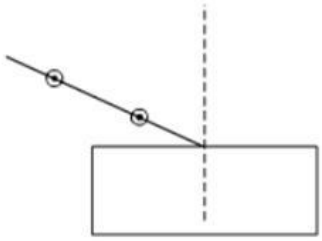
II.



III.



IV.



(a) I
(b) II
(c) III
(d) IV

30. After tracing the path of rays of light through a glass slab for three different angles of incidence, a student measured the corresponding values of angle of refraction 'r' and angle of emergence 'e' and recorded them in the table given below: [1]

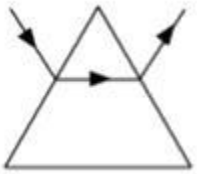
S. No	∠i	∠r	∠e
I	30°	20°	31°
II	40°	25°	40°
III	50°	31°	49°

The correct observations are:
(a) I and II
(b) II and III
(c) I and III
(d) I, II and III

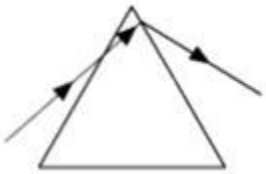
31. In an experiment to trace the path of a ray of light through a glass prism for different values of angle of incidence a student would find that the emergent ray: [1]
(a) is parallel to the incident ray
(b) perpendicular to the incident ray
(c) is parallel to the refracted ray
(d) bends at an angle to the direction of the incident ray

32. While performing an experiment to trace the path of a ray of light passing through a glass prism, four students marked the incident ray and the emergent ray in their diagrams in the manner shown below. Which one is correct? [1]

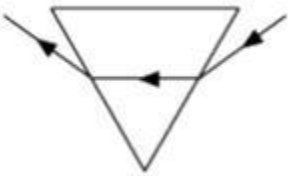
I.



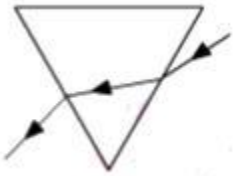
II.



III.



IV.



(a) I
(b) II
(c) III
(d) IV

33. Study the different conclusions draw by students of a class on the basis of observations of preserved/available specimens of plants and animals. [1]

I. Potato and sweet potato are analogous organs in plants and animals.
II. Wings of insects and wings of birds are homologous organs in animals.
III. Wings of insects and wings of bats are analogous organs in animals.
IV. Thorns of citrus and tendrils of cucurbita are analogous organs in plants

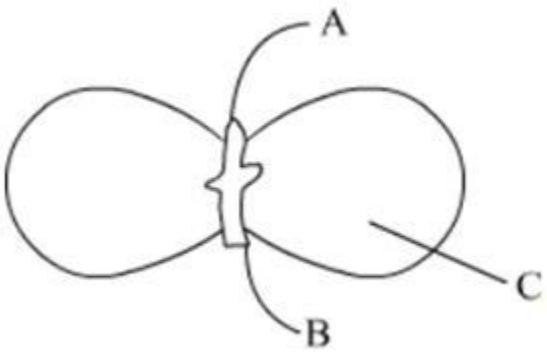
The correct conclusions are:

(a) I and II
(b) II and IV
(c) III and IV
(d) I and III

34. You have potato, carrot, radish, sweet potato, tomato and ginger bought from the market in your jute bag. Identify two vegetables to represent the correct homologous structures. [1]

(a) Potato and sweet potato
(b) Carrot and tomato
(c) Potato and tomato
(d) Carrot and radish

35. In the figure, the parts marked A, B and C are sequentially: [1]



(a) Plumule, Cotyledon and Radicle
(b) Radicle, Cotyledon and Plumule
(c) Radicle, Plumule and Cotyledon
(d) Plumule, Radicle and Cotyledon

36. Select the correct statements for the process of budding in yeast: [1]

I. A bud arises from a particular region on a parent body.
II. A parent cell divides into two daughter cells; here the parental identity is lost.
III. Before detaching from the parent body a bud may form another bud.
IV. A bud when detached from the parent body grows into a new individual.

(a) II, III and IV
(b) I, II and III
(c) III, IV and I
(d) None of the above

37. A student after observing a slide showing different stages of binary fission in Amoeba draws the following diagrams. However these diagrams are not in proper sequence. [1]

The correct sequence is:

(a) I, V, IV, III, II

(b) I, V, III, IV, II

(c) I, III, IV, V, II

(d) None of these

38. Read the following statements: [1]

I. When a red litmus paper is dipped into the reaction mixture of a saponification reaction, it turns blue and the reaction is exothermic.

II. When a blue litmus paper is dipped into the reaction mixture of a saponification reaction, its colour does not change and the reaction is exothermic.

III. When a red litmus paper is dipped into the reaction mixture of a saponification reaction, its colour does not change and the reaction is endothermic.

IV. When a blue litmus paper is dipped into the reaction mixture of a saponification reaction, its colour does not change and the reaction is endothermic.

Which of the above statements are correct?

(a) I and II

(b) II and III

(c) III and IV

(d) I and IV

39. A student prepared 20% sodium hydroxide solution in a beaker containing water. The observations noted by him are given below. [1]

I. Sodium hydroxide is in the form of pellets.

II. It dissolves in water readily.

III. The beaker appears cold when touched from outside.

IV. Red litmus paper turns blue when dipped into the solution.

The correct observations are:

(a) I, II, and III

(b) II, III and IV

(c) III, IV and I

(d) I, II and IV

40. Hard water required for an experiment is not available in a school laboratory. However, following salts are available in the laboratory. Select the salts which may be dissolved in water to make it hard for the experiment. [1]

1. Calcium Sulphate
2. Sodium Sulphate
3. Calcium Chloride
4. Potassium Sulphate
5. Sodium Hydrogen Carbonate
6. Magnesium Chloride

(a) 1, 2 and 4
(b) 1, 3 and 6
(c) 3, 5 and 6
(d) 2, 4 and 5

41. In an experiment to study the properties of acetic acid, a student takes about 2 ml of acetic acid in a dry test tube. He adds about 2 ml of water to it and shakes the test tube well. He is likely to observe that: [1]

(a) The acetic acid dissolves readily in water.
(b) The solution becomes light orange.
(c) Water floats over the surface of acetic acid
(d) Acetic acid floats over the surface of water.

42. A student takes 2 ml acetic acid in a dry test tube and adds a pinch of sodium hydrogen carbonate to it. He makes the following observations: [1]

I. A colourless and odourless gas evolves with a brisk effervescence.
II. The gas turns lime water milky when passed through it.
III. The gas burns with an explosion when a burning splinter is brought near it.
IV. The gas extinguishes the burning splinter which is brought near it.

The correct observations are:

(a) I, II and III
(b) II, III and IV
(c) III, IV and I
(d) IV, I and II

CBSE
Class X Science
Board Paper – 2013 (Set 1) Solution
Term II

SECTION A

1. There are 7 horizontal rows in the modern periodic table. They are called periods.

2. Geographical isolation and genetic drift could lead to speciation.

3. Exploitation and overconsumption of natural resources will ultimately result in their scarcity.

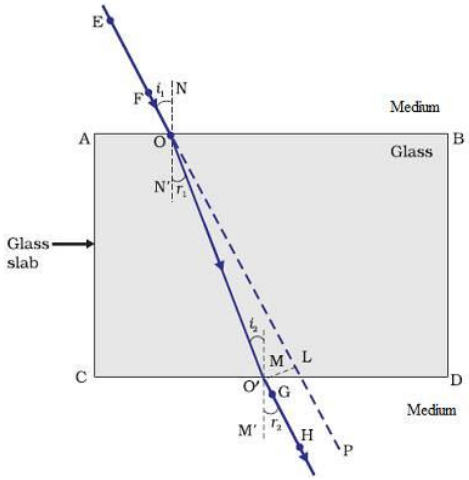
4.

(a) They produce male germ cells i.e. sperms.
(b) They act as endocrine glands and secrete the hormone testosterone which controls secondary sexual characters in males.

5.

(a) Use of materials such as paper should be preferred as they can be reused and re**c**ycled.
(b) Materials like glass and some plastics can be recycled on heating and get easily converted into different products like toys, containers which can be reused again.
(c) e-wastes such as unused computers, mobiles etc. can be repaired and used again.
(d) Household wastes such as vegetable wastes etc. can be used as manure for plants.

6. When a ray of light is incident on a rectangular glass slab immersed in a medium, the emergent ray comes out parallel to the incident ray. The path of the light ray is as shown :



EF is the incident ray and GH is the emergent ray which is parallel to the incident ray.

7. Some of ways to make people realise that the improper disposal of waste is harmful to the environment are:

(a) Improper disposal of waste will serve as a breeding ground for mosquitoes and will create favourable conditions for the spread of various diseases.

(b) Improper disposal of waste will release harmful gases in the environment which makes the environment unclean and unhygienic for normal living of organisms.

(c) The waste will flow to water bodies along with the rain water and become a threat to aquatic organisms.

8. Alkaline potassium permanganate ($KMnO_4$) or acidified potassium dichromate ($K_2Cr_2O_7$) can be used as an oxidising agent for conversion of ethanol to ethanoic acid.

i. Litmus test: Ethanoic acid turns blue litmus solution red whereas ethanol being neutral in nature has no effect on litmus solution.

ii. Reaction with sodium carbonate: Ethanoic acid reacts with sodium carbonate to form sodium ethanoate and carbon dioxide gas is evolved.

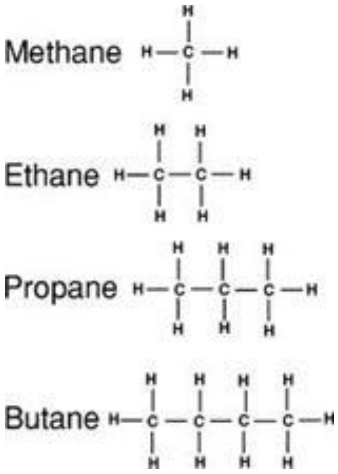
$2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + H_2O + CO_2$

Ethanol does not react with sodium carbonate.

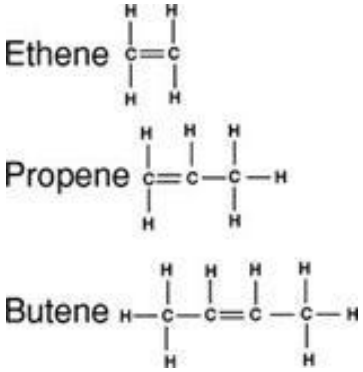
$CH_3CH_2OH + Na_2CO_3 \rightarrow$ No reaction

9.

(a) Alkanes: Hydrocarbons in which the carbon atoms are joined by single covalent bonds are called Alkanes. They have general formula C_nH_{2n+2}, where n is the number of carbon atoms. Suffix, -ane is used while naming alkanes.



Alkenes: Hydrocarbons in which the carbon atoms are joined by a double bond are called Alkenes. They have general formula C_nH_{2n}, where n is the number of carbon atoms. Suffix, -ene is used while naming alkenes.



(b) Alkanes generally burn with clean flame because in them, the percentage of carbon is comparatively low as compared to other unsaturated hydrocarbons. Hence they get oxidised completely by the oxygen present in air.

10.

i. $_{19}K$ has one electron in the outermost shell and its electronic configuration is 2, 8, 8, 1.

ii. $_4Be$ and $_{20}Ca$ belongs to same group i.e. Group 2.
Electronic configuration:
$_4Be$ – 2, 2
$_{20}Ca$ – 2, 8, 8, 2
$_4Be$ and $_{20}Ca$ have same number of valence electrons in outermost shell i.e. 2 so they belong to same group.

iii. $_9F$ and $_4Be$ belongs to the same period i.e. period 2.
Electronic configuration:
$_9F$ - 2, 7
$_4Be$ - 2, 2
$_4Be$ has a bigger atomic size than $_9F$ because the atomic radius decreases as we move from left to right in a period due to increase in nuclear charge which tends to pull the electrons closer to the nucleus and hence size of atom reduces.

11.

(a) Element X (atomic number 17)

Electronic configuration of X: 2, 8, 7

No. of electrons in outermost shell = 7

So, Group number = 17

No. of shells = 3

So, Period to which the element belongs = 3

Element Y (atomic number 20)

Electronic configuration of Y: 2, 8, 8, 2

No. of electrons in outermost shell = 2

So, Group number = 2

No. of shells = 4

So, Period to which the element belongs = 4

(b) X has 7 valence electrons so, it needs 1 electron to complete its octet and Y has 2 valence electrons so, it can donate its 2 electrons to acquire the octet configuration. Hence, X will gain 1 electron and Y will lose 2 electrons, so the chemical reaction is:

$X_2 + Y \rightarrow YX_2$

X = Cl (At. No. = 17) and Y = Ca (At. No. = 20)

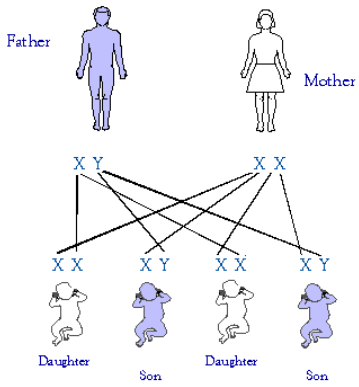
So, $Cl_2 + Ca \rightarrow CaCl_2$

12. In human beings, females have two X chromosomes and males have one X and one Y chromosome. Therefore, the females are represented as XX and males as XY.

At the time of mating, large number of sperms are ejaculated from the male reproductive organ (penis), into the female reproductive organ i.e. vagina. They travel towards the fallopian tubes, where only one sperm meets with the egg.

The process of fusion of the sperm and ovum is called fertilisation. The sperm has either X or Y chromosome and egg has only X chromosome. So, if a sperm carrying Y chromosome fuses with the egg, the newly born child will be male and if a sperm carrying X chromosome fuses with the egg, the newly born child will be female. There is an equal chance of fusion of either X or Y chromosome with the egg so we can say that the sex of a new born child is a matter of chance and none of the parent is responsible for it.

Sex determination in humans is shown below:



13.

Acquired traits	Inherited traits
i. The acquired traits are the traits which are experienced by an individual during his life time.	i. Inherited traits are the characteristics which one acquires from his/ her ancestors.
ii. These involve changes in non-reproductive tissues (or somatic cells), which cannot be passed on to the germ cells or progeny.	ii. These involve changes in the DNA. Hence, they are transmitted to the progeny
iii. Example- cut-tail of mice, learning to dance etc.	iii. Example- height, eye colour, skin color etc.

14. Sexually transmitted diseases by virus:

Genital Herpes is caused by the Herpes Simplex virus and AIDS is caused by HIV.

Sexually transmitted diseases by bacteria:

Gonorrhea is caused by *Nisseria gonorrhoeae* and Syphilis is caused by *Treponema pallidum*.

Prevention of transmission of STD's:

i. Having sex with infected or any unknown person should be avoided.
ii. Sharing of needles, syringes etc. must be prohibited.
iii. The surgical and dental instruments should be sterilised properly before use.
iv. Avoid blood transfusions from infected person. Blood should be tested before transfusion.
v. Adequate medical treatment should be provided to the pregnant woman to protect the child from getting infected.

15.

(a) Regeneration in Planaria:

In Planaria, any part of the body which gets cut is capable of regeneration or developing into a complete organism. Regeneration is carried out by specialised cells which proliferate and make large numbers of cells. From these mass of cells, different cells undergo changes to become various cell types and tissues. These changes take place in an organised sequence referred to as development.

(b)

Regeneration	Reproduction
1. It is a type of asexual mode of reproduction in which only single parent is involved.	1. It includes both sexual and asexual mode of reproduction in which either single parent or both the parents are involved respectively.
2. This mode of reproduction is dependent on a cut in an organism.	2. This mode of reproduction is independent of cut in an organism.
Example - Planaria.	Example - Sexual reproduction in humans.

16. Given that :

The height of the object h_o = 5 cm

Focal length of the lens = −10 cm

Object distance, u = −20 cm

Using lens formula,

$$\frac{1}{v}-\frac{1}{u}=\frac{1}{f}$$

$$\frac{1}{v}-\frac{1}{-20}=\frac{1}{-10}$$

$$\frac{1}{v}=\frac{1}{-10}-\frac{1}{20}$$

$$\Rightarrow v=\frac{-20}{3}=-6.66\,\text{cm}$$

Negative sign implies that the image is formed on the same side as the object.

We know that magnification, $m=\frac{v}{u}=\frac{-20/3}{-20}=\frac{1}{3}$

Since magnification is positive, so image is virtual and erect.

Let h_i be the height of the image.

We also know that: $m = \frac{v}{u}=\frac{h_i}{h_o}$

$$\frac{1}{3} = \frac{h_i}{5}$$

$$h_i = \frac{5}{3} = 1.66\,cm$$

As $h_i < h_o$

The image formed is smaller than the object.

17.

i. Rear view mirrors: Convex mirrors
   Reason: (a) They produce virtual and erect images of the objects. (b) They have a wider field of view as they are curved outwards.

ii. Shaving mirrors: Concave mirrors
   Reason: (a) Image formed is magnified so that the details of the object can be seen clearly. (b) Image formed is virtual and erect when the object is placed close to the mirror.

18. During sunrise and sunset, Sun is red in colour while at noon, the Sun appears white.

At the time of sunrise and sunset, the Sun is near the horizon. The rays from the Sun have to travel a much larger part of the atmosphere to reach an observer on earth. So, most of the blue light gets scattered away. The red colour which has the largest wavelength is scattered the least and enters into our eyes. Hence, the Sun appears red at the time of sunrise and sunset.

At noon, the sun is nearly overhead. The sunlight has to pass through much smaller portion of the Earth's atmosphere. The scattering is much less and the Sun looks white.

19. Ecosystem is a self sustaining system where the biotic and abiotic organisms of various communities live with each other.

(a) The two components of the ecosystem are- Biotic and Abiotic. Biotic system consists of all the living organisms of particular area like humans, animals etc. and the nonliving component consists of air, minerals, soil, water and sunlight.

(b) Ponds are an example of a natural ecosystem whereas an aquarium is an example of an artificial ecosystem. Ponds do not need to be cleaned but aquarium needs to be cleaned because an aquarium does not contain soil and decomposing bacteria which helps in degrading complex organic substances into simple inorganic substances. But ponds or lakes have this ability of self purification, and therefore these do not need to be cleaned.

20.

(a) Placenta is a disc like tissue which develops between the uterus wall and embryo.

Role of placenta:

i. Exchange of water between mother and the foetus.
ii. Exchange of nutrients.
iii. Exchange of respiratory gases.
iv. Excretion of nitrogenous wastes from foetus. Nitrogenous waste crosses the placenta and is removed by mother's kidney.
v. Antibodies also cross the placenta and provide immunity to the baby.

(b) Ways of preventing pregnancy:

i. Natural methods: In this method, sexual act is avoided from the 10^{th} day to the 17^{th} day of the menstrual cycle, since during this period ovulation is expected. Therefore, the chances of fertilisation are very high.
ii. Barrier methods: In this method, the fertilisation of ovum and sperm is prevented with the help of physical devices such as condoms and diaphragm.
iii. Oral contraceptives: In this method, tablets or drugs are taken orally. These contain small doses of hormones which prevent the release of eggs and prevent fertilisation.

21.

(a) A - Stigma.

Function - The stigma is a sticky surface where the pollen grains land and germinate.

B - Pollen tube.

Function - It carries the pollen grains to the egg cell for fertilisation.

C - Egg cell.

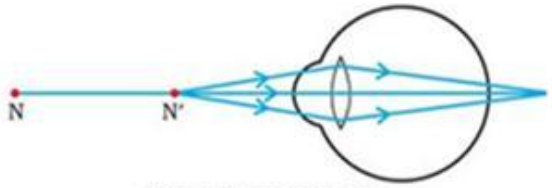
Function - It fuses with the male gamete and leads to the formation of the zygote.

(b) Role of gametes - Gametes play an important role in sexually reproducing organisms as they carry the entire genetic information of the organism. These gametes upon fusion result in the formation of the zygote, which develops into a new individual. Any deformation in the gametes will lead to deformity in the newly formed offspring.

Role of zygote - Zygote is the diploid cell formed by the fusion of male and female gametes during fertilisation in sexual reproduction. Zygote is the first stage in the development process of an organism and it contains all the genetic information of both the parents essential for the growth of the new organism.

22.

(a) The person is suffering from Hypermetropia i.e. far-sightedness. It is a defect of vision due to which a person cannot see nearby objects clearly though he can see distant objects clearly. In this defect the image of the nearby object is formed behind the retina of eye.

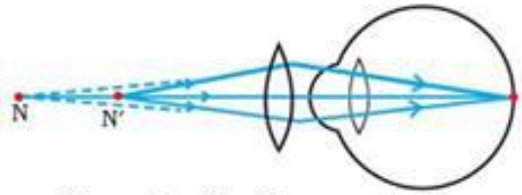


Hypermetropic eye

Hypermetropia is caused due to:

i. decrease in length of the eyeball
ii. increase in focal length of the eye lens

This defect can be corrected using a convex lens of appropriate focal length so that the image gets formed on the retina



Correction for Hypermetropic eye

(b) Eye donations:

Our eyes can live even after our death, so by donating our eyes, we can give vision to a blind person and give them an opportunity to see the world. By giving such advertisements in newspapers, we can make more people aware for this noble cause and raise the number of eye donations for blind people.

23. Snells' law of refraction: The ratio of the sine of angle of incidence to the sine of angle of refraction is constant for a pair of media.

Mathematically, it can be given as follows:

When light travels from medium a to medium b, such that 'i' is the angle of incidence and 'r' is the angle of refraction, then

$$\frac{\sin i}{\sin r} = {}^{a}n_{b}$$

where, ${}^{a}n_{b}$ is the relative refractive index of medium 'b' with respect to medium 'a'.

Relation between refractive index (n) of a medium and the speed of light in vacuum is:

$$n = \frac{\text{Speed of light in vacuum (c)}}{\text{Speed of light in medium (v)}}$$

Given that:

Refractive index of a with respect to b, ${}^{b}n_{a} = \frac{n_a}{n_b} = \frac{2}{3}$ ––––––––(i)

Refractive index of b with respect to c, ${}^{c}n_{b} = \frac{n_b}{n_c} = \frac{4}{3}$ ––––––––(ii)

$\therefore$ Refractive index of c with respect to a, ${}^{a}n_{c} = \frac{n_c}{n_a} = \frac{n_c}{n_b} \times \frac{n_b}{n_a}$

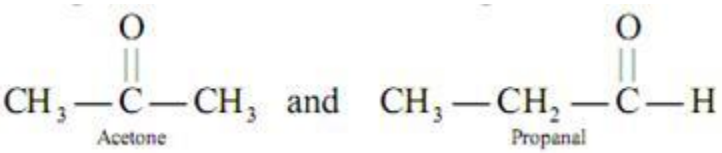
${}^{a}n_{c} = \frac{3}{4} \times \frac{3}{2}$ –––– Using eq. (i) and (ii)

${}^{a}n_{c} = \frac{9}{8}$

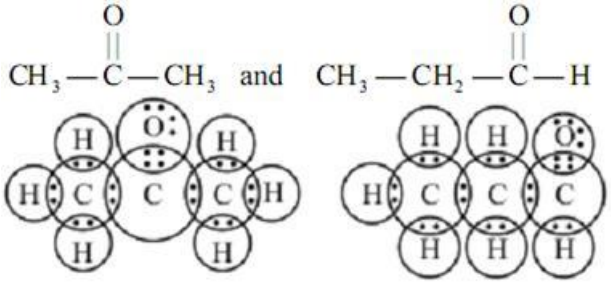
24.

(a) Compounds having same molecular formula but different structural formula are known as isomers.

(b) Two possible isomers of the compound with molecular formula C_3H_6O:



(c) Electron dot structure:



SECTION B

25. (b) He should move the mirror slightly towards the screen.

When an object is at infinity, image is formed at the focus and when an object is beyond C then image is formed between C and F. As the object is farther, image will be closer to F. So, the student should move the mirror slightly towards the screen.

26. (d) The device X is a convex lens of focal length 40 cm.

The parallel rays from the distant object fall on the convex lens and converge at its second principal focus (i.e., where the screen is placed). Then the distance between the screen and the convex lens gives the approximate focal length of the lens i.e. 40 cm.

27. (c) Ray diagrams I, II and III are correct.

The light ray passing through the optical centre of the lens does not deviate. The light ray parallel to the principal axis passes through the second focus of the lens. The light ray passing through the first focus becomes parallel to the principal axis after passing through the lens.

28. (b) Rays 2, 3 and 4 obey the laws of refraction.

Ray (2) is parallel to the principal axis and passes through the second focus of the lens.

Ray (3) passes through the optical centre and does not deviate.

Ray (4) passes through the first focus of the lens and goes parallel to the principal axis.

29. (a) I

The best set up is given in figure I. The incoming light should not fall perpendicularly as the light will emerge straight and refraction cannot be traced. The light rays should not be very close or far from the normal as the emergent rays are difficult to trace.

30. (d) I,II and III

For light rays passing through a glass slab, the following conditions should hold true:

1. $\angle i \approx \angle e$ and $\angle r < \angle i$
2. Also, with the increase in incident angle, the refracted angle also increases.

Both of these conditions are satisfied in all the three observations.

31. (d) bends at an angle to the direction of incident ray

As the light gets refracted twice at different angles the emergent ray bends at an angle to the direction of incident ray.

32. (c) III

When light goes form a rarer medium to a denser medium; it bends towards the normal and vice-versa. This condition is fulfilled in figure (III).

33. (a) I and II

Analogous organs are those which do not share a common ancestry but perform common functions. Hence, wings of insects and wings of bats are analogous organs in animals and potato and sweet potato are analogous organs in plants.

34. (d) Carrot and Radish

Homologous structures are similar in origin but perform different functions. Carrot and radish are underground roots. So, they are considered homologous structures.

35. (d) Plumule, Radicle and Cotyledon

In the figure, the part marked A is Plumule, B is Radicle and C is Cotyledon.

36. (d) None of the above

Yeast reproduces asexually by the process of budding.

Budding is a type of asexual reproduction in which a new organism is formed from a bud of an existing organism. A small bud is formed at a specific position on the parent cell. The nucleus of parent cell splits and a part of it enters inside the newly formed bud. The bud develops into a new cell or daughter organism. The new organism remains attached to the parent organism till it matures. After attaining maturity it separates from the parent body.

37. (d) None of these

The correct procedure in reproduction in Amoeba is,

(a) Chromosome is replicated.

(b) Chromosome splits into daughter strands.

(c) Cytokinesis splits the Amoeba into two daughter cells.

(d) Two Amoebae with identical DNA.

38. (a) I and II

Soap solution is basic in nature because it is formed from a strong base NaOH. Hence it turns red litmus paper blue and does not change the color of blue litmus paper. The saponification reaction is exothermic in nature. The correct statements are I and II.

39. (d) I, II and IV

Sodium hydroxide is in the form of small white pellets and is soluble in water. Being basic in nature, it turns red litmus paper blue. The correct observation is I, II and IV.

40. (b) 1,3 and 6

Hard water contains Ca^{2+} and Mg^{2+} ions. Thus the salts which can be added to water to make it hard are calcium sulphate, calcium chloride and magnesium chloride i.e. the salts 1, 3 and 6.

41. (a) The acetic acid dissolves readily in water.

The acetic acid dissolves readily in water to form a clear solution.

42. (d) IV, I and II

When acetic acid is taken in a dry test tube and sodium hydrogen carbonate is added to it, a colourless and odourless gas evolves with a brisk effervescence i.e. CO_2.

$$\underset{\text{acetic acid}}{CH_3COOH} + \underset{\text{Sodium hydrogen carbonate}}{NaHCO_3} \rightarrow \underset{\text{Sodium acetate}}{CH_3COONa} + H_2O + \underset{\text{carbon dioxide}}{CO_2}$$

When CO_2 is passed through lime water, it turns lime water milky because of formation of calcium carbonate ppt.

$$\underset{\text{lime water}}{Ca(OH)_{2(aq)}} + CO_{2(g)} \rightarrow \underset{\text{(white ppt)}}{CaCO_{3(s)}} + H_2O$$

CO_2 being a non-supporter of combustion extinguishes the burning splinter when it is brought near it. So, the correct observations are IV, I and II.