GRB BOOKS

Ankit Agarwal

GRB KOTA QUESTION BANK PHYSICAL CHEMISTRY

Part-I

FOR

IIT-JEE

OLYMPIAD & KVPY

G. R. BATHLA & SONS
DELHI • MEERUT

GRB KOTA

QUESTION BANK

PHYSICAL CHEMISTRY

Part-I

For

IIT-JEE

OLYMPIAD & KVPY

(A Surety in IIT-JEE Selection)

By :

Ankit Agarwal

B.Tech (IIT-Delhi), Gold Medalist

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PREFACE *to the Second Edition*

Over a period of time, results from a few institutes have been exceptional in **JEE Main** as well as **Advanced.** The heart of shining results revolves around exceptional faculty team in these institutes and its wonderful education system.

GRB Kota Question Bank (Physical Chemistry) has been written to assist those sincere students who are unable to access huge volume of questions solved in these various reputed institutes.

The GRB Kota Question Bank is a collection (from a research of more than 16 years) of all important questions framed and discussed in reputed coaching institutes, as well as relevant questions of National Olympiads of various countries like India, US, UK, Canada, Australia etc. Many of my students have brought laurels to our country by fetching Gold Medals in IJSO, ICHO as well as cracked JEE Advanced in TOP-100 ranks.

All varieties of questions viz. Single choice (sub-topicwise), Multiple choice, Assertion-reasoning, Comprehension Based, Matrix-match and Subjective (integer type) has been covered for students' benefit. The book has been written in two parts. Part-I contains all the class 11 topics taught in reputed coaching institutes, while Part-II contains topics of class 12.

The sequence of the chapters in the book is the same as taught in leading coaching institutes of INDIA. Hence, any coaching institute can very well use this book, for exhaustive problem solving for their students.

What makes this book special?—A Chapter on 'Graphical interpretation' has been introduced in Part-II. This chapter covers graph based questions from all physical chemistry chapters. This will play an important role in concept building.

It is almost guaranteed that, a student who solves the questions given in the GRB Kota Question Bank will be miles ahead in his / her preparation of JEE/KVPY/Chemistry Olympiad/ IJSO.

To help the student more, hints and solutions have also been given to almost all the questions. GRB Kota Question Bank has been designed in such a manner that any student who has studied NCERT of Class X, XI and XII can easily learn advance concepts from this book.

I would like to sincerely acknowledge my Teachers, my Students, my Parents, my Friends, my Wife and my lovely Daughters, who encouraged and supported me to compile this book. A special thanks to my colleagues—Dr. Sonal Rajora, Mr. Girish Gaur and Mr. ShashikantVaishnav, who also contributed in their respective subjects to bring out a complete study material for the benefit of students at large. I am also thankful to Shri Manoj Kumar Bathla, Proprietor, G.R. Bathla & Sons and Mr. Sugam Bathla for publishing and distributing the book across India.

Special thanks to my students Niyati, Jash, Sovesh, Poojan, Jaysheel, Mudita, Shrey, Dhruv, Naman, Mohit, Pratham who helped in making appropriate corrections/modifications in the book.

Any suggestions/ improvements from the readers are most welcome!

July, 2019 **Author**

Note **:** *Students and honourable teachers may feel free to give valuable suggestions on the mail* ***grbsonssuggestion@gmail.com*** *to improve the quality of the book.*

NOTE TO THE STUDENTS

Dear Student,

It is your great fortune to have this book in your hands. If this book is carefully handled then, be assured that you are successful! Only time is separating your success.

Based on my teaching experience of more than 16 years, I would suggest the following to get the best out of this book:-

1. Always keep an OMR handy while solving questions. Avoid solving questions in the book. If you can't arrange an OMR, then, write your answers in an A4 sheet.
2. Always solve questions in a timed manner. Ideal time duration is 60 minutes.
3. Before the time is complete, do not see the answers or solutions.
4. Be honest, while checking the answers. The questions you miss or wrongly attempt must be marked in RED.
5. Reattempting these RED marked questions, will help you tone up your preparation.
6. After 60 minutes, do some introspection of what better can be done with the missed or wrongly attempted questions. Reviewing the concepts for those problems is a must.
7. Be observant in checking all the options. Sometimes, rejection of options may help you arrive at the correct answer.
8. For Physical Chemistry, in a span of 60 minutes we can solve approximately 30 questions. So, our target should be to solve at least 20 questions and go upto30 eventually.
9. After attempting a chapter completely, please do attempt graph based questions from **Graphical Interpretation** chapter (Part-II of Physical Chemistry), so that fine tuning of concepts from that topic is done.

Do remember, that **key to success in Physical Chemistry** is to not get stuck with a single problem, **MOVE ON!** Let your higher intelligence work on it. After your complete attempt of 20-30 questions, come back to resolve those stuck up questions.

This book will help you achieve mastery in Physical Chemistry through problem solving.

All the Best for your Future! Your future is now in your hands…

ABOUT THE AUTHOR

Ankit Agarwal is a popular name in the realm of Chemistry. He is a B.Tech from IIT Delhi (Gold Medalist) and his passion to interact with bright minds plus his interest and love for Chemistry led him to teach and guide many IIT-JEE, Chemistry Olympiad aspirants. Over a period of 16 years, many of his students have brought laurels to the country by getting Gold medals in Olympiad and Top Ranks in IIT-JEE etc.

His intent to share his in-depth knowledge of the subject with many sincere students, who cannot come in direct contact with him, has made him write this book.

Currently, he is a senior faculty of Chemistry in a reputed institute of Kota.

Physical Chemistry : Part -I

Physical Chemistry : Part - II

CONTENTS

1 Chapter

Mole Concept, Stoichiometry, Concentration Terms

STRAIGHT OBJECTIVE TYPE

A. Mole Calculations

1. If the atomic mass of sodium is 23, the number of moles in 46 g of sodium is :
(a) 1 (b) 2
(c) 2.3 (d) 4.6

2. The charge on 1 g-ion of Al^{3+} is : (N_A = Avogadro's number, e = charge on one electron)
(a) $\frac{1}{27} N_A e$ coulomb (b) $\frac{1}{3} \times N_A e$ coulomb
(c) $\frac{1}{9} \times N_A e$ coulomb (d) $3 \times N_A e$ coulomb

3. Which of the following contains the greatest number of atoms?
(a) 1.0 g of butane (C_4H_{10})
(b) 1.0 g of nitrogen (N_2)
(c) 1.0 g of silver (Ag)
(d) 1.0 g of water (H_2O)

4. A gaseous mixture contains CO_2(g) and N_2O(g) in 2 : 5 ratio by mass. The ratio of the number of molecules of CO_2(g) and N_2O (g) is :
(a) 5 : 2 (b) 2 : 5
(c) 1 : 2 (d) 5 : 4

5. A sample of aluminium has a mass of 54.0 g. What is the mass of the same number of magnesium atoms? (At. wt. Al = 27, Mg = 24)
(a) 12 g (b) 24 g
(c) 48 g (d) 96 g

6. The weight of a molecule of the compound $C_{60}H_{22}$ is :
(a) 1.09×10^{-21} g (b) 1.24×10^{-21} g
(c) 5.025×10^{-23} g (d) 16.023×10^{-23} g

7. Four 1-1 litre flasks are separately filled with the gases H_2, He, O_2 and O_3 at the same temperature and pressure. The ratio of total number of atoms of these gases present in different flask would be :
(a) 1 : 1 : 1 : 1 (b) 1 : 2 : 2 : 3
(c) 2 : 1 : 2 : 3 (d) 3 : 2 : 2 : 1

8. Which of the following expressions is **correct** (n = number of moles of the gas, N_A = Avogadro constant, m = mass of 1 molecule of the gas, N = number of molecules of the gas)?
(a) $n = m N_A$ (b) $m = N_A$
(c) $N = nN_A$ (d) $m = n/N_A$

9. The volume of 1 mole of a gas at standard temperature and pressure is :
(a) 11.35 litres (b) 22.7 litres
(c) 100 litres (d) 22.4 litres

10. One mole of a gas is defined as :
(a) the number of molecules in one litre of gas
(b) the number of molecules in one formula weight of gas
(c) the number of molecules contained in 12 grams of (12 C) isotope
(d) the number of molecules in 22.7 litres of a gas at S.T.P.

11. If two moles of an ideal gas at 546 K occupies a volume of 44.8 litres, the pressure must be :
(a) 2 atm (b) 3 atm
(c) 4 atm (d) 1 atm

12. A container consists of O_2 gas at 4 atm pressure and 400 K. If the volume of the container is 8.21 litre then calculate number of oxygen atoms present in the container.
(a) 2 (b) $1.5 \times N_A$
(c) 6.023×10^{23} (d) 12.04×10^{23}

13. 2 moles of nitrogen atoms at STP occupy a volume of :

(a) 11.35 L (b) 45.4 L
(c) 22.7 L (d) 5.6 L

14. Under the same conditions, two gases have the same number of molecules. They must :
(a) be noble gases
(b) have equal volumes
(c) have a volume of 22.4 dm^3 each
(d) have an equal number of atoms

15. 3 g of a hydrocarbon on combustion in excess of oxygen produces 8.8 g of CO_2 and 5.4 g of H_2O. The data illustrates the law of :
(a) conservation of mass (b) multiple proportions
(c) constant proportions (d) none of these

16. The mass of 1 mole of neutrons ($m_n = 1.675 \times 10^{-27}$ kg) is :
(a) 1.800×10^{-3} kg (b) 1.008×10^{-4} kg
(c) 1.080×10^{-3} kg (d) 1.008×10^{-3} kg

17. 10^{21} molecules are removed from 200 mg of CO_2. The moles of CO_2 left are :
(a) 2.88×10^{-3} (b) 28.2×10^{-3}
(c) 288×10^{-3} (d) 28.8×10^{3}

18. If the mass of 0.25 moles of an element X is 2.25 g, the mass of one atom of X is about :
(a) 1.5×10^{-24} g (b) 2.5×10^{-23} g
(c) 1.5×10^{-23} g (d) 2.5×10^{-24} g

19. From 392 mg of H_2SO_4, 1.204×10^{21} molecules of H_2SO_4 are removed. How many moles of H_2SO_4 are left?
(a) 2×10^{-3} (b) 1.2×10^{-3}
(c) 4×10^{-3} (d) 1.5×10^{-3}

20. The number of molecules of water in 333 g of $Al_2(SO_4)_3 \cdot 18H_2O$ is :
(a) $18 \times 6.022 \times 10^{23}$ (b) $9 \times 6.022 \times 10^{23}$
(c) 18 (d) 36

21. The atomic weight for a triatomic gas is a. The correct formula for the number of moles of gas in its w g is :
(a) $\frac{3w}{a}$ (b) $\frac{w}{3a}$
(c) $3wa$ (d) $\frac{a}{3w}$

22. Which of the following will have maximum number of C atoms?
(a) 5.8 g of glyoxal ($C_2H_2O_2$)
(b) 3.1 g of acetone (C_3H_6O)
(c) 11.6 g of fumaric acid ($C_4H_4O_4$)
(d) 12 g of urea (CON_2H_4)

23. An organic compound contains 14 atoms of carbon per molecule. If mass % of carbon in the compound is 22.4 %, then molecular mass of the compound will be :
(a) 3000 (b) 750
(c) 12000 (d) 600

24. A sample of clay contains 50% silica and 10% water. The sample is partially dried by which it loses 8 gm water. If the percentage of silica in the partially dried clay is 52, what is the percentage of water in the partially dried clay?
(a) 2.0 % (b) 6.4%
(c) 10.4% (d) 2.4%

25. Which of the following samples must have molar mass greater than a mixture of CO and CO_2?
(a) Pure Ne
(b) Mixture of CH_4 and SO_3
(c) Mixture of O_3 and SO_2
(d) Pure O_2

26. 1 gm-atom of nitrogen may represent :
(a) 6.02×10^{23} N_2 molecules
(b) 22.4 lit. of N_2 at 1 atm and 273 K
(c) 11.2 lit. of N_2 at 1 atm and 0°C
(d) 28 g of nitrogen

27. The mass of CO_2 that must be mixed with 20 gm of oxygen such that 27 mL of a sample of the resulting mixture would contain equal number of molecules of each gas :
(a) 13.75 gm (b) 27.50 gm
(c) 41.25 gm (d) 55 gm

28. The mass of 3.2×10^5 atoms of an element is 8.0×10^{-18} gm. The atomic mass of the element is about :
(a) 2.5×10^{-22} (b) 15
(c) 8.0×10^{-18} (d) 30

29. 132 amu of B_{12} will contain :
(a) $12N_A$ atoms of boron
(b) 1 atom of boron
(c) 1 molecule of boron
(d) N_A molecules of boron

30. Which of the following contains largest number of atoms?
(a) 4 gm carbon (b) 12 gm calcium
(c) 6.35 gm copper (d) 22.4 gm cadmium
[C = 12, Ca = 40, Cu = 63.5, Cd = 112]

31. The **only incorrect** information related with 9.6 g ozone is :
(a) contains 0.2 g molecules of ozone
(b) contains 0.6 g atoms of oxygen
(c) occupy 4.48 L at 273 K and 1 bar
(d) occupy 4.48 L at 273° C and 2 atm.

32. Total number of neutrons present in 4g of heavy water (D_2O) is : (Where N_A represents Avogadro's number)
(a) $2.4\,N_A$ (b) $4\,N_A$
(c) $1.2\,N_A$ (d) $2\,N_A$

33. 30 g of element x contains 18.069×10^{23} atoms of x. Calculate gram-molecular mass of x_2.
(a) 20 amu (b) 10 amu
(c) 10 g (d) 20 g

34. If a sample of $CuSO_4 \cdot 5H_2O$ contains 64 g S. Calculate mass of H present in sample. (S = 32)
(a) 10 g (b) 20 g
(c) 5 g (d) 40 g

35. Volume at STP of 0.44 gm of CO_2 is the same as that of :
(a) 0.02 gm of hydrogen gas
(b) 0.085 gm of ammonia gas
(c) 320 mg of sulphur dioxide gas
(d) none of the above

36. The sodium salt of methyl orange has 7% sodium. What is the minimum molecular weight of the compound?
(a) 420 (b) 375
(c) 329 (d) 295

37. In the preceding problem, if the compound contains 12.8% nitrogen and 9.8% sulphur how many nitrogen and sulphur atoms are present per atom of sodium?
(a) 2 and 1 (b) 1 and 3
(c) 1 and 2 (d) 3 and 1

38. Which of the following will contain same number of atoms as 20 g of calcium?
(a) 24 g magnesium (b) 12 g carbon
(c) 8 g oxygen gas (d) 16 g oxygen atom

39. A sample of ammonium phosphate $(NH_4)_3PO_4$ contains 3.18 mol of H atoms. The number of moles of O atoms in the sample is :
(a) 0.265 (b) 0.795
(c) 1.06 (d) 3.18

40. Cortisone is a molecular substance containing 21 atoms of carbon per molecule. The mass percentage of carbon in cortisone is 69.98%. Its molar mass is :
(a) 176.5 (b) 252.2
(c) 287.6 (d) 360.1

41. The molar mass of normal water is ... as compared to heavy water.
(a) 10% less (b) 10% high
(c) 2% less (d) zero % less

42. How many moles of magnesium phosphate, $Mg_3(PO_4)_2$ will contain 0.25 mole of oxygen atoms?
(a) 0.02 (b) 3.125×10^{-2}
(c) 1.25×10^{-2} (d) 2.5×10^{-2}

43. Number of atoms in 560g of Fe (atomic mass 56g mol^{-1}) is :
(a) twice that of 70g N (b) half that of 20 g H
(c) both (a) and (b) (d) none of these

44. If we consider that $\frac{1}{6}$th in place of $\frac{1}{12}$th mass of carbon atom is taken to be the relative atomic mass unit, the mass of one mole of a substance will :
(a) decrease twice
(b) increase two fold
(c) remains unchanged
(d) be a function of the molecular mass of the substance

45. How many moles of electron weigh in one kilogram?
(a) 6.023×10^{23} (b) $\frac{1}{9.108} \times 10^{31}$
(c) $\frac{6.023}{9.108} \times 10^{54}$ (d) $\frac{1}{9.108 \times 6.023} \times 10^{8}$

46. Which has maximum number of atoms :
(a) 24 g of C (12) (b) 56 g of Fe (56)
(c) 27 g of Al (27) (d) 108 g of Ag (108)

47. Which of the following statement is **correct?**
(a) 1 mole of electron has 1.6×10^{-19} C of charge
(b) 1 mole of electrons weigh 0.548 mg
(c) 1 mole of electrons weigh 5.48 mg
(d) 1 mole of electrons weigh 0.548 kg

48. 5.85 g of NaCl is dissolved in 1 L of pure water. The number of ions in 1 mL of this solution is :
(a) 6.02×10^{19} (b) 1.2×10^{22}
(c) 1.2×10^{20} (d) 6.02×10^{20}

49. How many gram ions of SO_4^{-2} are present in 1 gram molecule of $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$?
(a) 2 (b) 3
(c) 1 (d) 4

50. If **KOTA CLASSES** is written by a graphite pencil, it weighs 3.0×10^{-10} gm. How many carbon atoms are present in it? ($N_A = 6 \times 10^{23}$)
(a) 1.5×10^{13} (b) 5×10^{12}
(c) 2×10^{33} (d) 1.5×10^{10}

51. A compound contains 7 carbon atoms, 2 oxygen atoms and 1.0×10^{-23} gm of other elements. The molecular mass of compound is : ($N_A = 6 \times 10^{23}$)
(a) 122 (b) 116
(c) 148 (d) 154

52. Total number of electrons present in 4.4 gm oxalate ion ($C_2O_4^{2-}$) is :
(a) 0.05 N_A (b) 2.3 N_A
(c) 2.2 N_A (d) 2.1 N_A

53. Which of the following options **correctly** represent mass of 10 molecules of Marshall's acid?
(a) 10 amu (b) 1940 amu
(c) 1940 gm (d) 10 gm

54. Which of the following options consist of substances that will illustrate law of reciprocal proportions?
(a) Water, carbon-dioxide and ethanol
(b) Ammonia, water and di-nitrogen pentaoxide
(c) Ferrous oxide, Ferric oxide and Fe_3O_4
(d) Nitrous oxide, Nitric oxide and sulphur di-oxide

55. Identify the option containing maximum number of atoms.
(a) 18 mg of glucose (b) 2 mg of hydrogen gas
(c) 10 mg of H_2O (d) 7.8 mg of benzene

56. 13.5 gm of aluminium when changes to Al^{3+} ion in solution, will lose :
[Al = 27, $N_A = 6 \times 10^{23}$]
(a) 18.0×10^{23} electrons (b) 6.0×10^{23} electrons
(c) 3.0×10^{23} electrons (d) 9.0×10^{23} electrons

57. One of the following combinations illustrate law of reciprocal proportions :
(a) N_2O_3, N_2O_4, N_2O_5 (b) NaCl, NaBr, NaI
(c) CS_2, CO_2, SO_2 (d) PH_3, P_2O_3, P_2O_5

58. The weight of 1×10^{22} molecules of $CuSO_4.5H_2O$ is :
(a) 41.59 g (b) 415.9 g
(c) 4.159 g (d) 0.4159 g

59. The largest number of molecules is in :
(a) 34 g of water (b) 28 g of CO_2
(c) 46 g of CH_3OH (d) 54 g of N_2O_5

60. A substance contains 7% by mass of N and 4% by mass of oxygen. Calculate minimum possible molar mass of the substance.
(a) 200 (b) 300
(c) 400 (d) 600

61. Molar mass of electron is nearly : ($N_A = 6 \times 10^{23}$)
(a) 9.1×10^{-31} kg mol^{-1} (b) 9.1×10^{-31} gm mol^{-1}
(c) 54.6×10^{-8} gm mol^{-1} (d) 54.6×10^{-8} kg mol^{-1}

62. Which one of the following pairs of gases contains the same number of molecules?
(a) 16 g of O_2 and 14 g of N_2
(b) 8 g of O_2 and 22 g of CO_2
(c) 28 g of N_2 and 22 g of CO_2
(d) 32 g of CO_2 and 32 g of N_2

63. Calculate the number of oxygen atoms and its weight in 50 gm of $CaCO_3$.
(a) 6.02×10^{23} and 12 gm
(b) 9.033×10^{23} and 24 gm
(c) 9.033×10^{23} and 12 gm
(d) 6.02×10^{23} and 24 gm

64. Equal masses of oxygen, hydrogen and methane are taken in identical conditions. What is the ratio of the volumes of the gases under identical conditions?
(a) 16 : 1 : 8 (b) 1 : 16 : 2
(c) 1 : 16 : 8 (d) 2 : 16 : 1

65. Which of the following options correctly represent the increasing order of number of O atoms in the following samples?
(P) 1.8 gm of glucose
(Q) 1 gm-atom of oxygen.
(R) Mixture of ozone and oxygen gas having total 5 millimoles of the two gases.
(S) Mixture of $CO_{(g)}$ and $NO_{(g)}$ having total 20 millimoles of the two gases.
(a) (R) < (S) < (P) < (Q) (b) (S) < (P) < (Q) < (R)
(c) (P) < (R) < (S) < (Q) (d) (S) < (R) < (Q) < (P)

66. If equal mass of following substance are taken then which will have maximum number of molecules.
(a) $C_6H_{12}O_6$ (b) $C_{12}H_{22}O_{11}$
(c) C_2H_6 (d) CO_2

67. Law of multiple proportion is illustrated by :
(a) Calcium carbonate and Barium carbonate
(b) Sodium chloride and potassium chloride
(c) Sulphur dioxide and sulphur trioxide
(d) Carbon dioxide and sulphur dioxide

68. 1 atom of X, 2 atoms of Y and 3 atoms of Z combine together to give a molecule XY_2Z_3. Now we take 10 gm of X and 2×10^{23} atoms of Y and 0.06 moles of Z in a container, to give 5.6 gm of XY_2Z_3. What is the molar mass of Z?
Given : M_X = 60 gm/mol M_Y = 80 gm/mol
(a) 25 (b) 24
(c) 32 (d) 20

69. 1.61 gm of anhydrous $ZnSO_4$ was placed in moist air after few days its weight was found to be 2.87 gm. What is the molecular formula of hydrated salt?
[Zn = 65]
(a) $ZnSO_4 \cdot H_2O$ (b) $ZnSO_4 \cdot 3H_2O$
(c) $ZnSO_4 \cdot 7H_2O$ (d) $ZnSO_4 \cdot 10H_2O$

70. A rock contains 1.02% Al_2O_3 and 1.80% SiO_2 (by mass). Apart from free SiO_2, some SiO_2 in the rock is present as kaolin ($Al_2O_3 \cdot 2SiO_2$). All Al_2O_3 in the

rock is present as kaolin. The mass percentage of free SiO_2 in the rock is : (Al = 27, Si=28)

(a) 1.2% (b) 0.6%
(c) 1.8% (d) 0.8%

71. A gaseous mixture contains SO_3 (g) and C_2H_6 (g) in a 16 : 15 ratio by mass. The ratio of total number of atoms present in C_2H_6(g) and SO_3 (g) is :

(a) 2 : 5 (b) 1 : 5
(c) 5 : 1 (d) 5 : 2

72. Haemoglobin ($C_{2952}\ H_{4664}\ N_{812}\ O_{832}\ S_8\ Fe_4$, molar mass = 65248 g/mol) is the oxygen carrier in blood. An average adult has about 5.0 L of blood. Every milliliter of blood has approximately 6.0×10^9 erythrocytes, or red blood cells and every red blood cell has about 3.0×10^8 haemoglobin molecules. The mass of haemoglobin molecules in an average adult is : ($N_A = 6 \times 10^{23}$)

(a) 978.72 gm (b) 652.48 gm
(c) 434.99 gm (d) 0.015 gm

73. A sample of protein was analysed for metal content and analysis revealed that it contained magnesium and titanium in equal amounts, by mass. If these are the only metallic species present in the protein and it contains 0.008% metal by mass, the minimum possible molar mass of the protein is : [Mg = 24, Ti = 48]

(a) 600000 (b) 150000
(c) 300000 (d) 1200000

74. Total number of protons, neutrons and electrons present in 14 mg of $_6C^{14}$ is :

(Take $N_A = 6 \times 10^{23}$)

(a) 1.2×10^{22} (b) 1.2×10^{25}
(c) 7.2×10^{21} (d) 1.08×10^{22}

75. Which of the following has the smallest number of molecules?

(a) 22.7 mL of CO_2 gas at STP
(b) 22 g of CO_2 gas
(c) 11.35 L of CO_2 gas at STP
(d) 0.1 moles of CO_2 gas

76. If a mole is defined to be 3×10^{24} (instead of Avogadro's Number, 6×10^{23}), what would be the mass of one mole of Argon atoms? [Atomic mass of Ar on conventional scale is 40]

(a) 40 gm (b) 200 gm
(c) 20 g (d) 8 gm

77. 1.19 gm mixture of Cu, Zn and Al contains 50% copper by weight and 3×10^{21} atoms of zinc. Find gram atoms of aluminium in given mixture?

(At. mass of Al = 27; Cu = 63.55; Zn = 65.0)

[$N_A = 6 \times 10^{23}$]

(a) 0.001 (b) 0.27
(c) 0.01 (d) 0.027

78. In the blood of an infant there are about 1.3×10^{12} red blood cells, which contain a total of 0.15 gm of iron ions. On an average, how many iron ions are present, in each red blood cell of an infant? [Fe = 56]

(a) 8.8×10^{23} (b) 4.7×10^{13}
(c) 1.2×10^9 (d) 3.0×10^8

79. Ratio of number of protons to neutrons present in 27.83×10^{29} molecules of ND_4^+:

(where D is $_1H^2$)

(a) $\dfrac{27.83 \times 10^{19}}{N_A}$ (b) 1
(c) 27.83 (d) 27.83×10^{19}

80. At certain temperature, two moles of A combines with five moles of B to produce two moles of C.If atomicity of A and B is 2, the formula of compound C is :

(a) AB_3 (b) A_2B_5
(c) AB_5 (d) A_5B_2

81. Which of the following will occupy greater volume under the similar conditions of pressure and temperature?

(a) 6 gm oxygen (b) 0.98 gm hydrogen
(c) 5.25 gm nitrogen (d) 1.32 gm helium

82. The number of electrons in 3.1 mg NO_3^- is :

(a) 32 (b) 1.6×10^{-3}
(c) 9.6×10^{20} (d) 9.6×10^{23}

83. The number of neutrons in 0.45 g water, assuming that all the hydrogen atoms are H^1 atoms and all the oxygen atoms are O^{16} atoms, is :

(a) 8 (b) 0.2
(c) 1.2×10^{23} (d) 4.8×10^{24}

84. The volume of one mole of water at 277 K is 18 ml. One ml of water contains 20 drops. The number of molecules in one drop of water will be :

(a) 1.07×10^{21} (b) 1.67×10^{21}
(c) 2.67×10^{21} (d) 1.67×10^{20}

85. 1.61 gm of $Na_2SO_4 \cdot 10H_2O$ contains same number of oxygen atoms as present in :

(a) 0.98 gm H_2SO_4 (b) 0.08 gm SO_2
(c) 1.78 gm $H_2S_2O_7$ (d) 0.05 gm $CaCO_3$

86. The number of hydrogen atoms in 0.9 gm glucose, $C_6H_{12}O_6$ is same as :

(a) 0.048 gm hydrazine, N_2H_4
(b) 0.17 gm ammonia, NH_3
(c) 0.30 gm ethane, C_2H_6
(d) 0.03 gm hydrogen, H_2

87. The number of g molecules of oxygen in 6.02×10^{24} CO molecules is :
(a) 1 g molecule (b) 0.5 g molecule
(c) 5 g molecule (d) 10 g molecule

88. One atomic mass unit in kilogram is :
(a) $\frac{1}{N_A}$ (b) $\frac{12}{N_A}$
(c) $\frac{1}{1000N_A}$ (d) $\frac{1000}{N_A}$

89. Rearrange the following (P to S) in the order of increasing masses.
(P) 0.5 mole of O_3
(Q) 0.5 gm molecule of nitrogen
(R) 3.011×10^{23} molecule of O_2
(S) 11.35 L of CO_2 at STP
(a) S < R < Q < P (b) Q < R < S < P
(c) R < Q < P < S (d) P < Q < R < S

90. Number of electrons in 36 mg of $^{18}_{8}O^{-2}$ ions are : (Take $N_A = 6 \times 10^{23}$)
(a) 1.2×10^{21} (b) 9.6×10^{21}
(c) 1.2×10^{22} (d) 1.9×10^{22}

91. The number of g-atoms of nitrogen in its 7 gm is equal to number of g-atoms in :
(a) 6 gm Mg (b) 28 gm Fe
(c) 30 gm Ca (d) 20 gm Hg

92. From 2 mg calcium, 1.2×10^{19} atoms are removed. The number of g-atoms of calcium left is :
(a) 5×10^{-5} (b) 2×10^{-5}
(c) 3×10^{-5} (d) 5×10^{-6}

93. The shape of Tobacco Mosaic Virus (TMC) is cylindrical, having length and diameter 3000 Å and 170 Å, respectively. The density of the virus is 0.08 gm/ml. The molecular weight of TMC is :
(a) 3.28 (b) 5.44×10^{-24}
(c) 5.44×10^{-18} (d) 3.28×10^{6}

94. Same mass of glucose ($C_6H_{12}O_6$) and acetic acid (CH_3COOH) contain :
(a) same number of carbon atoms
(b) same number of hydrogen atoms
(c) same number of oxygen atoms
(d) all of the above

95. 400 gm mixture of AB and AC_2 contains 26.25% of A by mass. Select the **incorrect** statement(s). (Atomic masses of $A = 15$, $B = 25$, $C = 22.5$)
(a) % mass of AB is 10
(b) Number of moles of AC_2 in the mixture is 4
(c) Number of moles of AB is 1
(d) Total moles of A atoms in mixture is 7

96. The number of nitrogen atoms in 3.68 g of $K_4[Fe(CN)_6]$ is : [N_0= Avogadro number]
(a) 0.06 (b) 0.01 N_0
(c) 0.06 N_0 (d) none of these

97. An unknown compound contains 8% sulphur by mass. Calculate **:**
(P) Least molecular weight of the compound and
(Q) Molecular weight if one molecule contains 4 atoms of S

P	Q		P	Q
(a) 200,	400	(b)	300,	400
(c) 400,	1600	(d)	400,	1200

98. The ratio of the masses of methane and ethane in a gas mixture is 4 : 5. The ratio of number of their molecules in the mixture is :
(a) 4 : 5 (b) 3 : 2
(c) 2 : 3 (d) 5 : 4

99. How many H atoms are in 3.42 g of $C_{12}H_{22}O_{11}$?
(a) 6.0×10^{23} (b) 1.3×10^{23}
(c) 3.8×10^{22} (d) 6.0×10^{21}

100. If 1.50 g of $H_2C_2O_4 \cdot 2H_2O$ were heated to drive off the water of hydration, how much anhydrous $H_2C_2O_4$ would remain?
(a) 0.34 g (b) 0.92 g
(c) 1.07 g (d) 1.50 g

101. How many millimoles of methane, CH_4, are present in 6.4 g of this gas?
(a) 0.40 (b) 4.0
(c) 40 (d) 4.0×10^2

102. Adipic acid, $HOOC(CH_2)_4COOH$, is used in making nylon. What is the total number of atoms in 1.0 g of adipic acid?

Molar Mass, g · mol^{-1}	
Adipic acid	146.26

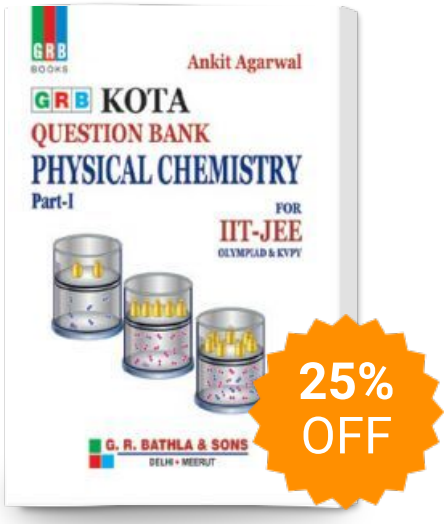
(a) 20 (b) 4.1×10^{21}
(c) 8.2×10^{22} (d) 7.2×10^{24}

103. How many moles are there in 2.24 m^3 of any gas 190 torr and 273° C?
(a) 1.25 moles (b) 12.5 moles
(c) 1.25×10^{-3} moles (d) 1.25×10^{3} moles

104. How many ozone molecules are in 3.20 g of O_3?
(a) 4.0×10^{22} (b) 6.0×10^{22}
(c) 1.2×10^{23} (d) 6.0×10^{23}

105. Number of neutrons in 5.5 gm T_2O (T is $_1H^3$) are :
(a) 0.25 N_A (b) 2.5 N_A
(c) 3 N_A (d) $4 \times N_A$

Kota Question Bank Physical Chemistry Part-I For IIT-JEE



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