

Saraswati

Lab Manual

SCIENCE

IX



Strictly in accordance with the latest CBSE syllabus

Saraswati
LAB MANUAL
SCIENCE

(For Class IX–First and Second Terms)

Based on CCE

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SYLLABUS

General Instructions

1. The units specified for each term shall be assessed through both Formative and Summative assessments.
2. In each term, there will be two Formative assessments each carrying 10% weightage.
3. The Summative assessment in each term will carry 30% weightage.
4. One Formative assessment carrying 10% weightage in each term should include hands on practicals.
5. Assessment of Practical Skills through Practical Based Questions (PBQ) will carry 15% weightage of total marks in each of the Summative assessments.

FIRST TERM COURSE STRUCTURE

UNITS	MARKS
I. Matter—Its Nature and Behaviour	29
II. Organisation in Living World	18
III. Motion, Force and Work	30
IV. Food; Food Production	13
Total	90

FIRST TERM PRACTICALS

Practicals should be conducted alongside the concepts taught in theory classes

1. To test (a) the presence of starch in the given food sample (b) the presence of the adulterant metanil yellow in dal.
2. To prepare
 - (a) a true solution of common salt, sugar and alum
 - (b) a suspension of soil, chalk powder and fine sand in water
 - (c) a colloidal solution of starch in water and egg albumin/milk in water and distinguish between these on the basis of:
 - ◆ transparency
 - ◆ filtration criterion
 - ◆ stability.
3. To prepare
 - (a) a mixture
 - (b) a compoundusing iron filings and sulphur powder and distinguish between these on the basis of:
 - (i) appearance, *i.e.*, homogeneity and heterogeneity
 - (ii) behaviour towards a magnet
 - (iii) behaviour towards carbon disulphide as a solvent
 - (iv) effect of heat.
4. To carry out the following reactions and classify them as physical or chemical changes.
 - (a) Iron with copper sulphate solution in water
 - (b) Burning of magnesium in air
 - (c) Zinc with dilute sulphuric acid
 - (d) Heating of copper sulphate
 - (e) Sodium sulphate with barium chloride in the form of their solutions in water.
5. To prepare stained temporary mounts of (a) onion peel and (b) human cheek cells and to record observations and draw their labelled diagrams.
6. To identify parenchyma and sclerenchyma tissues in plants, striped muscle fibres and nerve cells in animals, from prepared slides and to draw their labelled diagrams.

7. To separate the components of a mixture of sand, common salt and ammonium chloride (or camphor) by sublimation.
8. To determine the melting point of ice and the boiling point of water.
9. To establish relationship between weight of a rectangular wooden block lying on a horizontal table and the minimum force required to just move it using a spring balance.
10. To determine the mass percentage of water imbibed by raisins.

SECOND TERM COURSE STRUCTURE

UNITS	MARKS
I. Matter—Its Nature and Behaviour	17
II. Organisation in the Living World	25
III. Motion, Force and Work	36
IV. Our Environment	12
Total	90

SECOND TERM PRACTICALS

Practicals should be conducted alongside the concepts taught in theory classes

1. To verify laws of reflection of sound.
2. To determine the density of solid (denser than water) by using a spring balance and a measuring cylinder.
3. To establish the relation between the loss in weight of a solid when fully immersed in
 - (a) tap water
 - (b) strongly salty water,
 with the weight of water displaced by it by taking at least two different solids.
4. To observe and compare the pressure exerted by a solid iron cuboid on fine sand /wheat flour while resting on its three different faces and to calculate the pressure exerted in the three different cases.
5. To determine the velocity of a pulse propagated through a stretched string/slinky.
6. To study the characteristic of *Spirogyra* / *Agaricus*, Moss / Fern, *Pinus* (either with male or female cone) and an Angiospermic plant. Draw and give two identifying features of groups they belong to.
7. To observe and draw the given pictures /charts /models—earthworm, cockroach, bony fish and bird. For each organism record
 - (a) one specific feature of its phylum
 - (b) one adaptive feature with reference to its habitat.
8. To verify the law of conservation of mass in a chemical reaction.
9. To study the external features of root, stem, leaf and flower of monocot and dicot plants.
10. To study the life cycle of mosquito.



S.No.	Experiments	Page No.
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FIRST TERM

PHYSICS

1. MOTION F-9

Experiment 1. To establish a relationship between the weight of a rectangular wooden block lying on a horizontal table and the minimum force required to just move it using a spring balance. F-10

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1. NATURE OF MATTER—SOLUTION, SUSPENSION AND COLLOID F-17

Experiment 1. To prepare (a) a true solution of common salt, sugar and alum (b) a suspension of soil, chalk powder and fine sand in water (c) a colloidal of starch in water and egg albumin/milk in water and distinguish between these on the basis of (i) transparency (ii) filtration (iii) stability. F-19

2. NATURE AND BEHAVIOUR—MIXTURE AND COMPOUND F-29

Experiment 2. To prepare (a) a mixture (b) a compound using iron filings and sulphur powder and distinguish between these on the basis of (i) appearance, *i.e.*, homogeneity and heterogeneity (ii) behaviour towards a magnet (iii) behaviour towards carbon disulphide as a solvent (iv) effect of heat. F-30

3. TYPES OF CHEMICAL REACTIONS F-36

Experiment 3. To carry out the following reactions and classify them as physical or chemical change: (a) iron with copper sulphate solution in water (b) burning of magnesium in air (c) zinc with dilute sulphuric acid (d) heating of copper sulphate (e) sodium sulphate with barium chloride in the form of their solutions in water. F-38

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Experiment 5. To determine the melting point of ice and the boiling point of water. F-54

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Experiment 1.2. To test the presence of adulterant metanil yellow in dal. F-64

2. ORGANISATION IN THE LIVING WORLD F-70

Experiment 2.1. To prepare stained temporary mount of onion peel and to record observations and draw its labelled diagram. F-70

Experiment 2.2. To prepare stained temporary mount of human cheek cells and to record observations and draw its labelled diagram. F-71

S.No.	Experiments	Page No.
	Experiment 3.1. To identify different types of plant tissues from prepared slides and draw their labelled diagrams.	F-78
	Experiment 3.2. To identify different types of animal tissues from prepared slides and draw their labelled diagrams.	F-79
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SECOND TERM

PHYSICS

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	Experiment 4(A). To determine the velocity of a pulse through/along a stretched string.	S-28
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CHEMISTRY

1. CHEMICAL REACTIONS		S-37
	Experiment 1. To verify the law of conservation of mass in a chemical reaction.	S-38

BIOLOGY

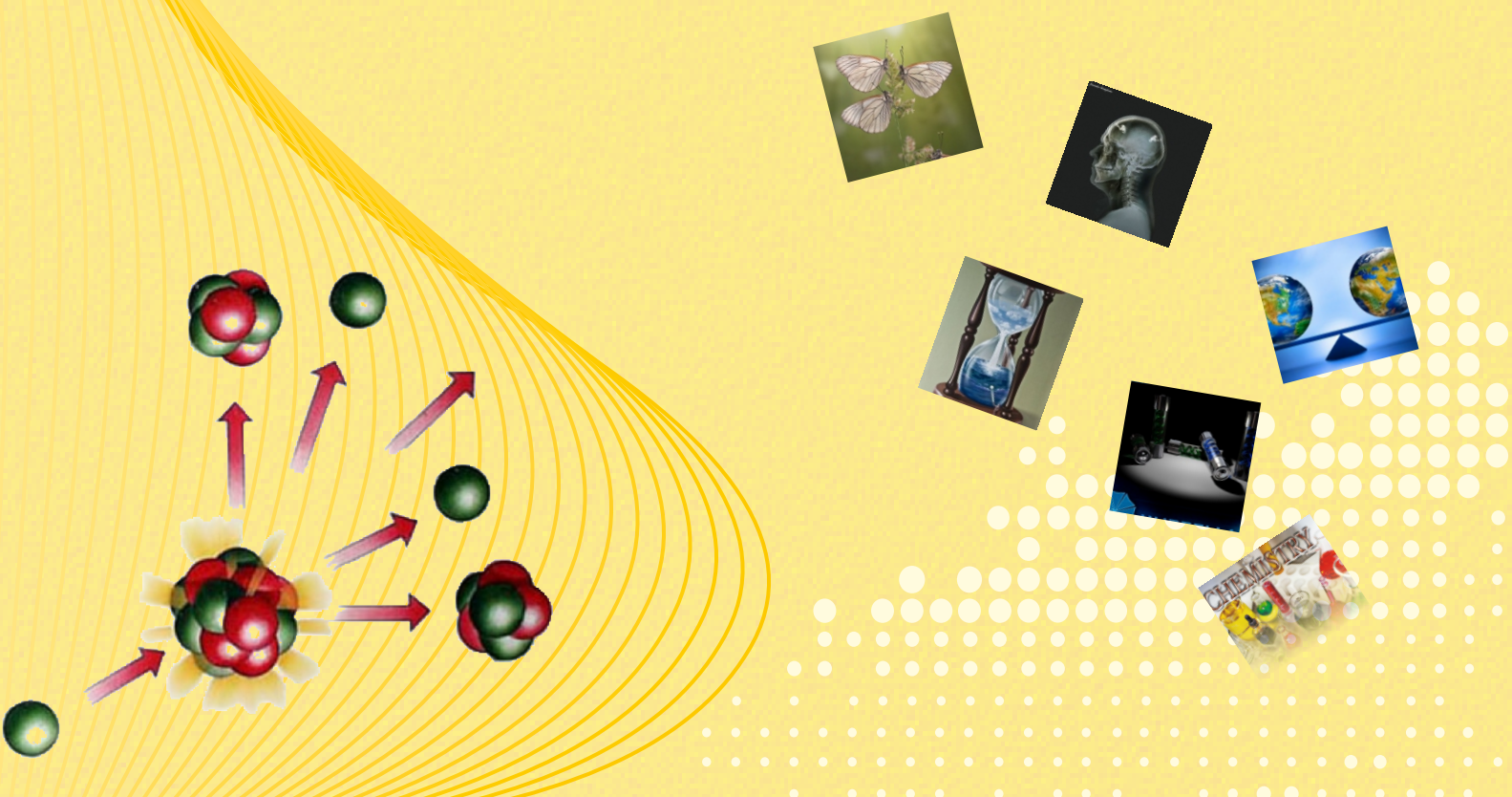
1. ORGANISATION IN THE LIVING WORLD		S-43
	Experiment 1. To study the characteristics of <i>Spirogyra</i> / <i>Agaricus</i> , Moss/Fern, <i>Pinus</i> (either with male or female cone) and an Angiospermic plant. Draw and give two identifying features of groups they belong to.	S-43
2. OUR ENVIRONMENT		S-52
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	Experiment 3. To study the external features of root, stem, leaf and flower of monocot and dicot plants.	S-61
	Experiment 4. To study the life cycle of mosquito.	S-64

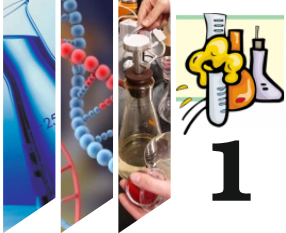
First Term

April to September



PHYSICS





1 Motion

INTRODUCTION

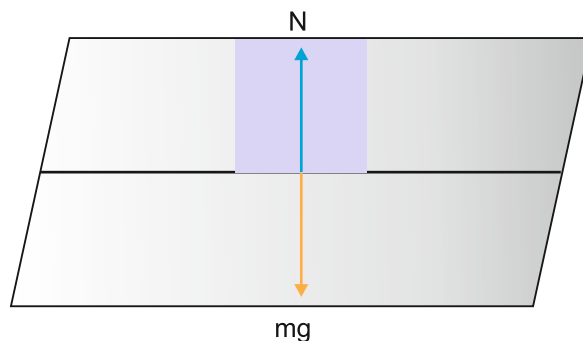
Newton's Third Law

According to Newton, whenever two objects interact with each other, they exert forces upon each other. When you are standing on a floor, your body exerts a downward force on the floor and the floor exerts an upward force on your body. These interactive forces are called action and reaction forces.

Newton said, "For every action, there is an equal and opposite reaction".

The value of the forces on the first object is equal to the value of the force on the second object in contact but the direction of the force on an object is opposite to the direction of the force on the second object. Forces always come in pairs – equal and opposite action-reaction force pairs.

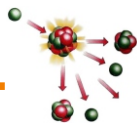
Action-reaction force pairs make it possible for fish to swim. A bird flies by use of its wings. A car is equipped with wheels that spin in a clockwise direction. As the wheels spin clockwise, they grip the road and push the road backwards. Since forces result from mutual interactions, the road must also be pushing the wheels forward. Action-reaction force pairs make it possible for cars to move along a roadway surface.



In the figure mg is exerted by the body of mass ' m ' on the floor. The reaction by the floor is indicated by ' N ' upward.



Experiment 1



AIM

To establish a relationship between the weight of a rectangular wooden block lying on a horizontal table and the minimum force required to just move it using a spring balance.

MATERIALS REQUIRED

A bench, a wooden slab, a string, a light weight pan, slotted weights, weight box, smooth pulley, a spring balance etc.

SPECIFIC OBJECTIVES

1. To learn about the force in taut strings called as Tension.
2. To learn about the presence of friction in an object even at rest – Static Friction.
3. To learn about the way the tension changes as more and more weight is added to the pan.
4. To learn about how the static friction varies as more and more weight is added to the pan.
5. To learn to handle a set-up with vertical and horizontal movement.

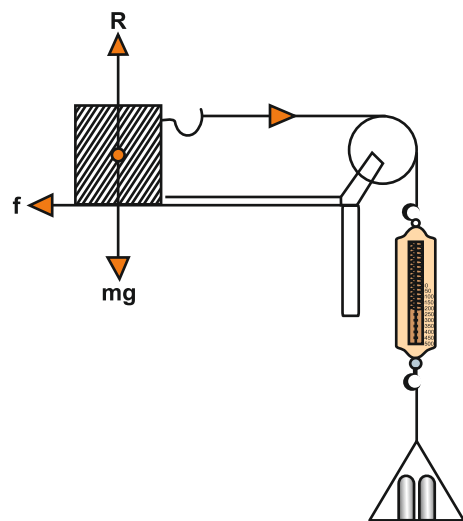
THEORY

As the slotted weights are placed on the pan attached to the spring balance, the weight shown by the spring balance increases indicating that the tension increases. As tension increases more and more force will be pulling the wooden block placed on the horizontal surface. The block does not move initially indicating the presence of friction between the wooden block and the horizontal surface. With increase in weight in the pan the friction varies and prevents the wooden block from moving. This indicates the presence of static friction – friction when an object is at rest. This friction is not a constant force. It varies directly with the applied force – increases with weight.

Method-1

PROCEDURE

1. Find the least count of the spring balance.
2. Remove any turns/twists in the string used and make it taut.
3. Arrange the set-up with a wooden block in the horizontal surface and connect it with a string through a smooth pulley to a spring balance holding a pan.
4. Observe the pointer in the balance. The value it shows is the weight of the pan with its contents (slotted weight if any) and so the tension in the string will be the corresponding force of gravity.
5. Keep a small weight – say 10 g on the pan.
6. Observe the pointer in the spring balance.
7. Check whether the wooden block is moving or not by gently tapping the table having the mass.
8. If the block is not moving, the tension in the string should be equal to the weight of the pan as shown by the spring balance.
9. Keep increasing the weight in the pan in small steps and observe the pointer of the spring balance and the wooden block till the block just moves. [As smaller the steps in which the weights are increased in the pan, the observation and the measure of the force is accurate]





10. Repeat the experiment at least once and/or ask your colleague/s to perform and find the difference if any in the measurement.
11. Repeat the experiment with at least two wooden blocks and record your observation.

OBSERVATION

Maximum measure in the spring balance $M = \dots\dots\dots$ g

Number of divisions in the spring balance $N = \dots\dots\dots$

Least count of the spring balance $L = (M/N) = \dots\dots\dots$ g

Weight of Block 1 = $W_1 = \dots\dots\dots$ g

Weight of Block 2 = $W_2 = \dots\dots\dots$ g

[Students are advised to increase the weights in small steps]

S. No.	Weight placed on the pan (in gram)		Reading of the spring balance (in gram)		Status of the block - Moves or remains at rest	
	Block 1	Block 2	Block 1	Block 2	Block 1	Block 2
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

Method-2

PROCEDURE

1. Repeat steps 1 to 10.
2. Place 50 g weight on the top of the block and repeat the experiment till the block moves.
3. Increase the weight by another 50 g and record the observation in the following table.

S. No.	Weight on the block	Reading of the spring balance when the block moves (in gram)
1.	W_1	
2.	$W_1 + 50g$	
3.	$W_1 + 100g$	
4.	$W_1 + 150g$	
5.	$W_1 + 200g$	
6.	$W_1 + 250g$	

RESULT

The study of force required to move a block of certain weight is done.

The force required was found to (increase / decrease) with the (increase / decrease) in the weight of the block.

Sources of Error :

1. Roughness and heaviness in the pulley.
2. Presence of dust involving friction.
3. The thread having a significant mass.
4. Tapping may be harder.

Precautions :

1. The pulley should be made smooth with oiling.
2. The horizontal surface should be cleaned.
3. The pan and the spring balance should not touch the wall or any surface.
4. Weight in the pan should be increased in small steps.

VIVA VOCE QUESTIONS

Q1. Can a mass be moved using a string which is not taut?

Ans. No, taut string has tension.

Q2. Why is the tension on the vertical and horizontal equal?

Ans. The string is incompressible, inextensible and massless. So tension will be the same at both the sides.

Q3. Why does the block not move as one places a weight on the pan at the first instance ?

Ans. Due to the presence of friction on the block.

Q4. Why is it necessary for a particular weight to be placed to move the block?

Ans. To overcome the friction between the block and the table.

Q5. Is friction experienced by the block a constant force?

Ans. No, it increases from zero to a particular value equal to the weight at which the slab slides.

Q6. In what way dust affects our reading?

Ans. Dust increases the friction.

Q7. Will your result hold good if the string is heavy?

Ans. No, as the tension varies from point to point in the string if the string is heavy.

Q8. Does the value of the contact area affect your result? Give reason.

Ans. No, friction does not depend on area of contact.

Practical Based Questions

Multiple Choice Questions (1 Mark)

1. A block rests on a table, exerting a downward force on the table. The reaction to this force is

- (a) the force of Earth on the block
- (b) the force of the table on the block
- (c) the force of Earth on the table
- (d) the force of the block on Earth

2. The 'reaction' force does not cancel the 'action' force because

- (a) the action force is greater than the reaction force
- (b) they are in the same direction
- (c) they act on the two different bodies in contact
- (d) the reaction force exists only after the action force is removed



3. A force F larger than the largest possible force of static friction is applied to the left to an object moving to the right on a horizontal surface. Then

- (a) the object must be moving at constant speed
- (b) F and the friction force act in opposite directions
- (c) the object must be slowing down
- (d) the object must be speeding up

4. A 400 N steel ball is suspended by a light rope from the ceiling. The tension in the rope is

- (a) 400 N
- (b) 800 N
- (c) zero
- (d) 200 N

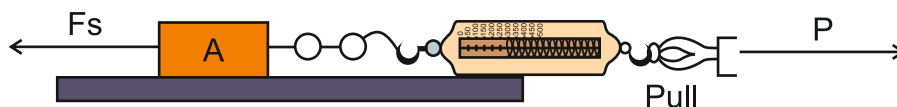
5. The mass and weight of a body

- (a) are the same physical quantities expressed in different units
- (b) are identical
- (c) differ by a factor of 9.8
- (d) are both a direct measure of the inertia of the body

6. As the weight in the pan is increased, the tension in the connecting string

- (a) increases
- (b) decreases
- (c) can increase or decrease
- (d) neither increases nor decreases

7. The spring balance in the following set-up indicates



- (a) F_s (static frictional force)
- (b) $2F$
- (c) $F/2$
- (d) $F/4$

8. A wooden block is lying on the horizontal surface of a table. The forces acting on this wooden block are

- (a) action on the surface of the table
- (b) reaction on the wooden block
- (c) action on the surface of the table and reaction on the wooden block
- (d) none of these.

9. By using a spring balance we apply a force of 200 N to move a wooden cabinet across a floor at a constant velocity. What will be the frictional force that will be extended on the cabinet?

- (a) No frictional force
- (b) Frictional force of 200N
- (c) Frictional force $< 200\text{N}$
- (d) Frictional force $> 200\text{N}$

10. How much force is required to move an object with a constant velocity?

- (a) No force is required
- (b) Force should be greater than frictional force
- (c) Force should be less than frictional force
- (d) Force just equal to the frictional force

11. A force of 100N acts on body moving with a constant velocity of 20 m/s on a floor in a straight line. What is the frictional force between the body and the floor?

- (a) Frictional force should be greater than 100 N
- (b) Frictional force should be equal to 100 N
- (c) Frictional force should be less than 100 N
- (d) None of these

12. To measure 500 g of mass, a spring balance of least count 'x' is chosen. The value of x is

- (a) 10 g (b) 100 g (c) 50 g (d) 25 g

13. In a spring balance, the spring is stretched by

- (a) Action
(b) Reaction
(c) Depends on the force applied
(d) Reaction should be greater than action.

Answers

1. (b) 2. (c) 3. (b) 4. (a) 5. (c) 6. (a) 7. (a)
8. (c) 9. (b) 10. (d) 11. (b) 12. (a) 13. (a)

Very Short Answer Questions (1 Mark)

Q1. What is the SI unit of tension?

Ans. As tension is a force, its SI unit is newton.

Q2. What is limiting friction?

Ans. The maximum value of force of friction which prevents the block from moving is called limiting friction.

Q3. While performing the experiment "To establish a relationship between the weight of a rectangular wooden block lying on a horizontal table and the minimum force required to just move it using a spring balance" why does the block not move as one places a weight on the pan at the first instance?

Ans. Due to the presence of friction on the block.

Q4. While performing the experiment, why is it necessary for a particular weight to be placed to move the block?

Ans. To overcome the friction between the block and the table.

Q5. Why does reaction force not cancel the action force?

Ans. Because both the action and reaction forces act on two different bodies in contact.

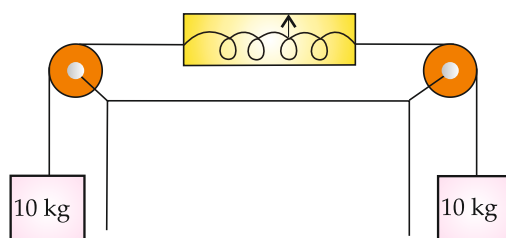
Q6. A 400 N steel ball is suspended by a light rope from the ceiling. What is the tension in the rope?

Ans. 400 N.

Q7. What should be the magnitude of force to just move the block on a horizontal surface?

Ans. Force should be greater than the largest possible static friction.

Q8. What would be reading of the spring balance in the following diagram?



Ans. 100 N.

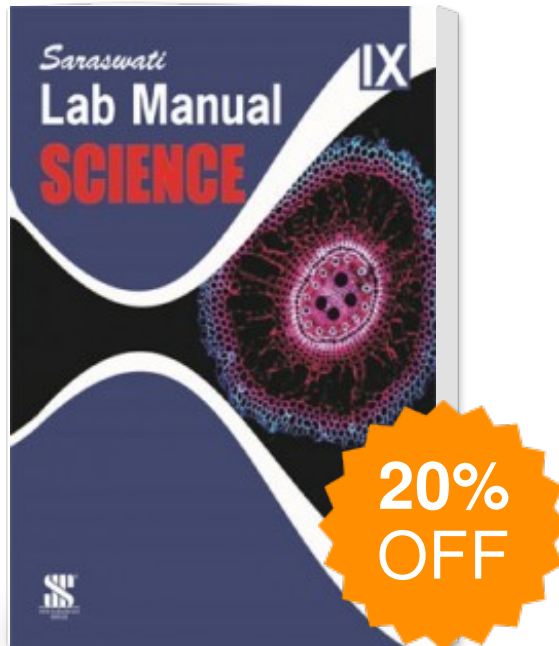
Short Answer Questions (2 Marks)

Q1. While performing the experiment to establish relationship between the weight of a rectangular wooden block lying on a horizontal table and the force required to just move it using a spring balance, what precautions should be taken?

Ans. Following precautions should be taken:

1. The pulley should be made smooth with oiling.
2. The horizontal surface should be cleaned.
3. The pan and the spring balance should not touch the wall or any surface.
4. Weight in the pan should be increased.

Saraswati Lab Manual Science Class-IX Term-I & II



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