SCIENCE (PHYSICS)
WORKSHEET-210725
CHAPTER 09 FORCE AND LAWS OF MOTION

SUBJECT: SCIENCE **MAX. MARKS : 40**

CLASS : IX **DURATION : 1½ hrs**

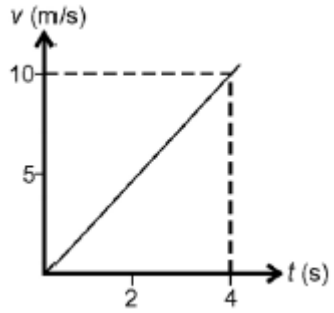
General Instructions:

(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. The v – t graph of a body of 5 kg moving with the help of a force is shown. Then the force involved is



(a) 20 N (b) 125 N (c) 12.5 N (d) 2.0 N

2. When a 12 N force acts on 3 kg mass for a second, the change in velocity is (in m/s)
(a) 36 (b) 4 (c) 2 (d) 18

3. Rahul tosses the coin in a moving car and it falls behind him. The motion of car is:
(a) non-uniform motion (b) along a straight line
(c) acceleration (d) retardation

4. What would happen if the smaller ball were rolling with a velocity of 5 m/s and struck the bigger ball at rest?
(a) The two balls would continue to roll in the direction of the strike.
(b) The smaller ball would rebound and the bigger ball would roll forward.
(c) The two balls would roll in the direction opposite to the strike.
(d) The smaller ball would stop rolling and the bigger ball would start rolling.

5. When the woman rowed a boat, she pushed the water backward with oars and the backward water exerts an equal and opposite push on the boat which makes the boat to move forward. Which principle is followed in this case?
(a) Inertia of motion (b) Newton's second law of motion
(c) Newton's first law of motion (d) Newton's third law of motion

6. A body of mass 9 kg is lying on a surface of table. Calculate the net force acting on it.
(a) 9 (b) 0 (c) 3 (d) 18

7. Kajal was cycling and the cycle comes to stop after some time as she stopped pedalling. She got confused as the situation does not follow Newton's first law of motion. What makes the cycle stop?
(I) Frictional force
(II) Gravitational force
(III) Inertia
(IV) Heat
(V) Air resistance
Options:
(a) (I) and (III) (b) (I) and (V) (c) (I), (II) and (III) (d) (I), (III) and (V)

8. An object of mass 2 kg is sliding with a constant velocity of 4 ms^{-1} on a frictionless horizontal table. The force required to keep the object moving with the same velocity is:
(a) 32 N (b) 0 N (c) 2 N (d) 8 N

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.
(a) Both the Assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.
(b) Both the Assertion and the Reason are correct but the Reason is not the correct explanation of the Assertion.
(c) Assertion is true but the Reason is false.
(d) Assertion is false but the Reason is true.

9. **Assertion (A):** Group of children are sitting on park bench. Their body weight is acting downwards and bench exerts an equal force upwards otherwise the bench will break.
Reason (R): According to Newton's third law of motion, "To every action, there is an equal and opposite reaction".

10. **Assertion (A):** In a long jump, an athlete is provided with a heap of sand on ground to prevent him/her from being hurt.
Reason (R): The heap of sand increases the momentum of the athlete.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. (a) Why is Newton's first law of motion also called law of inertia?
(b) What should be the value of F in the following, to balance the effect of F_1 and F_2?

12. A stone released from the top of a tower of height 19.6 m. Calculate its final velocity just before touching the ground. (Take g = 9.8 m/s^2)

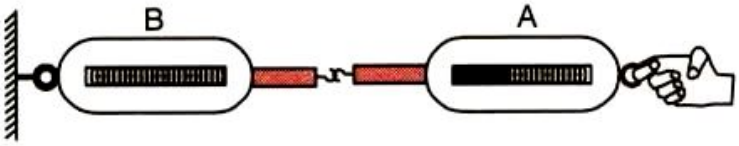
13. Water sprinkler used for grass lawns begins to rotate as soon as the water is supplied. Explain the principle on which it works.

14. Two friends on roller skates are standing apart facing each other. One of them throws a ball towards the other, who catches it, how will this activity affect the position of the two? Explain your answer.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Look at the diagram and answer the following questions:



(a) When a force is applied through the free end of the spring balance A, the reading on the spring balance A is 15 g wt. What will be the reading of spring balance B?
(b) Write reasons for your answer.
(c) Name the force which balance A exerts on balance B and the force of balance B on balance A.

16. Explain the following briefly:
(a) A cricket ball causes much severe injury than a tennis ball on hitting a spectator.
(b) An applied unbalanced force causes a change in momentum.
(c) A greater force is required to impart greater velocity to an object.

17. (a) State the law of conservation of momentum.
(b) A body of mass 2 kg, initially moving with a velocity of 10 m/s, collides with another body of mass 5 kg at rest. After collision velocity of first body becomes 1 m/s. Find the velocity of second body.

OR

Shahid and Arun travelled to Mumbai by car. Midway, their car broke down. However, they are able to push the car with uniform velocity on a flat road. The mass of the car is 1500 kg. To accelerate the car, they take the help of a third person and when all three of them push the car, an acceleration of 0.5 m/s^2 is produced. What is the force with which each person pushes the car? (Assume that everyone pushing the car is exerting the same muscular effort.)

SECTION – D

Questions 18 carry 5 marks each.

18. (a) Define 'inertia'.
(b) A shopkeeper shows three toys to a child made up of aluminium, steel and wood of same shape and volume. Which one of them would have highest inertia? Why?
(c) Describe in brief an activity to illustrate the property of inertia of rest.

OR

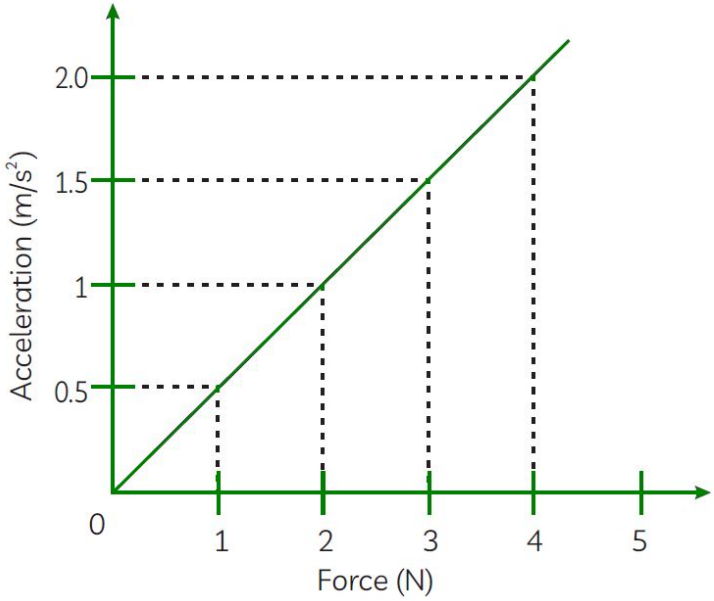
(a) State Newton's second law of motion and show that the first law of motion can be mathematically stated from the mathematical expression for the second law of motion.
(b) A stone dropped from a window reaches the ground in 0.5 seconds (given g = 10 ms^{-2}).
(i) Calculate the speed just before it hits the ground.
(ii) What is the average speed at t = 0.5 s?
(iii) Calculate the height of window from the ground.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Read the following information and answer the questions based on information and related studied concepts.

Mahesh measures the acceleration of the Volvo using an apparatus. The result is obtained as shown in the Acceleration-Force graph. It is known that the more is force applied to an object, the more is its acceleration. Acceleration is proportional to force, as may be demonstrated experimentally. It may also be demonstrated that the greater the object's mass, the lower is its acceleration for the same force. The force must rise in proportion to the mass to obtain the same acceleration.



(a) Calculate the mass of Volvo from given graph if Yogesh takes the force applied is 1 N.
(b) If the force applied on the Volvo as doubled and acceleration is halved. What is the ratio of mass?
(c) Define momentum. What happens to the momentum of a body if its speed is doubled?

20. Read the given passage and answer the questions that follow based on the passage and related studied concepts.

While playing carrom, the coins on a carrom board are arranged vertically. Aditya observed that a fast moving striker strikes a pile of carrom coins and only the bottom coin gets removed and the vertical arrangements of the coins remain intact.

(a) Which law best describes the given situation?
(b) What's the reason that only the bottom coin is removed and the rest of the coins do not fall?
(c) What is the momentum of a body of mass 2m and velocity v/2?