DELHI PUBLIC SCHOOL NEWTOWN
SESSION 2024-2025
HALF YEARLY EXAMINATION

CLASS: IX **FULL MARKS: 80**
SUBJECT: PHYSICS [SET A] **TIME: 2 HOURS**

Candidates are allowed additional 15 minutes for only reading the paper.
They must NOT start writing during this time.
The intended marks for questions or parts of questions are given in brackets [ ]
Section A is compulsory. Attempt any four questions from Section B
This paper consists of six printed pages

SECTION A

Question 1 **[15 × 1 = 15]**

Choose the correct answers to the questions from the given options:

(i) Pamela claimed that the diameter of a wire is 1.042 cm using Vernier calliper. Up to what extent she is right?
(a) 1 cm **(b) 1.0 cm** **(c) 1.04** **(d) 1.042**

(ii) Choose the derived unit of power.
(a) $kgms^{-2}$ **(b) kgm^2s^{-2}** **(c) kgm^2s^{-3}** **(d) $kgm^{-1}s^{-2}$**

(iii) Assertion: A human body floats easily by using a rubber tube.
Reason: A deflated rubber tube having greater volume increases the upthrust.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

(iv) If the radius of earth were to shrink by 1%, its mass remaining the same, the time period of a simple pendulum will
(a) decrease. **(b) increase.**
(c) remain unchanged. **(d) can't be calculated.**

(v) A tennis ball and a cricket ball, both are stationary. To start motion in them
(a) a less force is required for the cricket ball than for the tennis ball.
(b) a less force is required for the tennis ball than for the cricket ball.
(c) same force is required for both the balls
(d) no force is required.

(vi) The odd one out is
(a) momentum **(b) weight** **(c) energy** **(d) acceleration**

(vii) A goalkeeper in a game of football pulls his hands backwards after holding the ball shot at the goal. This enables the goalkeeper to

(a) increase the rate of change of momentum
(b) decrease the rate of change of momentum
(c) increase the force exerted by the balls on the hands
(d) exert larger force on the ball

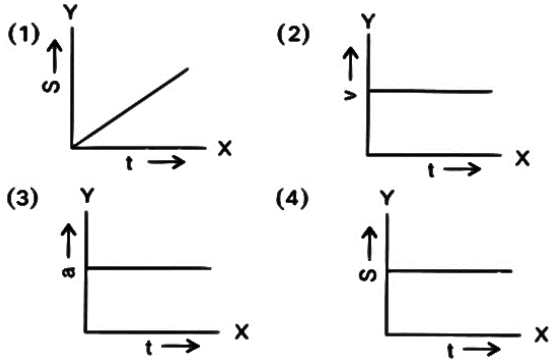
(viii) Hydraulic machines act like a

(a) force multiplier (b) force reducer (c) speed multiplier (d) both (a) and (c)

(ix) Which of the following is true about two objects of different masses falling freely near the surface of the moon from the same height?

(a) They both have different accelerations.
(b) They have the same velocities at any instant.
(c) They experience forces of the same magnitude.
(d) Their individual momentum remains the same.

(x) The graph that representing the state of rest is (s, v and a represent distance, velocity and acceleration respectively)



(a) (1) (b) (2) (c) both (2) and (3) (d) (4)

(xi) The physical quantity represented by the slope of force (Y axis) vs mass (X axis) graph is

(a) speed (b) acceleration (c) velocity (d) displacement

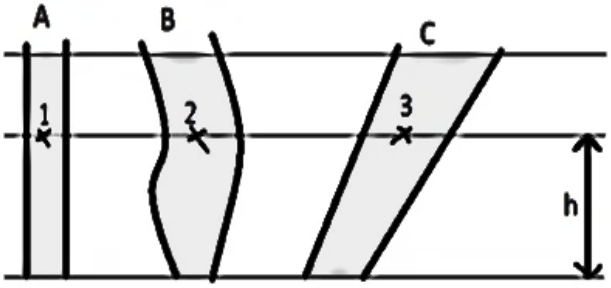
(xii) A force is applied on a cube of side 3 m. Another force, double the magnitude of the previous force is applied on a cube of side 1 m. The ratio of pressure exerted by the first cube to that by the second cube is

(a) 1:9 (b) 1:6 (c) 1:18 (d) 1:2

(xiii) A sensitive spring balance records weight of a body in vacuum as W_1 and in air as W_2. These are related as

(a) $W_1 > W_2$ (b) $W_1 = W_2$ (c) $W_1 < W_2$ (d) W_1 is zero, W_2 remains

(xiv) Three containers A, B, and C are filled with water as shown in the figure. What is the relation between the pressures at 1, 2, 3? Assume that all jars are stationery.



(a) 1:1:1 **(b) 1:2:3** **(c) 3:2:1** **(d) 1:2:1**

(xv) If force is plotted along X axis and pressure along Y axis for a given surface area. The nature of the graph will be

(a) a straight line parallel to the X axis.
(b) a straight line parallel to the Y axis.
(c) a curved line with increasing slope.
(d) a straight line passing through the origin making an angle 45° with the X axis.

Question 2

(i) Complete the following by choosing the correct answers from the bracket: [6]

a) Cutting tools have either sharp or pointed edges so that _____ *[more/less]* thrust may cause _____ *[more/less]* pressure at that edge and cutting can be done effectively.

b) A piece of wood is held under water. The upthrust on the piece will be __ *[less than/more than/equal to]* the weight of the wood piece.

c) Buoyant force on a body acts ___ *[downward/upward]* at the ___ *[centre of buoyancy/centre of gravity]*

d) If the force acting on a moving body is zero, its momentum is __ *[zero/constant/infinite].*

e) The numerical ratio of displacement to distance for a moving object is __ *[always less than 1/ always greater than 1/equal or less than 1]*

f) The atmospheric pressure at the surface of the earth is P_1 and inside a mine is P_2. They are related as ___ *[$P_1 = P_2$/ $P_1 > P_2$/ $P_1 < P_2$]*

(ii) Why does a horse rider fall backward if the horse suddenly starts running? [2]

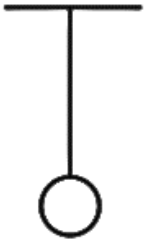
(iii) A certain force accelerates a body of mass m_1 with an acceleration of 4 ms^{-2} and another body of mass m_2 with acceleration of 6 ms^{-2}. If both the masses are tied together what would be the total acceleration of the combined system. [2]

Question 3

(i) Deep water fish often die in shallow water. Why? [2]

(ii) A spring balance is used to find the weight of a body X on the surface of the moon. The mass of the body X is 2 kg and its weight is recorded as 3.4 N. The weight of another body Y recorded by the same balance is found to be 7.65 N. Calculate the mass of the body Y. [2]

(iii) Copy the diagram below and clearly mark the directions of the forces that act on it and name the forces. [2]



(iv) Show graphically the relation between the distance fallen with time. [2]

(v) How is the barometric height of a simple barometer affected

(a) if the tube is pushed down into the trough of mercury?

(b) if a drop of water is introduced in the empty space above the mercury column? [2]

(vi) Mention the functions of the following

(a) Sleeve on a screw gauge,

(b) Strip on a vernier calliper. [2]

(vii) Least count of an instrument is one of the very important parameters in order to get precise readings of instruments like vernier calliper and screw gauge used in various experiments. It serves as a benchmark for the instrument's precision, indicating the finest measurement it can discern without ambiguity or discrepancy. [3]

(a) Define least count.

(b) What is the least count of a standard laboratory micrometre screw gauge?

(c) How can the least count of a vernier calliper be decreased?

SECTION B

(Attempt any four questions)

Question 4 [3+3+4]

(i) A force of 0.4 N acts on a mass of 4 kg at rest. Calculate its velocity and momentum at the end of 10 second.

(ii) a) A stone is thrown vertically upward with a velocity of 9.8 ms^{-1}. When will it reach the ground? (g = 9.8 ms^{-2})

b) Since action reaction forces are always equal in magnitude and opposite in direction, how can anything be ever accelerated?

(iii) a) What will happen to the gravitational force of attraction between two objects if the mass of each object is doubled and the distance between them is also doubled? Show necessary calculation.

b) State law of gravitation.

c) State the value of universal gravitational constant in S.I. unit.

Question 5 [3+3+4]

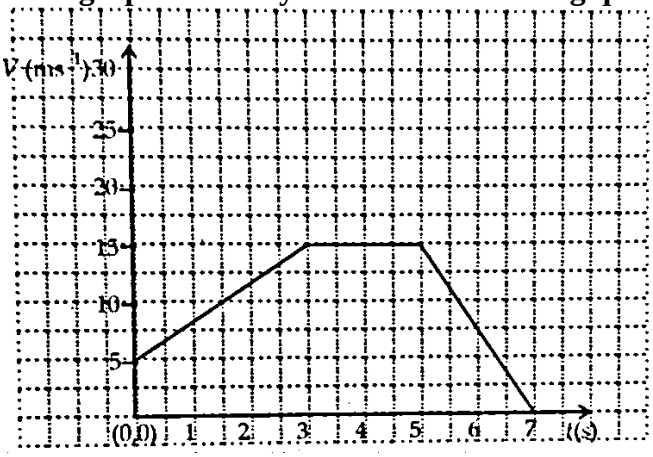
(i) Two simple pendulums A and B have lengths 1.0 m and 4.0 m respectively at a certain place.

(a) Which pendulum will make more oscillations in one minute?

(b) Justify your answer with appropriate calculations.

(ii) A stone is thrown vertically upward with an initial velocity of 40 ms^{-1}. Draw the velocity time graph of the motion of the stone till it reaches back to the ground. Use graph to find out maximum height reached by the stone. [Take g = 10 ms^{-2}]

(ii) Using the velocity-time graph of a body answer the following questions



(a) During which time interval(s) the body is moving with variable velocity?

(b) What is the acceleration of the body?

(c) What is the displacement of the body in the last 4 second?

Question 6 **[3+3+4]**

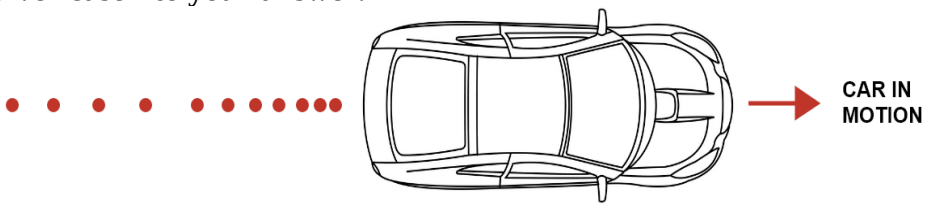
(i) A scooter initially at rest picks up a velocity of 20 m/s over a distance of 40 m. Calculate

(a) acceleration.

(b) time in which it attains a velocity of 20 m/s.

(ii) A hockey ball of mass 100 g at rest, is hit by a hockey stick, such that the force acts on the ball for 0.08 s. The ball covers a distance of 80 m in next 1.6 s. Find the magnitude of force applied.

(iii) (a) The diagram below shows the pattern of the oil on the road, dripping at a constant rate from a moving car. What information do you get from it about the motion of car? Give reason to your answer.



(b) What is the direction of velocity of an object, moving in a circular path?

(c) How does a bird fly in the sky?

Question 7 **[3+3+4]**

(i) Derive the equation of motion S= ut + 0.5at^2 graphically

(ii) Calculate the greatest and the least pressure exerted by a metal block of size 20 cm × 8 cm × 5 cm and having a mass of 5 kg. [Take g = 10 ms^{-2}]

(iii) (a) What does it mean by the statement 'The atmospheric pressure at a place is 76 cm of Hg'?

(b) Mention it's value in Pa.

(c) Give any two reasons for using mercury as a barometric liquid.

Question 8 **[3+3+4]**

(i) (a) A bunch of feathers and a stone of the same mass are released simultaneously in air. Which one will fall faster and why?

(b) How will your observation be different if they are released simultaneously in vacuum?

(ii) A balloon has volume of 1000 m^3. It is filled with Helium of density 0.018 kgm^{-3}. Find out the maximum load that it can lift? [The density of air is 1.29 kgm^{-3} and g = 10 ms^{-2}]

(iii) (a) The area of pistons in hydraulic machine are 6 cm^2 and 576 cm^2. What force on the smaller piston will support a load of 1152 N on the larger piston? State the assumption made in the above calculation.

(b) State Archimedes' principle.

Question 9 **[3+3+4]**

(i) a) Why does a piece of steel sink in water but float on mercury?

b) If a bowl is formed from the same steel piece, then it can float in water. Why?

(ii) A piece of brass (alloy of copper and zinc) weighs 12.9 gf in air. When completely immersed in water it weighs 11.3 gf. If the densities of copper and zinc are 8.9 gcm^{-3} and and 7.1 gcm^{-3} respectively, what is the mass of copper contained in the alloy?

(iii) (a) How does a dropper suck liquid when its rubber bulb is pressed?

(b) Show the positions of centre of buoyancy and centre of gravity for a partially submerged body with a neat labelled diagram

(c) Why does atmospheric pressure decrease with height in a non-linear way?