

Answer to this paper must be written on the paper provided separately.

You will not be allowed to write during the first 15 minutes.

This time is to be spent in reading the question paper.

The time given at the head of this paper is the time allowed for writing the answers.

Section A is compulsory. Attempt any four questions from Section B

The intended marks for questions or parts of questions are given in brackets [ ].

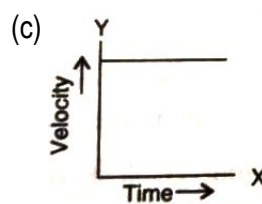
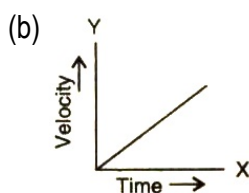
**“Section –A” (40 Marks)**

**Question -1**

**[1X15]**

**Choose the correct answers to the question from the given option.**

- (i) Which of the following units is not a fundamental unit?
  - (a) Metre
  - (b) Litre
  - (c) Second
  - (d) Kilogram
- (ii) Identify the incorrect statement(s) from the following:
  - (a) The time period of oscillations depends on the extent of swing on either side.
  - (b) The time period of oscillations is directly proportional to the square root of acceleration due to gravity.
  - (c) The time period of oscillations is inversely proportional to the length.
  - (d) The time period of oscillations does not depend on the mass or material of the suspended body.
- (iii) For a uniformly retarded motion, the velocity -time graph is:
  - (a) a curve
  - (b) a straight line parallel to the time axis
  - (c) a straight line perpendicular to the time axis
  - (d) a straight line inclined to the time axis.
- (iv) Which of the following graphs shown below represents the uniform motion of an object?



- (v) The normal atmospheric pressure is :

- (a) 76 m of Hg
- (b) 76 cm of Hg
- (c) 76 Pa
- (d) 76 N m<sup>-2</sup>

- (vi) A body initially at rest, starts moving with a constant acceleration of 0.5 ms<sup>-1</sup> and travels a distance 25m, then its final velocity is:

- (a) 5 ms<sup>-1</sup>
- (b) 20 ms<sup>-1</sup>
- (c) 15 ms<sup>-1</sup>
- (d) -15 ms<sup>-1</sup>

- (vii) On doubling the separation between two bodies the magnitude of the non-contact force between them becomes:

- (a) one-eighth
- (b) one-half
- (c) one-fourth
- (d) remains the same

- (viii) Which one of the following is not an example of inertia of rest?
- When a train suddenly starts moving forward, the passenger standing in the compartment tends to fall backwards.
  - When a hanging carpet is beaten with a stick, dust particles start falling out of it.
  - On shaking the branches of a tree, the fruits fall down.
  - When a passenger jumps out of a moving train, he falls down.
- (ix) For precise measurement, least count of an instrument should be
- as small as possible
  - as large as possible
  - equal to 1
  - least count has no relation with measurement
- (x) For relation  $F = \frac{m\Delta v}{\Delta t}$  to hold true, the condition(s) necessary is/are:
- velocities are equal to the velocity of light
  - velocities are much smaller than the velocity of light
  - mass remains constant
  - both (b) and (c)
- (xi) Why is it necessary to wear seat belts while driving according to Newton's law of motion?
- To increase the inertia of the passenger.
  - To balance the action and reaction forces acting between the passenger and car.
  - To prevent passenger from being thrown forward due to their inertia when the car stops suddenly.
  - To increase the momentum of passengers during a collision by applying an external force.
- (xii) A body floats in a liquid A of density  $d_1$  with a part of its submerged inside liquid while in liquid B of density  $d_2$  totally submerged inside liquid. The densities  $d_1$  and  $d_2$  are related as :
- $d_1 = d_2$
  - $d_1 < d_2$
  - $d_1 > d_2$
  - nothing can be said
- (xiii) A rectangular cement block has length, breadth and height of 60 cm, 30 cm and 15 cm respectively. Identify the correct position of the block and pressure exerted by it on the ground.
- Minimum pressure is exerted when breadth and height form the base.
  - Maximum pressure is exerted when breadth and height form the base.
  - Maximum pressure is exerted when length and breadth form the base.
  - Minimum pressure is exerted when length and height form the base.
- (xiv) The rate of change of momentum represents
- acceleration
  - velocity
  - force
  - pressure
- (xv) Action and reaction act on the
- same body in opposite directions
  - different bodies in opposite directions
  - different bodies, but in same direction
  - same body in same direction

## Question -2

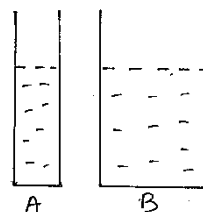
- (i) Fill in the blanks. [6]
- The apparent weight of a floating body is \_\_\_\_\_.
  - If a body is at rest, the  $d-t$  graph is \_\_\_\_\_ to the time axis.
  - $1 \text{ nm} = \frac{\circ}{\text{A}}$
  - The ratio of 1 micron to 1 nanometer is \_\_\_\_\_.
  - The force of gravitation between two bodies of masses 1 kg each separated by a distance of 1 m is \_\_\_\_\_ N.
  - The time period of a seconds pendulum is \_\_\_\_\_ seconds.

- (ii) Write two differences between speed and velocity. [2]  
 (iii) State (i) Pascal's law (ii) Newton's law of gravitation. [2]

### Question -3

- (i) A pendulum P completes 40 oscillations in 50 seconds and pendulum Q takes 0.5 seconds to move from mean to extreme position. Calculate the ratio of their effective lengths. [2]  
 (ii) What is the slope of  $v-t$  graph? How will you find the distance travelled from this graph? [2]  
 (iii) Write two characteristics of non-contact force. [2]

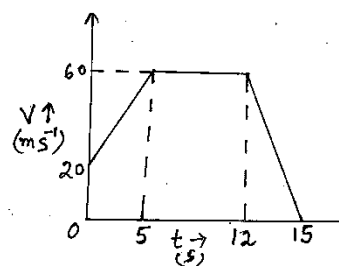
- (iv) In which container A or B, pressure at the bottom is more? Give reason. [2]



- (v) Draw a diagram showing a body suspended from a rigid support by a string. Mark the forces present. [2]  
 (vi) A body of mass 120 gf has density  $5.4 \times 10^3 \text{ kg m}^{-3}$ . How much will it weigh in liquid of relative density 1.8? [2]

- (vii) In the given graph, calculate.

- (i) acceleration in first 5 seconds.  
 (ii) distance travelled during retardation  
 (iii) acceleration from 5 seconds to 12 s.



### “Section –B”(40 Marks) (Answer ANY FOUR)

#### Question - 4

[3+3+4]

- (a) (i) State Newton's second law of motion.  
 (ii) When is force said to be 1 N?  
 (iii) Write an expression for change in momentum for a body which travels nearly equal to the speed of light.  
 (b) A bullet of mass 50g moving with an initial velocity  $100 \text{ m s}^{-1}$ , strikes a wooden block and comes to rest after penetrating a distance 2 cm in it. Calculate : (i) retardation caused by the wooden block (ii) resistive force exerted by the wooden block.  
 (c) (i) Find the weight of a body of mass 200g in gf.  
 (ii) Write the value of gravitational constant.  
 (iii) Define inertia. On what factor does it depend?

#### Question-5

[3+3+4]

- (a) What kind of weather is forecasted when the barometric height  
 (i) Suddenly falls  
 (ii) Suddenly rises  
 (iii) Slowly rises

- (b) A hammer exerts 2.5 N and 4N on two nails A and B of area  $0.5 \text{ cm}^2$  and  $0.8 \text{ cm}^2$  respectively. Compare the pressure exerted on A to B.
- (c) (i) Name two factors that affect the atmospheric pressure. Mention them as per linear and non linear change.  
 (ii) The areas of pistons in a hydraulic machine are  $5 \text{ cm}^2$  and  $625 \text{ cm}^2$ . What force on the smaller piston will support a load of 1250 N on the larger piston?

#### Question-6

[3+3+4]

- (a) A car initially at rest starts moving with a constant acceleration of  $0.5 \text{ m s}^{-2}$  and travels a distance of 25m.  
 Find: (i) its final velocity (ii) the time taken (iii) How much distance is covered in 8 seconds.
- (b) Derive the expression  $S = ut + \frac{1}{2} at^2$
- (c) (i) Write two differences between distance and displacement.  
 (ii) A body is moving with uniform velocity of 40 m/s for 10 seconds. Find its acceleration.  
 (iv) Classify into scalar and vector quantities.  
 momentum, distance, current, weight.

#### Question - 7

[3+3+4]

- (a) A solid weighs 32 gf in air and 28.8 gf in water. Find : (i) the volume of solid, (ii) R.D. of solid, and (iii) the weight of solid in a liquid of density  $0.9 \text{ g cm}^{-3}$ .
- (b) (i) State the law of floatation. What is the magnitude of apparent weight of a floating body?  
 (ii) The relative density of iron is 7.6. Write its density in S.I. unit.
- (c) A block of wood of volume  $25 \text{ cm}^3$  floats on water with  $20 \text{ cm}^3$  of its volume immersed. Calculate:  
 (i) the density and (ii) the weight of block of wood.

#### Question - 8

[3+3+4]

- (a) (i) Why does a swing oscillates faster when a person stands on it?  
 (ii) Light year is the unit of which quantity?  
 (iii) Define effective length of a simple pendulum.
- (b) (i) 1 micron = \_\_\_\_\_m.  
 (ii) What is the S.I. unit of luminous intensity?  
 (iv) Why does a clock goes slow at top of a mountain?
- (c) A train first travels for 30 min with a velocity  $30 \text{ km h}^{-1}$  and then for 40 min with a velocity  $40 \text{ km h}^{-1}$  in the same direction, Calculate: (i) the total distance travelled,  
 (ii) the average velocity of the train.

#### Question - 9

[3+3+4]

- (a) (i) Define gravitational constant. Write its value.  
 (ii) Relate acceleration due to gravity and gravitational constant by an expression.
- (b) (i) Write the mathematical expression for Newton's 2<sup>nd</sup> law, when mass is constant.  
 (ii) Derive Newton's first law from the second law.
- (c) (i) We beat the carpet to take out the dust particle. Give reason.  
 (ii) A cricket drags his hands back while catching the ball. Give reason.