

PHYSICS (M001)

(SCIENCE PAPER 1)

Maximum Marks: 40

Time allowed: 60 minutes

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during first 10 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 two** questions from Section B.*

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

SECTION A (20 marks)

*(Attempt **all** questions from this Section)*

Question 1

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

[7]

(Do not copy the questions, write the correct answers only.)

(i) For a given mass and velocity the kinetic energy remains constant if

- (a) mass is four times and velocity is $\frac{1}{2}$
- (b) mass is $\frac{1}{2}$ and velocity is doubled
- (c) mass and velocity are both squared
- (d) mass is $\frac{1}{2}$ and velocity is $\frac{1}{2}$

(ii) Which of the following is the correct expression for gain in kinetic energy, if initial velocity is not zero?

- | | |
|---------------------------|-----------------------------------|
| (a) $k = \frac{1}{2}mv^2$ | (c) $k = \frac{mv^2}{2t}$ |
| (b) $k = \frac{mv^2}{4}$ | (d) $k = \frac{1}{2}m(v^2 - u^2)$ |

(iii) A half meter scale is balanced at 5 cm mark when a weight of 10 gf is suspended at one of its ends. The weight of the scale is:

- (a) 2.5 gf (b) 100 gf (c) 0.2 gf (d) 50 gf

(iv) The center of gravity of a regular object would lie

- (a) On the body
(b) Outside the body
(c) Inside the body
(d) All of the above

(v) Moment of force is to the distance of point of application of force and fulcrum.

- (a) inversely proportional
(b) directly proportional
(c) not equal
(d) equal

(vi) In a block and tackle system of pulleys the load is lifted through a height of 2 m while the effort is applied for 6 m. Hence the velocity ratio of this system is:

- (a) 2 (b) 3 (c) 6 (d) 12

(vii) A pulley system consisting of four pulleys has efficiency as 90%. Calculate the Mechanical Advantage of the system.

- (a) 360 (b) 3.6 (c) 36 (d) 0.36

Question 2

(i) [3]

(a) What is the work done by the gravitational force on the Moon that revolves around the Earth?

(b) What is a machine?

(c) Is it possible that a body may possess energy even when it is not in motion?

(ii) [2]

(a) Name the force required for uniform circular motion. State its direction.

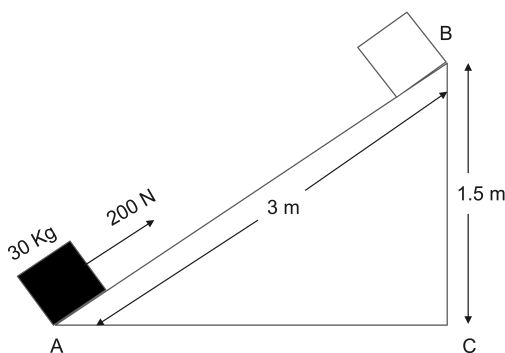
(b) Mention one point of distinction between work and power.

(iii) [2]

(a) A man climbs a slope and another walks same distance on level road. Which of the two expends more energy and why?

(b) State the relation between S.I. and C.G.S. units of work.

(iv) A block of mass 30 kg is pulled up a slope, as shown in the diagram with a constant speed, by applying a force of 200 N parallel to the slope. A and B are initial and final positions of the block. [2]



(a) Calculate the work done by force in moving the block from A to B.

(b) Calculate P.E. gained by block.

[Take $g = 10 \text{ ms}^{-2}$]

(v) [2]

- (a) When an arrow is shot from its bow, it has kinetic energy. From where does it get the kinetic energy?
- (b) Where is the C.G. of a triangular lamina located?

(vi) [2]

- (a) What physical quantity does electron volt (eV) measure? How is it related to S.I. unit of that quantity?
- (b) A body of mass 50 kg and another body of mass 100 kg have equal momentum. Which body will have more kinetic energy?

SECTION B (20 marks)

*(Attempt **any two** questions from this **Section**)*

Question 3

(i) [3]

- (a) Define kilowatt hour.
- (b) How is kilowatt hour related to joule?
- (c) Define moment of force.

- (ii) How long should an electric motor of power 2 H.P. operate, so as to pump 5 m^3 of water from a depth of 15 m. [3]

[Take $g = 10 \text{ N kg}^{-1}$]

(iii) [4]

- (a) State two ways of increasing the efficiency of a block and tackle system of pulleys.
- (b) State the energy changes in the following devices:
 - i. A loudspeaker
 - ii. A glowing electric bulb

Question 4

(i) Give one example when: [3]

- Heat energy changes to kinetic energy.
- Sound energy changes to electrical energy.
- Light energy changes to chemical energy.

(ii) [3]

(a) State two conditions for a body to be in equilibrium.

(b) Give an example of static equilibrium.

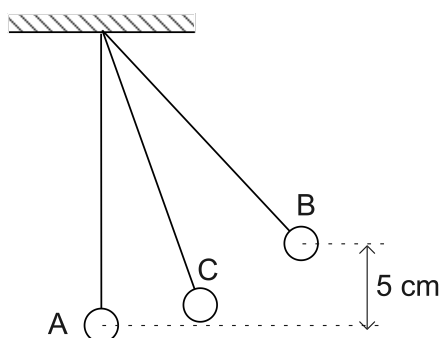
(iii) A uniform meter scale is balanced at 40 cm mark, when weights of 20 gf and 5 gf are suspended at 5 cm mark and 75 cm mark respectively. Calculate the weight of meter scale. [4]

Question 5

(i) An energy of 4000 J causes a displacement of 80 m in 4 s. Calculate (i) Force (ii) Power. [2]

(ii) In the case of block and tackle arrangement, the mechanical advantage increases with the number of pulleys. Explain. [2]

(iii) The figure below shows a simple pendulum of mass 200 g. It is displaced from the mean position A to the extreme position B. The potential energy at the position A is zero. At the position B the pendulum bob is raised by 5 cm. [6]



(a) What is the potential energy of the pendulum at the position B?

(b) What is the total mechanical energy at point C?

(c) What is the speed of the bob at the position A when released from B?

[Take $g = 10 \text{ ms}^{-2}$ and no loss of energy]