ICSE CLASS 10 EXAMINATION

PRACTICE QUESTION PAPER

PHYSICS

Chapter 2 : WORK, ENERGY AND POWER

(Work and Power · Forms of Energy · Kinetic and Potential Energy · Conservation of Energy)

Maximum Marks: 40 **Time allowed: One hour**

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

2. You will not be allowed to write during the first 5 minutes. This time is to be spent in reading the question paper.

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

*4. **Section A** is compulsory. Attempt **all** questions from Section A and **any two** questions from Section B.*

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

6. Show all working clearly. Take g = 10 m s^{-2} wherever required.

SECTION A (20 Marks)

(Attempt all questions from this Section.)

Question 1

Choose the correct answers to the questions from the given options. *(Do not copy the question, write the correct answers only.)* **[8]**

(i) The S.I. unit of work is:

(a) joule (b) watt

(c) newton (d) pascal

(ii) The work done by a force on a body is zero when the angle between the force and the displacement is:

(a) 0° (b) 45°

(c) 90° (d) 180°

(iii) One kilowatt hour (1 kWh) is equal to:

(a) 3.6×10^3 J (b) 3.6×10^9 J

(c) 1000 J (d) 3.6×10^6 J

(iv) The kinetic energy of a body of mass 2 kg moving with a speed of 5 m s^{-1} is:

(a) 10 J (b) 25 J

(c) 50 J (d) 5 J

(v) Assertion (A): A coolie walking on a level road with a load on his head does no work against the force of gravity.

Reason (R): The displacement of the load is perpendicular to the force of gravity acting on it.

(a) (A) is true and (R) is false.

(b) (A) is false and (R) is true.

(c) Both (A) and (R) are true, and (R) is the correct explanation for (A).

(d) Both (A) and (R) are true, but (R) is not the correct explanation for (A).

(vi) A pump raises 100 kg of water through a height of 10 m in 20 s. The power of the pump is (take g = 10 m s^{-2}):

(a) 50 W (b) 200 W

(c) 5000 W (d) 500 W

(vii) If the speed of a moving body is doubled, its kinetic energy becomes:

(a) four times (b) two times

(c) half (d) the same

(viii) In a microphone, the energy changes from:

(a) electrical to sound (b) chemical to electrical

(c) sound to electrical (d) light to electrical

Question 2

(a) Define power. State its S.I. unit and the relation between horse power (H.P.) and watt. **[2]**

(b) In Fig. 1, a constant force of 20 N acts on a box at an angle of 60° to the horizontal and displaces it through 3 m along the horizontal floor. Write the expression for the work done by the force and calculate it. **[2]**

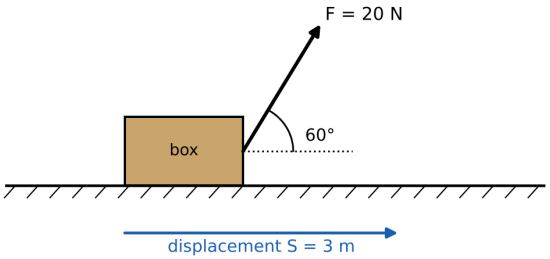

Fig. 1

(c) State two differences between potential energy and kinetic energy. **[2]**

Question 3

(a) A boy of mass 40 kg climbs a flight of 25 steps, each 16 cm high, in 10 s. Calculate (i) the work done by him against the force of gravity, and (ii) the power developed by him. **[3]**

(b) Fig. 2 shows the graph of a variable force F acting on a body along the direction of its displacement S. Using the graph, calculate the work done by the force (i) in the first 4 m (OA), (ii) from S = 4 m to S = 10 m (AB), and (iii) in the whole displacement of 10 m. **[3]**

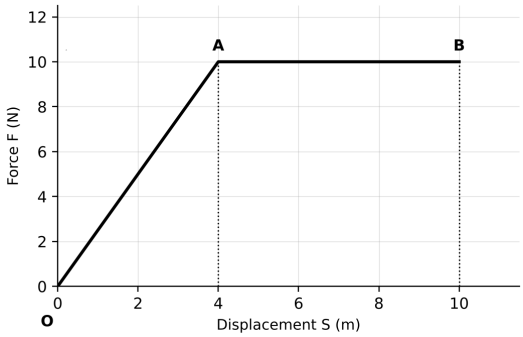

Fig. 2

SECTION B (20 Marks)

(Attempt any two questions from this Section.)

Question 4

(a) (i) Define one kilowatt hour (kWh). (ii) An electric heater of power 2 kW is used for 5 hours. Calculate the energy consumed in (1) kWh and (2) joule. **[3]**

(b) Derive an expression for the kinetic energy of a body of mass m moving with velocity v. **[3]**

(c) Fig. 3 shows a block of mass 20 kg being pulled up, at a constant speed, from A to B along a rough inclined plane by a force of 150 N acting parallel to the slope. AB = 4 m and BC = 2 m. Calculate: **[4]**

(i) the work done by the force in moving the block from A to B, **[1]**

(ii) the gain in potential energy of the block, **[1]**

(iii) the work done against friction, and **[1]**

(iv) the force of friction between the block and the plane. **[1]**

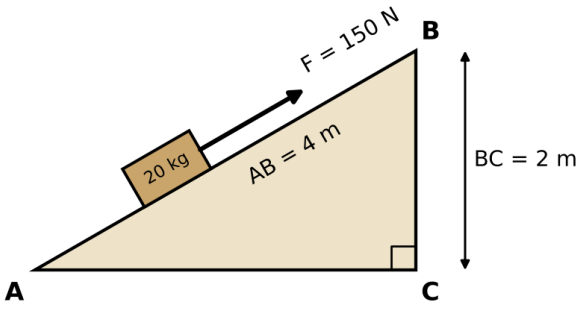

Fig. 3

Question 5

(a) State the principle of conservation of energy. A ball of mass 0.5 kg is thrown vertically upwards with a speed of 10 m s^{-1}. Using this principle, find the maximum height reached by the ball (neglect air friction). **[3]**

(b) Fig. 4 shows a simple pendulum whose bob has a mass of 0.4 kg. The bob is released from the extreme position B, which is 0.2 m above the mean position A. D is the point midway in height between A and B. Neglecting air friction, calculate (i) the total mechanical energy of the pendulum, (ii) the speed of the bob at A, and (iii) the kinetic energy and potential energy of the bob at D. (Take the potential energy at A to be zero.) **[3]**

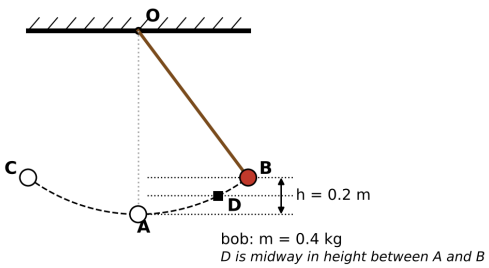

Fig. 4

(c) In Fig. 5, a block of mass 2 kg is released from rest at A, which is 20 m above the ground, and slides down a smooth track. B is at a height of 15 m above the ground and C is on the ground. Calculate: **[4]**

(i) the potential energy of the block at A, **[1]**

(ii) the kinetic energy and the speed of the block at B, and **[2]**

(iii) the speed of the block on reaching C. **[1]**

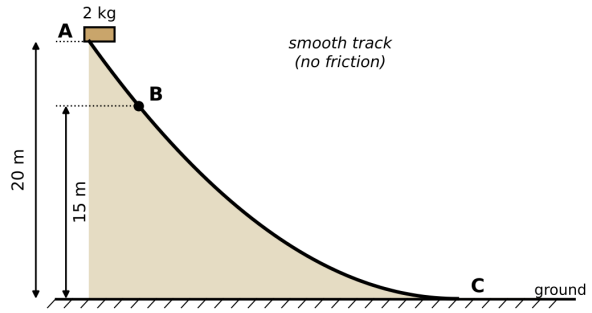

Fig. 5

Question 6

(a) A bullet of mass 20 g moving with a speed of 300 m s^{-1} strikes a wooden block and penetrates 0.3 m into it before coming to rest. Calculate (i) the initial kinetic energy of the bullet, and (ii) the average resistive force offered by the block. **[3]**

(b) A man pulls a cart with a constant force of 250 N and moves it with a constant speed of 12 m s^{-1}. Write the relation between power, force and speed, and calculate (i) the power spent by the man, and (ii) the work done by him in 2 minutes. **[3]**

(c) Fig. 6 is a flow chart showing the energy changes in a coal-fired power station that lights an electric bulb. Name the forms of energy P, Q, R and S. **[4]**

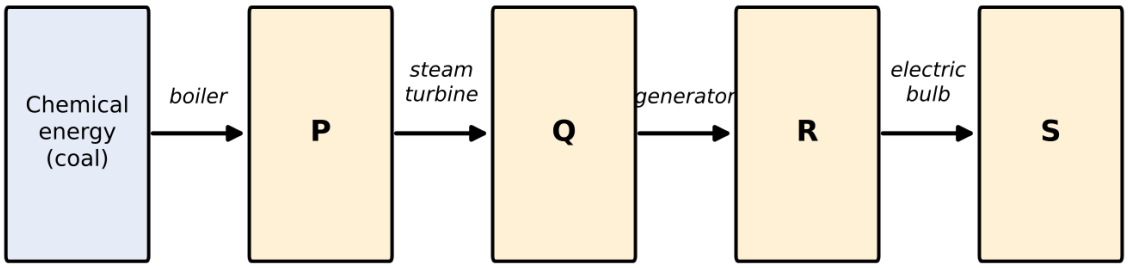

Fig. 6

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