CLASS IX – SCIENCE PRACTICE PAPER (2026-27)

Chapter 7: Work, Energy, and Simple Machines

Max. Marks: 40 **Time Allowed: 1 hour 30 minutes**

General Instructions:

(i) This question paper consists of **20 questions** in **5 sections (A to E)**. All questions are compulsory. Internal choice is given in some questions.

(ii) **Section A** has 10 questions of 1 mark each: Q1–8 are Multiple Choice Questions and Q9–10 are Assertion–Reason questions.

(iii) **Section B** has 4 Very Short Answer questions of 2 marks each (about 30–40 words).

(iv) **Section C** has 3 Short Answer questions of 3 marks each (about 50–60 words).

(v) **Section D** has 2 Case-Based questions of 4 marks each.

(vi) **Section E** has 1 Long Answer question of 5 marks with an internal choice.

(vii) Questions are competency-based and application-oriented. Show all steps, with units, in numerical questions. Take $g = 10\ \text{m s}^{-2}$ wherever required.

(viii) **Questions 2, 6, 12, 16, 19 and 20 are figure-based** and refer to Fig. 1 to Fig. 6.

SECTION A – Objective Questions (10 × 1 = 10 marks)

1 One joule of work is done when: **1**

(A) a force of 1 N displaces an object by 1 m in the direction of the force

(B) a force of 1 N is applied on an object for 1 s

(C) a force of 1 N is applied on an object of mass 1 kg

(D) an object of mass 1 kg is displaced by 1 m

2 **[Figure-based]** Fig. 1 shows how the force acting on an object in the direction of its motion varies with the displacement. The work done by the force in moving the object through 8 m is: **1**

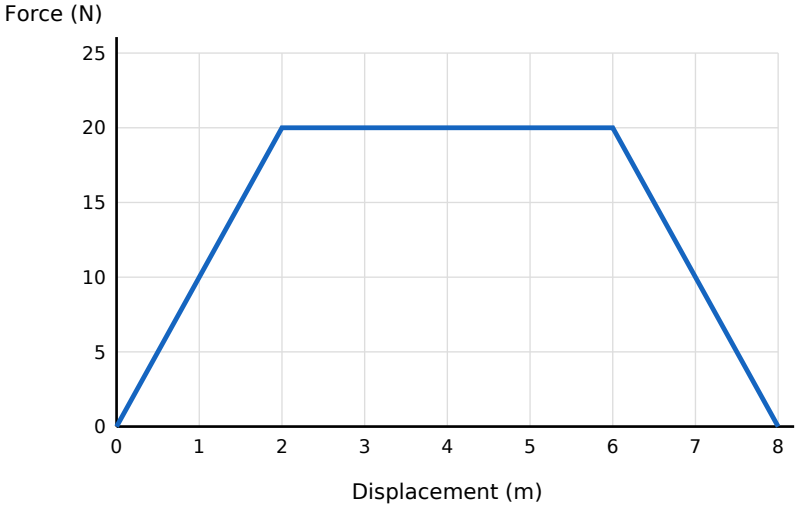


Fig. 1: Force-displacement graph

(A) 80 J

(B) 100 J

(C) 120 J

(D) 160 J

3 In which of the following situations is the work done, in the scientific sense, zero? **1**

(A) A porter lifts luggage up a flight of stairs.

(B) A weightlifter holds a barbell steady above her head.

(C) A boy pushes a wheelchair along a level road.

(D) A boy kicks a football.

4 If the velocity of a moving vehicle becomes three times its original value, its kinetic energy becomes: **1**

(A) 3 times
(B) 6 times
(C) 9 times
(D) 12 times

5 The potential energy of a 2 kg object at a height of 5 m above the ground (g = 10 m s^{-2}) is: **1**

(A) 10 J
(B) 50 J
(C) 100 J
(D) 200 J

6 **[Figure-based]** A pendulum bob of mass 0.5 kg is released from rest at P, which is 0.2 m above the lowest point Q (Fig. 2). Ignoring friction, the speed of the bob at Q is: **1**

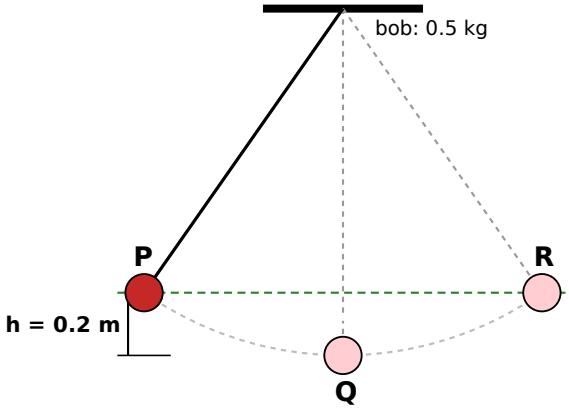


Fig. 2: A swinging pendulum

(A) 1 m s^{-1}
(B) 2 m s^{-1}
(C) 4 m s^{-1}
(D) 20 m s^{-1}

7 A motor does 600 J of work in 20 s. Its power is: **1**

(A) 30 W
(B) 12000 W
(C) 0.033 W
(D) 3 W

8 Which of the following is an example of a class II lever (load between the fulcrum and the effort)? **1**

(A) Scissors
(B) Wheelbarrow
(C) Tweezers
(D) Seesaw

Questions 9 and 10 consist of two statements: Assertion (A) and Reason (R). Choose the correct option:
(A) Both A and R are true, and R is the correct explanation of A.
(B) Both A and R are true, and R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

9 **Assertion (A):** A fixed pulley is useful even though its mechanical advantage is 1. **1**

Reason (R): A fixed pulley changes the direction of the applied force, making it convenient to pull downward.

10 **Assertion (A):** Using a simple machine reduces the total work needed to do a task. **1**

Reason (R): A simple machine reduces the effort by increasing the distance through which the effort acts.

SECTION B – Very Short Answer Questions (4 × 2 = 8 marks)

11 Define one joule of work. State **one** condition under which the work done by a force on an object is zero, with an example. (1 + 1) **2**

12 **[Figure-based]** A uniform rod is used as a lever to lift a load of 90 N, as shown in Fig. 3. **2**

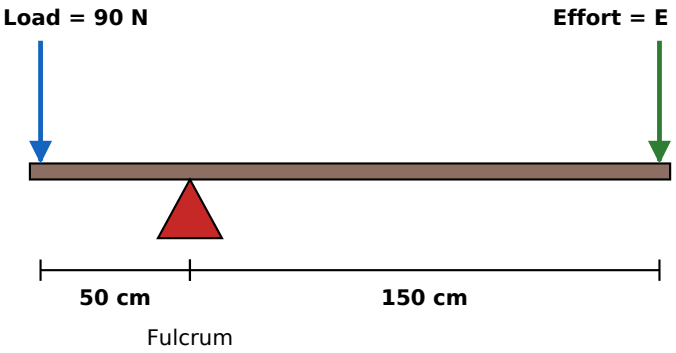


Fig. 3: A lever

(a) Find the mechanical advantage of the lever. (1)

(b) Find the effort E needed to lift the load. (1)

13 A boy of mass 40 kg climbs a flight of stairs of total height 3 m in 6 s. Find (i) the work done by him against gravity and (ii) his power. (1 + 1) **2**

14 *Attempt either option A or B.* **2**

A. A car of mass 1000 kg increases its speed from 10 m s^{-1} to 20 m s^{-1}. Find the increase in its kinetic energy. (2)

OR

B. A fixed pulley does not reduce the effort needed to lift a load. Why is it still used, for example to raise a flag? (2)

SECTION C – Short Answer Questions (3 × 3 = 9 marks)

15 A fielder catches a cricket ball of mass 0.2 kg moving at 30 m s^{-1} and brings it to rest by moving his hands back through 0.3 m. Find (i) the kinetic energy of the ball just before it is caught, (ii) the average stopping force exerted by the hands, and (iii) the average force if the hands had moved back through 0.6 m. (1 + 1 + 1) **3**

16 **[Figure-based]** A load of 500 N is raised slowly to a height of 3 m using the smooth inclined plane shown in Fig. 4. Ignore friction. **3**

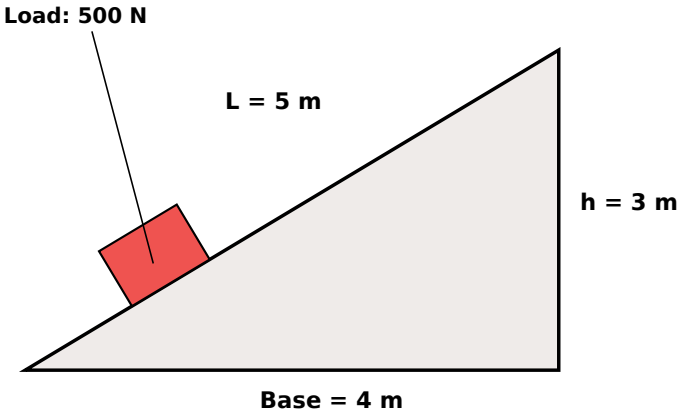


Fig. 4: A smooth inclined plane

(i) Find the mechanical advantage of the inclined plane. (1)

(ii) Find the effort required to move the load up the plane. (1)

(iii) Find the work done by the effort and compare it with the work needed to lift the load vertically through 3 m. (1)

17 *Attempt either option A or B.* **3**

A. A ball of mass 0.5 kg is dropped from a height of 10 m. Show that its mechanical energy is the same at the top and when it is at a height of 5 m from the ground. (3)

OR

B. Differentiate between class I and class III levers, giving one example of each. (1 + 1 + 1)

SECTION D – Case-Based Questions (2 × 4 = 8 marks)

18 **Case Study: A Crane at a Construction Site** **4**

A crane lifts a bundle of bricks of mass 200 kg slowly to a height of 12 m in 8 s. The site engineer compares it with a smaller crane that takes 16 s to do the same job.

(i) Calculate the work done by the crane on the bundle. (1)

(ii) What is the gain in potential energy of the bundle? Which principle links this to your answer in (i)? (1)

(iii) Calculate the power of the first crane. (1)

(iv) What is the power of the smaller crane? Compare the work done by the two cranes. (1)

19 Case Study: Ball Roller Coaster in a Science Park **4**

[Figure-based] A ball of mass 0.5 kg is released from rest at A, the highest point of a smooth track (Fig. 5). Point B is 10 m high and C is at ground level. Take g = 10 m s^{-2} and ignore friction.

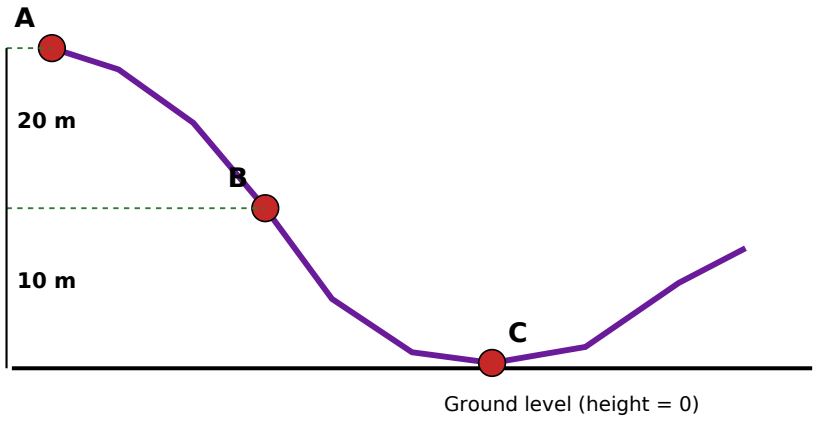


Fig. 5: A ball roller coaster

(i) Find the potential energy of the ball at A. (1)

(ii) Find the kinetic energy of the ball at B. (1)

(iii) Find the speed of the ball at C. (1)

(iv) In a real exhibit, later humps are lower than the first one. Give a reason. (1)

SECTION E – Long Answer Question (1 × 5 = 5 marks)

20 **[Figure-based]** Fig. 6 shows a truck of mass 5000 kg entering an escape ramp at 36 km h^{-1} (10 m s^{-1}). The ramp is inclined at 30°, so the truck rises 1 m vertically for every 2 m it travels along the ramp. **5**

Attempt either option A or B.

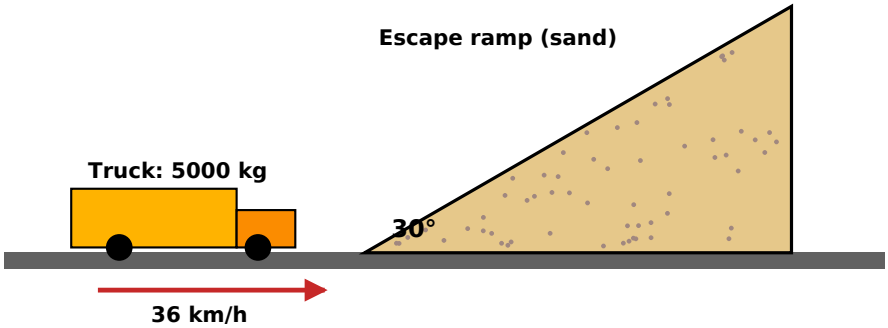


Fig. 6: A truck entering an escape ramp

A.

(i) Calculate the kinetic energy of the truck when it enters the ramp. (1)

(ii) If there were no resistance, to what vertical height would the truck rise before stopping? (1)

(iii) What length of ramp would be needed in this ideal case? (1)

(iv) The sand exerts a constant resisting force of 25000 N. Using the work-energy theorem, find the minimum length d of the ramp needed to stop the truck. (1)

(v) Find the work done by the sand on the truck. Why is its sign negative? (1)

OR

B. The same ramp (length 10 m, height 5 m) is used by workers to push a barrel of weight 2000 N slowly up to the platform, ignoring friction.

(i) Find the mechanical advantage of the ramp. (1)

(ii) Find the effort required. (1)

(iii) Find the work done by the workers. (1)

(iv) Find the potential energy gained by the barrel and compare it with (iii). (1)

(v) If they take 20 s, find the power developed by the workers. (1)

***** END OF QUESTION PAPER *****