# WORKSHEET_210825

## CHAPTER 10 WORK AND ENERGY

**SUBJECT: SCIENCE** **MAX. MARKS : 40**

**CLASS : IX** **DURATION : 1½ hrs**

**General Instructions:**

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

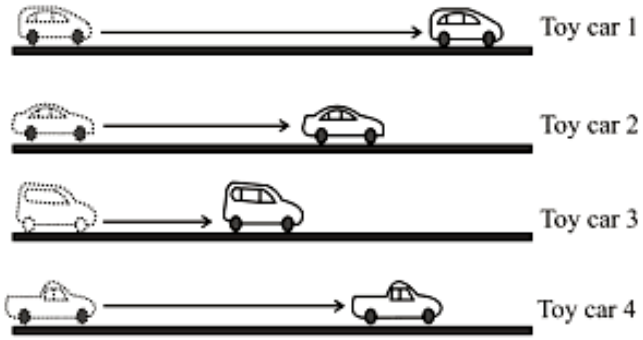
(iv). There is no overall choice.

(v). Use of Calculators is not permitted

## SECTION – A

**Questions 1 to 10 carry 1 mark each.**

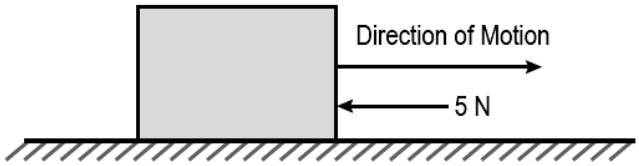
**1.** Rahul pushed four toy cars on a surface. The picture shows the distance each toy car travelled before coming to a stop.




In pushing, on which car was the work done by Rahul was the greatest?

(a) Toy car 1 (b) Toy car 2 (c) Toy car 3 (d) Toy car 4

**2.** An object is moving with a uniform velocity along a particular direction. A retarding force of 5N, is applied in the direction as shown.




The object stops after a displacement of 5m. What is the work done by the retarding force?

(a) –5J (b) –25J (c) 5J (d) 25J

**3.** In which of these conditions is the work done negative?

(I) Wind force making a boat move forward on water.

(II) Brake force resisting the motion of a moving wheel.

(III) Buoyant force slowing the sinking of an iron nail in water.

Options:

(a) (I) and (II) (b) Only (II) (c) Only (III) (d) (II) and (III)

**4.** A force of 20 N acts on a body. The body moves 2 m in the direction of the force. What is the work done by the force?

(a) 10 J (b) 40 J (c) 10 W (d) 40 W

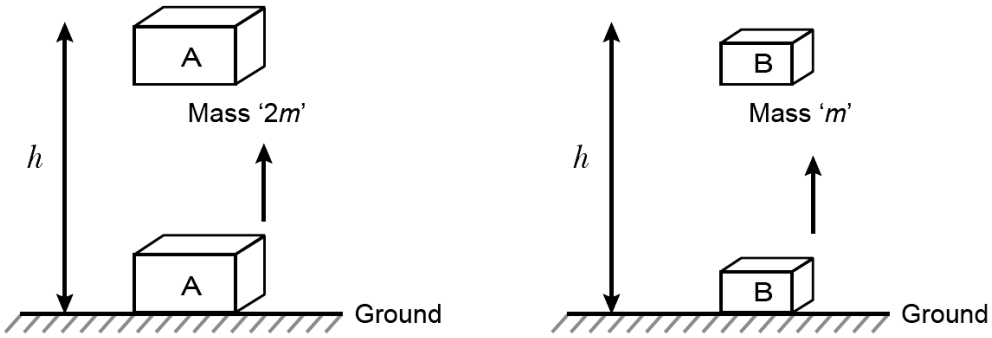
**5.** Which type of energy conversion is found in a microphone?

(a) Mechanical energy into sound energy

(b) Electrical energy into sound energy

(c) Sound energy into electrical energy
(d) Mechanical energy to electrical energy and then sound energy

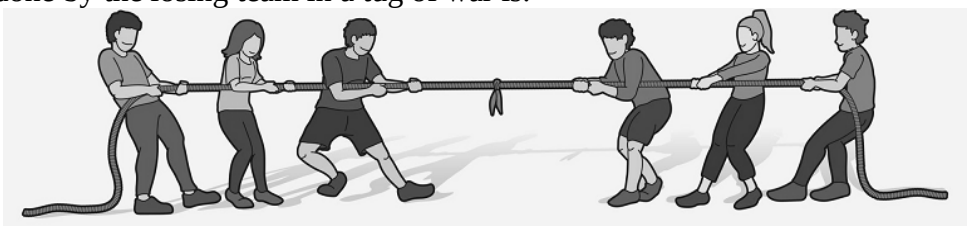
**6.** Compare the energy possessed by the virtue of position for the 2 bodies shown below.




(a) By virtue of their positions, the energy possessed by body A is half the energy possessed by body B.
(b) By virtue of their positions, the energy possessed by body A is twice the energy possessed by body B.
(c) By virtue of their positions, the energy possessed by body A is 4 times the energy possessed by body B.
(d) By virtue of their positions, the energy possessed by both Body A and Body B is the same.

**7.** A person A does 500 J of work in 10 minutes and another person B does 600 J of work in 20 minutes. Let the power delivered by A and B be $P_A$ and $P_B$ respectively. Then,
(a) $P_A = P_B$ (b) $P_A > P_B$ (c) $P_A < P_B$ (d) $P_A$ and $P_B$ are undefined

**8.** The work done by the losing team in a tug of war is:



(a) zero (b) positive (c) negative (d) none of these

**In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.**
(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 falling coconut, a speeding car, a rolling stone, a flying aircraft, flowing water, blowing wind and a running athlete, all possess kinetic energy.
**Reason (R):** Objects in motion possess kinetic energy.

**10.** **Assertion (A):** When a light and a heavy body have the same momentum, the lighter body has more kinetic energy.
**Reason (R):** The square of a body's velocity determines its kinetic energy.

## SECTION – B

**Questions 11 to 14 carry 2 marks each.**

**11.** The kinetic energy of an object of mass, m moving with a velocity of 5 $ms^{-1}$ is 25 J. What will be its kinetic energy when its velocity is doubled? What will be its kinetic energy when its velocity is increased three times?

**12.** A man carrying a bag of mass 25 kg climbs up to a height of 10m in 50 seconds. Calculate the power delivered by him to the bag.

**OR**

Calculate the work required to be done to stop a car of 1500 kg moving at a velocity of 60 km/h?

**13.** A person holds a bundle of hay over his head for 30 minutes and gets tired. Has he done some work or not? Justify your answer.

**OR**

Avinash can run with a speed of 8 m/s against the frictional force of 10 N and Kapil can move with a speed 3 m/s against the frictional force of 25 N. Who is more powerful and why?

**14.** (a) Define 1 J of work.
(b) A pair of bullocks exerts a force of 140 N on a plough. The field being ploughed is 15 m long. How much work is done in ploughing the length of the field?

## SECTION – C

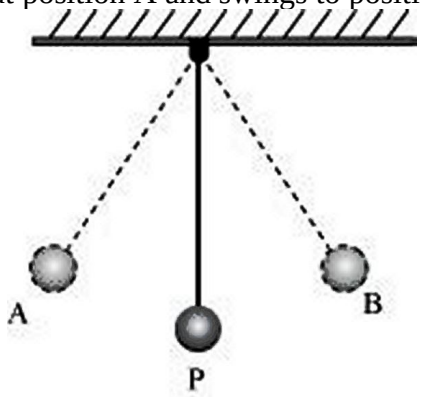
**Questions 15 to 17 carry 3 marks each.**

**15.** A 10 kg ball is thrown upwards with a speed of 5 m/s. (*i*) Find its potential energy when it, reaches the highest point. (*ii*) Calculate the maximum height it reaches.

**16.** (i) A body thrown at a certain angle to the ground moves in a curved path and falls back to the ground. The initial and final points of the path of the object lie on the same horizontal line. What is the work done by the force of gravity on the object?
(ii) You lift a heavily packed carton of mass m in vertically upward direction through a height h. What is the work done (a) by you on the carton, (b) by force of gravity on the carton?
(iii) Anil is doing work at a rapid rate but works for only one hour. Ashok does work at a somewhat slower rate but continues to work for six hours. Who has greater power? Who has more energy?

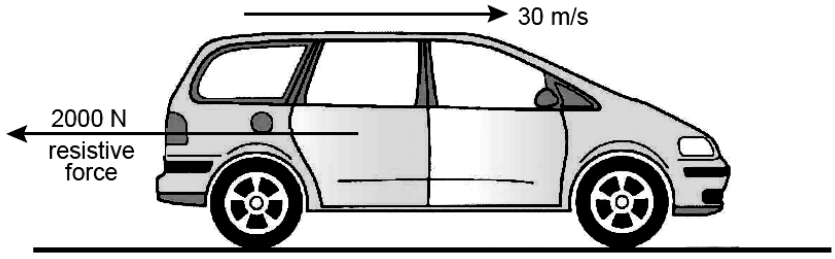
**OR**

A simple pendulum is released at position A and swings to position B as shown in Figure.




One complete oscillation is when the pendulum swings from A to B and then returns to A.
Why does the bob eventually come to rest? What happens to its energy eventually?

**17.** A car of mass 900 kg is travelling at a steady speed of 30 m/s against a resistive force of 2000 N, as illustrated in figure.




(i) Calculate the kinetic energy of the car.

(ii) Calculate the energy used in 1.0 s against the resistive force.
(iii) What is the minimum power that the car engine has to deliver to the wheels?

**OR**

(a) What is the work done by the force of gravity on a satellite moving round the earth? Justify your answer.
(b) Can there be displacement of an object in the absence of any force acting on it? Justify your answer.

## SECTION – D

**Questions 18 carry 5 marks each.**

**18.** (a) Derive an expression for kinetic energy of an object.
(b) If the velocity of an object is doubled. What will be change in its kinetic energy?

**OR**

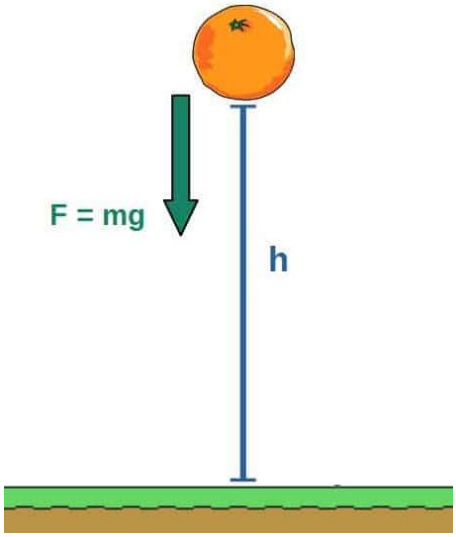
In a small house, there are six bulbs of 100 W and two fans of 60 watt. Two ACs of 2 kW are operated for 4 hours every day.
Calculate the following:
(a) Total power consumed every day.
(b) Total power utilised in 30 days.
(c) Total electrical energy consumed in 30 days.
(d) Cost of electricity at the rate of Rs. 4 per unit.

## SECTION – E (Case Study Based Questions)

**Questions 19 to 20 carry 4 marks each.**

**19. Read the given passage and answer the questions that follow based on the passage and related studied concepts.**

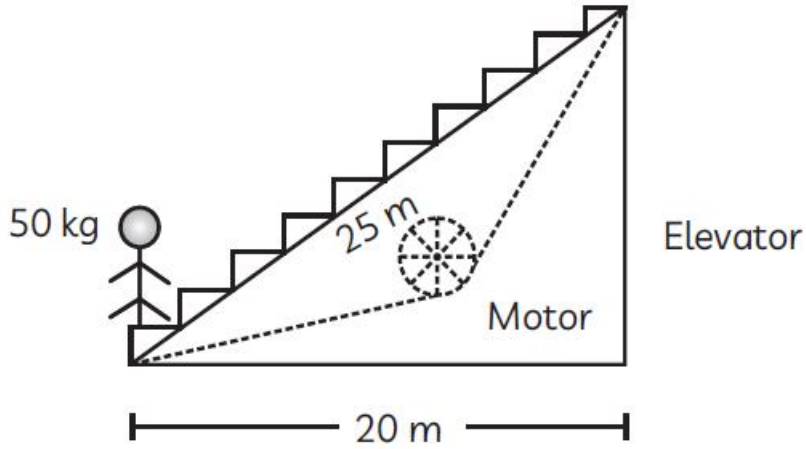
When an object is allowed to fall from higher level to a lower level, it gains speed due to gravitational pull, *i.e.*, it gains kinetic energy. Therefore, in possessing height, a body has the ability to convert its height into kinetic energy, *i.e.*, it possesses potential energy.
The magnitude of its gravitational potential energy is equivalent to the amount of work done by the weight of the body in causing the descent.
If a mass *m* is at a height *h* above a lower level, the P.E. possessed by the mass is *mgh*.
The chosen level from which height is measured has no absolute position. It is, therefore, important to indicate clearly the zero P.E. level in any problem in which P.E. is to be calculated.
The potential energy of a body may be positive or negative.




**Based on the above information, Answer the following questions:**
(a) A cement bag of weight 50 kg has potential energy of 490 J. To what height should it be raised? (1)
(b) When an arrow is shot from its bow, it has kinetic energy. From where does it get this kinetic energy? (1)
(c) Define potential energy. What is the potential energy of a stone of mass 5 kg placed at a height of 2 m above the ground? ($g = 9.8\ m/s^2$). (2)

**20. Read the following information and answer the questions based on information and related studied concepts.**

A girl weighing 50 kg is travelling in an elevator moving at a speed of 2 m/s. Horizontal distance covered is 25 m while displacement is 20 m.




(a) Calculate K.E. of the girl. (1)
(b) Calculate the gravitational potential energy when the girl reaches the top. (2)
(c) What is the work done by motor to raise the girl to a vertical height? (1)