WORKSHEET 1

CHAPTER 2 – WORK, ENERGY AND POWER

A. Tick (✓) the correct option.

1. When the displacement is at right angles to the direction of force then work done is

   a. positive. b. zero. c. negative. d. none of these.

2. One electron volt is equivalent to

   a. 1.6×10^{19} J. b. 1.6×10^{17} J. c. 1.6×10^{-19} J. d. 1.8×10^{-19} J.

3. When a force F is applied on a body and it displaces the body by a distance S in time t then the power is given by the expression

   a. $F \times v$. b. $F \times S$. c. $\frac{F}{v}$. d. $\frac{v}{F}$.

4. The expansion and contraction of our chest during breathing is an example of

   a. Translational kinetic energy.

   b. Vibrational kinetic energy.

   c. Rotational kinetic energy.

   d. None of these.

5. Gravitational potential energy is given by the expression

   a. $U = m \times g$. b. $U = \frac{m \times g}{h}$. c. $U = m \times g \times h$. d. None of these.

B. Fill in the blanks.

1. A vibrating body possesses _____ energy.
2. The ability of a body to do work is called its _____
3. In an electric cell, chemical energy transforms into _____
4. The energy possessed by a body by virtue of its position is called _____
5. A ball rolling on the ground is an example of _____ motion.

C. State whether the following statements are true or false.

1. When the displacement is at right angles to the direction of force then work done is zero.
2. One electron volt (eV) is equal to 1.6×10^{-20} J.
3. The motion of the blades of a fan have vibrational kinetic energy.
4. Electric motor is an example of commission of electrical energy into mechanical energy.
5. One kilowatt-hour (kWh) is equal to 3.6×10^{6} J.

Name: ..... Teacher's signature: .....

Class: ..... X ..... Date: .....

D. Match the following.

1. 1 Joule	rotational motion
2. Windmills	10^7 erg
3. Stretched bow	4.18 J
4. 1 calorie	elastic potential energy
5. 1 h.p.	746 W

E. Answer the following questions.

Very short answer questions

1. State work-energy theorem.
2. What are essential conditions for work to be done?

Short answer questions

1. Calculate the work done in lifting 120 kg of stone through a vertical height of 20 metres. (Given g = 9.8 m/s^2).
2. Explain three forms of kinetic energy by giving examples.

Long answer questions

1. What kind of energy transformation takes place in each case?

   a. electric motor

   b. burning of fuels

   c. respiration

   d. photosynthesis

   e. electromagnet
2. Two bodies of equal masses move with uniform velocities v and $4v$ respectively. Find the ratio of their kinetic energies. What will happen to the K.E.?

ANSWERS

WORKSHEET 1

A. Tick (✓) the correct option.

1. b 2. c 3. a 4. b 5. c

B. Fill in the blanks.

1. sound 2. energy 3. electrical 4. potential 5. translatory

C. State whether the following statements are true or false.

1. T 2. F 3. F 4. T 5. T

D. Match the following.

1. 1 Joule	10^7 erg
2. Windmills	rotational motion
3. Stretched bow	elastic potential energy
4. 1 calorie	4.18 J
5. 1 h.p.	746 W

E. Answer the following questions.

Very short answer questions

1. Work done by the net force on a body is equal to the change in its kinetic energy of the body.
2. Two conditions need to be satisfied for work to be done are
   i. A force should act on an object.
   ii. The object must be displaced in the direction of the force.

Short answer questions

1. Here,

$$\text{Mass } (m) = 120 \text{ kg}$$
$$\text{Height } (h) = 20 \text{ m}$$
$$g = 9.8 \text{ m/s}^2$$
$$\therefore \quad \text{Work done} = m \times g \times h$$
$$\Rightarrow \quad W = 120 \times 9.8$$
$$W = 23520 \text{ J}$$

Hence, work done is 23520 J.

2. The three forms of kinetic energy are as follows:
   i. *Translational kinetic energy:* The motion of a body in a straight line path is called translational motion and the kinetic energy of the body due to the motion in a straight line is called translational kinetic energy. For example, a freely falling stone.

ii. *Rotational kinetic energy:* If a body rotates about its axis, it is called rotational motion and the kinetic energy of the body due to the rotational motion is called rotational kinetic energy, for example, a spinning top.

iii. *Vibrational kinetic energy:* If a body moves to and fro about its mean position, the motion is called vibrational motion. The kinetic energy of the body due to its vibrational motion is called the vibrational kinetic energy. For example, string of a guitar.

Long answer questions

1. a. Electrical energy → mechanical energy

   b. Chemical energy → heat energy

   c. Chemical energy of food → heat energy

   d. Light energy → chemical energy of food

   e. Electrical energy → magnetic energy

2. Here,

$$\text{Mass of the first body} = m$$

$$\text{Velocity of the first body} = v \text{ (given)}$$

So, $$\text{K.E.}_1 = \frac{1}{2}mv^2 \quad \text{...(i)}$$

Also, $$\text{Mass of the second body} = m$$

$$\text{Velocity of the second body} = 4v \quad \text{[4 times of original velocity]}$$

So, $$\text{K.E.}_2 = \frac{1}{2}m(4v)^2$$

$$= \frac{1}{2} \times m \times 16v^2 = 8\,mv^2 \quad \text{...(ii)}$$

Now to find ratio, divide equation (i) by equation (ii), so

$$\frac{\text{K.E.}_1}{\text{K.E.}_2} = \frac{\frac{1}{2}mv^2}{8\,mv^2}$$

$$= \frac{mv^2}{16\,mv^2} = \frac{1}{16}$$

Thus, $$\text{K.E.}_1 : \text{K.E.}_2 = 1 : 16$$

The kinetic energy becomes 16 times when velocity is four times the original velocity.