CBSE Test Paper 03

Chapter 11 Work and Energy

1. One joule work is said to be done when **(1)**

   a. a force of 1 N displaces a body by 1 cm
   b. a force of 1 dyne displaces a body by 1 m
   c. a force of 1 N displaces a body by 1 m
   d. a force of 1 dyne displaces a body by 1 cm

2. What happens to the kinetic energy of a freely falling object which eventually stops on reaching the ground? **(1)**

   a. It changes in vibration energy
   b. It changes into heat & sound energy
   c. It changes into electric energy
   d. It changes into light energy

3. A mass m is moving in a circle of radius 1 m with a uniform speed of 5 m/s. The work done when its radius turns by 60^{o} is **(1)**

   a. zero
   b. 10 joule
   c. 2.5 joule
   d. 5 joule

4. Relative density of a substance is defined as the ratio of the density of the substance to the density of water at _____ **(1)**

   a. 6^{o} C
   b. 8^{o} C
   c. 4^{o} C
   d. 5^{o} C

5. K. E of a body is always **(1)**
   a. +ve

b. zero
c. depends on the situation
d. -ve

6. Name at least three commonly used units of energy. **(1)**
7. When a book is lifted from a table, against which force work is done? **(1)**
8. Is it possible that some force is acting on a body but still the work done is zero? **(1)**
9. What will have happen to the kinetic energy of a body if its velocity is halved? **(1)**
10. What are the various energy transformations that occur when you are riding a bicycle? **(1)**
11. Suppose a hammer which falls freely on a nail placed on a piece of wood of mass 1 kg, if it falls from a height of 1 m, how much kinetic energy it will have just before hitting the nail? Take g = 10 ms^{-2}. **(3)**
12. Give reason : An iron nail sinks in water, but a ship made of iron floats. **(3)**
13. When an arrow is shot from its bow, it has kinetic energy. From where does it get this kinetic energy? **(3)**
14. Illustrate the law of conservation of energy by discussing the energy changes which occur when we draw a pendulum bob to one side and allow it to oscillate. Why does the bob eventually come to rest? What happens to its energy eventually? Is it a violation of the law of conservation of energy? **(5)**
15. The volume of a 500 g sealed tin is 350 cm^{-3}. What is the density of the packed tin? Will the packet float or sink in water if it has a density 1 g cm^{-3}? What will be the mass of water displaced by this tin? What will be the relative density of the packed tin? **(5)**

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Answers

1. c. a force of 1 N displaces a body by 1 m
   Explanation: 1 joule(J) is the amount of work done, when a force of 1 Newton(N) displaces a object 1 meter(m).
   1J = 1N × 1m or 1J = 1Nm.

2. b. It changes into heat & sound energy
   Explanation: When a freely falling body eventually stops on reaching the ground, its kinetic energy appears in the from of: (i) heat (the body and the ground become warmer due to collision). (ii) sound (produced due to collision of the body with the ground).

3. a. zero
   Explanation: The object moves in a circular path. In this case the centripetal force acts on the object at right angles to the direction of motion of object. So, the work done by the object in circular path is zero.

4. c. $4^{o}C$
   Explanation: When density of a substance is compared with the density of water, then it is called relative density. Thus relative density of a substance is the ratio of its density to that of water at 4°C having the same volume as that of the substance.

5. a. +ve
   Explanation: Kinetic energy of a body is K.E = $\frac{1}{2}\ mv^2$. Kinetic energy depends upon mass of the body and velocity. Since mass and velocity never be negative, kinetic energy is always positive.

6. i. joule
   ii. erg
   iii. kilowatt hour

7. Work is done against the force of gravity.

8. Yes, when a force acts at an angle of 90^{o} with the displacement.

9. The Kinetic energy of the body will become one-fourth.

10. It is the transformation of chemical energy of food to heat energy to our muscular energy to kinetic energy on paddling the bicycle.

11. Given : m = 1 kg, h = 1 m , g = 10 ms^{-2} PE = ?
    Using U = mgh = 1 × 10 × 1 = 10 J
    Since potential energy is converted completely into kinetic energy, therefore kinetic energy transferred to the nail is 10 J.

12. If we place an iron nail on the surface of water, it sinks. This is because the density of iron is greater than that of water, so the weight of the nail is more than the upthrust of water on it. On the other hand a ship made of iron does not sink. This is because the ship is hollow and the empty space contains air which makes the average density of the ship less than that of water. Therefore, even with a small part of it submerged into water, the weight of the water displaced becomes equal to the total weight of the ship and hence the ship floats.

13. A stretched bow possesses potential energy on account of a change in its shape. When the arrow is released, the potential energy of the bow gets converted into the kinetic energy of the arrow.

14. When the pendulum bob is pulled (say towards left), the energy supplied is stored in it is the form of P.E. on account of its higher position. When the pendulum is released so that it starts moving towards right, then its P.E. changes into K.E., such that in mean position, it has maximum K.E. and zero P.E. As the pendulum moves towards extreme right, its K.E. changes into P.E. and zero K.E. When it moves from this extreme position to mean position, its P.E. again changes to K.E. This illustrates the law of conservation of energy. Eventually, the bob comes to rest, because during each oscillation a part of the energy possessed by it transferred to air and in overcoming friction at the point of suspension. Thus, the energy of the pendulum is dissipated in air.
    The law of conservation of energy is not violated because the energy merely changes

its form and is not destroyed.

15. Given: Mass of packed tin (m) = 500 g

    Volume of tin (V) = 350 cm^{-3}

    i. Therefore density of the tin

    $density = \frac{mass}{volume} = \frac{500}{350}$ = 1.429 gcm^{-3}

    ii. As the density of the tin is more than the density of water therefore it will sink in water.

    iii. Volume of water displaced by packed tin = volume of packed tin = 350 cm^{-3}

    Therefore mass of water displaced by tin

    M = V × d = 350 × 1 = 350 g

    iv. Relative density of packed tin,

    R D = $\frac{density\ of\ tin}{density\ of\ water} = \frac{1.429}{1}$ = 1.429