CBSE Test Paper 04

Chapter 11 Work and Energy

1. A car is accelerated on a leveled road and attains a velocity 4 times of its initial velocity. In this process the potential energy of the car **(1)**

   a. does not change
   b. becomes 16 times that of initial
   c. becomes twice to that of initial
   d. becomes 4 times that of initial

2. Which of the following statements is true for the pressure exerted by solid body? **(1)**

   a. Greater the area over which the force acts, greater is the pressure
   b. It does not depends upon the area of contact for the magnitude of force
   c. It depends upon the area of contact for the same magnitude of force
   d. It does not depend upon the area of contact for the same magnitude of force

3. Match the following with correct response. **(1)**

Column A	Column B
(1) Battery	(A) Steam energy converts into mechanical energy
(2) Bulb	(B) Chemical energy converts into electrical energy
(3) Steam engine	(C) Sound energy converts into electrical energy
(4) microphone	(D) Electrical energy converts into light energy

   a. 1-D, 2-A, 3-C, 4-B
   b. 1-C, 2-B, 3-D, 4-A
   c. 1-B, 2-D, 3-A, 4-C
   d. 1-A, 2-C, 3-B, 4-D

4. Match the following with correct response. **(1)**

Column A	Column B

(1) Velocity effects	(A) Energy
(2) Maximum work done	(B) 90°
(3) Work done is zero	(C) O°
(4) Work done, when force act obliquely	(D) $F \times S \times \cos\theta$

a. 1-C, 2-B, 3-D, 4-A
b. 1-D, 2-A, 3-C, 4-B
c. 1-A, 2-C, 3-B, 4-D
d. 1-B, 2-D, 3-A, 4-C

5. An object of mass 1 kg has a potential energy of 1 joule relative to the ground when it is at a height of **(1)**

a. 1 m
b. 32 m
c. 9.8 m
d. 0.102 m

6. Name at least six forms of energy. **(1)**

7. What is negative work. **(1)**

8. A person holds a bundle of hay over his head for 30 minutes and gets tired. Has he done some work or not? **(1)**

9. 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? **(1)**

10. What is energy? **(1)**

11. A 1800 Kg car is moving at 30 m/s. when brakes are applied. If the average force exerted by the brakes is 6000 N, find the distance travelled by the car before it comes to rest? **(3)**

12. Why does a block of plastic released under water come up to the surface of water? **(3)**

13. A solid weighs 200 gf in air, 160 gf in water and 170 gf in a liquid. Calculate the

relative density of the solid and that of the liquid. **(3)**

14. Look at the activities listed below. Reason out whether or not work is done in the light of your understanding of the term 'work'. **(5)**

i. Suma is swimming in a pond.
ii. A donkey is carrying a load on its back.
iii. A wind-mill is lifting water from a well.
iv. A green plant is carrying out photosynthesis.
v. An engine is pulling a train.
vi. Food grains are getting dried in the sun.
vii. A sailboat is moving due to wind energy.

15. A man standing on the top of a tower 60 m high throws a ball in the vertically upward direction with a velocity of 20 ms^{-1}. How long will it take the ball to pass by the man while moving in the downward direction? How long will it take the ball to hit the ground? (Take g = 10 ms^{-2}) **(5)**

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Answers

1. a. does not change

   Explanation: Potential energy will not change as the road is leveled and the height of the body remains the same, although its speed increases.

2. c. It depends upon the area of contact for the same magnitude of force

   Explanation: $P = \frac{F}{A}$,

   For the same force $P \propto \frac{1}{A}$

3. c. 1-B, 2-D, 3-A, 4-C

   Explanation:

   A. In Battery, chemical energy converts into electrical energy.

   B. In Bulb, electrical energy converts into light energy.

   C. In Steam , engine steam energy converts into mechanical energy.

   D. In microphone, sound energy converts into electrical energy.

4. c. 1-A, 2-C, 3-B, 4-D

   Explanation:

   i. As the velocity of object increases it's Kinetic energy also increases.

   ii. W= F x S cos θ (cos 0° = 1) So, w = F x S means maximum work is done.

   iii. W= F x S cos θ (cos 90° = 0) So, w = 0 means zero work is done.

   iv. W= F x S cos θ where F = force, d = displacement

5. d. 0.102 m

   Explanation: P.E. = mgh

   m= 1 kg P.E. = 1J g = 9.8m/s2

   1 = 1 × 9.8 ×h

   h = 1 ÷ 9.8 = 0.102 m

6. a. Chemical energy

   b. Heat energy

   c. Light energy

   d. Electrical energy

e. Sound energy
f. Solar energy.

7. If the force has a component in the direction opposite to the displacement, the force does negative work.

8. The person does no work because, no displacement takes place in the direction of applied force as the force acts in the vertically upward direction.

9. $Workdone = Force \times displacement$
= $140N \times 15m$ = 2100J

10. The capacity of a body to do work is called energy possessed by the body. It is a scalar quantity and is measured in joule (J).

11. M = Mass of car = 1800 Kg
V = velocity of car = 30 m/s
F = Force = 6000 N
K.E. = $\frac{1}{2}mv^2$
$= \frac{1}{2}1800 \times 900$
K E = 810000 J
K. E. =work done
work done = force $\times$ Displacement
W=F*S
$810000 = 6000 \times S$
$\frac{810000}{6000} = S$
135m=S
distance travelled by car before stoppi g is 135m.

12. The block of plastic displaces more weight of water than its own weight and therefore, experiences a buoyant force greater than its own weight. As a result the net force acts in the upward direction. Thus on being released it comes upto the surface of water.

13. Given: Weight of solid in air = 200 gf
Weight of solid in water = 160 gf
Weight of solid in liquid = 170 gf

Loss of weight of solid in water = Weight in air - weight in water = 200 - 160 = 40 gf

Loss of weight of solid in liquid = Weight in air - weight in liquid = 200 - 170 = 30 gf

RD of solid = $\frac{weight\ of\ solid\ in\ air}{loss\ in\ weight\ in\ water} = \frac{200}{40}$ = 5

RD of liquid = $\frac{loss\ of\ solid\ in\ liquid}{loss\ in\ weight\ in\ water} = \frac{30}{40}$ = 0.75

14. Work will be done if a force acts on an object and displacement occurs in the direction of force. According to this explanation work is done in following activities:

    a. Suma is doing work. She is applying force to move horizontally.
    b. Donkey is not doing any work. Here, the displacement and the force are at 90°.
    c. Work is done by the windmill. The water is lifted against force of gravity.
    d. No work is done by a green plant during photosynthesis.
    e. The engine applies a pulling force on the train, and the train moves in the direction of this force. Therefore, engine is doing work.
    f. During drying of food grains in the sun no work is done.
    g. Work is done by the air. The sailboat moves in the direction of the force exerted by wind.

15. For the vertically upward motion of the ball

    Initial velocity (u) = 20 ms^{-1}

    Final velocity (v) = 0

    Time (t) = ?

    Distance covered upward (S) = ?

    Acceleration due to gravity (g) = -10 ms^{-2}

    For finding time taken by the ball to move upwards

    Using v = u+ gt

    ⇒ 0 = 20 - 10 × t

    ⇒ 10 t = 20

    ⇒ t = 2s

    As the ball takes 2 s to attain the maximum height, therefore, it will take another 2 s to just pass the thrower (since time of ascent is equal to the time of descent) thus, the time in which the ball passes the thrower.

    = (2 + 2) s = 4 s

    The total distance travelled by the ball in moving upwards and returning to the

thrower can be obtained as follows

$V^2 - u^2 = 2as$

$\Rightarrow 0^2 - (20)^2 = 2 \times (-10) \times S$

$\Rightarrow S = \frac{-400}{-20} = 20m$

For the downward motion of the ball from the top we have

Initial velocity $u = 0\ ms^{-1}$

Distance of free fall (S) = 60 + 20 = 80 m

Time take t = ?

Using $S = ut + \frac{1}{2}at^2$ we have

$80 = 0 \times t + \frac{1}{2} \times 10 \times t^2$

$\Rightarrow t^2 = 16$

$\Rightarrow t = 4s$

Therefore total time taken by the ball to reach the ground level = (2 + 4) = 6 s.