Chapter 11

WORK AND ENERGY

Multiple Choice Questions

1. When a body falls freely towards the earth, then its total energy
(a) increases
(b) decreases
(c) remains constant
(d) first increases and then decreases

2. A car is accelerated on a levelled road and attains a velocity 4 times of its initial velocity. In this process the potential energy of the car
(a) does not change
(b) becomes twice to that of initial
(c) becomes 4 times that of initial
(d) becomes 16 times that of initial

3. In case of negative work the angle between the force and displacement is
(a) 0^0 (b) 45^0 (c) 90^0 (d) 180^0

4. An iron sphere of mass 10 kg has the same diameter as an aluminium sphere of mass is 3.5 kg. Both spheres are dropped simultaneously from a tower. When they are 10 m above the ground, they have the same
(a) acceleration
(b) momenta
(c) potential energy
(d) kinetic energy

5. A girl is carrying a school bag of 3 kg mass on her back and moves 200 m on a levelled road. The work done against the gravitational force will be (g = 10 m s^{-2})
(a) 6×10^3 J
(b) 6 J
(c) 0.6 J
(d) zero

6. Which one of the following is not the unit of energy?
(a) joule
(b) newton metre
(c) kilowatt
(d) kilowatt hour

7. The work done on an object does not depend upon the
(a) displacement
(b) force applied
(c) angle between force and displacement
(d) initial velocity of the object

8. Water stored in a dam possesses
(a) no energy
(b) electrical energy
(c) kinetic energy
(d) potential energy

9. A body is falling from a height h. After it has fallen a height $\frac{h}{2}$, it will possess
(a) only potential energy
(b) only kinetic energy
(c) half potential and half kinetic energy
(d) more kinetic and less potential energy

Short Answer Questions

10. A rocket is moving up with a velocity v. If the velocity of this rocket is suddenly tripled, what will be the ratio of two kinetic energies?

11. Avinash can run with a speed of 8 m s^{-1} against the frictional force of 10 N, and Kapil can move with a speed of 3 m s^{-1} against the frictional force of 25 N. Who is more powerful and why?

12. A boy is moving on a straight road against a frictional force of 5 N. After travelling a distance of 1.5 km he forgot the correct path at a round about (Fig. 11.1) of radius 100 m. However, he moves on the circular path for one and half cycle and then he moves forward upto 2.0 km. Calculate the work done by him.

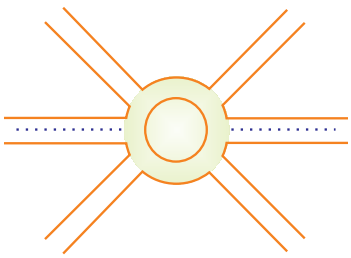

Fig. 11.1

13. Can any object have mechanical energy even if its momentum is zero? Explain.

14. Can any object have momentum even if its mechanical energy is zero? Explain.

15. The power of a motor pump is 2 kW. How much water per minute the pump can raise to a height of 10 m? (Given g = 10 m s^{-2})

16. The weight of a person on a planet A is about half that on the earth. He can jump upto 0.4 m height on the surface of the earth. How high he can jump on the planet A?

17. The velocity of a body moving in a straight line is increased by applying a constant force F, for some distance in the direction of the motion. Prove that the increase in the kinetic energy of the body is equal to the work done by the force on the body.

18. Is it possible that an object is in the state of accelerated motion due to external force acting on it, but no work is being done by the force. Explain it with an example.

19. A ball is dropped from a height of 10 m. If the energy of the ball reduces by 40% after striking the ground, how much high can the ball bounce back? (g = 10 m s^{-2})

20. If an electric iron of 1200 W is used for 30 minutes everyday, find electric energy consumed in the month of April.

Long Answer Questions

21. A light and a heavy object have the same momentum. Find out the ratio of their kinetic energies. Which one has a larger kinetic energy?

22. An automobile engine propels a 1000 kg car (A) along a levelled road at a speed of 36 km h^{-1}. Find the power if the opposing frictional force is 100 N. Now, suppose after travelling a distance of 200 m, this car collides with another stationary car (B) of same mass and comes to rest. Let its engine also stop at the same time. Now car (B) starts moving on the same level road without getting its engine started. Find the speed of the car (B) just after the collision.

23. A girl having mass of 35 kg sits on a trolley of mass 5 kg. The trolley is given an initial velocity of 4 m s^{-1} by applying a force. The trolley comes to rest after traversing a distance of 16 m. (a) How much work is done on the trolley? (b) How much work is done by the girl?

24. Four men lift a 250 kg box to a height of 1 m and hold it without raising or lowering it. (a) How much work is done by the men in lifting the box? (b) How much work do they do in just holding it? (c) Why do they get tired while holding it? (g = 10 m s^{-2})

25. What is power? How do you differentiate kilowatt from kilowatt hour? The Jog Falls in Karnataka state are nearly 20 m high. 2000 tonnes of water falls from it in a minute. Calculate the equivalent power if all this energy can be utilized? (g = 10 m s^{-2})

26. How is the power related to the speed at which a body can be lifted? How many kilograms will a man working at the power of 100 W, be able to lift at constant speed of 1 m s^{-1} vertically? (g = 10 m s^{-2})

27. Define watt. Express kilowatt in terms of joule per second. A 150 kg car engine develops 500 W for each kg. What force does it exert in moving the car at a speed of 20 m s^{-1}?

28. Compare the power at which each of the following is moving upwards against the force of gravity? (given g = 10 m s^{-2})

(i) a butterfly of mass 1.0 g that flies upward at a rate of 0.5 m s^{-1}.

(ii) a 250 g squirrel climbing up on a tree at a rate of 0.5 m s^{-1}.