Ch.4 work,Energy& Power
Questions&Answers

1."All manual labours are not considered as work." Justify this statement.

Ans. Work is said to be done, only when an object is displaced under the action of force. For example, A person standing still on a floor carrying a load on his head. He has been applying force on the load against the gravitational force, but there is no displacement to the object. So work done is zero.

2.Explain the factors influencing the measure of work.

Ans. We have work done, W = Fxd. Hence work done depends on the magnitude of force applied and displacement in the direction of force.

3. Give the unit of work.

Ans. 'Nm' is the unit of work. It is called 'joule'.

4. What are the forces experienced on a stone lying on a table?

Ans. i. Gravitational force (weight) acting vertically downward direction.

ii. Reactive force from the surface of the table in vertically upward direction.

5. Write down an expression for work done to raise a body of mass 'm' to the height 'h' against the gravitational force.

Ans. Work, W = mgh. Where 'g' is the acceleration due to gravity.

6. A force of 50 N is applied continuously on a body of mass 3 kg and displaced to 2 m in the direction of force. Calculate the work done by the force. If the same body is raised to the height of 2 m. Calculate the work done against gravitational force.

Ans. i. We have W = Fxs , Here F = 50 N, d = 2 m.

So Work done = 50x2 = 100 J

ii. Work done against the gravitational force W_g = mgh = 3x9.8x2 = 58.8 J.

7. Work may be positive and negative. Which is the situation at which work is considered as negative? Give an example for negative work.

Ans. If the displacement is opposite to the direction of force, the work is negative.

Work done by frictional force is always negative.

8. "Work done by gravity may be positive or negative." Comment to this statement..

Ans. This statement is correct. When a body is projected vertically upward direction, it is displaced opposite to the direction of gravity. So work done by the gravity is negative. But in the case of a freely falling body, work done by the gravity is positive as it is displaced in the direction of gravity.

9. A boy continuously applied 10 N force on a brick of mass 5 kg lying on a flat floor and displaced to 8 m. If the frictional force experienced on the brick is 4 N,

a. What is the work done by the boy? b. Calculate the work done by the frictional force.

c. What is the work done against the gravity? (Take g = 10 m/s^2)

Ans.a. W_b = Fxs = 10x8 = 80 J. b. W_f = Fxs = -4x8 = -32 J

c. As there is no displacement against the direction of gravitational force, work done against the gravity is zero.

10."A person walking along a flat floor carrying a load on his head doesn't do any work" Comment to this statement.

Ans. This statement is wrong. Here only the work done against the gravity is zero. But he has been applying a force in the horizontal direction to move his body forward. He has done work for this.

11.What is energy? What is its unit? Give examples for various form of energy.

Ans.i. Energy is the capacity to do work. ii. Its unit is same as that of work and is *joule*.

iii. Mechanical energy, heat energy, chemical energy, electrical energy.

12.What is meant by kinetic energy? Write expression for calculating kinetic energy of an object.

Ans. i.Energy possessed by a body by virtue of its motion is called kinetic energy.

ii. Kinetic Energy , K = ½ mv^2, m – mass of the object and v – speed.

13. i.What are the factors influencing kinetic energy of a body?

ii. What will be the change in kinetic energy of an object in the following situations?

a. Mass is doubled. b. Speed is doubled.

Ans.i. Mass and speed.

ii.a. As Kinetic energy is directly proportional to the mass, kinetic energy also is doubled.

b. But kinetic energy is quadrupled when speed is doubled as it is proportional to the square of speed.

14. A car of mass 1500 kg is running with a speed of 20 m/s. Find its kinetic Energy.

Ans. Kinetic Energy, K = ½ mv^2 = ½ x1500x20x20= 300000 J.

15. A boy of mass 50 kg is riding a bicycle of mass 10 kg with a speed of 2 m/s. Calculate the total Kinetic Energy.

Ans. Total mass m = 50+10=60 kg. Speed = 2 m/s

Total Kinetic Energy = ½ mv^2 = ½ x 60x2x2= 120 J

16. What is potential Energy? Give a few examples for objects possessed potential energy.

Ans.Energy possessed by a body due to its position or strain is known as potential Energy.

Stone placed at a height, stretched rubber band, compressed spring, water stored in a tank etc..

17. Write down expression for potential energy of an object kept at a height.

Ans. Petential Energy U = mgh. m – mass, g – Acceleration due to gravity, h – height.

18. In all our domestic electrical devices, energy in one form is being converted to another form. Find out the energy conversion in the following devices.

a. Electric Bulb. b. Electric motor. c. Electric Generator d. Iron box e. Electric fan.

Ans. a. Electric bulb : Electrical energy is transformed to light and heat energy.

b. Electric motor: Electrical energy is transformed to mechanical energy.

c. Electric Generator : Mechanical Energy is transformed to electrical Energy.

d. Iron box : Electrical energy is transformed to heat energy.

e. Electric fan: Electrical energy is transformed to mechanical energy.

19. State law of conservation of energy.

Ans. Energy can neither be created nor destroyed. One form of energy can only be converted to another form.

20.What forms of energies does a freely falling body posses? Identify the transformation of energy during the fall.

Ans. Kinetic Energy & Potential Energy.

Potential energy is being converted to kinetic energy.

21. Define power. What is its unit?

Ans: Power is the rate of doing work.

Power P = Work(W)/time(t). Unit of power is J/s and is called 'watt'.

Another unit for power is horse power (HP).

22. A man of mass 70 kg climbs up a mountain in 5 minutes. Find the power.

Ans: mass, m = 70 kg height,h = 30 m time, t = 5x60 = 300 s

Power, P = W/t = mgh/t = 70x9.8x30/300 = 68.6 W

23. If a man of mass 50 kg takes 60 s to climbs up 20 steps each of height 15 cm, find the power. (take g = 10 m/s^2)

Ans: mass, m = 50 kg Total height,h =0.15x20 = 3 m time, t = 60 s

Power, P = W/t = mgh/t = 50x10x3/60 = 25 W

24. A stone of mass 40 kg is kept on a terrace of 12 m hight.
a. What is the potential energy of the stone?
b.If it is allowed to fall down, what will be its kinetic energy when it just reaches the ground?
c. State the law which helps you to find the answer of question (b).
Ans:a. Potential Energy ,U = mgh = 40x10x12 = 4800 J.
b. Kinetic Energy,K = 4800 J.
c. Law of conservation of energy: *Energy can neither be created nor destroyed. One form of energy can only be converted to another form*.
25.According to the law of conservation of energy, energy cannot be created. Then how energy is acquired by a stone kept at a height or a compressed spring?
Ans.(i)The work that had done to raise the stone to the present height is stored in it as potential energy. Similarly the work done to compress the spring is stored in the spring as potential energy.
26. A bird of mass 0.5 kg is flying with certain speed keeping the height as 5m. If its potential energy and kinetic energy are equal, find
a. Potential Energy of the bird. b. Speed of the bird. (Given g = 10 m/s^2)
Ans. a.Potential Energy U = mgh = 0.5x10x5 = 25 J
b. Since kinetic energy and potential energy are equal, ½ mv^2 = 25
½ x0.5xv^2 = 25 Or v^2 = 25x2/0.5 = 100 Then v= 10 m/s
27. A stone kept at height of 100 m possessed 200 J of potential energy. And it is allowed to fall freely. Find out the location at which
a. Kinetic energy and potential energy becomes equal.
b. Kinetic energy becomes maximum.
c. Total energy becomes maximum.
Ans.a.At halfway between the path. ie, when it reaches at the height 50 m from the ground.
b. When it just reaches the ground.
c. Total energy remains the same throughout the fall.

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