CBSE Class 9 Work Energy and Power Solved test paper-05

Q. 1. A man of 50 kg jumps up to a height of 1.2 m. What is his potential energy at the highest point?

Solution The potential energy of man = mgh = = 50 + 10 X 1.2 J = 600 J

Q.2. The potential energy of a body is 39600J. How high is the body if its mass is 20kg?

The potential energy of a body = mgh

Solution: h = PE/mg = 39600j/20kg x9.8m/s^2=198m

Q.3. A force of 20 N displaces a body through a distance of 1 m at an angle of 60° from its own direction. Calculate the amount of work done.

Solution Here, force F = 20 N, displacement, s = 1 m. Angle between force and displacement 60°.

Work done,W =Fscos0 =20 X 1 X cos60°=20X 1 X 1/2 = 10J.

Q.4. How much work is done by a force of 10 N in moving an object through a distance of 4 m in the direction of the force.

Solution Work done Force x Displacement =F.s = (10 N) x (4 rn) = 40 joule or 40J.

Q.5. 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?

Solution Linear momentum of 1st object = $p_1=m_1v_1$

Linear momentum of 2nd object = $p^2 = m^2v^2$

Given, $p_1 > p_2$ ----------(i)

$\Rightarrow m_1v_1 > m_2v_2$

But, $m_1<m_2$ (A light and a heavy object) $\Rightarrow v_1 > v_2$ ----------(ii)

Ke = ½ mv^2 = ½ m v x v = ½ p v

From (i)and (ii) $p_1v_1 > p_2v_2 \Rightarrow ½\ p_1v_1 > ½\ p_2v_2 \Rightarrow KE_1 > KE_2$

Q.6. what is power? How do you differentiate kilowatt from kilowatt hour?

Solution: Power is the rate of doing work. Kilowatt is the unit of power and kilowatt hour is the unit of energy.

Q.7. Calculate the work done in lifting 200 kg of water through a vertical height of 6 m.

Solution: Work done in lifting a body = Weight of body X vertical distance

The work done in lifting = W = mgh = 200 kg x $10m/s^2$ x6 m = 1200J

Q.8. Give one example each of potential energy (i) due to position (ii) due to shape.

Solution: (i) Potential energy due to position: Water stored in dam has potential energy.

(ii) Potential energy due to shape: In a toy car, the wound spring possesses potential energy, and as the spring is released, its potential energy changes into kinetic energy due to which the car moves.

Q.9. What kind of energy transformation takes place when a body is dropped from a certain height?

Solution: When a body falls, its potential energy gradually gets converted into kinetic energy. On reaching the ground, the whole of the potential energy of the body gets converted into kinetic energy

Q.10. Can kinetic energy of a body be negative?

Solution: No as m ass and velocity cannot ne negative

Q.11. A freely falling object eventually stops on reaching the ground. What happens to its kinetic energy?

Solution: A freely falling object just before hitting the ground has maximum kinetic energy. After falling, it rolls on the rough ground and finally comes to rest. The kinetic

energy of the object is used up in doing work against friction; which finally appears as heat energy.

Q.12. Find the energy in kWh consumed in 10 hours by four devices of power 500 W each.

Solution: Energy consumed = Power x time taken

$$= 2000W \times 10\ h = 20000\ Wh = 20\ kWh.$$

Q.13. Calculate the work required to be done to stop a car of 1500 kg moving at a velocity of 60 km/h?

Solution: The work required to be done to stop a car

$$= (\tfrac{1}{2} mu^2) - (\tfrac{1}{2} mv^2) = \tfrac{1}{2} m(u^2 - v^2) = \tfrac{1}{2} \times 1500\ (602 - 0) = 2.08J$$

Q.14. What is the work done by the force of gravity on a satellite moving round the Earth? Justify your answer.

Solution: The work done by the force of gravity on a satellite moving around the Earth is zero.

When a satellite moves around the Earth in a circular path, then the force of gravity acts on it directed towards the centre. The motion of the satellite is in the horizontal plane. Therefore, the force of gravity of Earth on the satellite and the direction of motion of satellite are perpendicular to each other. Therefore, net work done = Fs cos 90 = 0.

Q.15. The potential energy of a freely falling object decreases progressively. Does this violate the law of conservation of energy? Why?

Solution: During the free fall of the object, there is continuous decrease in potential energy. This decrease in potential energy appears as an equal amount of increase in kinetic energy. Thus, the sum of the potential energy and kinetic energy of the object would be the same at all points. That is, potential energy + kinetic energy = constant.

According to the law of conservation of energy, the total energy of system remains unchanged. Thus, the given statement does not violate the law of conservation of energy.