Cosmo School

Physics	Worksheet 3 : 07/07/2020	Class - IX

CHAPTER 4 : WORK, POWER AND ENERGY

Instructions:

✓ Read the chapter in your book - quickly and thoroughly, preferably more than once.

✓ Watch the uploaded video classes from school's website. For becoming more clear about the basics, watch more than once, if needed.

(Questions given in this worksheet are important questions for all exams)

✓ Learn the answers given in this worksheet in the following schedule:

Day 1 (07/07/2020) : All cognitive questions (1-9) and analytical questions 1-5.

Day 2 (08/07/2020) : Analytical questions 6-13.

Day 3 (09/07/2020) : Analytical questions 14-20.

✓ For any difficulty in understanding, feel free to contact me.

Cognitive Questions (Mark - 1)

1. What is called work done?

Ans.: The product of applied force on a body and its displacement along the direction of the force applied is called work done.

2. What is 1 joule?

Ans.: If an object has one meter displacement towards force from applying one Newton force on it then the amount of work done is called one joule.

3. What is power?

Ans.: Power is the rate of doing work or transformation of energy.

4. What is watt?

Ans.: If one joule work is done in one second then it is called watt 0r one watt.

5. Write down the principle of conservation of energy.

Ans.: "Energy cannot be created, neither be destroyed, it can be transformed from one form to another or multiple forms. The total amount of energy of the universe is constant and unchangeable."

6. What is kinetic energy?

Ans.: The energy to work that an object receives due to being in motion is called kinetic energy.

7. What is called potential energy?

Ans.: When an object is brought to another state or position from its natural state or position then the ability of work that the object gains is called the potential energy of that object.

8. What is efficiency?

Ans.: The ratio of effective energy and the total given energy is called efficiency.

9. What is mechanical energy?

Ans.: Energy that is attained due to position, shape and motion of an object is mechanical energy.

Analytical Questions (Marks - 2)

1. What do you mean by the work 50j?

Ans.: The work 50j means-

i. If a force of 50N is applied on a body and the body gets displacement of 1m along the direction of force, then the work done is said to be 50j.

ii. If 1N force is used to move a body 50m along the direction of force, then the work done is said to be 50j.

2. Write down the differences between energy and power.

Ans.:   The differences between energy and power are given below -

Energy	Power
i. The ability to work is energy.	i. The rate of work done is called power.
ii. Energy is determined by the total amount of work done.	ii. Total amount of work done is not needed to determine power. In doing the same work, the fastest has the more power.
iii. Energy has different forms. It can be transformed from one form to another.	iii. It has no different forms. So, there is no question of transforming.
iv. The unit of energy is joule (j).	iv. The unit of power is watt (w)

3. Explain why the unit of energy and work is same.

Ans.:   Ability to do work is energy. Doing work means transforming energy from one state to another state.

In this case, the amount of work done is equal to the amount of energy transformed. This means that total amount of work done by body is energy. Since energy of a body is measured from the amount of work done. So, unit of work and energy is same and it is joule (j).

4. In all respect, equal work cannot be done by applying force. Explain.

Ans.:   We know, work = force x displacement

If the displacement of the body is zero on the application of a force, then work done will be zero. Again, if the displacement is opposite to the direction of force then work is negative and work is positive when the displacement is in the same direction of force. Thus, in all respect work done cannot be equal.

5. What do you mean by potential energy? Explain.

Ans.:   The energy that an object gains for changing its position or state is potential energy inside it. If a piece of stone or brick is thrown from roof on any object it can break or bend. When the stone or brick was kept on the roof, energy was stored in it. When the stone falls, that energy is used. The energy was hidden within the stone as it was above the ground. Again, if the two ends of a spring is

attached to two object and then released then they will strike each other. Though the spring was stretched, energy was conserved in it. When it is released, work is done. Energy was hidden when the spring was stretched, because it was strained. Now, for the both cases, as there was a change in the position from normal state on the ground, an energy was stored within them due to strain of them and this is called potential energy.

6. What factors does potential energy depend on? Explain.

Ans.: Potential energy = weight of the body x vertical height

$\therefore E_p = mgh \therefore$

i. e. potential energy = mass of the body x acceleration due to gravity x vertical height

Potential energy depends on the vertical height of the object from the surface of the earth. Te more is the height, the higher will be the potential energy. Potential energy also depends on the mass of the object. The more the mass the more will be the potential energy of the object.

7. What is meant by the work done against the force?

Ans.: If the displacement of a body takes place opposite to the direction of force then the work done is called work done against force. If a duster is lifted on the top of a table from the floor then the work is done against force. If a duster is lifted on the top of a table from the floor then the work is done against the force of gravity. This is because, the displacement taken place opposite to the direction of force of gravity.

8. How the kinetic energy of a moving body is related with the velocity? Explain.

Ans.: Let a body at rest with mass m accelerated at a velocity 'v' when 'F' force was applied on it. In this time, the body travelled 's' distance towards the direction of force. So the work to give this velocity to the body is its kinetic energy.
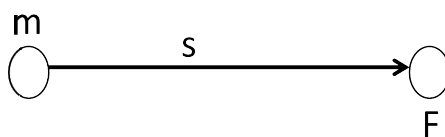
$\therefore$ kinetic energy = work done

$$\Rightarrow E_k = \text{Force x displacement}$$

$$\Rightarrow E_k = F \times s$$

$$\Rightarrow E_k = mas \; [F = ma] \; \text{------------------------(1)}$$

But, $v^2 = u^2 + 2as$

$$\Rightarrow v^2 = 2as \; [u = 0]$$

$$\Rightarrow as = v^2/2$$

Putting the value of 'as' into equation (1) and we get,

$$E_k = m. \; v^2/2$$

$$\Rightarrow E_k = 1/2 \; mv^2$$

$$\therefore E_k = v^2 \; [\text{mass, m = constant}]$$

Therefore, kinetic energy is proportional to the square of velocity.

9. Can kinetic energy of Rahim be negative?

Ans.: Rahim's kinetic energy can never be negative. Because if any moving object's mass is 'm' and velocity is 'v' then kinetic energy is $1/2mv^2$. Object's mass m can never be negative. Object's velocity can be positive or negative but its square is always positive. So, kinetic energy can never be negative.

10. Why the nuclear reaction is not environmentally friendly? Explain.

Ans.: There is no emission of carbon-dioxide in a nuclear power plant. But nuclear wastages are very radioactive and these have to preserved for millions of years for their radioactivity to reach a safe level which is not hazardous for the environment. though nuclear power plant is very safe due to modern technology, sometimes owing to people's mistakes or natural calamities major accident happens to create a fatal disaster. These are why, nuclear reaction is not environmentally friendly.

11. Why effective energy depends on efficiency? Explain.

Ans.: The ratio of the amount of work done by a machine and total given energy is called the efficiency of that machine.

$$\text{Efficiency} = \frac{\text{Amount of work}}{\text{Energy given}}$$

or, Amount of work = Efficiency x Energy given

So, amount of work will increase with the efficiency of a machine. So, less energy will be wasted. So, amount of work depends on the efficiency.

12. How can geothermal energy be used? Explain.

Ans.: The heat below the earth surface can be used as an energy source. The heat below the surface is so high that sometimes due to

geological changes, this magma comes upwards which accumulates slightly below the earth surface. These places are known as hot spot. Water beneath the surface vaporizes in contact with hotspots. Pipes can be inserted into this hot spots to extract this vapor using high pressure which can produce electricity by rotating turbines.

13. When we throw an arrow by stretching the string of a bow, how does the energy transformation take place?

Ans.: While pulling the string of a bow, potential energy accumulates in the string due to the position change of the string. Then, while shooting the arrow, the potential energy in the string accumulates kinetic energy in the bow. this how potential energy changes to kinetic energy while shooting an arrow by pulling the string of the bow.

14. Explain why biomass can be considered as a multiple source of energy.

Ans.: Biomass refers to those organic matter that can be changed to energy. A lot of organisms including humans consume biomass as food and then turn it into energy to keep daily activities in motion. The organic matters that can be used as the source of biomass energy are trees, fuel wood, waste of wood, crops, rice husks, leaves, faeces of animals and birds, municipal waste etc. This is why biomass is considered as a multiple source of energy.

15. Write the difference between potential energy and kinetic energy.

Ans.: Difference between kinetic energy and potential energy is as follows:

Kinetic energy	Potential energy
i. The ability of work that a moving object gains from its motion state is called kinetic energy.	i. The energy that an object gains from its position change with respect to the surroundings is called potential energy.
ii. Kinetic energy of a falling object gradually increases.	ii. Potential energy of a falling object gradually decreases.
iii. If an object is not in motion then its kinetic energy is zero.	iii. The potential energy of an object on the ground is zero.

16. How mechanical energy transforms into another type of energy?

Ans.: Mechanical energy can be transformed into heat-energy. If palms are rubbed, heat is produced. If we blow at the open side of pen it generates sound energy. When water is stored in the top of the mountain it stays as potential energy and it transforms into kinetic energy while falling down. Electricity can be produced by rotating a wheel using this water flow. In this way, mechanical energy transforms into electric energy.

17. What is meant by kinetic energy of 500j of a body?

Ans.: Kinetic energy of 500j of a body means -

i. If the body moves at a certain velocity, because of motion it can do 500j of work.

ii. If force is applied to stop the body, the body will work an amount of 500j against the applied force until the body stops.

18. "The efficiency of an engine is 90%" - what is meant by this?

Ans.: The efficiency of an engine is 90% means, if 100 unit of energy is given to that engine, the amount of work done will be 90 unit.

19. "All moving objects are in possession of kinetic energy" - explain.

Ans.: Creating velocity in a body in rest increasing the velocity of moving object means to produce acceleration in it. For this, force has to be applied. as a result, work will be done on the body. For this, the body will obtain the ability to work and this work will be stored in the object as kinetic energy. This is why all moving objects are in possession of kinetic energy.

20. Differentiate between work and power.

Ans.:   The differences between work and power are -

Work	*Power*
i. If force can displace a body from its original position then it is called work	i. Power is the rate of work or transformation of energy.
ii. The unit of work is joule (j).	ii. The unit of power is watt (w).
iii. The dimension of work is $[M L^2 T^{-2}]$.	iii. The dimension of power is $[M L^2 T^{-3}]$.
iv. Time is not needed to measure work.	iv. Time is essential to measure power.