CHAPTER#5 WORK, ENERGY & POWER

1. Write difference between work and energy.
OR What is work done. OR Define energy. Write its unit.

Ans: **Work:** *The product of magnitude of force and the distance covered in the direction of force.*
Unit: *Joule* **(J)** **Formula:** $W=F\ x\ S$
Energy: *The ability of a body to do work is called energy.* **Unit:** *Joule* **(J)**

$1\ W = 1\ Js^{-1}$
$1\ kW = 10^3\ W$
$1\ MW = 10^6\ W$

2. Define unit of work. OR Define Joule.
OR SI unit of work is joule, define one joule of work.

Ans: **Joule:** *One joule work is done when a force of one newton acting on a body moves it through a distance of one meter in its own direction.* **1J= 1N x 1m**

3. On which factors work depends?

Ans: *i.Force ii.displacement iii.angle between force and displacement*

4. What is the work done on an object that remains at rest when a force is applied on it?
OR Is work done when a force applied but there is no displacement?

Ans: *The work done is zero. As* $S = 0$ *, So* $W= F\ x\ S = F\ x\ 0 = 0$

5. How does a force do work?

Ans: *Work is done when force acts on a body and displaces it in the direction of the force.*

6. Define kinetic and potential energy. Also write their equation or formula & unit.
OR Define kinetic energy. Find an expression for the kinetic energy of a moving body.
OR Define potential energy. What is the potential energy of a body of mass "m" when it is raised to a height "h".

Ans: **Kinetic Energy:** *The energy possessed by a body due to its motion.*
Unit: *Joule* **Formula:** $E_k=\frac{1}{2}mv^2$

Potential Energy: *The energy possessed by a body due to its position.*
Unit: *Joule* **Formula:** $E_p=mgh$

Types: *i. Elastic potential energy ii. Gravitational potential energy*

7. Can an object have both kinetic and potential energy simultaneously?

Ans: *Yes, for example a ball rolling uphill have both kinetic and potential energy.*

8. A slow-moving car may have more kinetic energy than a fast-moving motorcycle. How is this possible?

Ans. *Since* $KE=\frac{1}{2}mv^2$
Because mass of a car is much larger than the motorcycles, so it has more kinetic energy.

9. Can the kinetic energy of a body ever be negative?

Ans. *No, kinetic energy cannot be negative. It is always positive or zero.*

10. A car is moving along a curved road at constant speed. Does its kinetic energy change?

Ans: *No, kinetic energy remains same, as speed is constant.*

11. Define gravitational potential energy and elastic potential energy.

Ans: **Gravitational Potential Energy:**
The energy possessed by a body due to its position in gravitational field.
Elastic Potential Energy:
The energy stored in a stretched or compressed spring is called elastic potential energy.

12. Define different forms of energy.

Fossil fuel Energy	*The energy released by burning of oil, coal and natural gas.*
Solar Energy	*The energy of sunlight that can be converted into electricity.*
Nuclear Energy	*It is the energy released by breaking the nucleus of an atom*
Wind Energy	*The energy produced by using the kinetic energy of fast blowing wind.*
Hydroelectric Generation	*The electricity generated by using the kinetic energy of the falling water.*
Geothermal Energy	*The heat energy of hot rocks present deep under the earth surface.*
Biofuel Energy	*The energy obtained by fermentation of organic materials in the form of biogas.*

13. What is the relationship b/w kinetic energy & momentum?
Ans: *Kinetic energy is proportional to the square of the momentum.*

14. Can an object have potential energy without being at height?
Ans: *Yes, as potential energy exists in different forms like elastic potential energy.*

15. Define Principle of conservation of energy.
Ans: *Energy cannot be created or destroyed. It may be transformed from one form to another, but the total amount of energy never changes.*

16. Comment on the statement. "An object has one joule of potential energy."
Ans. *This statement is incomplete. Because it doesn't show the height of on object.*
Correct statement:
"An object has one joule of potential energy, having mass 'm' kg and height 'h' meter.

17. Differentiate between renewable and non-renewable energy sources.
Write the name of 3 renewable and non-renewable sources of energy.
Ans. ***Renewable energy sources:*** *The energy resources, which are replaced by new ones after their use.* ***e.g.*** *solar energy, wind energy, tidal energy etc.*
Non-renewable energy sources: *The energy resources, which are not easily replaced by new ones after their use.*
e.g. *fossil fuels, nuclear energy, biomass energy*

18. Why fossil fuels are called non-renewable source of energy?
OR Why non-renewable sources of energy are limited?
Ans: *Because fossil fuels took millions of years for their formation and can't renew in short time.*

19. Define power and its unit.
OR What is power? Define the unit used for it.
Ans: ***Power:*** *The rate of doing work is called power.*
Unit: *Watt* ***Formula:*** $P = \frac{W}{t}$
Watt: *One watt is work done at the rate of one joule per second.*

Why a system cannot have 100% efficiency?
Ans. *Due to energy losses from friction, heat and other inefficiencies.*

20. Define watt and write how much watt is equal to one horsepower.
Ans: *One watt is work done at the rate of one joule per second.* *1hp = 746Watt*

21. How does power of an object change when the time taken to do work decreases?
Ans: *As power is inversely proportional to time. So power increases, time taken decreases.*

22. Define efficiency and write its formula.
Ans: *The ratio of useful output energy and total input energy is called efficiency.*

$$Efficiency = \frac{useful\ Output\ energy}{total\ Input\ energy}$$

$$\%\ Efficiency = \frac{useful\ Output\ energy}{total\ Input\ energy} \times 100$$

Is timber or wood renewable source of heat energy? Comment.
Ans: *Yes, timber or wood can be renewable if trees are replanted after cutting.*

23. Can the efficiency of the machine be greater than "1"?
Ans: *No, as output energy of a machine can't be greater than the input energy.*

24. A force F_1 does 5 J of work in 10s. Another force F_2 does 3J of work in 5s. Which force delivers greater power?
Ans: $P_1 = \frac{W_1}{t} = \frac{5}{10} = 0.5W$ $P_1 = \frac{W_2}{t} = \frac{3}{5} = 0.6W$
So F_2 will deliver more power.

25. While driving on a motorway, tyre of a vehicle sometimes bursts. What may be its cause?
Ans: *Tyre bursts due to too much air, heat and friction.*

26. While playing cricket on a street, the ball smashes a window pane.
Describe the energy changes in this event.
Ans: *Ball's kinetic energy breaks window, energy transfers from ball to glass.*

27. Can energy be created or destroyed?
Ans: *No. Energy can be converted from one form to another only.*

28. What happens to the energy of an object when it is converted from one form to another?
Ans: *When energy is converted from one form to another, the total energy of an object remains same. However the form of energy changes.*

29. A man rowing boat upstream is at rest with respect to the shore. Is he doing work?
Ans. *Yes, he is doing work, by exerting force against water flow.*

Some Energy Sources
i. wind energy
ii. Solar energy
iii. Nuclear energy
iv. Geothermal energy