Board – ICSE	Class –8th	Topic – Energy

1. Write the form of energy possessed by the body in the following situations:
   (a) A coconut falling from a tree
   (b) An object raised to a certain height
   (c) Wind blowing in an area
   (d) A child driving a bicycle on a road

   Ans:

   The form of energy possessed by the body is:
   (a) Kinetic as well as potential energy
   (b) Potential energy
   (c) Kinetic energy
   (d) Kinetic energy

2. A body of mass 200 g possesses 40 J of energy when placed at the top of a tower. How high is the tower? [g = 10 m/s^2]

   Ans:

   Given: PE = 40 J; m = 200 g = 0.2 kg; g = 10 m/s^2

   The potential energy possessed by a body of mass m at a height h is

   $PE = mgh$

   $h = \frac{PE}{mg}$

   $= \frac{40}{0.2 \times 10}$

   $= 20m$

   Hence, the height of the tower is 20 m.

3. State any four precautions which one should take while using energy in everyday life.

   Ans:

   i. Use of fossil fuels like coal, petroleum and natural gas must be done only when there is no alternative energy.
   ii. Renewable sources of energy like solar energy, wind energy, hydro-electric energy, etc. must be used more than the non-renewable sources.

iii. Use of public transport or sharing vehicles (car pooling) must be done to save fuel.

iv. More trees must be planted instead of cutting them down.

4. What energy transformations are taking place in the following examples?

(a) Electric motor

(b) Burning of wood

Ans:

(a) Electric motor: Electrical energy is converted to mechanical energy.

(b) Burning of wood: Chemical energy is converted to heat energy and light energy.

5. In a hydroelectric power plant more electrical power can be generated if the water falls from a greater height.

Ans:

In a hydroelectric power plant more electrical power can be generated if the water falls from a greater height because a greater height means larger potential energy, and this large amount of potential energy can be converted into large kinetic energy, thereby producing more power.

6. A fan of power 300 W is used for 510 minutes. Calculate the electrical energy consumed in joules.

Ans:

Given: Power of the fan is P = 300 W = 0.3 kW

Time for which the fan is used is t = 510 minutes = 8.5 hours

We know that energy consumed is given as

E =Pt

$\therefore E = 0.3 \times 8.5 = 2.55$ kWh

Now, we know that 1 kWh = 3.6×10^6 J

So, we get

$E = 2.55 \times 3.6 \times 10^6$

$\therefore E = 9.18 \times 10^8$ J

7. The gravitational potential energy stored in a box of weight 150 kgf is 1.5×10^4 J. Find the height of the box. Take l kgf = 10 N.

Ans:

Gravitational potential energy U = mg ×h

1.5×10^4 J = (150 kgf) ×h

1.5×10^4 J=(150 × 10 N) × h

$$h = \frac{1.5 \times 10^4}{1500} = \frac{15}{10} \times \frac{10000}{1500} = 10 \text{ m}$$

8. A car is moving with a speed of 15 km h^{-1} and another identical car is moving with a speed of 30 km h^{-1}. Compare their kinetic energy.

Ans:

Two identical cars means, they have equal mass

$$K.E = \frac{1}{2}mv^2$$

Let m be the mass of each car

$$\text{Kinetic energy of car A} = \frac{1}{2} \text{ m} \times (15)^2 = \frac{225}{2}\text{m} = 112.5 \text{ m J}$$

$$\text{Kinetic energy of car B} = \frac{1}{2} \text{ M } (30)^2$$

$$= 450 \text{ M J}$$

$$\frac{\text{K. E. of A}}{\text{K. E. of B}} = \frac{225 \text{ m}}{2 \times 450 \text{ m}} = \frac{1}{4} = 1:4$$

K.E. of car B is 4 times K.E. of car A.

9. It takes 20 s for a girl A to climb up the stairs while girl B takes 15 s for the same job. Compare: (i) the work done and (ii) the power spent by then.

Ans:

(i) As height is same for both girls A and B, work done is same (irrespective of time)

∴ Work done by A : Work done by B = 1 : 1

(ii) $$\text{Power} = \frac{\text{Work done}}{\text{Time taken}} = \frac{\text{Energy}}{\text{Time}}$$

$$= \frac{\text{Power of A}}{\text{Power of B}} = \frac{\frac{\text{Energy}}{t_1}}{\frac{\text{Energy}}{t_2}} = \frac{1}{t_1} \cdot \frac{t_2}{1} = \frac{15}{20}$$

$$= \frac{3}{4} = 3:4$$

10. A truck of mass 1000 kg, increases its speed from 36 km h^{-1} to 72 km h^{-1}.

Find the increase is its kinetic energy.

Ans

Weight of truck = Force = 1000 kgf

$\therefore$ Mass of truck $= \frac{1000 \text{ kg} \times g}{g} = 1000\text{kg}$

Initial speed $u = 36 \text{ km h}^{-1} = 36 \times \frac{5}{18} = 10\text{ms}^{-1}$

Final speed $v = 72 \text{ km h}^{-1} = 72 \times \frac{5}{18} = 20\text{ms}^{-1}$

Work done = Increase in energy

$= \frac{1}{2}mv^2 - \frac{1}{2}mu^2 = \frac{1}{2}m[(v+u)(v-u)]$

$= \frac{1}{2} \times 1000(20+10)(20-10) = \frac{1}{2} \times 1000 \times 30 \times 10$

Work done $W = 150000 \text{ J} = 1.5 \times 10^5 \text{J}$

$t = 2 \text{ minutes} = 2 \times 60 = 120 \text{ s}$

$\therefore$ Power of engine $= \frac{w}{t} = \frac{150000}{120} = 1250 \text{ W}$

$= \frac{1250}{100} \times 100 = \frac{125}{100} \times 10^3 = 1.25 \times 10^3 \text{W}$

11. A man lifts a mass of 20 kg to a height of 2.5 m. Assuming that the force of gravity on 1 kg mass is 10 N, find the work done by the man.

Ans:

Mass = 20 kg h = 2.5 m

Force of gravity on a mass of 1 kg = 10 N

Force of gravity on a mass of 20kg

F = mg = 20 × 10 = 200 N

Work done in lifting the mass to height h = 20 m is

W = F × h

= 200 N × 2.5 m

$= 200 \times \frac{25}{10} = 500 \text{ J}$

12. Give reasons for the following A horse and a dog are running with the same speed. Which one of them has more kinetic energy than the other .

Ans:

A horse has more mass than dog. As both are running with the same speed.

M_1 of horse is greater than M_2 of dog

∴ K.E. of horse is more than K.E. of dog

13. Give the difference between energy and power

Ans:

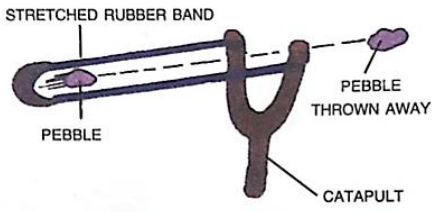
Energy	Power
1. Energy of a body is its capacity to do work. 2. Energy spent does not depend on time. 3. S.I. unit of energy is joule (J)	1. Power of a source is the rate at which energy is supplied or work is done by it. 2. Power depends on the time in which energy is spent 3. S.I unit of power is watt (W).

14. Give one example of a body that has potential energy in each of the following due to its elongated stretched state.

Ans:

P.E. due to its elongated stretched state:

A stretched rubber band (elongated state) has potential energy. It does work in restoring itself to its original state. A pebble placed on the stretched rubber catapult, is thrown away when it is released to restore its original state.



A stretched rubber catapult has potential energy

15. Explain factors affecting the amount of work done by a force.

Ans:

1. **Dependence of the amount of work done on the magnitude of the force applied on the body:** Work is done us more if the force applied to move the body is more

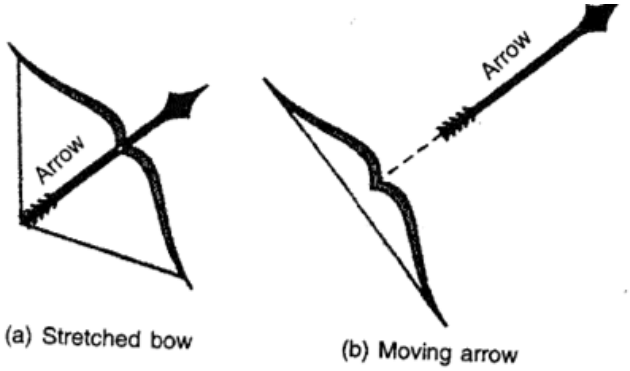
Example: More work is done by us if we lift a bucket full of water from the ground floor to the first floor than if we lift an empty bucket to the same height. The reason is that we have to apply a greater force to lift the bucket full of water than to lift the empty bucket.

2. **Dependence of the amount of work done on the distance moved by the body in the direction of force:** Work done is more if the distance moved by the body in the direction of force is more.
   Example: More work is done by us if we lift a bucket of water from the ground floor to the second floor than if we lift the same bucket from the ground floor to the first floor.

16. Give an example to show the conversion of potential energy to kinetic energy when put in use.

Ans:

A stretched bow has the potential energy because of its stretched position. When the stretched bow is released the potential energy of the bow changes into its kinetic energy.



Potential energy of a stretched bow changes into its kinetic energy