Energy Ch-4

Home Assignment

① Define work.

A-> The work done by a force on a body is equal to the product of the force applied and distance moved by the body in the direction of force i.e.

2-> when does a force perform work?

A-> work said to be done when the applied force makes the body move (there is displacement of the body).

3-> state two conditions when no work is done by a force.

A-> The two condition when no work is done by force are:-

i) There is no displacement of the body = 0

ii) The displacement is normal to the direction of force i.e. - $\theta = 90^\circ$

4-> in which of the following cases is work being done:-

A-> b-> a boy climbing up the stairs

d-> a girl moving on the road.

5⇒ A coolie is moving on a road with a luggage on his head. does he perform against the force of gravity? Give reason for your answer.

A⇒ No he performs no force against gravity because he is moving with a luggage in his head. is doing work.

6⇒ The moon is revolving around the earth in a circular path. How much work is done by the moon?

A⇒ He does no work It is revolving due to the earth's gravity and the work done is 0.

7⇒ Write the expression for work done by a force.

A⇒ The work done by a force is 0 if the body moves in a direction perpendicular direction of force.

~~eg ⇒ when a stone tied at the~~

8⇒ State the S.I unit of work and define it.

A-⇒ The SI unit of work is Joule.

One Joule of work is said to be done if one newton when acting on a body moves it by 1 meter in the direction of force.

9⇒ State two factors on which the work done on a body depends.

A⇒ The work done by a body depends upon the.

1) The magnified of the amount of work.

10⇒ Define the term energy.

A-⇒ Energy is the ~~capacity~~ capacity of doing work.

11-⇒ State the S.I unit of energy.

A-⇒ The SI unit of energy is ~~Joule~~ Joule.

12⇒ Define 1 joule of energy.

A⇒ One Joule of work is said to be done. if one newton force when acting on a force applied and the distance moved by the body in the direction of force.

13⇒ How is work related to energy?

A⇒ It is related to energy by it is the energy gives us a strong to do work.

14⇒ what are the two kinds of mechanical energy?

A⇒ The two kinds of Mechanical Energy.

1) Potential Energy
2) Kinetic Energy

15⇒ what is potential energy? state its unit.

A⇒ The energy possessed by a body due to its state

of rest or position is called potential energy. Its potential energy are g.

16⇒ Give one example of body that has potential energy in each of the following.

(a) due to its position at a hight.

A⇒ water.

b⇒ due to its elongated stretched state.

A⇒ Strectched rubber band.

17⇒ State two factors on which the Potential energy of a body at a certain height above the ground depends.

A⇒ State two factors on which the Potential energy of a body are ⇒ mass.

~~Acceleration~~ • height above the ground depends

18⇒ Two bodies A and B of masses 10kg and 20kg respectively are at the same height above the ground. which of the two has greater potential energy.

A⇒ We know that $PE = mgh$

Height of body A and B is same and g is constant hence with greater mass i.e. Body B has greater potential energy.

19→ We know that PE = mgh

As 'g' is constant in both cases and quantity of water is the same in both cases. PE depends on height, the height of the second beaker is greater as it is on the second floor, hence the second beaker has greater PE.

20→ Expression for gravitational Potential Energy = U = mgh

g is Acceleration due to gravity

mg is the force acting on body

h is the distance of height moved above the ground level.

2) When a body of mass m at A on ground is raised above the ground through height above ground through height B force is applied

Force applied = weight of body

Force on mass m = F = mg

g is the acceleration due to gravity on mass of 1kg.

3) work done = Force x displacement (distance)

W = mgh

4) The work done is stored in a body in the form of potential energy.

P.E = mgh

22→ The energy possed by a body by virtue of its motion is called Kinetic energy.

Example → A bullet moving at high speed has less mass but possesses Kinetic energy and can penetrate the body

23→ Kinetic energy of a moving body depends on:

i) mass of the body

ii) velocity of the body

24→ Kinetic energy = $\frac{1}{2}$ × mass (velocity)^2

Since the speed of both the cars is same hence car with greater mass will posses more kinetic energy.

Car B has more mass than car A, hence the kinetic energy

of car B is greater

25) Kinetic energy $= \frac{1}{2} \times \text{mass} \times (\text{velocity})^2$

Since speed is doubled. its square will become 4 times

Hence Kinetic energy increases by 4 times

26) Kinetic energy $= \frac{1}{2} \times m \times v^2$

Where m is the mass of body and v is the speed of body.

27) Kinetic energy of a ball of mass m is moving with a speed $v = \frac{1}{2} \times mv^2$

28) Potential Energy

29) Yes, a body can possess energy when it's not in motion For e.g. → water store in the

dam is not in motion and possess a potential energy

30) a) Kinetic energy
b) Potential energy
c) Potential energy
d) Kinetic energy
e) Kinetic energy
f) Kinetic energy
g) Potential energy

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

32) A wound up watch spring has potential energy stored in it because it is wound up. The spring unwinds

itself, the potential energy changes into kinetic energy which it moves. The hands of the watch.

33. a) A wall does not move when pushed hence the object is not moving. NO work is done.

b) When a hammer is lifted, the potential energy stored in it is used in driving the nail into the wood.

c) When a horse and a dog are running at the same speed. The animal having more mass will have more kinetic energy of a horse is more than the dog, hence the kinetic energy of a horse is more than the kinetic energy of a dog.

d) A child reading a book while standing is not moving from its place i.e. displacement is zero. Hence

no work is done by the child.

d) ~~A child reading heat wire~~

E) a) Electrical energy to light energy

b) Electrical energy to heat energy.

c) Electrical energy to sound energy

d) Electrical energy to mechanical energy

e) ~~kite nice~~ kinetic energy to potential energy

C) F = 30N

d = 5m

Work done = F x d

= W = 30 x 5 = 150 Joules

2) Mass = 20kg
h = 2.5m
Force of gravity on a mass of
1kg = 10N
Force of gravity on mass
of 20kg = 10N × 20 = 200N

W = F × h

= 200N × 2.5 m

= 500 J

3) F = 10 kgf = 10 × 10N = 100N

Displacement = s = 0.5m

Work done which displacement is in direction of force

W = F × s

W = 100N × 0.5m = 50J

4) Gravitational potential

energy = mgh

Gravitational potential energy of body 1 = mgh

Gravitation potential energy of body 2 = 2mgh

On comparing = $\frac{mgh}{2mgh} = \frac{1}{2}$

The Gravitational potential energy of object 2 is twice that of object 1.

5⇒ Gravitational potential energy - U = mgh

m = 2.5 kg

g = 10 N

h = 15 m

U = 2.5 × 10 × 15

375 J

6) Gravitational potential energy =
$V = mgh$

$1.5 \times 10^4 = V = 150 kgh \times h$

$1.5 \times 10^4 = J = 50 \times 10N \times h$

$h = (15 \times 1000) \div 1500$

$h = 10m$

7) Potential energy = Force × height

$V = (mg)h$

$[00J] = (0.5 \times 10)N \times h$

$h = 100 \div 5 = 20m$

8) $m = 60kg$

$V = 50\ ms^{-1}$

Kinetic energy $= \frac{1}{2} mv^2$

$K.E. = \frac{1}{2} \times 60 \times 50 \times 50$

$K.E = 75000J$

9→ Weight of truck = Force = 1000kgf

Mass = 1000kg

Initial velocity = 36 km h⁻¹

$\frac{36 \times 1000}{60 \times 60} = 10 m s^{-1}$

New velocity = 72 km h⁻¹

$\frac{72 \times 1000}{60 \times 60} = 20 m s^{-1}$

Work done = Increase in energy

$= \frac{1}{2} mv^2 - \frac{1}{2} mu^2$

$= \frac{1}{2} m(v+u)(v-u)$

$= \frac{1}{2} \times 1000 \times 30 \times 10$

$= 150000 J$

$= 1.5 \times 10^5$

10→ K.E. $= \frac{1}{2} mv^2$

Let m be the mass of each car

Kinetic energy of car A $= \frac{1}{2} m \times 15^2$

$\frac{225}{2} = 112.5\ mJ$

Kinetic energy of car B $= \frac{1}{2} m$

$30^2 = 450\ J$

KE of car B is 4 times of kinetic energy of car A.

11) Energy spent $= W = 4 \times 10^5\ J$

Time taken $= 10\ s$

Power = Energy / Time

$P = \frac{4 \times 10^5}{10}$

$= 4 \times 10^4\ W$

12) As weight is same for both girls A and B work done is same.

Work done by A : work done by B

1 : 1

13) Power = Energy / Time $= 15 : 20$

$= 3 : 4$