| PHYSICS | | |
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| CH:11 WORK AND ENERGY<br>SOLUTIONS | | |
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| Name: _____ | Date:_____ | Class: IX Sec: ___ |
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## I MULTIPLE CHOICE QUESTIONS (MCQs)

1. K is the initial kinetic energy of a body. If its velocity becomes half, then its kinetic energy will become

i) K/4 ii) 2K iii) K/2 iv) 4K

Ans: i) K/4

2. Which of the following is not the unit of energy?

i) Joule ii) KW iii) KWh iv) Nm

Ans: ii) KW

4. 1 KWh is

i) $3.3 \times 10^4$ J ii) $3.6 \times 10^6$ J iii) $3.6 \times 10^4$ J iv) $3.6 \times 10^2$ J

Ans: ii) $3.6 \times 10^6$ J

5. Water stored in a dam possesses

i) no energy ii) electrical energy iii) kinetic energy iv) Potential energy

Ans: iv) Potential energy

## II SHORT ANSWER TYPE

1. Can any object have mechanical energy even if its momentum is zero? Explain.

Ans: Yes. Mechanical energy comprises kinetic energy and potential energy. If body has zero momentum, its kinetic energy is zero but the object may possess potential energy and hence mechanical energy.

2. What is power? How do you differentiate kilowatt from kilowatt hour?

Ans: Power is rate of doing work or rate of transfer of energy. Kilowatt is the unit of power whereas the Kwh is the commercial unit of electrical energy.

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

Ans: PE to KE

4. Write the form of energy (KE/PE) possessed by the body in the following situations:

a) A coconut falling from tree-KE

b) An object raised to a certain height-PE

c) Blowing wind-KE

d) A child driving a bicycle on the road-KE

5. Explain the work done by the constant force, when the direction of force and displacement may be

i) Same ii) Opposite iii) Perpendicular to each other iv) There may not be displacement at all

Ans: i) Positive work ii) Negative work iii) Zero work Iv) Zero work

6. Which would have a greater effect on kinetic energy of an object, doubling the mass or doubling the velocity?

Ans: Doubling of velocity would have a greater effect on kinetic energy as kinetic energy directly proportional to the square of velocity.

7. A girl writes 10 pages of a notebook in order to practice maths problems, yet she has not done work in terms of science concept. Give reason

Ans: Work done will be zero as there is no displacement of notebook.

III **NUMERICALS**

1. The potential energy of a body is 39600J. How high is the body if its mass is 20kg? 9g=10 m/s$^2$)

Ans: PE= 39600 J, m=20 Kg

PE=mgh=39600

h= 39600/20x10=198 m

2. 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?

Ans: F=10 N, S= 4 m

W=Fs=10x4=40 J

3. A rocket is moving up with a velocity v. If the velocity of this rocket is suddenly tripled, what will be the ratio of two kinetic energies?

Ans: KE =1/2 mv$^2$

KE'=1/2 m (3v)$^2$= 9 KE

Ratio=KE/KE'= 1/9

4. Calculate the work done in lifting 200 kg of water through a vertical height of 6 m. (g=10 m/s$^2$)

Ans: m=200 Kg, h= 6m

PE=mgh=200x 10x6=12000 J

5.A athlete weighing 60kg runs up a staircase having 10 steps each of 1m in 30 sec. Calculate power (g = 10 ms-1

Ans: 10 steps each of 1 m, total height, h= 10 m

P=w/t=mgh/t= 60x10x10/30=200 W

6. Calculate the time taken for a 60 w bulb to consume 3000 J of energy.

Ans: p=60 W, E= 3000 J

P=E/t

t= E/P= 3000/ 60=50 s

7. A bullet of mass 15 g has a speed of 400 m/s. What is its kinetic energy? The bullet strikes a thick target and is brought to rest in 2 cm, calculate the average net force acting on the bullet. What happens to kinetic energy originally in the bullet?

Ans:

KE initial= ½ $mv^2$= ½ x 0.015x ( 400)$^2$=1200 J

KE initial = 1200 J

KE final=0

W= change in kinetic energy

Fs = 1200

F= 1200/ .02=60000 N

The Kinetic energy is converted to heat & sound energy.

8. Two bodies A and B of equal masses are kept at height of h and 2h respectively. What will be the ratio of their potential energy?

Ans: $PE_A$=mgh

$PE_B$= mg 2h

$PE_{A/}$ $PE_{B=}$ mgh/mg2h=1/2

Ratio: 1:2

9. A body of mass 2 kg is thrown vertically upward with an initial velocity of 20 m/s. What will be the potential energy at the end of 2s? (g=10 m/s$^{2)}$

Ans: m= 2kg , u=20 m/s , t= 2 s Height reached

$h = ut - 1/2\ gt^2 = 20x2 - 1/2\ x10x4 = 20$ m

PE=mgh= 2x10x20=400 J

10. Two children A and B having the same weight climbing up a rope separately up to a height of 8m. If A takes 15 seconds while B takes 20 seconds to accomplish the task. Who has more power and why?

Ans: Power, P= W/t

As 2 children A and B having same weight and they climbed the same height, work done will be same. Person A is doing same amount of work in less time. So, person A has more power.

11. A crane is lifting the body to a height h in time t. Find the relation between power of the crane to the speed at which it is lifting the object.

Ans: Given:

Height=h meters

time=t sec

Formula:

Power= workdone/ Time

=F x S /time [∵W=Fx S]

=F x V [∵speed= Distance/time]

∴P=F X V

12. If an iron box of 1600 W is used for 45 minutes every day. Find the electric energy consumed in the month of March.

Ans:

1600 W= 1.6 KW

I hr=60 mint

45 minutes=45/60=0.75 hr

P=E/t=

Energy=Time Taken x Power

Therefore

Energy=0.75x1.6

=1.2kWhr.

This will be the energy consumed in one day.

Since March has 31 days, energy consumed in March:

=31x1.2

=37.2kWhr

13. The Weight of a person on planet A is about half that on the earth. He can jump up to 0.4 m height on the surface of the earth. How high he can jump on planet A.

**Ans:** Since, a weight of the person on planet A is half that on the earth, the acceleration due to gravity there will be 1/2 that on the earth. Hence he can jump double the height with the same muscular force.

14. The power of a motor pump is 2 KW. How much water per minute the pump can raise to a height of 10m?

Ans: Power of pump = 2 KW =2000 W

Time (t)= 60 sec

Height (h) = 10 m

g = 10 $m/s^2$

As we know that:

Work done = m x g x h = m ×10×10 =100 m

Therefore, 2000 W = 100 m/60 s

Therefore, **m = 1200 kg**

So, the pump can raise 1200 kg of water in one minute.

15. Two women Karuna and Krishna each of mass 50 kg and 60 kg respectively climb up through a height of 10m. Karuna takes 20s while Krishna takes 40 s to reach. Calculate the difference in the power expended by karuna and Krishna. (Take g=10 $m/s^2$)

Ans:

Power, p=W/t= mgh/t

Karuna

P1= mgh/t= 50x10x10/20= 250 W

Krishna

P2= mgh/t=60x10x10/ 40= 150 W

Difference in power= 250-150=100 W