

WORKSHOP CALCULATION AND SCIENCE-UNIT 5.SPEED VELOCITY WORK POWER ENERGY ANSWERS

SEMESTER – 1

1. What is the formula for speed?

A : Distance covered/Time

B : Change in velocity/Time

C : Distance in definite direction /Time

D :Change in momentum/Time

Ans: Distance covered/Time

2. What is the unit of speed?

A : Metre/second

B : Metre/second²

C : Metre/minute

D : Metre/hour

Ans: Meter/second

3. What is the formula for velocity?

a) Distance covered / Time

b) distance in definite direction/time

b) Change in velocity

d) change of momentum/Time

Ans: Distance in definite direction/Time

4. What is the unit for velocity

a) Meter/second

b) meter/second²

c) meter/minute

d) meter/hour

Ans: meter/second

5. What is called if a body posses only magnitude or size alone?

a) Speed

b) velocity

c) vector quantity

d) scalar quantity

Ans: scalar quantity

6. What is called if a body posses both magnitude and direction of velocity

b) a) Speed

b) velocity

c) vector quantity

d) scalar quantity

Ans: vector quantity

7. what is the rate of change of displacement of a body?

a) Body at rest

b) body at motion

c) speed

d) velocity

Ans: velocity

8. What is called if a body does not change its position with respect to its surroundings?

a) Body at motion

b) body at rest

c) speed

d) velocity

Ans: body at rest

9. What is called if a body changes its position with respect to its surroundings?

a) Body at rest

b) body at motion

c) speed

d) velocity

Ans: body at motion

10. What is the velocity of a body travels a distance of 168 meters in a line in 21 seconds?

a) 6 m/sec

b) 8 m/sec

c) 10 m/sec

d) 12 m/sec

Ans: Velocity = $\frac{\text{Displacement}}{\text{Time}} = \frac{168 \text{ m}}{21 \text{ sec}} = 8 \text{ m/sec}$

11. What is the speed of a train of 80 metre long train passes a railway platform of 120 metres length in 20 seconds?

a) 30 km/hour

b) 32 km/hour

c) 34 km/hour

d) 36 km/hour

Ans: Speed = $\frac{\text{Distance}}{\text{Time taken}}$

(Total distance = Train length + platform length

= 120 + 80 = 200 meter = 200/1000 km = 0.2 km

Time taken = 20 sec = 20/60/60 hour = 0.0055 hour)

Speed = $\frac{0.2 \text{ km}}{0.0055 \text{ hour}} = 36.36 \text{ hour}$

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12. What is the formula for acceleration?

- a) $a = \frac{v+u}{t}$ b) $a = \frac{v-u}{t}$ c) $a = \frac{v^2-u^2}{t}$ d) $a = \frac{v^2+u^2}{t}$
Ans: a = $\frac{v-u}{t}$

13. What is the unit of acceleration of an object?

- a) Meter/sec b) meter/second² c) meter/minute d) meter/minute²
Ans: meter/second²

14. What is the acceleration of a car if the speed of the car has increased from 25 km per hour to 40 km per hour in one minute?

- a) 0.059 m/sec² b) 0.59 m/sec² c) 0.069 m/sec² d) 0.69 m/sec²

Ans: Acceleration = $\frac{\text{Change in velocity}}{\text{Time taken}}$
 (Change in velocity = 40 km/h – 25 km/h
 = 15 km/h (1 km = 1000 m)
 = 150000/(60x60) m/sec (1 hour = 60x60 sec)
 = 4.16 m/sec
 Time taken = 1 minute = 60 sec)
 Acceleration = $\frac{4.16}{60} = 0.069 \text{ m/sec}^2$

15. What is the retardation of a car moving with a velocity of 50 km/hour is brought to rest in 45 seconds?

- a) 0.40 m/sec² b) 0.30 m/sec² c) 0.20 m/sec² d) 0.10 m/sec²

Ans: (Retardation is opposite of acceleration $R = \frac{u-v}{t}$)
 Initial velocity u = 50 km/hour = 50x1000/(60x60) = 500/36 = 13.88 m/sec
 Final velocity v = 0
 $R = \frac{13.88-0}{45} = 0.30 \text{ m/sec}^2$

16. How much work done in one hour if a pump can raise 100 litres of water through a height of 200 meters in one minute?

- a) 12 x 10⁴ kg meter b) 12 x 10⁵ kg meter c) 12 x 10⁶ kg meter d) 12 x 10⁷ kg meter

Ans: Work = Force x Distance (W=Fs)
 (Force/Load = 100 litres = 100 kg
 Distance = 200 meter in one minute)
 Work done in 1 minute = 100 x 200 = 20000
 Work done in one hour = 20000 x 60 = 1200000 = **12 x 10⁵ kg meter**

17. What is the acceleration of an aero plane taking off from landing field has to run 700 meters if it leaves the ground in 10 seconds from the start?

- a) 8 meter/sec² b) 10 meter/sec² c) 12 meter/sec² d) 14 meter/sec²

Ans: $s = u t + \frac{1}{2} a t^2$
 Where distance s = 700 m, initial velocity u = 0, time t = 10 sec;
 700 = (0 x 10) + $\frac{1}{2}$ x a x 10²
 700 = $\frac{1}{2}$ x a x 100
A = 14 meter/sec²

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18. What is the maximum height a stone will reach if it is thrown upwards with a velocity of 20 m/sec? ($g = 10 \text{ m/sec}^2$)

- a) 10 m b) 20 m c) 30 m d) 40m

Ans: To find the distance of stone travelled $S = u t - \frac{1}{2}gt^2$

When you throw a stone upwards, initial velocity $u = 20 \text{ m/sec}$; Final velocity $v = 0$;

$$\begin{aligned}\text{To find t: } \quad V &= u - gt \\ 0 &= 20 - 10 \times t \\ T &= 2 \text{ sec ;}\end{aligned}$$

$$\text{Maximum height} = 20 \times 2 - \frac{1}{2} \times 10 \times 2^2 = \mathbf{20 \text{ m}}$$

19. What is the work done in unit time?

- a) Energy b) power c) force d) acceleration

Ans: Power

20. What is the capacity of a body to do work is called?

- a) Energy b) power c) acceleration d) force

Ans: Energy

21. What is the ratio of power output to power input?

- a) Work b) energy c) efficiency d) acceleration

Ans: Efficiency

22. What is called if a force of 1 Newton on a body and moves it through a distance of 1 meter?

- a) 1 Joule b) 10 Joules c) 1 dyne d) 10 dynes

Ans: 1 Joule

23. How many ergs for 1 Joule?

- a) 10^3 ergs b) 10^5 ergs c) 10^7 ergs d) 10^9 ergs

Ans: 10^7 ergs

24. How many newtons for 1 kilogram?

- a) 981 Newtons b) 98.1 Newtons c) 9.81 Newtons d) 0.981 newtons

Ans: 9.81 Newtons

25. How many watts for 1 horse power in metric system?

- a) 725.5 watts b) 735.5 watts c) 745.5 watts d) 755.5 watts

Ans: 735.5 watts

26. How many watts for 1 horse power in british system?

- b) 726 watts b) 736 watts c) 746 watts d) 756 watts

Ans: 746 watts

27. What is the equivalent unit for 1 horse power in metric system?

- a) 75 kg.m/sec b) 76 kg.m/sec c) 77 kg.m/sec d) 78 kg.m/sec

Ans: 75 kg.m/sec

28. What is the formula for potential energy?

- a) Mgh joule b) mgh^2 joule c) $\frac{1}{2} mgh$ joule d) $\frac{2}{3} mgh$ joule

Ans: mgh joule

29. What is the formula for kinetic energy?

- a) $\frac{1}{2} mv$ joule b) $\frac{1}{2} mv^2$ joule c) $\frac{2}{3} mv^2$ joule d) $\frac{2}{3} mv$ joule

Ans: $\frac{1}{2} mv^2$ joule

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30. How much work done in one hour if a pump can raise 100 litres of water through a height of 200 meters in one minute?

- b) 12×10^4 kg meter b) 12×10^5 kg meter c) 12×10^6 kg meter d) 12×10^7 kg mete

Ans: Work = Force x Distance ($W=Fs$)

(Force/Load = 100 litres = 100 kg

Distance = 200 meter in one minute)

Work done in 1 minute = $100 \times 200 = 20000$

Work done in one hour = $20000 \times 60 = 1200000 = 12 \times 10^5$ kg meter

31. What is the workdone if a force of 250 newtons acted upon a body and the body has been moved through a distance of 15 meters?

- a) 3720 joules b) 3730 joules c) 3740 joules d) 3750 joules

Ans: Force =250 N

Distance Moved = 15 Meter

Work done = Force x Distance

= $250 \text{ N} \times 15 \text{ M}$

= **3750 Joules**

32. What is the potential energy, if a body of mass 250 kg is at a height of 30 meter?

- a) 72.57 KJ b) 73.57 KJ c) 74.57 KJ d) 75.57 KJ

Ans: Potential energy (PE) = $m g h$ Joules; (Mass $m = 250 \text{ Kg}$; Height $h = 30 \text{ M}$)

PE = $250 \times 9.81 \times 30$ Joules (The value of $g = 9.81 \text{ m/sec}^2$)

= 73575 Joules = **73.57 KJ** (1000 Joules = 1 Kilo Joule)

33. What is the potential energy in a body of mass 10 kg kept on the top of a pole 20 meters height?

- a) 1942 Joules b) 1952 Joules c) 1962 Joules d)1972 Joules

Ans: Potential energy (PE) = $m g h$ Joules (Mass $m = 10 \text{ Kg}$; Height $h = 20 \text{ M}$)

= $10 \times 9.81 \times 20$ kg.m²/sec²

= **1962 Joules**

34. What is the work done in joules if a load of 15.5 kg is lifted through a height of 4.4 meters?

- a) 639 joules b) 649 joules c) 659 joules d) 669 joules

Ans: Workdone = Force x distance

Weightforce = $M \times g = 15.5 \times 9.81 = 152 \text{ N}$

Distance $s = 4.4 \text{ m}$;

$W = 152 \times 4.4 = 668.8 \text{ Nm} = 669 \text{ Joules}$

35. What is the kinetic energy of a bullet of mass 5gm travels with a speed of 500 m/sec?

- a) 620 Joules b) 625 Joules c) 630 Joules d) 635 Joules

Ans: (Mass = $5\text{gm} = 5/1000 \text{ kg}$; $v = 500 \text{ m/sec}$)

KE = $\frac{1}{2} m v^2 = \frac{1}{2} \times 0.005 \times 500^2$

= $625 \text{ kg.m}^2/\text{sec}^2 = 625 \text{ Joules}$