DPMT - 2008 (Memory Based)
PHYSICS

1. A rod of length l and mass m is kept vertically on the ground. Its potential energy is

   (1) mgL (2) $mg\dfrac{L}{2}$ (3) $mg\dfrac{L}{3}$ (4) $mg\dfrac{L}{4}$

Sol: Ans [2]

$$u = Mg\,\frac{L}{2}$$

$\dfrac{L}{2}$ is distance of e.m. from ground.

2. A satellite is put in orbit at height $h = R$. What is change in potential energy.

   (1) mgR (2) $\dfrac{mgR}{2}$ (3) $2\,mgR$ (4) $\dfrac{3}{2}mgR$

Sol: Ans [2]

$$\Delta u = u_f - u_i = -\frac{GMm}{2R} - \left(-\frac{GMm}{R}\right) \qquad .... (i)$$

and $GM = gR^2$ $.... (ii)$

$\therefore$ $\Delta u = \dfrac{mgR}{2}$

3. A body is projected at an angle 45º with horizontal. If escape velocity when projected vertically up its escape velocity is 11.2 km/sec. What is new escape velocity ?

   (1) $\dfrac{11.2}{\sqrt{2}}$ km/sec   (2) $11.2\sqrt{2}$ km/sec   (3)   11.2 km/sec   (4)   none of these

Sol: Ans [3]

Escape velocity is direction independent.

4. If total energy of satellite is E. What is its potential energy.

   (1) $2E$ (2) $-2E$ (3) E (4) $-E$

Sol: Ans [1]

P.E. $= 2 \times$ Total energy

5. If radius of earth is reduced

    (1) tide duration is reduced   (2) earth rotates slower

    (3) time period of earth decreases   (4) duration of day increases

Sol: Ans [3]

    Use conservation of angular momentum.

6. Zener diode acts as

    (1) Voltage regulator in reverse biasing   (2) Voltage regulator in forward biasing

    (3) Current regulator in reverse biasing   (4) Current regulator in forward biasing

Sol: Ans [1]

    Zener works in reverse biase condition.

7. What is $\dfrac{e}{m}$ ratio of electron ?

    (1) 2.76×10^{10} (2) 2.76×10^{10} (3) 1.76×10^{10} (4) 1.76×10^{11}

Sol: Ans [4]

    Use value of *e* and *m*.

8. What is charge on 90 kg of electrons.

    (1) 1.58×10^{13} (2) 2.3×10^{12} (3) 2.53×10^{12} (4) none of these

Sol: Ans [1]

$$\text{Charge} = \frac{\text{charge}}{\text{mass}} \times \text{total mass}$$

9. At what temperature iron becomes paramagnetic ?

    (1) 200°C   (2) 400°C   (3) 600°C   (4) 800°C

Sol: Ans [4]

    Factual

10. Sparkling of diamond is because of

    (1) Total internal reflection   (2) Refraction

    (3) Diffraction   (4) Scattering

Sol: Ans [1]

    Factual

11. Pressure variation in mechanical wave depends upon as

    (1) $\propto$ intensity   (2) independent of intensity

    (3) $\propto \dfrac{1}{\text{intensity}}$ (4) none of these

Sol: Ans [1]

$P_m = BkA$ and $I \propto A^2$

12. Earth's magnetic field is

(1) 10^{-4} T   (2) 10^{-5}T   (3) 10^{-6}T   (4) none of these

Sol: Ans [2]

Factual

13. If charge and distance between them is reduced to half. Force between them

(1) remains same   (2) increases four times (3) reduce four times   (4) none of these

Sol: Ans [1]

Use $F = k.\dfrac{q_1 q_2}{r^2}$

14. A car of mass 400 kg is pulling a coach of mass 300 kg. If friction force is 1N/100 kg, what is tension?

(1) 2100 N   (2) 2126 N   (3) 1926 N   (4) 2750 N

Sol: Ans [3]

$$T = 300 \times a = 300 \times \left(\frac{4500 - 7}{400 + 300} \right) = 1926 \text{ N}$$

15. Masses m and M on pulley move 0.6 m in 4 sec. What is ratio of $\dfrac{m}{M}$?

(1) $\dfrac{55}{57}$ (2) $\dfrac{113}{117}$ (3) $\dfrac{57}{55}$ (4) $\dfrac{117}{113}$

Sol: Ans [No matching answer]

$$a = \frac{25}{t^2} \Rightarrow \frac{(M-m)g}{(M+m)}$$

16. Three rods of equal length of thermal conductivity k, $2k$ and $3k$ are symmetrically joined. If temperature of ends are 0ºC, 50ºC and 100ºC respectively, what is temperature of function.

(1) 20ºC   (2) $\dfrac{100}{3}$ºC   (3) $\dfrac{200}{3}$ºC   (4) none of these

Sol: Ans [3]

$$\frac{(3kA)(100-T)}{l} + \frac{(2kA)(50-T)}{l} = \frac{kA(T-0)}{l} \Rightarrow T = \frac{200}{3}ºC$$

17. Frequency of cyclotron does not depend upon

(1) charge   (2) mass   (3) velocity   (4) $\dfrac{q}{m}$

Sol: Ans [3]

Factual

18. No. of beats between A and B is 5 Hz and between B and C are 3 Hz. Beat frequency between A and C may be

(1) 1   (2) 2   (3) 8   (4) none of these

Sol: Ans [2, 3]

Beat frequency is difference of two frequencies.

19. A gas at one atmosphere and having volume 100 ml is mixed with another gas of equal moles at 0.5 atm and having volume 50 ml in flask of one litre. What is their final pressure ?

(1) 0.5 atm   (2) 1 atm   (3) 0.75 atm   (4) 0.125 atm

Sol: Ans [4]

$$\frac{1 \times 100}{RT} + \frac{0.5 \times 50}{RT} = \frac{P \times 1000}{RT} \implies P = 0.125 \text{ atm}$$

20. A body cools from 80ºC to 64ºC in 5 minutes nad same body cools from 80ºC to 52ºC in 10 minutes, what is temperature of surrounding

(1) 24ºC   (2) 28ºC   (3) 22ºC   (4) 25ºC

Sol: Ans [1]

$$\frac{80 - 64}{5} = k\left(\frac{80 + 64}{2} - T\right)$$

$$\frac{80 - 52}{10} = k\left(\frac{80 + 52}{2} - T\right)$$

$\implies$ $T = 24$ºC

21. Sky waves are reflected are reflected by

(1) statosphere   (2) mesosphere   (3) inosphere   (4) none of these

Sol: Ans [3]

Factual

22. What is size of gold nuclei ?

(1) $3R_0$ (2) $4R_0$ (3) $5R_0$ (4) $5.8R_0$

Sol: Ans [4]

$$R = R_0(A)^{1/3}$$

23. In *L-C-R* resonant circuit what is phase angle; ϕ

    (1) 90º   (2) 180º   (3) 0º   (4) 60º

Sol: Ans [3]

    At resonance $\phi = 0$

24. In *R-C* circuit $\omega = 100$ rod/sec, $R = 100$ Ω, $C = 20\mu F$. What is impedence.

    (1) 510Ω (2) 200Ω (3) 250Ω (4) 300Ω

Sol: Ans [1]

$$z = \sqrt{R^2 + \left(\frac{1}{\omega c}\right)^2} = \sqrt{(100)^2 + \left(\frac{1}{100 \times 20 \times 10^{-6}}\right)^2} = 510\ \Omega$$

25. A body is moving forward and backward change in frequency observed of source is 2%. What is velocity of the body (speed of sound is 300 m/sec)

    (1) 6 m/sec   (2) 2 m/sec   (3) 2.5 m/sec   (4) 3 m/sec

Sol: Ans [4]

$$f_1 = f\frac{v-u}{v}$$

$$f = f\frac{v+u}{v}$$

$$f_2 - f_1 = f \cdot \frac{2u}{v}$$

$$\frac{\Delta f}{f} \times 100 = \frac{2u}{v} \times 100$$

    Solving $u = 3$ m/sec.

26. A body is projected horizontally with velocity 196 m/sec from height 400 m. What is time to reach the ground.

    (1) 5   (2) 10   (3) 15   (4) 20

Sol: Ans [2]

$$t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \times 400}{10}} = 4\sqrt{5} \simeq 10\ \text{sec}.$$

27. Two spheres of unequal mass and unequal radius are released on inclined plane. They rolls down with slipping. Which one will reach early.

(1) Lighter sphere will reach first   (2) Heavier sphere will reach first

(3) Same time   (4) none of these

Sol: Ans [3]

Body having larger acceleration will come down first.

$$a = \frac{g\sin\theta}{1+\dfrac{K^2}{R^2}} = \frac{g\sin\theta}{1+\dfrac{2}{5}}$$

28. A cylinder is rolling down a inclined plane of inclination 60º. What is its acceleration

(1) $g/\sqrt{3}$ (2) $g/\sqrt{3}$ (3) $\sqrt{\dfrac{2g}{3}}$ (4) none of these

Sol: Ans [1]

$$a_c = \frac{g\sin 60}{1+\dfrac{1}{2}} = g/\sqrt{3}$$

29. Lead is

(1) Diamagnetic   (2) Paramagnetic   (3) Ferromagnetic   (4) None of these

Sol: Ans [1]

Factual

30. $M = xH$ is applicable

(1) Iron   (2) Bismuth   (3) Copper   (4) Nickil

Sol: Ans [2, 3]

Factual

31. If temperature of rod is increased 10ºC its length changes 1%. What is percentage change in volume of body of same material for 10ºC increase in temperature

(1) 9%   (2) 1%   (3) 5%   (4) 3%

Sol: Ans [4]

$$\frac{\Delta L}{L}\times 100 = \alpha\times 10\times 100$$

$$\frac{\Delta V}{V}\times 100 = 3\alpha\times 10\times 100$$

Solving % change in volume = 3%

32. Water falls from height 100 m. Temperature of water

(1) increases   (2) decreases   (3) remains same   (4) none of these

Sol: Ans [1]

Potential energy will convert into heat energy.

33. Two identical co-centric rings each of mass *m* and radius *R* are placed perpendicularly. What is the moment of inertia about axis of one of the rings.

(1) $\dfrac{3}{2}MR^2$ (2) $2MR^2$ (3) $3MR^2$ (4) $\dfrac{1}{2}MR^2$

Sol: Ans [1]

$$I = MR^2 + \frac{MR^2}{2} = \frac{3MR^2}{2}$$

34. A motor of power 60 W draws current 5A from a source of 15 V. What is loss of power.

(1) 30 W   (2) 25 W   (3) 20 W   (4) 15 W

Sol: Ans [4]

Loss = $15 \times 5 - 60 = 15$ W

35. An electron and proton are placed at distance 4.3 nm. What is dipole moment ? (C-M)

(1) 3.44×10^{-28} (2) 2×10^{-28} (3) 6.85×10^{-28} (4) none of these

Sol: Ans [3]

$P = 1.6 \times 10^{-19} \times 4.3 \times 10^{-9} = 6.85 \times 10^{-28}$.

36. . What is current *I*.

(1) 6 A   (2) 5 A   (3) 7 A   (4) 8 A

Sol: Ans [4]

Apply Kirchhoff's first law.

37. Police is chasing the thief 50 m ahead. In 10 seconds distance between them reduces by 6 m. What is distance between them in 25 sec.

(1) 10 m   (2) 25 m   (3) 35 m   (4) 20 m

Sol: Ans [3]

Let relative velocity = *v*

$\Rightarrow$ $6 = v \times 10 \Rightarrow v = 0.6$ m/sec

Distance between them in 25 secs = $50 - 0.6 \times 25 = 35$ m

38. A body of mass 10 kg is initially at rest aquires velocity 10 m/sec. What is work done.

(1) –500 J   (2) 500 J   (3) 50 J   (4) –50 J

Sol: Ans [2]

$$W = \Delta K = \frac{1}{2} \times 10(10)^2 - 0 = 500 \text{ J}$$

39. A stone is whirled in path of radius 1 m and its speed decreases from 4 m/sec. to 2 m/sec. in 2 sec. What is angular acceleration ?

(1) 1 rad/sec^2 (2) 2 rad/sec^2 (3) 4 rad/sec^2 (4) none of these

Sol: Ans [1]

Using $v = u + at$

$a = -1$ m/sec^2

$$\alpha = \frac{a}{R} = 1 \text{ rad/sec}^2$$

40. What is nature of light and sound waves ?

(1) Light is transverse and sound is longitudinal

(2) Light is longitudinal and sound is transverse

(3) Both transverse

(4) Both longitudinal

Sol: Ans [1]

Factual

41. If the colour code of carbon resistor is as follows, then give the value of its resistance in KΩ.

Colour of I strip – yellow

Colour of II strip – blue

Colour of III strip – orange

Colour of IV strip – gold

(1) $(46 \pm 5\%)$ (2) $0.46 \pm 5\%$ (3) $46 \pm 10\%$ (4) $0.46 \pm 10\%$

Sol: Ans [1]

Using the sequence

B B R O Y G B V G W

0 1 2 3 4 5 6 7 8 9

For yellow strip use 4

For blue strip use 6

For orange strip use 10^3

For gold strip use 5%

Answer is $(46 \times 10^3 \pm 5\%)$ Ω   or $(46 \pm 5\%)$ kΩ

42. Self inductance of solenoid is proportional to

(1) $\dfrac{NA}{l}$ (2) $\dfrac{NA^2}{l}$ (3) $\dfrac{A}{L}$ (4) $\dfrac{N^2A}{l}$

Sol: Ans [4]

$$L = \frac{\mu_0 N^2 A}{l}$$

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