NEET(UG)
05/05/2024

MATRIX

Paper Code
Q6

Question Paper with Solutions & Answer Keys

for

NEET (UG)-2024

Time : 3 hrs. 20 Min. **M.M. : 720**

Read carefully the Instructions on the Cover of this Test Booklet.

Important Instructions :

1. The test is of 3 hours 20 minutes duration and the Test Booklet contains 200 multiple choice questions (Four options with a single correct answer). There are two sections in each subject, i.e. Section-A & Section-B. You have to attempt all 35 questions from Section-A & only 10 questions from Section-B out of 15. (Candidates are advised to read all 15 questions in each subject of Section-B before they start attempting the question paper. In the event of a candidate attempting more than ten questions, the first ten questions answered by the candidate shall be evaluated.)
2. Each question carries 4 marks. For each correct response, the candidate will get 4 marks. For every wrong response 1 mark shall be deducted from the total scores. The maximum marks are 720.
3. Use Blue / Black Ball point Pen only for writing particulars on this page / marking responses on Answer Sheet.
4. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
5. On completion of the test, the candidate must handover the Answer Sheet to the Invigilator before leaving the Room / Hall. The candidates are allowed to take away this Test Booklet with them.
6. The CODE for this Booklet is F6.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet. Use of white fluid for correction is NOT permissible on the Answer Sheet.
8. Each candidate must show on-demand his/her Admission Card to the Invigilator.
9. No candidate, without special permission of the Centre Superintendent or Invigilator, would leave his/her seat.
10. Use of Electronic/Manual Calculator is prohibited.
11. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
12. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
13. The candidates will write the Correct Test Booklet Code as given in the Test Booklet / Answer Sheet in the Attendance Sheet.

SUBJECT : PHYSICS

SECTION - A

1. A bob is whirled in a horizontal plane by means of a string with an initial speed of ω rpm. The tension in the string is T. If speed becomes 2ω while keeping the same radius, the tension in the string becomes -

(1) T (2) 4T (3) $\frac{T}{4}$ (4) $\sqrt{2}T$

Ans. (2)

Sol. $T = m\omega^2 r$

$T' = m(2\omega)^2 r$

$T' = 4m\omega^2 r$

$T' = 4T$

2. A particle moving with uniform speed in a circular path maintains -

(1) constant velocity.

(2) constant acceleration.

(3) constant velocity but varying acceleration.

(4) varying velocity and varying acceleration.

Ans. (4)

Sol. Uniform circular motion $\rightarrow$ direction of velocity and acceleration is variable.

3. A logic circuit provides the output Y as per the following truth table -

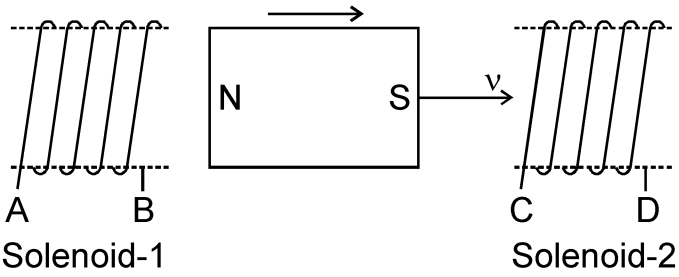
A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

The expression for the output Y is -

(1) $A.B + \overline{A}$ (2) $A.\overline{B} + \overline{A}$ (3) $\overline{B}$ (4) B

Ans. (3)

4.

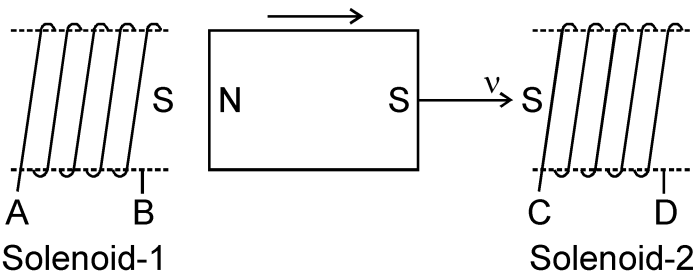


In the above diagram, a strong bar magnet is moving towards solenoid-2 from solenoid-1. The direction of induced current in solenoid-1 and that in solenoid-2, respectively, are through the directions -

(1) AB and DC (2) BA and CD (3) AB and CD (4) BA and DC

Ans. **(1)**

Sol. Acc. to lenz's law



Direction of induced current

(A to B) (D to C)

5. Given below are two statemens : one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A : The potential (V) at any axial point, at 2 m distance(r) from the centre of the dipole of dipole moment vector $\vec{P}$ of magnitude, 4×10^{-6} C m, is $\pm 9 \times 10^3$ V.

(Take $\frac{1}{4\pi \in_0} = 9 \times 10^9$ SI units)

Reason R : $V = \pm \frac{2P}{4\pi \in_0 r^2}$, where r is the distance of any axial point, situated at 2 m from the centre of the dipole.

In the light of the above statements, choose the **correct** answer from the options given below -

(1) Both A and R are true and R is the correct explanation of A.

(2) Both A and R are true and R is NOT the correct explanation of A.

(3) A is true but R is false.

(4) A is false but R is true.

Ans. (3)

Sol. Potential at an axial point $V = \frac{KP}{r^2} = \pm\frac{P}{4\pi \in_0 r^2} = \pm\frac{9\times10^9\times4\times10^{-6}}{2^2} = \pm 9 \times 10^3$ volt

6. Match **List-I** with **List-II**.

List-I **(Material)**	**List-II** **(Susceptibility (χ))**
A. Diamagnetic	I. $\chi = 0$
B. Ferromagnetic	II. $0 > \chi \geq -1$
C. Paramagnetic	III. $\chi >> 1$
D. Non-magnetic	IV. $0 < \chi < \varepsilon$ (a small positive number)

Choose the correct answer from the options given below -

(1) A-II, B-III, C-IV, D-I

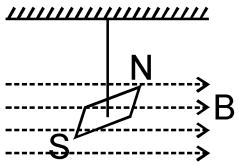
(2) A-II, B-I, C-III, D-IV

(3) A-III, B-II, C-I, D-IV

(4) A-IV, B-III, C-II, D-I

Ans. (1)

7. In a uniform magnetic field of 0.049 T, a magnetic needle performs 20 complete oscillations in 5 seconds as shown. The moment of inertia of the needle is 9.8×10^{-6} kg m^2. If the magnitude of magnetic moment of the needle is $x \times 10^{-5}$ Am^2; then the value of 'x' is -



(1) $5\pi^2$ (2) $128\pi^2$ (3) $50\pi^2$ (4) $1280\pi^2$

Ans. (4)

Sol. $T = 2\pi\sqrt{\frac{I}{MB}}$

$\frac{1}{f} = 2\pi\sqrt{\frac{I}{MB}}$

$\frac{1}{4} = 2\pi\sqrt{\frac{I}{MB}}$

$\frac{1}{16} = 4\pi^2\frac{I}{MB} \Rightarrow M = 1280\pi^2 \times 10^{-5}\ Am^2$

$x = 1280\pi^2$

8. In an ideal transformer, the turns ratio is $\frac{N_p}{N_s} = \frac{1}{2}$. The ratio $V_s : V_p$ is equal to (the symbols carry their usual meaning) -

(1) 1 : 2 (2) 2 : 1 (3) 1 : 1 (4) 1 : 4

Ans. (2)

Sol. $\frac{N_p}{N_s} = \frac{V_p}{V_s}$

$\frac{V_p}{V_s} = \frac{1}{2} \Rightarrow V_s : V_p = 2 : 1$

9. In a vernier calipers, (N + 1) divisions of varnier scale coincide with N divisions of main scale. If 1 MSD represents 0.1 mm, the vernier constant (in cm) is -

(1) $\frac{1}{10N}$ (2) $\frac{1}{100(N+1)}$ (3) 100 N (4) 10 (N + 1)

Ans. (2)

Sol. Vernier constant = L.C. = 1 MSD – 1 VSD

$\Rightarrow$ (N + 1) VSD = N MSD

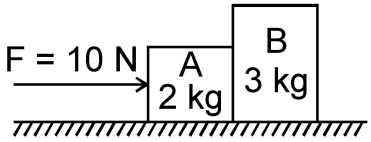
$1\ VSD = \frac{N}{N+1}\ MSD$

L.C. = 1 MSD – 1 VSD

$$= 0.01 \text{ cm} - \frac{N}{N+1} 0.01 \text{ cm}$$

$$= \frac{1}{100(N+1)} \text{ cm}$$

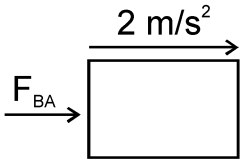
10. A horizontal force 10 N is applied to a block A as shown in figure. The mass of block A and B are 2 kg and 3 kg, respectively. The blocks slide over a frictionless surface. The force exerted by block A on block B is -



(1) zero (2) 4 N (3) 6 N (4) 10 N

Ans. (3)

Sol. $a = \frac{10}{2+3} = 2 \text{ m/s}^2$



$F_{BA} = 3 \times 2$

$F_{BA} = 6 \text{ N}$

11. If $x = 5 \sin\left(\pi t + \frac{\pi}{3}\right)$ m represents the motion of a particle executing simple harmonic motion, the amplitude and time period of motion, respectively, are -

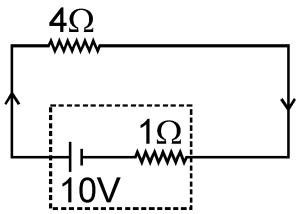
(1) 5 cm, 2 s (2) 5 m, 2 s (3) 5 cm, 1 s (4) 5 m, 1 s

Ans. (2)

Sol. $T = \frac{2\pi}{\omega}$, from equation $\omega = \pi$ and amplitude A = 5 m

$$T = \frac{2\pi}{\pi} = 2s$$

12. The terminal voltage of the battery, whose emf is 10V and internal resistance 1Ω, when connected through an external resistance of 4Ω as shown in the figure is -



(1) 4V (2) 6V (3) 8V (4) 10V

Ans. (3)

Sol. V = E – ir

$$i = \frac{E}{R+r} = \frac{10}{4+1} = 2A$$

V = 10 – 2 × 1 = 8V

13. Given below are two statements -

Statement I : Atoms are electrically neutral as they contain equal number of positive and negative charges.

Statement II : Atoms of each element are stable and emit their characteristic spectrum.

In the light of the above statements, choose the most appropriate answer from the options given below -

(1) Both Statement I and Statement II are correct.

(2) Both Statement I and Statement II are incorrect.

(3) Statement I is correct but Statement II is incorrect.

(4) Statement I is incorrect but Statement II is correct.

Ans. (3)

Sol. In an atom total number of electrons equals to total number of protons, So total negative & postive charge are equal.

All atoms are not stable, Some show atomic reactions to get stability.

14. If c is the velocity of light in free space, the correct statements about photon among the following are -

A. The energy of a photon is $E = h\nu$.

B. The velocity of a photon is c.

C. The momentum of a photon, $p = \frac{h\nu}{c}$.

D. In a photon-electron collision, both total energy and total momentum are conserved.

E. Photon possesses positive charge.

Choose the correct answer from the options given below -

(1) A and B only

(2) A, B, C and D only

(3) A, C and D only

(4) A, B, D and E only

Ans. (2)

Sol. Photon is electrically nutral.

15. Match **List-I** with **List-II**.

List-I (Spectral Lines of Hydrogen for transitions from)	**List-II (Wavelengths (nm))**
A. $n_2 = 3$ to $n_1 = 2$	I. 410.2
B. $n_2 = 4$ to $n_1 = 2$	II. 434.1
C. $n_2 = 5$ to $n_1 = 2$	III. 656.3
D. $n_2 = 6$ to $n_1 = 2$	IV. 486.1

Choose the correct answer from the options given below -

(1) A-II, B-I, C-IV, D-III

(2) A-III, B-IV, C-II, D-I

(3) A-IV, B-III, C-I, D-II

(4) A-I, B-II, C-III, D-IV

Ans. (2)

Sol. $\Delta E = E_2 - E_1 = \frac{hc}{\lambda}$

$\lambda = \frac{hc}{\Delta E}$

16. A tightly wound 100 turns coil of radius 10 cm carries a current of 7 A. The magnitude of the magnetic field at the centre of the coil is (Take permeability of free space as $4\pi \times 10^{-7}$ SI units)

(1) 44 mT (2) 4.4 T (3) 4.4 mT (4) 44 T

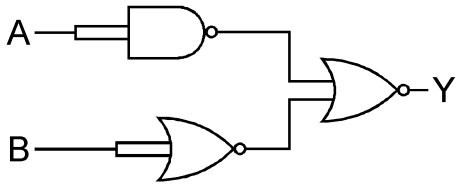
Ans. (3)

Sol. $B = \frac{\mu_0 Ni}{2r}$

$= \frac{4\pi \times 10^{-7} \times 100 \times 7}{2 \times \left(\frac{10}{100}\right)}$

$= 4.4 \times 10^{-3}\,T = 4.4\,mT$

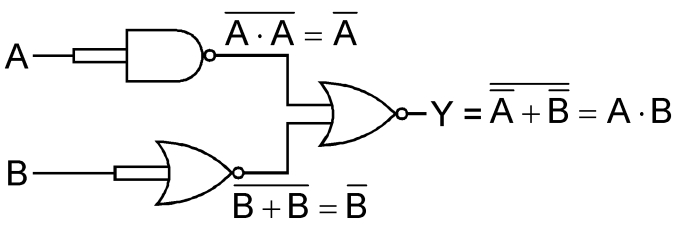
17. The output (Y) of the given logic gate is similar to the output of an/a -



(1) NAND gate (2) NOR gate (3) OR gate (4) AND gate

Ans. (4)

Sol.

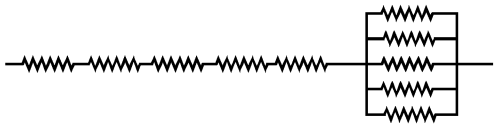


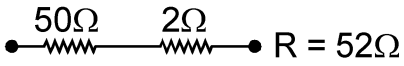
18. A wire of length '*l*' and resistance 100Ω is divided into 10 equal parts, The first 5 parts are connected in series while the next 5 part are connected in parallel. The two combinations are again connected in series. The resistance of this final combination is -

(1) 26Ω (2) 52Ω (3) 55Ω (4) 60Ω

Ans. (2)

Sol. The resistance of each part is 10Ω





19. $^{290}_{82}X \xrightarrow{\alpha} Y \xrightarrow{e^+} Z \xrightarrow{\beta^-} P \xrightarrow{e^-} Q$

In the nuclear emission stated above, the mass number and atomic number of the product Q respectively, are -

(1) 280, 81 (2) 286, 80 (3) 288, 82 (4) 286, 81

Ans. (4)

Sol. $^{290}_{82}X \xrightarrow{\alpha} {}^{286}_{80}Y \xrightarrow{e^+} {}^{286}_{79}Z \xrightarrow{\beta^-} {}^{286}_{80}P \xrightarrow{e^-} {}^{286}_{81}Q$

20. The maximum elongation of a steel wire of 1 m length if the elastic limit of steel and its Young's modulus, respectively, are 8×10^8 N m^{-2} and 2×10^{11} N m^{-2}, is -

(1) 4 mm (2) 0.4 mm (3) 40 mm (4) 8 mm

Ans. (1)

Sol. $Y = \frac{F}{A} \times \frac{l}{\Delta l}$

$\Delta l = \left(\frac{F}{A}\right) \times \frac{l}{Y}$

$= \frac{\left(8 \times 10^8\right) \times 1}{2 \times 10^{11}} = 4 \times 10^{-3} = 4$ mm

21. If the monochromatic source in Young's double slit experiment is replaced by white light, then

(1) interference pattern will disappear.

(2) there will be a central dark fringe surrounded by a few coloured fringes.

(3) there will be a central bright white fringe surrounded by a few coloured fringes.

(4) all bright fringes will be of equal width.

Ans. (3)

Sol. White light have different wavelengths.

22. At any instant of time t, the displacement of any particle is given 2t – 1 (SI units) under the influence of force of 5N. The value of instantaneous power is (in SI unit) -

(1) 10 (2) 5 (3) 7 (4) 6

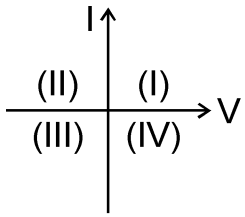
Ans. (1)

Sol. $P = \vec{F} \cdot \vec{V}$

$= FV \Rightarrow V = \frac{ds}{dt} = 2$ m/s

$= 5 \times 2 = 10$ W

23. Consider the following statements A and B and identify the correct answer -



A. For a solar-cell, the I-V characteristics lies in the IV quadrant of the given graph.

B. In a reverse biased pn junction diode, the current measured in (μA), is due to majority charge carriers.

(1) A is correct but B is incorrect. (2) A is incorrect but B is correct.

(3) Both A and B are correct. (4) Both A and B are incorrect.

Ans. (1)

Sol. In a reverse biased pn junction diode, the current measured in (mA), is due to majority charge carriers.

24. Two bodies A and B of same mass undergo completely inelastic one dimensional collision. The body A moves with velocity v_1 while body B is at rest before collision. The velocity of the system after collision is v_2. The ratio $v_1 : v_2$ is -

(1) 1 : 2 (2) 2 : 1 (3) 4 : 1 (4) 1 : 4

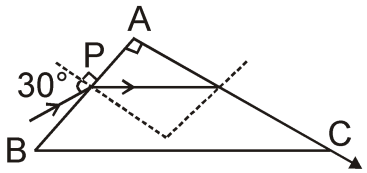
Ans. (2)

Sol. By conservation of linear momentum

$m_A V_1 = (m_A + m_B)V_2$

$$\frac{V_1}{V_2} = \frac{m_A + m_B}{m_A} = \frac{2}{1}$$

25. A light ray enters through a right angled prism at point P with the angle of incidence 30° as shown in figure. It travels through the prism parallel to its base BC and emerges along the face AC. The refractive index of the prism is -



(1) $\frac{\sqrt{5}}{4}$ (2) $\frac{\sqrt{5}}{2}$ (3) $\frac{\sqrt{3}}{4}$ (4) $\frac{\sqrt{3}}{2}$

Ans. (2)

Sol. $1 \times \sin30° = \mu \sin r_1$.....(1)

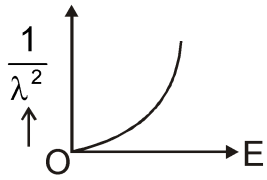
$\mu \sin r_2 = 1 \times \sin90° \Rightarrow \mu \sin r_2 = 1$ .....(2)

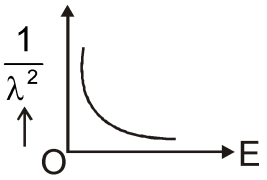
$r_1 + r_2 = 90°$.....(3)

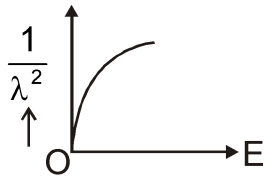
$\mu \sin(90 - r_2) = \frac{1}{2} \Rightarrow \mu \cos r_2 = \frac{1}{2}$.....(4)

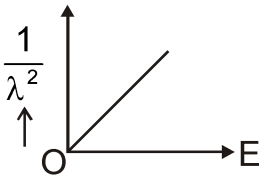
$(2) \div (4) \Rightarrow \tan r_2 = 2 \Rightarrow \sin r_2 = \frac{2}{\sqrt{5}}$ from equation to $\mu = \frac{\sqrt{5}}{2}$

26. The graph which shows the variation of $\left(\frac{1}{\lambda^2}\right)$ and its kinetic energy, E is (where λ is de Broglie wavelength of a free particle -

(1) 

(2) 

(3) 

(4) 

Ans. (4)

Sol. $\lambda = \frac{h}{\sqrt{2mE}} \Rightarrow E = \frac{h^2}{2m\lambda^2} \Rightarrow E \propto \frac{1}{\lambda^2}$

27. The quantities which have the same dimensions as those of solid angle are -

(1) strain and angle

(2) stress and angle

(3) strain and arc

(4) angular speed and stress

Ans. (1)

Sol. Strain = change in length / length of arc

28. An unpolarised light beam strikes a glass surface as Brewster's angle. Then -

(1) the reflected light will be partially polarised.

(2) the refracted light will be completely polarised.

(3) both the reflected and refracted light will be completely polarised.

(4) the reflected light will be completely polarised but the refracted light will be partially polarised.

Ans. (4)

Sol. Reflected ray is completely polarised and refracted ray will be partially polarised.

29. The moment of inertia of a thin rod about an axis passing through its mid point and perpendicular to the rod is 2400 g cm^2. The length of the 400 g rod is nearly -

(1) 8.5 cm (2) 17.5 cm (3) 20.7 cm (4) 72.0 cm

Ans. (1)

Sol. $I = \frac{m\ell^2}{12}$

$2400 = \frac{400\ell^2}{12}$

$\ell^2 = 72 \Rightarrow \ell = 8.5$ cm

30. A thin flat circular disc of radius 4.5 cm is placed gently over the surface of water. If surface tension of water is 0.07 Nm^{-1}, then the excess force required to take it away from the surface is -

(1) 19.8 mN (2) 198 N (3) 1.98 mN (4) 99 N

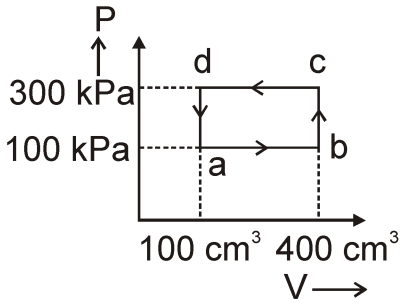
Ans. (1)

Sol. $T \times 2\pi r = F_{ex}$

$\frac{0.07}{100} \times 2 \times \frac{22}{7} \times 4.5 \times 10^{-2} = F_{ex}$

F_{ex} = 19.8 mN

31. A thermodynamic system is taken through the cycle abcda. The work done by the gas along the path bc is -

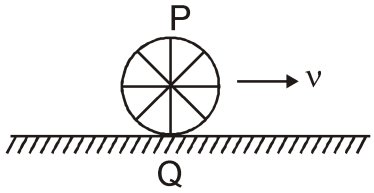


(1) zero (2) 30 J (3) –90 J (4) –60 J

Ans. (1)

Sol. V = constant, so work done will be zero along the path bc.

32. A wheel of a bullock cart is rolling on a level road as shown in the figure below. If its linear speed is v in the direction shown, which one of the following options is correct (P and Q are any highest and lowest points on the wheel, respectively) ?



(1) Point P moves slower than Point Q .

(2) Point P moves faster than point Q.

(3) Both the points P and Q move with equal speed.

(4) Point P has zero speed.

Ans. (2)

Sol. $V_P = 2V; V_Q = 0$

33. The mass of planet is $\frac{1}{10}$ th that of earth and its diameter is half that of the earth. The acceleration due to gravity on that planet is -

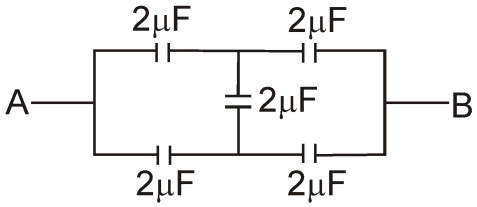
(1) 19.6 m s^{-2} (2) 9.8 m s^{-2} (3) 4.9 m s^{-2} (4) 3.92 m s^{-2}

Ans. (4)

Sol. $g = \frac{GM}{R^2}$

$$g' = \frac{GM}{10 \times \frac{R^2}{4}} = \frac{4g}{10} = 3.92 \text{ m/s}^2$$

34. In the following circuit, the equivalent capacitance between terminal A and terminal B is -



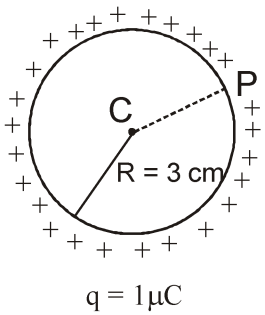
(1) 2μF (2) 1μF (3) 0.5μF (4) 4μF

Ans. (1)

Sol. Balanced wheatstone bridge.

35. A thin spherical shell is charged by some source. The potential difference between the two points C and P (in V) shown in the figure is -

(Take $\frac{1}{4\pi\varepsilon_0} = 9\times10^9$ SI units)



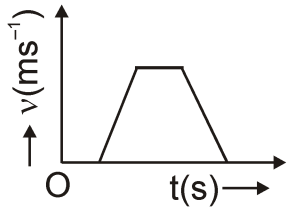
(1) 3×10^5 (2) 1×10^5 (3) 0.5×10^5 (4) zero

Ans. (4)

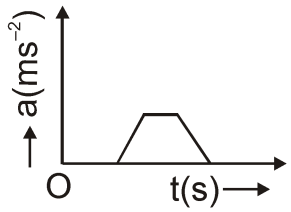
Sol. $V_c = V_p = \frac{KQ}{R}$; $\Delta V = 0$

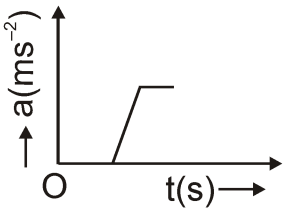
SECTION - B

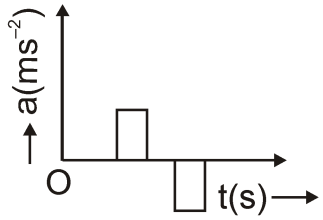
36. The velocity (v) – time (t) plot of the motion of a body is shown below -

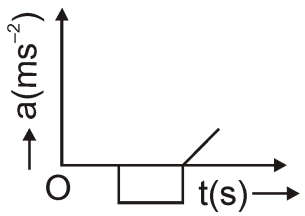


The acceleration (a) – time (t) graph that best suits this motion is -

(1) 

(2) 

(3) 

(4) 

Ans. (3)

Sol. Slope of v-t graph is acceleration

37. If the mass of the bob in a simple pendulam is increased to thrice its original mass and its length is made half its original length, then the new time period of oscillation is $\frac{x}{2}$ times its original time period.Then the value of x is -

(1) $\sqrt{3}$ (2) $\sqrt{2}$ (3) $2\sqrt{3}$ (4) 4

Ans. (2)

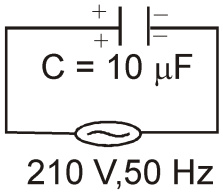
Sol. $T = 2\pi\sqrt{\frac{l}{g}}$

$T \propto \sqrt{l}$

$\frac{T'}{T} = \sqrt{\frac{l}{2l}}$

$T' = \frac{T}{\sqrt{2}} = \frac{\sqrt{2}T}{2}$

38. A 10μF capacitor is connected to a 210 V, 50 Hz source as shown in figure. The peak current in the circuit is nearly ($\pi = 3.14$) -



(1) 0.58 A (2) 0.93 A (3) 1.20 A (4) 0.35 A

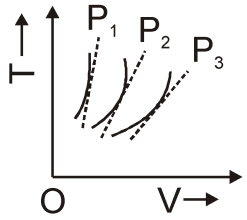
Ans. (2)

Sol. $X_c = \frac{1}{2\pi fc}$

$X_c = \frac{1}{100\pi \times 10 \times 10^{-6}} = \frac{1000}{\pi}$

$I = \frac{V_0}{X_c} = \frac{210\sqrt{2} \times \pi}{1000} = 0.93 \text{ A}$

39. The following graph represents the T-V curves of an ideal gas (where T is the temperature and V the volume) at three pressure P_1, P_2 and P_3 compared with those of Charle's law represented as dotted lines -



Then the correct relation is -

(1) $P_3 > P_2 > P_1$ (2) $P_1 > P_3 > P_2$ (3) $P_2 > P_1 > P_3$ (4) $P_1 > P_2 > P_3$

Ans. (4)

Sol. Slope = $\frac{dT}{dV}$

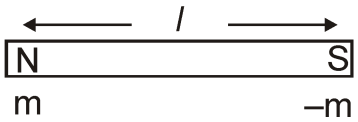
$P_1 > P_2 > P_3$

40. An iron bar of length L has magnetic moment M. It is bent at the middle of its length such that the two arms make an angle 60° with each other. The magnetic moment of this new magnet is -

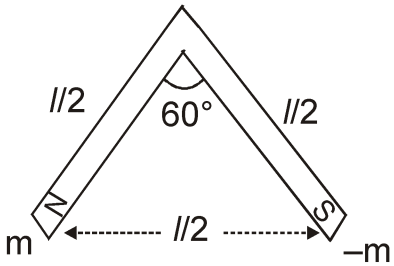
(1) M (2) $\frac{M}{2}$ (3) 2M (4) $\frac{M}{\sqrt{3}}$

Ans. (2)

Sol.



M = m/



$M' = \frac{m/}{2} = \frac{M}{2}$

41. The minimum energy required to launch a satellite of mass m from the surface of earth of mass M and radius R in a circular orbit at an altitude of 2R from the surface of the earth is-

(1) $\frac{5GmM}{6R}$ (2) $\frac{2GmM}{3R}$ (3) $\frac{GmM}{2R}$ (4) $\frac{GmM}{3R}$

Ans. **(1)**

Sol. By energy conservation

$T.E_{surface} = T.E_{orbit}$

$$E - \frac{GmM}{R} = \frac{GMm}{2(3R)}, \quad (r = 3R)$$

$$E = \frac{GmM}{R}\left[1 - \frac{1}{6}\right] = \frac{5}{6}\frac{GmM}{R}$$

42. A parallel plate capacitor is charged by connecting it to a battery through a resistor. If I is the current in the circuit, then in the gap between the plates -

(1) there is no current

(2) displacement current of magnitude equal to I flows in the same direction as I.

(3) displacement current of magnitude equal to I flows in a direction opposite to that of I.

(4) displacement current of magnitude greater than I flows but can be in any direction.

Ans. **(2)**

Sol. $I_C = I_d$

43. The property which is not of an electromagnetic wave travelling in free space is that -

(1) they are transverse in nature.

(2) the energy density in electric field is equal to energy density in magnetic field.

(3) they travel with a speed equal to $\frac{1}{\sqrt{\mu_0\varepsilon_0}}$.

(4) they originate from charges moving with uniform speed.

Ans. **(4)**

Sol. EM waves produced by accelerated charged particle.

44. A metallic bar of Young's modulus, 0.5×10^{11} N m^{-2} and coefficient of linear thermal expansion 10^{-5} °C^{-1}, length 1 m and area of cross-section 10^{-3} m^2 is heated from 0°C to 100°C without expansion or bending. The compressive force developed in it is -

(1) 5×10^3 N (2) 50×10^3 N (3) 100×10^3 N (4) 2×10^3 N

Ans. (2)

Sol. $\frac{\Delta l}{l} = \alpha \Delta T$

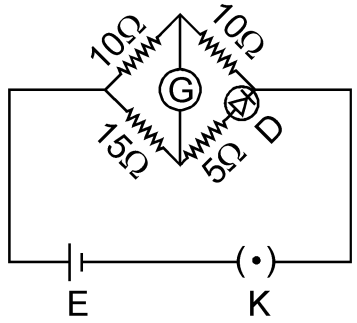
$\frac{\Delta l}{l} = \frac{F}{AY} = \alpha \Delta T$

$F = AY\,\alpha\Delta T$

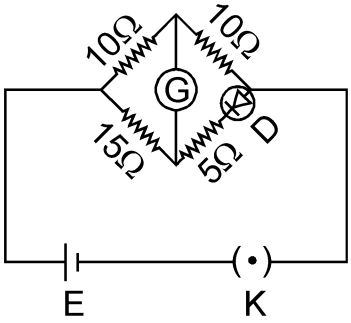
$F = 0.5 \times 10^{11} \times 10^{-5} \times 10^{-3} \times 100 = 50 \times 10^3$ N

45. Choose the correct circuit which can achieve the bridge balance -

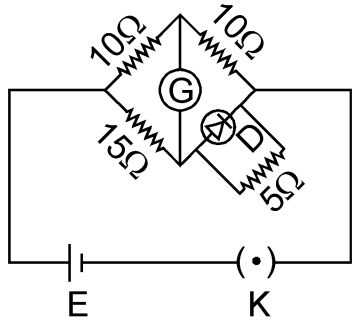
(1)



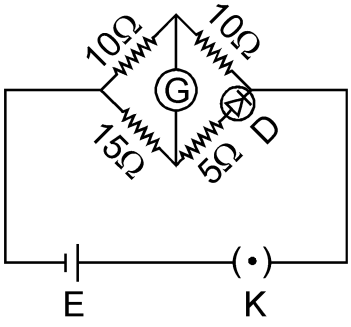
(2)



(3)



(4)



Ans. (1)

Sol. Diode act as short circuit in forward bias.

46. A sheet is placed on a horizontal surface in front of a strong magnetic pole. A force is needed to -

A. hold the sheet there if it is magnetic.

B. hold the sheet there if it is non-magnetic.

C. move the sheet away from the pole with uniform velocity if it is conducting.

D. move the sheet away from the pole with uniform velocity if it is both, non-conducting and non-polar.

Choose the correct statement(s) from the options given below -

(1) B and D only
(2) A and C only
(3) A, C and D only
(4) C only

Ans. (2)

47. If the plates of a parallel plate capacitor connected to a battery are moved close to each other, then -

A. the charge stored in it, increases.

B. the energy stored in it, decreases.

C. its capacitance increases.

D. the ratio of charge to its potential remains the same.

E. the product of charge and voltage increases.

Choose the most appropriate answer from the options given below -

(1) A, B and E only
(2) A, C and E only
(3) B, D and E only
(4) A, B and C only

Ans. (2)

Sol. $\because$ Battery is connected]

$\therefore$ V = constant.

$$C \propto \frac{1}{d}$$

$\Rightarrow d\downarrow, C\uparrow$

$Q = CV$

$Q \propto C$

$\Rightarrow C\uparrow, Q\uparrow, Q \cdot V\uparrow$

48. Two heaters A and B have power rating of 1 kW and 2 kW, respectively. Those two are first connected in series and then in parallel to a fixed power source. The ratio of power outputs for these two cases is -

(1) 1 : 1 (2) 2 : 9

(3) 1 : 2 (4) 2 : 3

Ans. (2)

Sol. $P_s = \frac{P_1P_2}{P_1+P_2} = \frac{1\times 2}{1+2} = \frac{2}{3}$; $P_p = P_1 + P_2 = 1 + 2 = 3$

$\frac{P_s}{P_p} = \frac{2}{9}$

49. A small telescope has an objective of focal length 140 cm and an eye piece of focal length 5.0 cm. The magnifying power of telescope for viewing a distant object is -

(1) 34 (2) 28 (3) 17 (4) 32

Ans. (2)

Sol. $m = \frac{f_0}{f_e} = \frac{140}{5} = 28$

50. A force defined by $F = \alpha t^2 + \beta t$ acts on a particle at a given time t. The factor which is dimensionless, if α and β are constants, is -

(1) $\frac{\beta t}{\alpha}$ (2) $\frac{\alpha t}{\beta}$ (3) $\alpha\beta t$ (4) $\frac{\alpha\beta}{t}$

Ans. (2)

Sol. Dimensionless = $\frac{[\alpha t^2]}{[\beta t]} = \frac{\alpha t}{\beta}$