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NEET UG-2024

[PAPER WITH ANSWER KEY]

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PAPER CODE

T3

PHYSICS

SECTION-A

[Q.1] A tightly wound 100 turns coil of radius 10 cm carries a current of 7A. 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] 4.4 mT [2] 44 T [3] 44 mT [4] 4.4 T

[ANS] **1**

[Q.2] Match List-I with List-II

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

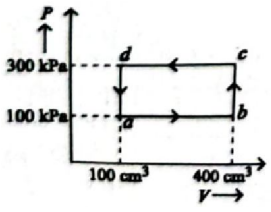
Choose the correct answer from the options given below :-

[1] A-III, B-II, C-I, D-IV [2] A-IV, B-III, C-II, D-I

[3] A-II, B-III, C-IV, D-I [4] A-II, B-I, C-III, D-IV

[ANS] **3**

[Q.3] A thermodynamic system is taken through the cycle abcda. The work done by the gas along the path bc is :



[1] – 90 J [2] – 60 J

[3] zero [4] 30 J

[ANS] **3**

[Q.4] An unpolarised light beam strikes a glass surface at Brewster's angle. Then

[1] both the reflected and refracted light will be completely polarized.

[2] the reflected light will be completely polarized but the refracted light will be partially polarized.

[3] the reflected light will be partially polarized.

[4] the refracted light will be completely polarized.

[ANS] **2**

[Q.5] 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 : 1 [2] 1 : 4 [3] 1 : 2 [4] 2 : 1

[ANS] **4**

[Q.6] 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] $\bar{B}$ [2] B [3] A.B + $\bar{A}$ [4] $A.\bar{B} + \bar{A}$

[ANS] **1**

[Q.7] In a vernier calipers, (N + 1) divisions of vernier scale coincide with N divisions of main scale. If 1 MSD represents 0.1 mm, the vernier constant (in cm) is:

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

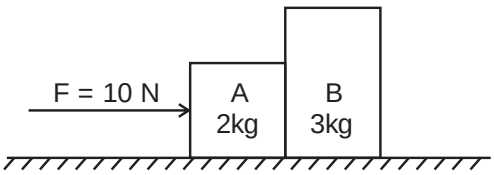
[ANS] 4

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

[1] 40 mm [2] 8 mm [3] 4 mm [4] 0.4 mm

[ANS] 3

[Q.9] A horizontal force 10 N is applied to a block A as shown in figure. The mass of blocks A and B 2 kg and 3 kg, respectively. The blocks slide over a frictionless surface. The force exerted by block A on block B is:



[1] 6 N [2] 10 N [3] zero [4] 4 N

[ANS] 1

[Q.10] If the monochromatic source in Young's double slit experiment is replaced by white light, then

[1] there will be a central bright white fringe surrounded by a few. coloured fringes.

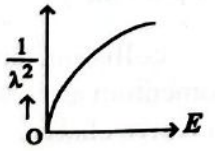
[2] all bright fringes will be of equal width.

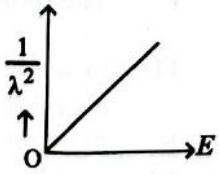
[3] interference pattern will disappear.

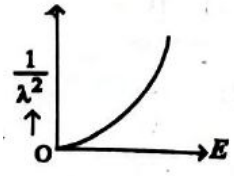
[4] there will be a central dark fringe surrounded by a few coloured fringes.

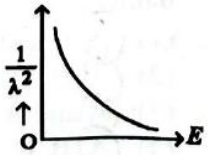
[ANS] 1

[Q.11] The graph which show 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] 

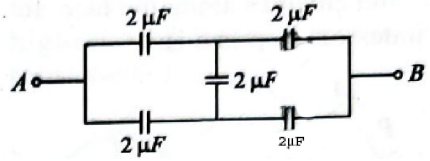
[2] 

[3] 

[4] 

[ANS] **2**

[Q.12] In the following circuit, the equivalent capacitance between terminal A and terminal B is



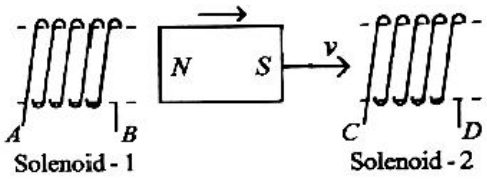
[1] 0.5μF

[2] 4μF

[3] 2μF

[4] 1μF

[ANS] **3**

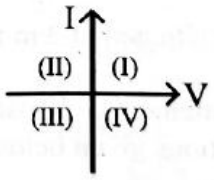
[Q.13] 

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 CD [2] BA and DC [3] AB and DC [4] BA and CD

[ANS] **3**

[Q.14] 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 quandrant of the given graph.

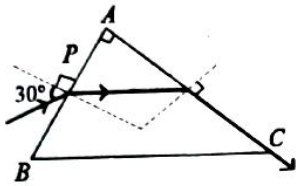
B. In a revese biased pn junction diode, the current measured in (μA), is due to majority charge carriers.

[1] Both A and B are correct. [2] Both A and B are incorrect

[3] A is correct but B is incorrect [4] A is incorrect but B is correct

[ANS] 3

[Q.15] 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] $\frac{\sqrt{3}}{4}$ [2] $\frac{\sqrt{3}}{2}$ [3] $\frac{\sqrt{5}}{4}$ [4] $\frac{\sqrt{5}}{2}$

[ANS] 4

[Q.16] Given below are two statements: 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 distance (r) from the centre of the dipole of dipole moment vector $\vec{P}$ of magnitude, 4×10^{-6} C m, is 9×10^{3} V.

(Take $\frac{1}{4\pi\in_0}=9\times10^{9}$ 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 2m from the centre of the dipole.

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

[1] A is true but R is false. [2] A is false but R is true.

[3] Both A and R are true and R is NOT the correct explanation of A.

[4] Both A and R are true and R is NOT the correct explanation of A.

[ANS] 1

[SOLN] $V = \frac{KP\cos\theta}{r^2}$, at axial point, $\theta = 0 \Rightarrow \cos\theta = 1$

$$\Rightarrow V = \frac{P}{4\pi \in_0 r^2} = \frac{9\times10^9 \times 4\times10^{-6}}{4} = 9\times10^3 V$$

At other side of axis, $\theta = \pi \Rightarrow \cos\theta = -1$

hence, $V = -9\times10^3$ valt. (on other side)

[Q.17] The moment of inertia of a thin rod about an axis passing through its mid point and perpendicular to the rod is 2400 gm-cm^2. The length of the 400 g rod is nearly:

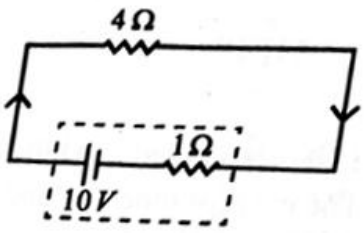
[1] 20.7 cm [2] 72.0 cm [3] 8.5 cm [4] 17.5 cm

[ANS] **3**

[SOLN] $I = \frac{1}{12}ml^2 \Rightarrow 2400 = \frac{1}{12}\times400\times l^2$

$l = 8.5$ cm

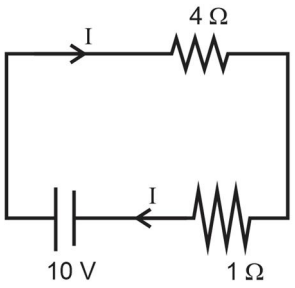
[Q.18] The terminal voltage of the battery, whose emf is 10V and internal resistance 1Ω, when connected through an external resistance of 4Ω as shown in the figure is:



[1] 8 V [2] 10 V [3] 4 V [4] 6 V

[ANS] **1**

[SOLN]



$I = \frac{10}{5} = 2A$

$V_{terminal} = 10 - 2\times1 = 8$ valt

[Q.19] Match List I with List II.

	List I (Spectral Lines of Hydrogen for transitions from)		**List II (Wavelength (nm))**
A.	$n_2 = 3$ to $n_1 = 2$	I.	410.2
B.	$n_2 = 4$ to $n_1 = 2$	II.	433.1
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-IV, B-III, C-I, D-II

[2] A-I, B-II, C-III, D-IV

[3] A-II, B-I, C-IV, D-III

[4] A-III, B-IV, C-II, D-I

[ANS] **4**

[SOLN] $\lambda_{n=3 \text{ to } n=2} = \frac{1242}{1.9}\text{nm} = 656.3\,\text{nm}.$

$\lambda_{n=4 \text{ to } n=2} = \frac{1242}{2.55}\text{nm} = 486.1\,\text{nm}.$

$\lambda_{n=5 \text{ to } n=2} = \frac{1242}{2.856}\text{nm} = 434.1\,\text{nm}.$

$\lambda_{n=6 \text{ to } n=2} = \frac{1242}{3.02}\text{nm} = 410.25\,\text{nm}.$

[Q.20] 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, C and D only

[2] A, B, D and E only

[3] A and B only

[4] A, B, C and D only

[ANS] **4**

[Q.21] $^{290}_{82}X \xrightarrow{\alpha} Y \xrightarrow{e^+} Z \xrightarrow{\beta^-} P \xrightarrow{e^-} Q$

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

[1] 288, 82 [2] 286, 81 [3] 280, 81 [4] 286, 80

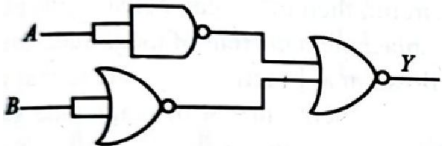
[ANS] 2

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

[1] 7 [2] 6 [3] 10 [4] 5

[ANS] 3

[Q.23] The output (Y) of the given logic gate is similar to the output of an/a :



[1] OR gate [2] AND gate [3] NAND gate [4] NOR gate

[ANS] 2

[Q.24] The mass of a planet is $\frac{1}{10}^{th}$ that of the earth and its diameter is half that of the earth. The acceleration due to gravity on that planet is :

[1] 4.9 m s^{-2} [2] 3.92 m s^{-2} [3] 19.6 m s^{-2} [4] 9.8 m s^{-2}

[ANS] 2

[Q.25] 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] Statement I is correct but Statement II is incorrect.

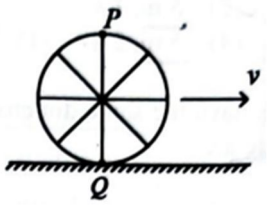
[2] Statement I is incorrect but Statement II is correct.

[3] Both Statement I and Statement II are correct.

[4] Both Statement I and Statement II are incorrect.

[ANS] 1

[Q.26] 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] Both the points P and Q move with equal speed.

[2] Point P has zero speed.

[3] Point P moves slower than point Q.

[4] Point P moves faster than point Q.

[ANS] 4

[Q.27] A particle moving with uniform speed in a circular path maintains :

[1] constant velocity but varying acceleration.

[2] varying velocity and varying acceleration.

[3] constant velocity.

[4] constant acceleration.

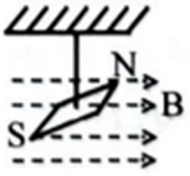
[ANS] 2

[Q.28] 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] 1.98 mN [2] 99 N [3] 19.8 mN [4] 198 N

[ANS] 3

[Q.29] 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] 50 π^2 [2] 1280 π^2 [3] 5 π^2 [4] 128 π^2

[ANS] 2

[Q.30] 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. The velocity of the system after collision is v_2. The ratio $v_1 : v_2$ is :

[1] 4 : 1 [2] 1 : 4 [3] 1 : 2 [4] 2 : 1

[ANS] **4**

[Q.31] 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, 1 s [2] 5m, 1 s [3] 5 cm, 2s [4] 5m, 2s

[:ANS] **D**

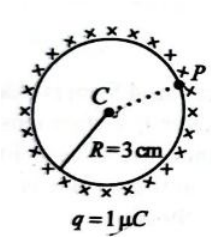
[Q.32] The quantities which have the same dimensions as those of solid angle are:

[1] strain and arc [2] angular speed and stress

[3] strain and angle [4] stress and angle

[:ANS] **C**

[Q.33] A thin spherical shell is charged by some source. The potential difference between the two points Cand P (in V) shown in the figure is: (Take $\frac{1}{4\pi \in_0} = 9\times10^9$ SI Units)



[1] **0.5×10^5** [2] **zero** [3] **3×10^5** [4] **1×10^5**

[:ANS] **B**

[Q.34] 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 /4 [2] $\sqrt{2}$ T [3] T [4] 4T

[:ANS] D

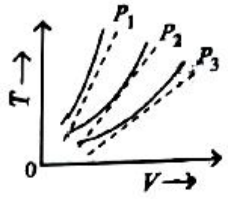
[Q.35] A wire of length 'l' and resistance 100Ω is divided into 10 equal parts. The first 5 parts are connected in series while the next 5 parts are connected in parallel. The two combinations are again connected in series .The resistance of this final combinations is:

[1] 55Ω [2] 60Ω [3] 26Ω [4] 52Ω

[ANS] D

SECTION-B

[Q.36] The following graph represents the T-V curves of an ideal gas (where T is the temperature and V the volume) at three pressures P_1, P_2 and P_3 compared with those of Charle's law represented as dotted lines.



Then the correct relations is:

[1] $P_2 > P_1 > P_3$ [2] $P_1 > P_2 > P_3$ [3] $P_3 > P_2 > P_1$ [4] $P_1 > P_3 > P_2$

[ANS] **2**

[SOLN] $P_1 > P_2 > P_3$

In Charle's law pressure remains constant. Hence, in the graph shown greater slope means greater pressure.

[Q.37] 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] displacement current of magnitude equal to I flows in a direction opposite to that of I.

[2] displacement current of magnitude greater than I flows but can be in any direction.

[3] there is no current.

[4] displacement current of magnitude equal to I flows in the same direction as I.

[ANS] **4**

[SOLN] Displacement current and conduction current have equal magnitude and also have same direction.

[Q.38] The property which is not of an electromagnetic wave travelling in free space is that:

[1] they travel with a speed equal to $\frac{1}{\sqrt{\mu_0 \in_0}}$.

[2] they originate from charges moving with uniform speed.

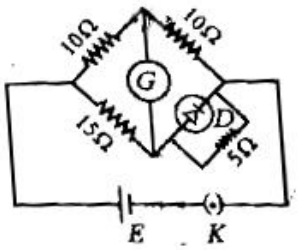
[3] they are transverse in nature.

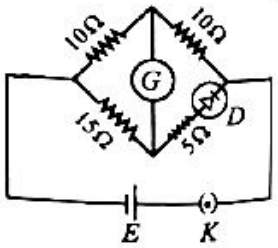
[4] the energy density in electric field is equal to energy density in magnetic field.

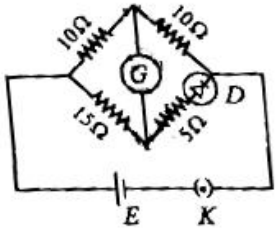
[ANS] **2**

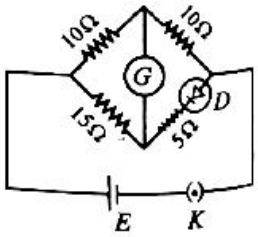
[SOLN] Electromagnetic wave travelling in free space is originated by accelerating charge.

[Q.39] Choose the correct circuit which can achieve the bridge balance.

[1] 

[2] 

[3] 

[4] 

[ANS] **3**

[SOLN] In 3rd option if we use diode with forward resistance 10Ω, then balanced bridge can be achieved.

[Q.40] 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] B, D and E only

[2] A, B and C only

[3] A, B and E only

[4] A, C and E only

[ANS] **4**

[Q.41] 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] $\alpha\beta t$ [2] $\frac{\alpha\beta}{t}$ [3] $\frac{\beta t}{\alpha}$ [4] $\frac{\alpha t}{\beta}$

[ANS] **4**

[Q.42] A metallic bar of Young's modulus, $0.5\times10^{11}\,Nm^{-2}$ 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] $100\times10^{3}\,N$ [2] $2\times10^{3}\,N$

[3] $5\times10^{3}\,N$ [4] $50\times10^{3}\,N$

[ANS] 4

[Q.43] 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] 17 [2] 32

[3] 34 [4] 28

[ANS] 4

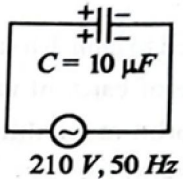
[Q.44] An iron bar of length L has magnetic moment M. It is bent at the middle of its length such that the two arms make an angle 60° with each other. The magnetic moment of this new magnet is :

[1] 2 M [2] $\frac{M}{\sqrt{3}}$

[3] M [4] $\frac{M}{2}$

[ANS] 4

[Q.45] A $10\,\mu F$ capacitor is connected to a 210 V, 50Hz source as shown in figure. The peak current in the circuit is nearly $(\pi = 3.14)$:



[1] 1.20 A [2] 0.35 A

[3] 0.58 A [4] 0.93 A

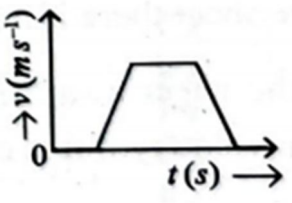
[ANS] 4

[Q.46] 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:

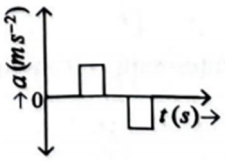
[1] 1 : 2 [2] 2 : 3 [3] 1 : 1 [4] 2 : 9

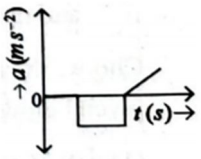
[ANS] 4

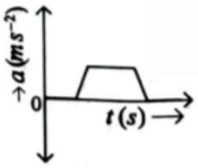
[Q.47] The velocity (v) – time (t) plot of the motion of a body is shown below :

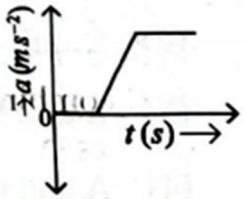


The acceleration (a) – time (t) graph that best suits this motion is

[1] 

[2] 

[3] 

[4] 

[ANS] 1

[Q.48] If the mass of the bob in a simple pendulum 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] $2\sqrt{3}$ [2] 4 [3] $\sqrt{3}$ [4] $\sqrt{2}$

[ANS] 4

[Q.49] 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] $\frac{GmM}{2R}$

[2] $\frac{GmM}{3R}$

[3] $\frac{5GmM}{6R}$

[4] $\frac{2GmM}{3R}$

[ANS] 3

[Q.50] 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] A, C and D only

[2] C only

[3] B and D only

[4] A and C only

[ANS] 4