

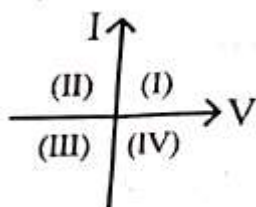
R5

NEET 2024

Physics

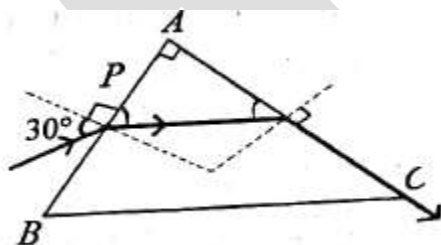
Section – A (Compulsory)

1. 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 incorrect but B is correct.
 (2) Both A and B are correct.
 (3) Both A and B are incorrect.
 (4) A is correct but B is incorrect.

2. 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:



- (a) $\frac{\sqrt{5}}{2}$ (b) $\frac{\sqrt{3}}{4}$
 (c) $\frac{\sqrt{3}}{2}$ (d) $\frac{\sqrt{5}}{4}$

3. A particle moving with uniform speed in a circular path maintains:
- (1) constant acceleration.
 (2) constant velocity but varying acceleration.
 (3) varying velocity and varying acceleration.
 (4) constant velocity.
4. 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) 2 : 1 (2) 1 : 1
 (3) 1 : 4 (4) 1 : 2
5. 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) 5 (2) 7
 (3) 6 (4) 10
6. 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) 17.5 cm (2) 20.7 cm
 (3) 72.0 cm (4) 8.5 cm

7. 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 - III, B-IV, C-II, D-I
- (2) A-IV, B-III, C-I, D-II
- (3) A-I, B-II, C-III, D-IV
- (4) A-II, B-I, C-IV, D-III

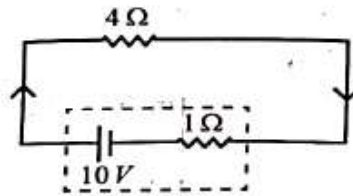
8. A bob is whirled in a horizontal plane by means of a string with an initial speed of ω rpm. The tension in the string is T. If speed becomes 2ω while keeping the same radius, the tension in the string becomes :

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

9. An unpolarised light beam strikes a glass surface at Brewster's angle. Then

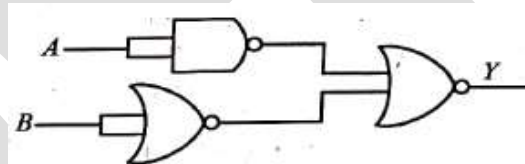
- (1) the refracted light will be completely polarised.
- (2) both the reflected and refracted light will be completely polarised.
- (3) the reflected light will be completely polarised but the refracted light will be partially polarised.
- (4) the reflected light will be partially polarised.

10. 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:



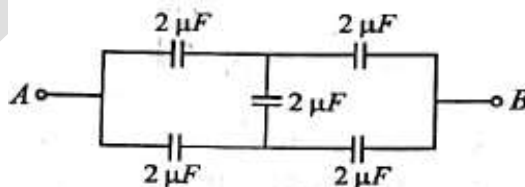
- (1) 6 V
- (2) 8 V
- (3) 10 V
- (4) 4 V

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

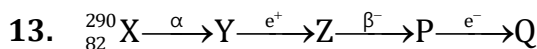


- (1) NOR gate
- (2) OR gate
- (3) AND gate
- (4) NAND gate

12. In the following circuit, the equivalent capacitance between terminal A and terminal B is:



- (1) $1\mu F$
- (2) $0.5\mu F$
- (3) $4\mu F$
- (4) $2\mu F$



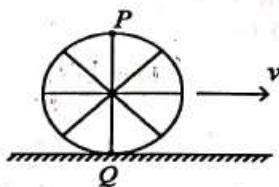
In the nuclear emission stated above, the mass number and atomic number of the product Q respectively, are:

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

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

- (1) stress and angle
- (2) strain and arc
- (3) angular speed and stress
- (4) strain and angle

15. 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 faster than point Q.
- (2) Both the points P and Q move with equal speed.
- (3) Point P has zero speed
- (4) Point P moves slower than point Q.

16. 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 combination is:

- (1) 52Ω
- (2) 55Ω
- (3) 60Ω
- (4) 26Ω

17. 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) 198 N
- (2) 1.98 mN
- (3) 99 N
- (4) 19.8 mN

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

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

19. 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 $4\pi \times 10^{-7} \text{ SI units}$):

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

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

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

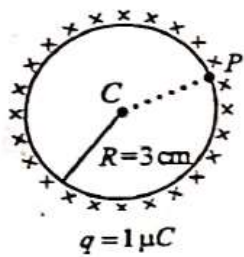
22. If c is the velocity of light in free space, the correct statements about photon among the following are:

- A. The energy of a photon is $E = hv$
 - B. The velocity of a photon is c .
 - C. The momentum of a photon, $p = \frac{hv}{c}$
 - 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, B, C and D only
- (2) A, C and D only
- (3) A, B, D and E only
- (4) A and B only

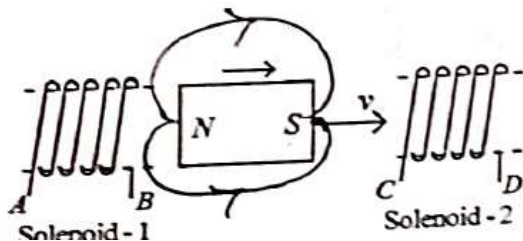
23. A thin spherical shell is charged by some source. The potential difference between the two points C and P (in V) shown in the figure is:

(Take $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$ SI units)



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

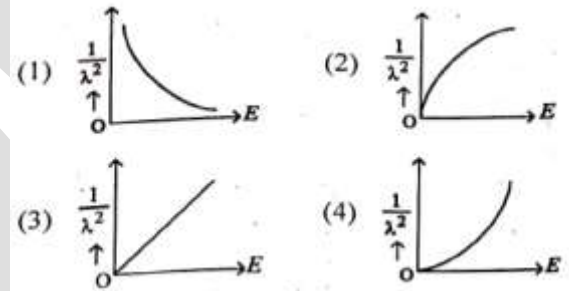
24.



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:

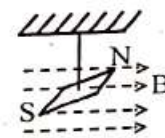
- (1) BA and CD
- (2) AB and CD
- (3) BA and DC
- (4) AB and DC

25. 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):



(Ans: 3)

26. 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 m². If the magnitude of magnetic moment of the needle is $x \times 10^{-5}$ Am²; then the value of 'x' is:



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

27. 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	$\chi \gg 1$
D.	Non-magnetic	IV	$0 < \chi < \epsilon$ (a small positive number)

Choose the correct answer from the options given below

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

28. 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 m, 2 s
- (2) 5 cm, 1 s
- (3) 5 m, 1 s
- (4) 5 cm, 2 s

29. 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.

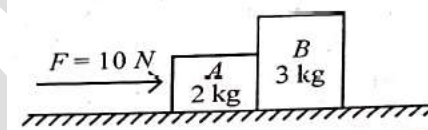
In the light of the above statements, choose the most appropriate answer from the options given below:

- (1) Both Statement I and Statement II are incorrect.
- (2) Statement I is correct but Statement II is incorrect.
- (3) Statement I is incorrect but Statement II is correct.
- (4) Both Statement I and Statement II are correct

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

- (1) there will be a central dark fringe surrounded by a few coloured fringes.
- (2) there will be a central bright white fringe surrounded by a few coloured fringes.
- (3) all bright fringes will be of equal width
- (4) interference pattern will disappear

31. A horizontal force 10 N is applied to a block A as shown in figure. The mass of blocks 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:

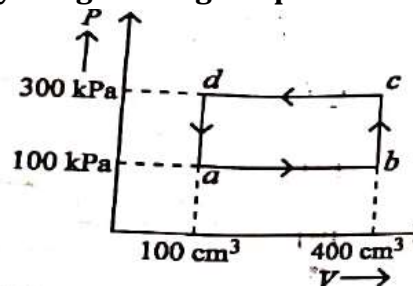


- (1) 4 N
- (2) 6 N
- (3) 10 N
- (4) Zero

32. 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) 2 : 1
- (2) 4 : 1
- (3) 1 : 4
- (4) 1 : 2

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



- (1) 30 J (2) -90 J
 (3) -60 J (4) zero

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

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

35. 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 m distance (r) from the centre of the dipole of dipole moment vector \vec{P} of magnitude, $4 \times 10^{-6} \text{ C m}$, is $\pm 9 \times 10^3 \text{ V}$.

(Take $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ SI units}$)

Reason R: $V = \pm \frac{2P}{4\pi\epsilon_0 r^2}$, 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 NOT the correct explanation of A.
 (2) A is true but R is false.
 (3) A is false but R is true.
 (4) Both A and R are true and R is the correct explanation of A.

Section – B (Attempt Any 10)

36. 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) 28 (2) 17
 (3) 32 (4) 34

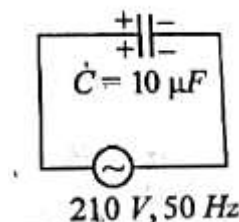
37. The minimum energy required to launch a satellite of mass m from the surface of earth of mass M and radius R in a circular orbit at an altitude of 2R from the surface of the earth is:

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

38. 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:

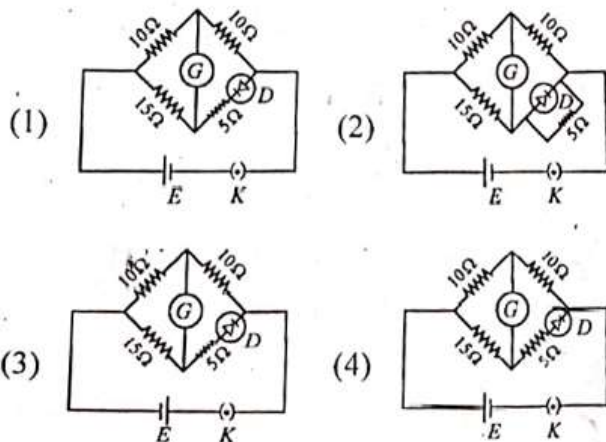
- (1) 2 : 9 (2) 1 : 2
 (3) 2 : 3 (4) 1 : 1

39. A $10 \mu\text{F}$ 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) 0.93 A (2) 1.20 A
 (3) 0.35 A (4) 0.58 A

40. Choose the correct circuit which can achieve the bridge balance.



(Ans: D)

41. 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, C and E only
- (2) B, D and E only
- (3) A, B and C only
- (4) A, B and E only

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

- (2) displacement current of magnitude equal to I flows in a direction opposite to that of I
- (3) displacement current of magnitude greater than I flows but can be in any direction
- (4) there is no current

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

- (1) the energy density in electric field is equal to energy density in magnetic field.
- (2) they travel with a speed equal to $\frac{1}{\sqrt{\mu_0 \epsilon_0}}$
- (3) they originate from charges moving with uniform speed
- (4) they are transverse in nature

44. 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) $\sqrt{2}$
- (2) $2\sqrt{3}$
- (3) 4
- (4) $\sqrt{3}$

45. 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) $\frac{\alpha t}{\beta}$
- (2) $\alpha \beta t$
- (3) $\frac{\alpha \beta}{t}$
- (4) $\frac{\beta t}{\alpha}$

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

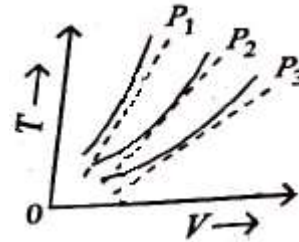
47. A metallic bar of Young's modulus, $0.5 \times 10^{11} \text{ N m}^{-2}$ and coefficient of linear thermal expansion $10^{-5} \text{ }^\circ\text{C}^{-1}$, length 1 m and area of cross-section 10^{-3} m^2 is heated from 0°C to 100°C without expansion or bending. The compressive force developed in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

- (1) $50 \times 10^3 \text{ N}$
- (2) $100 \times 10^3 \text{ N}$
- (3) $2 \times 10^3 \text{ N}$
- (4) $5 \times 10^3 \text{ N}$

48. 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) $\frac{M}{2}$
- (2) $2M$
- (3) $\frac{M}{\sqrt{3}}$
- (4) M

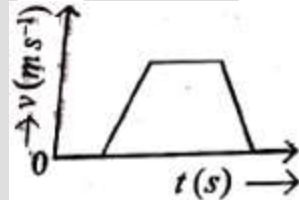
49. The following graph represents the T-V curves of an ideal gas (where T is the temperature and V the volume), at three pressures P_1, P_2 and P_3 compared with those of Charles's law represented as dotted lines.



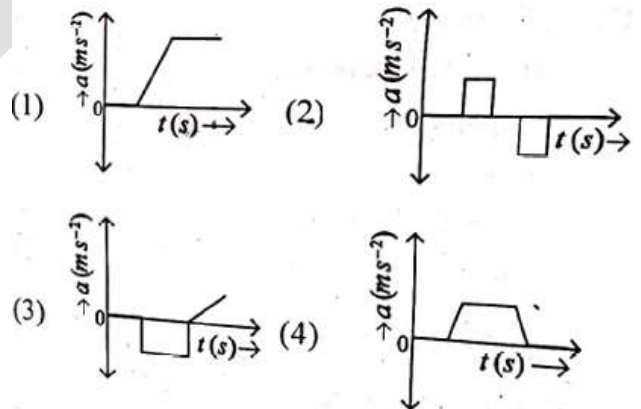
Then the correct relation is:

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

50. The velocity (v) - time (t) plot of the motion of body is shown below:



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



(Ans: B)