Time : 1½ Hours	**FIRST-TERM**	**PHYSICS**
	Subject Code	

H 4 7 0 2

Total No. of Questions : 40　(Printed Pages : 16)　　Maximum Marks : 40

INSTRUCTIONS :

(i) Paper contains 40 multiple choice questions carrying 1 mark each.

(ii) Every question has four choices for its answers (A), (B), (C) and (D) and only one of them is the correct answer.

(iii) On the OMR sheet, for each question number, darken with a ball point pen ONLY ONE bubble corresponding to what you consider to be the most appropriate answer, from among the four choices.

(iv) **Please note that it is not possible to change the answer once you have filled up the bubble with a ball point pen. Hence care must be taken while darkening the bubbles.**

(v) For each question, you will be awarded ONE mark if you have darkened only the bubble corresponding to the correct answer. In all other cases, you will get zero mark. There is no negative marking.

(vi) Only one OMR sheet will be provided.

(vii) Use only Black *or* Blue ball point pen.

(viii) You may use the following values of physical constants wherever necessary.

$c = 3 \times 10^8$ ms^{-1}, $e = 1.6 \times 10^{-19}$ C, $h = 6.6 \times 10^{-34}$ Js, $m_c = 9.1 \times 10^{-31}$ kg, $\mu_0 = 4\pi \times 10^{-7}$ TmA^{-1}, $\varepsilon_0 = 8.85 \times 10^{-12}$ C^{2}N^{-1}m^{-2}.

1.   Which of the following electromagnetic radiations has the lowest wavelength ?

(A)   Radio waves

(B)   Infrared rays

(C)   Gamma rays

(D)   Microwaves

2.   Two electric field lines can never cross each other because :

(A)   Electric field lines are closed curves

(B)   Electric field lines repel each other

(C)   Electric field lines are crowded only near the charge

(D)   Electric field has a unique direction at each point

3.   Consider a system of six charges $+ 1\mu C$, $+ 2\ \mu C$, $- 3\ \mu C$, $+ 4\ \mu C$, $- 5\ \mu C$ and $+ 6\ \mu C$. The total charge of the system is :

(A) $+ 5\ \mu C$

(B) $- 5\ \mu C$

(C) $+ 21\ \mu C$

(D) $+ 2\ \mu C$

4.   To convert a galvanometer into a voltmeter :

(A)   a high resistance is connected in parallel with galvanometer

(B)   a low resistance is connected in series with galvanometer

(C)   a high resistance is connected in series with galvanometer

(D)   a low resistance is connected in parallel with galvanometer

5. Resistance of the colour-coded carbon resistor is 0.58 Ω ± 5%. Then the sequence of colour code is :

   (A) Green Grey Gold Silver

   (B) Green Grey Silver Gold

   (C) Grey Green Silver Gold

   (D) Grey Green Gold Silver

6. Figure shows electric field lines due to a charge configuration. From this figure it is concluded that :
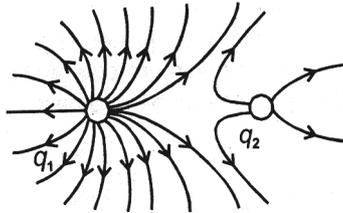
   (A) q_1 and q_2 are positive and $q_2 > q_1$

   (B) q_1 and q_2 are positive and $q_1 > q_2$

   (C) q_1 and q_2 are negative and $|q_1| > |q_2|$

   (D) q_1 and q_2 are negative and $|q_2| > |q_1|$

7. The electric and magnetic field of a propagating electromagnetic wave are in :

   (A) phase and parallel to each other

   (B) opposite phase and perpendicular to each other

   (C) opposite phase and parallel to each other

   (D) phase and perpendicular to each other

8. The equivalent capacitance of the combination shown in the following figure is :
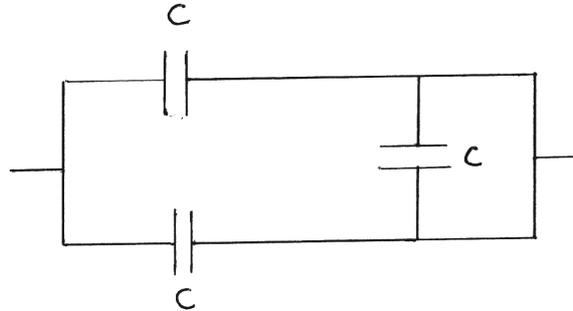
(A) C/2

(B) 3C/2

(C) 3C

(D) 2C

9. When a negatively charged particle is brought closer to another negatively charged particle then the electric potential energy of the system :

(A) decreases

(B) increases

(C) remains constant

(D) becomes zero

10. A charged particle is projected along the magnetic field line. Magnetic force on the particle is :

(A) Perpendicular to the velocity only

(B) Perpendicular to the magnetic field only

(C) Perpendicular to both the velocity and the magnetic field

(D) Zero

11. The magnetic hysteresis loop for a given ferromagnetic material is shown in the figure. For the material to be suitable for making a permanent magnet :
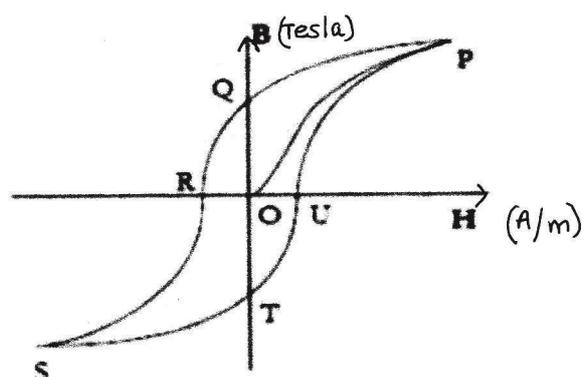

(A)   OQ and OR both should be large

(B)   OQ should be large and OR should be small

(C)   OQ should be small, OR should be large

(D)   OQ and OR both should be small

12. A sphere encloses an electric dipole with charges $+ 2 \times 10^{-6}$ C and -2×10^{-6} C. Then total electric flux through the sphere is :

(A) 2×10^{-6} Nm²/C

(B)   zero

(C) -2×10^{-6}N m²/C

(D) 4×10^{-6} Nm²/C

13. Choose the *incorrect* statement.

Equipotential surfaces :

(A) are closer in regions of large electric fields compared to regions of lower electric fields

(B) are of concentric spherical shells for a point charge

(C) will be more crowded near sharp edges of a conductor

(D) will always be equally spaced

14. The threshold wavelength for a metal having work function ϕ_0 is λ_0. What is the threshold wavelength for a metal whose work function is $\phi_0/2$?

(A) $2\lambda_0$

(B) $4\lambda_0$

(C) $\lambda_0/2$

(D) $\lambda_0/4$

15. The magnetic susceptibility is negative for :

(A) paramagnetic and ferromagnetic materials

(B) diamagnetic material only

(C) paramagnetic material only

(D) ferromagnetic material only

16. The net magnetic flux through any closed surface is :

(A) $\mu_0 i$

(B) μ_0

(C) i/μ_0

(D) Zero

17. A proton is moving perpendicular to the magnetic field with speed v and takes time T to complete one revolution. If the speed of the particle is increased to $2v$, then how much time will it take to complete one revolution ?

(A)   T

(B)   T/2

(C)   2T

(D)   4T

18. Consider a system of two point charges Q and –2Q which are placed some distance apart. If the electric field at the location of Q is E, then the electric field at the location of –2Q will be :

(A)   –E/2

(B)   –3E/2

(C)   –E

(D)   –2E

19. The equivalent resistance between the points M and N is :

(A)   9Ω

(B)   1/9Ω
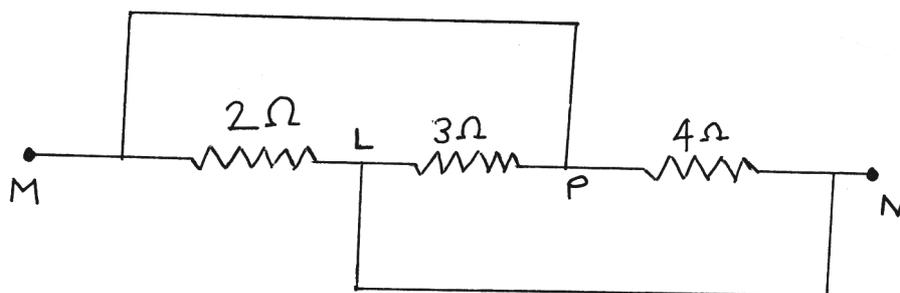
(C)   12/13 Ω

(D)   13/12 Ω

20. A regular hexagon of side 10 cm has a charge 5 µC at each of its vertices. The potential at the centre of the hexagon is :

(A) 3.7×10^{-6} V   (B) 2.7×10^{6} V

(C) 2.7×10^{-4} V   (D) 3.7×10^{4} V

21. In a potentiometer arrangement, a cell (A) of emf 1.25 V gives a balance point at 35.0 cm length of the wire. If the cell (A) is replaced by another cell (B) and the balance point shifts to 70.0 cm. The emf of cell (B) is :

(A)   2.5 V   (B)   0.25 V

(C)   0.625 V   (D)   6.25 V

22. The dependence of resistivity (ρ) on temperature (T) for a typical semiconductor is represented by :

(A)

(B)

(C)

(D)
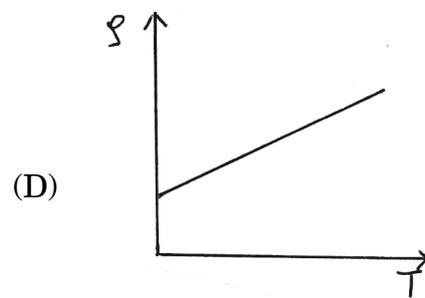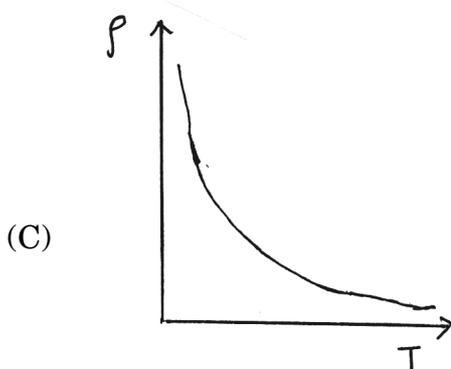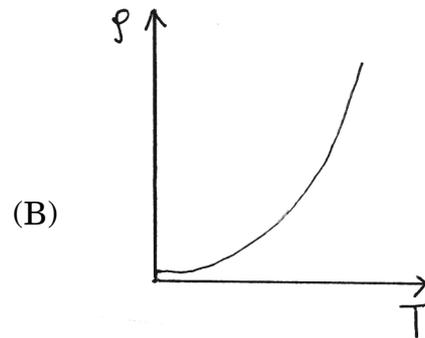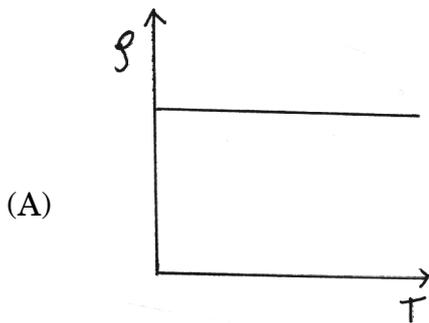
23. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?

(A)   zero

(B)   one-fourth

(C)   four times

(D)   doubled

24. The capacitance of a capacitor does not depend on :

(A)   the size of the plates

(B)   the charges on the plates

(C)   the shape of the plates

(D)   the separation between the plates

25. In the circuit shown, the current through the 4Ω resistor is 1 amp when the points P and M are connected to a D.C. voltage source. The potential difference between the points M and N is :
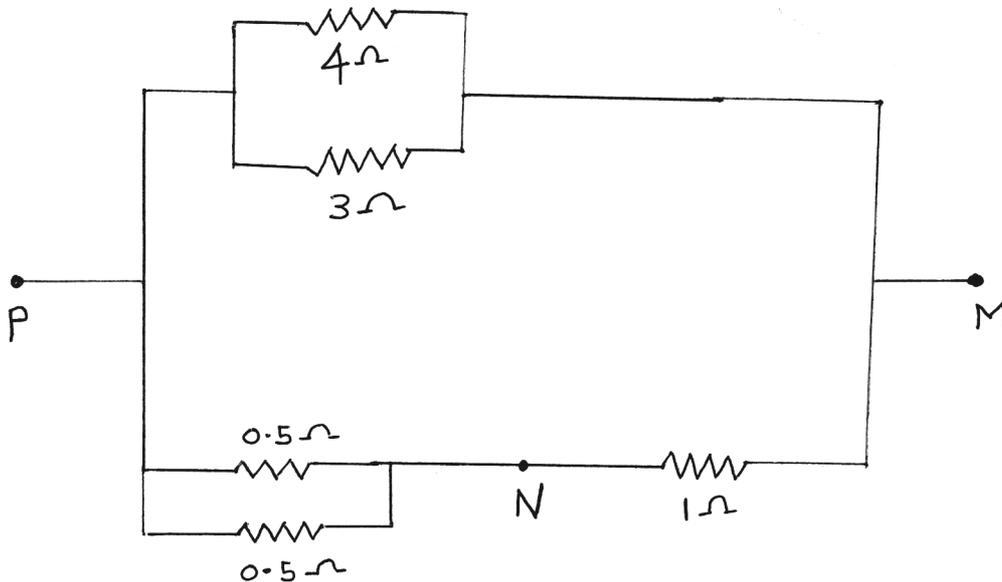
(A)   1.0 V

(B)   0.5 V

(C)   3.2 V

(D)   1.5 V

26. The work done in rotating a bar magnet of magnetic moment m from its unstable equilibrium position to its stable equilibrium position in a uniform magnetic field B is :

(A) 2 mB

(B) mB

(C) –mB

(D) –2 mB

27. Three resistances P, Q, R each of 2 Ω and an unknown resistance S form the four arms of a Wheatstone bridge circuit. When a resistance of 6Ω is connected in parallel to S the bridge gets balanced. What is the value of S ?

(A) 3 Ω

(B) 6 Ω

(C) 1 Ω

(D) 2 Ω

28. Four point charges q_A = 2µC, q_B = –5µC, q_C = 2µC, and q_D = –5µC are located at the corners of a square ABCD of side 10 cm. The force on a charge of 1µC placed at the centre of the square is :
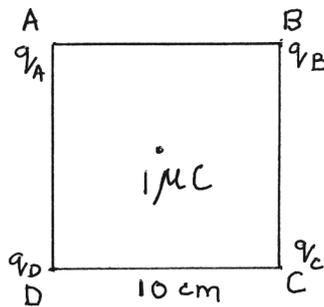
(A) Zero N   (B) 18 N

(C) 1 N   (D) 9N

29. de-Broglie wavelength (λ) of a charge particle accelerated from rest by potential difference V is related as :

   (A) $\lambda \alpha V$

   (B) $\lambda \alpha \sqrt{V}$

   (C) $\lambda \alpha 1 / \sqrt{V}$

   (D) $\lambda \alpha 1 / V$

30. All photons present in a light beam of a particular frequency have :

   (A) same energy but different momentum

   (B) same momentum but different energy

   (C) different energy and different momentum

   (D) same energy and same momentum

31. Polar molecules are the molecules :

   (A) which acquire a dipole moment only in the presence of electric field due to displacement of charges

   (B) which acquire a dipole moment against the direction of electric field

   (C) having a permanent electric dipole moment

   (D) having zero electric dipole moment

32. At a certain place vertical component of magnetic field of earth is $\sqrt{3}$ times that of horizontal component. Then the angle of dip at this place will be :

   (A) 30^0

   (B) 45^0

   (C) 60^0

   (D) 90^0

33. Two cells of emfs E_1 and E_2 ($E_2 > E_1$) and internal resistances r_1 and r_2 respectively are connected in parallel as shown in the following figure. The equivalent emf E_{eq} of the two cells is :
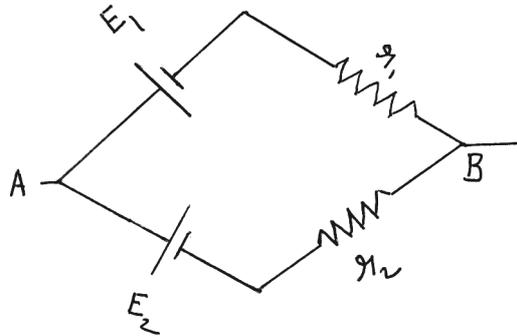
(A)   Smaller than E_1

(B)   Smaller than E_2 but greater than E_1

(C)   Equal to $E_1 + E_2$

(D)   Independent of internal resistances r_1 and r_2

34. When the light of frequency $2Y_0$ (where, Y_0 = threshold frequency) is incident on a metal plate, the maximum velocity of electrons emitted is v_1. When the frequency of the incident radiation is increased to $5Y_0$, the maximum velocity of the electrons emitted from the same plate is v_2. The ratio of v_1 to v_2 is :

(A)   4 : 1

(B)   1 : 4

(C)   1 : 2

(D)   2 : 1

35. Current sensitivity of a moving coil galvanometer is 5 div/mA and its voltage sensitivity is 20 div/V. The resistance of the galvanometer is :

    (A) 250 Ω

    (B) 25 Ω

    (C) 40 Ω

    (D) 500 Ω

36. A current carrying square loop is suspended in a uniform magnetic field acting in the plane of the loop. If the force on one arm of the loop is $\vec{F}$, the net force on remaining three arms of the loop is :

    (A) $-3\vec{F}$

    (B) $\vec{F}$

    (C) $3\vec{F}$

    (D) $-\vec{F}$

37. Out of the following options, which one can be used to produce an electromagnetic wave ?

    (A) a charge moving at constant velocity

    (B) an accelerating charge

    (C) a stationary charge

    (D) a chargeless particle

38. When equal current is passed through two circular coils, equal magnetic field is produced at their centres. If the ratio of number of turns in the coils is 8 : 15, then the ratio of their radii will be :

    (A) 1 : 1

    (B) 15 : 8

    (C) 8 : 15

    (D) 1 : 2

39. The resistance of a wire is 5 ohm at 50°C and 6 ohm at 100°C. The resistance of the wire at 0°C will be :

(A)   1 ohm

(B)   4 ohm

(C)   3 ohm

(D)   2 ohm

40. A planar square loop of side 'a' carrying a steady current I_2 is lying on a horizontal surface near a long straight conductor carrying a steady current I_1 in the same plane at a distance 'a' as shown in figure.
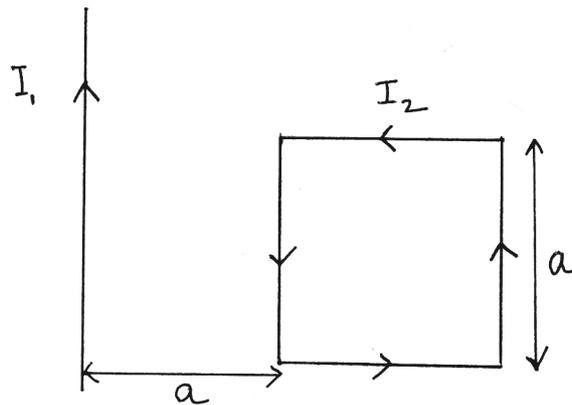
The net force on the loop due to the wire will be :

(A) $\dfrac{\mu_0 I_1 I_2}{2\pi}$

(B) $\dfrac{\mu_0 I_1 I_2}{3\pi}$

(C)   Zero

(D) $\dfrac{\mu_0 I_1 I_2}{4\pi}$

Space For Rough Work

Space For Rough Work