INDIAN SCHOOL AL WADI AL KABIR

SAMPLE PAPER PHYSICS - 3 (042)

DEPARTMENT OF SCIENCE (21-22)

1. The unit of permittivity of free space (ε_0) is

(a) $CN^{-1}m^{-1}$ (b) Nm^2C^{-2} (c) $C^2N^{-1}m^{-2}$ (d) $C^2N^{-2}m^{-2}$

2. A charge '***q***' is placed at the center of the line joining two exactly equal positive charges ***Q***. the system of three charges will be in equilibrium if ***q*** is equal to

(a) –Q/4 (b) +Q (c) -Q (d) Q/2

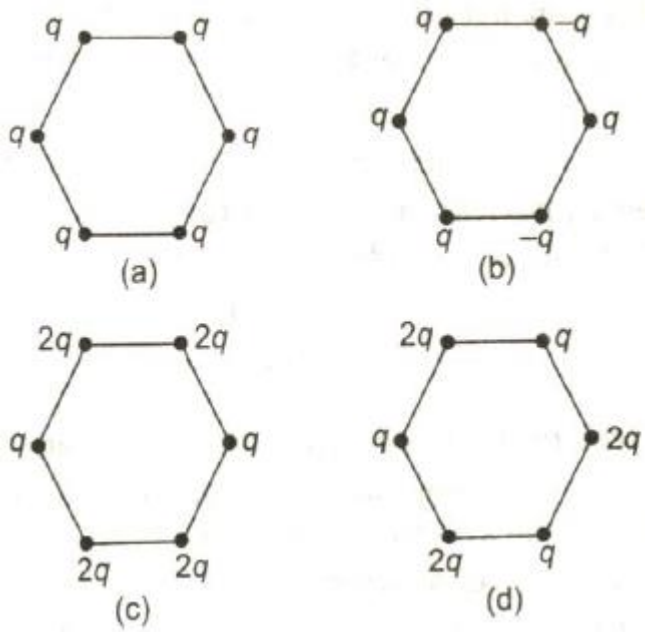
3. Point Q lies on the perpendicular bisector of an electrical dipole moment p. if the distance of Q from the dipole is r (much larger than the size of the dipole), then the electric field intensity E at Q is proportional to

(a) r^{-2} (b) r^{-4} (c) r^{-1} (d) r^{-3}

4. An electric dipole consists of two opposite charges, each of magnitude 1.0μC separated by a distance of 2.0 cm. The dipole is placed in an external electric field of 10^5 NC^{-1}. The maximum torque on the dipole is

(a) 0.2×10^{-3} N-m (b) 1×10^{-3} N-m
(c) 2×10^{-3} N-m (d) 4×10^{-3} N-m

5. Figures shown below regular hexagons, with charges at the vertices. In which of the following cases the electric field at the centre is not zero?



6. In a region, 10^{19} α-particles and 10^{19}protons move to the left, while 10^{19} electrons move to the right per second. The current is

(a)3.2A towards left (b) 3.2A towards right

(c)6.4A towards left (d) 6.4A towards right

7. A capacitor of 10μF has a potential difference of 40 V across it. If it is discharged in 0.2 s, the average current during discharge is

(a)2 mA (b)4 mA (c)1 mA (d)0.5 mA

8. The alloys constant and managing are used to make standard resistance because they have

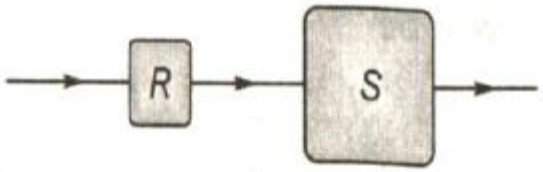
(a) high resistivity (b) low temperature coefficient of resistance

(c) low resistivity (d) both (a) and (b)

9. The resistance of a 10 m long wire is 10Ω. Its length is increased by 25% by stretching the wire uniformly. The resistance of wire will charge to (approximately)

(a)12.5 Ω (b)14.5 Ω (c)15.6 Ω (d)16.6 Ω

10. Two plates R and S are in the form of a square and have the same thickness. A side of S is twice the side of R. Compare their resistances. The direction of current is shown by an arrow head in figure.



(a) The resistance of R is twice that of S

(b) Both have the same resistance

(c) The resistance of S is four times that of R

(d) The resistance of R is half that of S

11. Two parallel wires, 4 cm apart, carry currents of 2A and 4A respectively, in opposite directions. The force per unit length in N/m of one wire on the other is:

(a). 1×10^{-3}, repulsive (b). 1×10^{-3}, attractive

(c). 4×10^{-5}, repulsive (d). 4×10^{-5}, attractive

12. A long straight cylindrical shell carries current i parallel to its axis and uniformly distributed over its cross section. The magnitude of the magnetic field is greatest:

(a). at the inner surface of the shell

(b). at the outer surface of the shell

(c). inside the shell near the middle

(d). in hollow region near the inner surface of the shell

13. A toroid has a square cross section with the length of an edge equal to the radius of the inner surface. The ratio of the magnitude of the magnetic field at the inner surface to the magnitude of the field at the outer surface is:

(a). ¼ (b). ½ (c). 1 (d). 2

14. A long straight wire carrying a 3.0A current enters a room through a window 1.5m high and 1.0 m wide. The path integral around the window frame has the value (in Tm):

(a). 0.20 (b). 2.5×10^{-7} (c). 3.0×10^{-7} (d). 3.8×10^{-6}

15. Solenoid 2 has twice the radius and six times the number of turns per unit length as solenoid 1. The ratio of the magnetic field in the interior of 2 to that in the interior of 1 is:

(a). 2 (b). 4 (c). 6 (d). 1

16.A magnet of magnetic moment μ and pole strength is divided in two equal parts, the magnetic moment of each part will be

(a)M (b)M/2 (c)M/4 (d)2M

17. Two magnets have the same length and the same pole strength. But one of the magnets has a small hole at its centre. Then

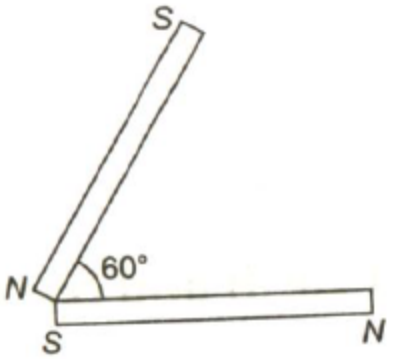
(a) Both the equal magnetic moment

(b) One with hole has smaller magnetic moment

(c) One with hole has large magnetic moment

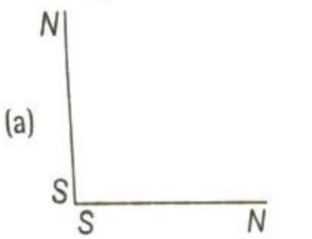
(d) One with hole loses magnetism through the hole

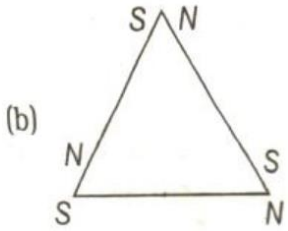
18. Two magnets of equal magnetic moments M each are placed as shown in figure. The resultant magnetic moment is,

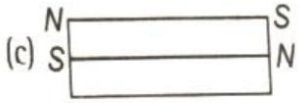


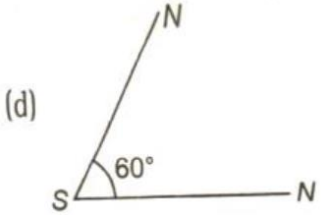
(a)M (b) $\sqrt{3}$M (c) $\sqrt{2}$M (d) M/2

19. In which orientation the resultant magnetic moment of two magnets, will be zero, if magnetic moment of each magnets is M in the following figures?









20. The vertical component of earth's magnetic field always has a vertical component except at the

(a)magnetic poles (b)geographic poles

(c)every place (d)magnetic equator

21. In a permanent magnet at room temperature

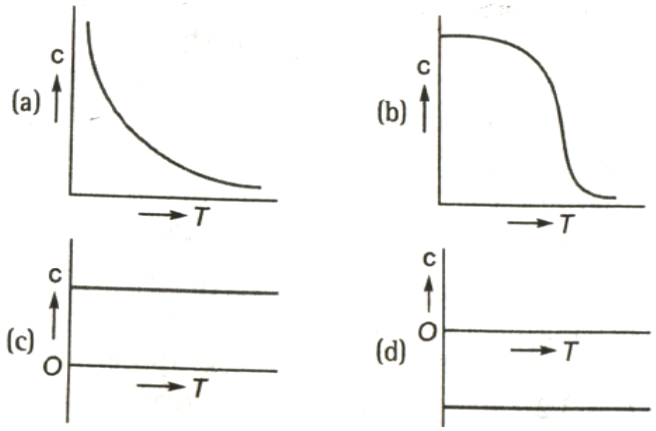
(a) Magnetic moment of each molecule is zero

(b) The individual molecules have non-zero magnetic moment which are all perfectly aligned

(c) Domains are partially aligned

(d) Domains are all perfectly aligned

22. The variation of magnetic susceptibility (χ) with temperature for a diamagnetic substance is best represented by figured



23. A cylindrical bar magnet is kept along the axis of a circular coil. The magnet is rotated about its axis such that north pole faces the coil. The induced current in the coil

(a) is zero (b) is clockwise from magnet side

(c) may be clockwise or anti-clockwise (d) is anti-clockwise from magnet side

24. A jet plane is travelling towards west at a speed of 1800 km/h. What is the voltage difference developed between the ends of the wing having a span of 25 m, if the earth's magnetic field fat the location has a magnitude of 5 x 10^{-4} T and the dip angle is 30°.

(a)2.1V (b)3.1V (c)4.1 V (d)5.2 V

25. The wing span of an Aeroplane is 36 m. if the plane is flying at 400 kmh^{-1}, the emf induced between the wings tips is (Assume V = 4 x 10^{-5} T)

(a)16 v (b)1.6 V (c)4.1 V (d)0.16 V

26. A copper ring is held horizontally and a bar magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the falling magnet while it is passing through the ring is

(a) More than that due to gravity (b) Less than that due to gravity

(c) Depends on the diameter of the ring and the length of the magnet

(d) None of the above

27. The two rails of a railways track insulated from each other and the ground are connected to a milli-voltmeter. What is the reading of the mV, when a train travels at a speed of 180 kmh^{-1} along the track, given that the horizontal component of earth's magnetic field is 0.2×10^{-4} Wbm^{-2} and the rails are separated by 1m.

(a)10^{-2} mV (b)10 mV (c) 10^{2} mV (d)1 mV

28. A coil as an area of 0.05 m^2 and it has 800 turns. It is placed perpendicularly in a magnetic field of strength 4×10^{-5} Wb/m^2, it is rotated through 90° in 0.1 s. The average emf induced in the coil is

(a)0.016 V (b)0.032 V (c)0.064 V (d)0.029 V

29. In step-up transformer, relation between number of turns in primary (N_P) and number of turns in secondary (N_S) coils is

(a) $N_S > N_P$ (b) $N_S < N_P$ (c) $N_S = N_P$ (d) $2N_S = N_P$

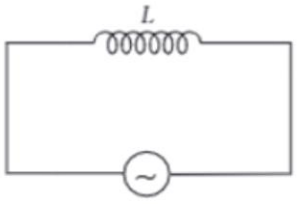
30. In an ideal transformer, the voltage is stepped-down from 11 kV to 220 V. If the primary current be 100 A, the current in the secondary coil will be

(a)5 kA (b)1 kA (c)0.5 kA (d)0.1kA

31.

AC Voltage Applied to an Inductor

Let a source of alternating e.m.f. $E = E_0 \sin\omega t$ be connected to a circuit containing a pure inductance L. If I is the value of instantaneous current in the circuit, then $I = I_0 \sin\left(\omega t - \frac{\pi}{2}\right)$. The inductive reactance limits the current in a purely inductive circuit and is given by $X_L = \omega L$.



(i) A 100 hertz a.c. is flowing in a 14 mH coil. The reactance is

(a) 15 Ω (b) 7.5 Ω (c) 8.8 Ω (d) 10 Ω

(ii) In a pure inductive circuit, resistance to the flow of current is offered by

(a) resistor (b) inductor (c) capacitor (d) resistor and inductor

(iii) In a inductive circuit, by what value of phase angle does alternating current lags behind e.m.f.?

(a) 45° (b) 90° (c) 120° (d) 75°

(iv) How much inductance should be connected to 200 V, 50 Hz a.c. supply so that a maximum current of 0.9 A flows through it?

(a) 5 H (b) 1 H (c) 10 H (d) 4.5 H

(v) The maximum value of current when inductance of 2 H is connected to 150 volt, 50 Hz supply is

(a) 0.337 A (b) 0.721 A (c) 1.521 A (d) 2.522 A

For question numbers 32, 33, 34 and 35, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

a) Both A and R are true and R is the correct explanation of A

b) Both A and R are true but R is NOT the correct explanation of A

c) A is true but R is false

d) A is false and R is also false

32. Assertion: - A current flows in a conductor only when there is an electric field within the conductor.

Reason: - The drift velocity of the electrons in the presence of electric field decreases.

33. Assertion: Longer wires have greater resistance and the smaller wires have lesser resistance.

Reason**:** Resistance is inversely proportional to the length of the wire.

34. Assertion: Magnetic Resonance Imaging (MRI) is a useful diagnostic tool for producing images of various parts of human body.

Reason**:** Protons of various tissues of the human body play a role in MRI.

35. Assertion: If a compass needle be kept at magnetic north pole of the earth the compass needle may stay in any direction.

Reason: Dip needle will stay vertical at the north pole of earth.

ANSWERS OF MCQs; -1. (d),2. (a), 3. (d), 4. (d), 5. (b), 6. (d), 7. (a), 8. (d), 9. (c), 10. (a), 11. (c), 12. (b), 13. (d), 14. (d), 15. (c),16. (b),17. (b), 18. (a), 19. (c), 20. (d), 21. (c), 22. (c), 23. (a), 24. (b), 25. (d), 26. (b), 27. (d), 28. (a), 29. (a), 30. (a)

ANSWERS OF case study; 31, (i)c (ii)b (iii)b (iv)b (v)a

ANSWERS OF AR: - 32(c), 33(c), 34(a), 35(b).