SET   A

INDIAN SCHOOL MUSCAT
PRE-BOARD EXAMINATION
TERM I
PHYSICS (042)

CLASS: XII   Time Allotted: 90 min.

02.11.2021   Max. Marks: 35

SECTION A
This section consists of 25 multiple choice questions with overall choice to attempt any 20 questions. In case more than desirable number of questions are attempted, ONLY first 20 will be considered for evaluation.

1   The work done to move a charge on an equipotential surface
    (a) cannot be defined   (b) is a negative quantity
    (c) is zero   (d) is a positive quantity

2   Two point charges placed in a medium of dielectric constant 5 are at a distance 'r' between them experience an electrostatic force 'F'. The electrostatic force between them in vacuum at the same distance 'r' will be
    (a) 5F   (b) F   (c) F/2   (d) F/5

3   Eight dipoles of charges of magnitude 'e' are placed inside a cube. The total electric flux coming out of the cube will be
    (a) 0   (b) e   (c) -e   (d) 8e

4   Three capacitors each of capacitance 4μF are to be connected in such a way that the effective capacitance is 6μF. This can be done by connecting
    (a) them in parallel   (b) all of them in series   (c) two in series and one in parallel
         (d) two in parallel and one in series

5   Three charges are placed at the vertices of an equilateral triangle of side 'a'. The force experienced by the charge placed at vertex A in a direction normal to BC is
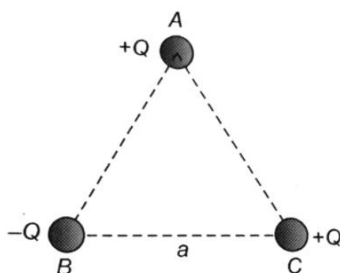
(a) $\dfrac{Q^2}{4\pi\varepsilon_0 a^2}$ (b) $\dfrac{-Q^2}{4\pi\varepsilon_0 a^2}$ (c)   Zero   (d) $\dfrac{Q^2}{2\pi\varepsilon_0 a^2}$

6	The electric flux through a closed Gaussian surface depends upon
(a) Net charge enclosed and permittivity of the medium
(b) Net charge enclosed, permittivity of the medium and size of the Gaussian surface
(c) Net charge enclosed only
(d) Permittivity of the medium only

7	Two capacitors of capacitances C_1 and C_2 are connected in parallel. If a charge Q is given to the combination the charge gets shared. The ratio of the charge on the capacitor C_1 to the charge on C_2 will be

(a)	$\dfrac{C_1}{C_2}$	(b)	$\sqrt{\dfrac{C_1}{C_2}}$	(c)	$\sqrt{\dfrac{C_2}{C_1}}$	(d)	$\dfrac{C_2}{C_1}$

8	The relaxation time in conductors
(a) increases with increase in temperature	(b) decreases with increase in temperature
(c) it does not depend on temperature	(d) all of a sudden changes at 400 K

9	The drift velocity per unit applied electric field is called
(a) Resistivity	(b) Conductivity	(c) Mobility	(d) Drift velocity

10	The drift velocity of the electrons in a copper wire of length 2m under the application of a potential difference of 200V is 0.5m/s. Their mobility (in $m^2V^{-1}s^{-1}$) is
(a) 5 x 10^2	(b) 5 x 10^{-3}	(c) 2.5 x 10^2	(d) 2.5 x 10^{-3}

11	In a Wheatstone bridge circuit, P = 7Ω, Q = 8 Ω, R = 12 Ω and S=7 Ω. Find the additional resistance to be used in series with S, so that the bridge is balanced.
(a) 6.67 Ω	(b) 6.71 Ω	(c) 2.67 Ω	(d) 6.27 Ω

12	In a potentiometer arrangement, a cell of emf 1.25 V gives a balance point at 35.0 cm length of wire. If the cell is replaced by another cell and the balance point shifts to 63.0 cm then emf of the second cell will be
(a) 3.25 V	(b) 1.25 V	(c) 3.0 V	(d) 2.25 V

13	In a meter bridge experiment, the balancing length corresponding to null deflection in galvanometer is L_1 .What is the effect on null deflection of galvanometer, when the radius of the meter bridge wire is doubled?
(a) there will be no change	(b) null point shifts to ½ L_1 point
(c) Null point will shift to 2L_1 point	(d) Null point will not be available

14	When cell of e.m.f. E is connected with an external resistance R, the potential difference across the cell becomes V. The expression for the internal resistance 'r' of the cell is

(a)	$\left(\dfrac{V-E}{V}\right)R$	(b)	$\left(\dfrac{V-E}{E}\right)R$	(c)	$\left(\dfrac{E-V}{E}\right)R$	(d)	$\left(\dfrac{E-V}{V}\right)R$

15 A galvanometer coil has a resistance of 100 Ω and the meter shows full scale deflection for a current of 1mA. The shunt resistance required to convert the galvanometer into an ammeter of range 0 to 5A is about
    (a) 0.01 Ω   (b) 0.1Ω   (c) 0.02 Ω   (d) 0.2 Ω

16 What happens to the current sensitivity and voltage sensitivity if we increase the number of turns of the coil of the moving coil galvanometer?
    (a) Current sensitivity remains constant but voltage sensitivity changes
    (b) Current sensitivity increases but voltage sensitivity remains same
    (c) Both current sensitivity and voltage sensitivity increases
    (d) No change in current sensitivity and voltage sensitivity

17 A long solenoid has 200 turns per cm and carries a current of 2.5A. The magnetic field at its centre is ($\mu_0 = 4\pi \times 10^{-7}$ Wb/Am)
    (a) 3.14×10^{-2} Wb/m^2 (b) 6.28×10^{-2} Wb/m^2
    (c) 9.42×10^{-2} Wb/m^2 (d) 12.56×10^{-2} Wb/m^2

18 A charged particle (charge q) is moving in a circle of radius R with uniform speed 'v'. The magnetic moment μ associated with it is given by

(a) $\dfrac{qvR}{2}$	(b) qvR	(c) qvR^2	(d) $\dfrac{qvR^2}{2}$

19 What happens to the magnetic field at the centre of a circular current carrying coil if we double the radius of the coil keeping the current unchanged?
    (a) halved   (b) doubled   (c) becomes zero   (d) remains unchanged

20 The maximum value of current when an inductor of inductance 2 H is connected to a 150 V, 50 Hz supply is
    (a) 0.337 A   (b) 0.721 A   (c) 1.521 A   (d) 2.522 A

21 The electric current flowing in a wire in the direction from A to B is increasing. The direction of induced current if any, in the metallic loop kept above the wire is
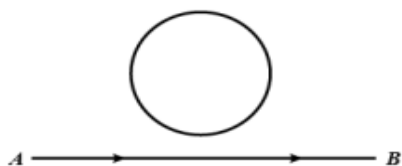
    (a) first clockwise and then anti-clockwise   (b) clockwise   (c) anti-clockwise
    (d) no current is induced in the coil

22 The self-inductance L of a solenoid of length l and area of cross-section A, with a fixed number of turns N increases as
    (a) l and A increase.   (b) l decreases and A increases
    (c) l increases and A decreases.   (d) both l and A decrease

23   An inductor and a light bulb are connected in series with an ac source through a key. The switch is closed and a soft iron core is then inserted into the interior of the inductor. What will happen to intensity of the bulb?

     (a) intensity of the bulb remains the same   (b) intensity of the bulb decreases.

     (c) intensity of the bulb increases.   (d) the bulb ceases to glow

24   Which of the following graphs represent the variation of current (I) with frequency (f) in an AC circuit containing a pure inductor?


     (a)   (b)   (c)   (d)
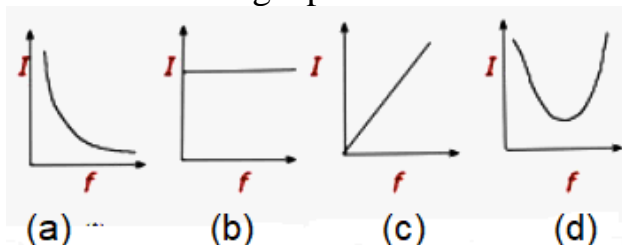
25   Which of the following combination should be selected for better tuning of an L.C.R circuit used for communication?

     (a) $R = 20\Omega$, L= 1.5H, C = 35µF   (b) $R = 25\Omega$, L= 2.5H, C = 45µF

     (c) $R = 15\Omega$, L= 3.5H, C = 30µF   (d) $R = 25\Omega$, L= 1.5H, C = 45µF
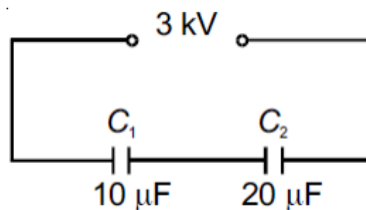
SECTION B

This section consists of 24 multiple choice questions with overall choice to attempt any 20 questions. In case more than desirable number of questions are attempted, ONLY first 20 will be considered for evaluation.

26   Two point charges + 8q and –2q are located at x = 0 and x = L, respectively. The location of a point on the X-axis at which the net electric field due to these two point charges is zero, is

     (a) 8 L   (b) 4 L   (c) 2 L   (d) L/4

28   Equal charges are given to two conducting spheres of different radii. The potential will

     (a) be more on smaller sphere   (b) be more on bigger sphere

     (c) be equal on both the spheres   (d) depend on the nature of materials of the spheres

29   SI unit of electric flux is

     (a) Vm   (b) $Wb\ m^{-2}$ (c) $C^2 N^{-1}\ m^{-2}$ (d) Vm^{-1}

30   Three charges are placed at the vertex of an equilateral triangle as shown in figure. For what value of Q, the electrostatic potential energy of the system is zero?
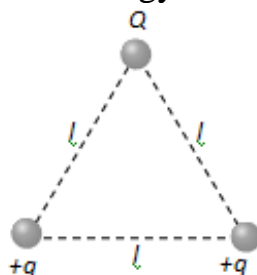

     (a) $-q$ (b) $q/2$ (c) $-q/2$ (d) $-2q$

31   The transformation ratio in the step-up transformer is
      (a) One   (b) greater than one
      (c)less than one   (d) greater or less than one depending on the other factors

32   In an a.c series circuit the instantaneous current is maximum when the instantaneous
      voltage is maximum. The circuit element connected to the source will be
          (a) pure inductor   (b) pure capacitor   (c) inductor and capacitor   (d) pure resistor

33
      Capacitors C_1 (10 µF) and C_2 (20 µF) are connected in series across a 3 kV supply, as
      shown. What is the charge on the capacitor C_1?

                                    3 kV

 C_1 C_2
                          ⊣⊢   ⊣⊢
                        10 µF   20 µF
          (a) 45000 µC   (b) 20000 µC   (c) 15000 µC   (d) 10000 µC

34   A cell of emf 10V with small finite internal resistance is charged with the help of an
      external battery. Terminal Potential drop across the cell while charging would be
          (a) greater than 10 V   (b) less than 10 V   (c) zero   (d) equal to 10 V

35   A strip of copper and another of germanium are cooled from room temperature to 80K.
      The resistance of
          (a) Each of them increases
          (b) Each of them decreases
          (c) Copper strip increases and that of Germanium decreases
          (d) Copper strip decreases and that of Germanium increases

36   A 100W, 200V bulb is being operated at 160V, the power dissipation is

          (a) 64W   (b) 32W   (c) 100W   (d) 160W

37   Find the value of the unknown resistance in the given meter bridge set up with null
      deflection in the galvanometer.

                          55 Ω   R

                            G

                    20 cm

          (a) 55 Ω   (b) 200 Ω   (c) 220 Ω   (d) 110 Ω
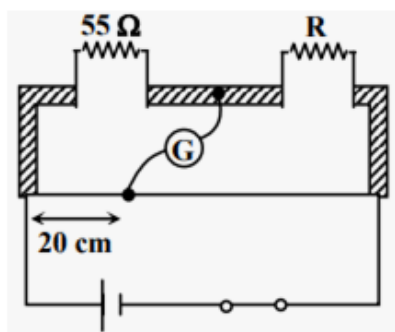
38 A magnetic needle, free to rotate in a vertical plane, orients itself vertically at a certain place on the Earth. The angle of dip at this place is
    (a) 0^0 (b) 90^0 (c) 45^0 (d) 11.3^0

39 In a series LCR circuit, voltages across an inductor, a capacitor and a resistor are 30V, 30V and 60V respectively. The phase difference between applied voltage and current in the circuit is
    (a) π rad   (b) zero   (c) $\pi/2$ rad   (d) $\pi/4$ rad

40 The correct plot of the magnitude of magnetic field $\vec{B}$ versus distance 'r' (r < R and r > R)

from the centre of a long straight wire of a circular cross section (radius R) carrying a steady current is
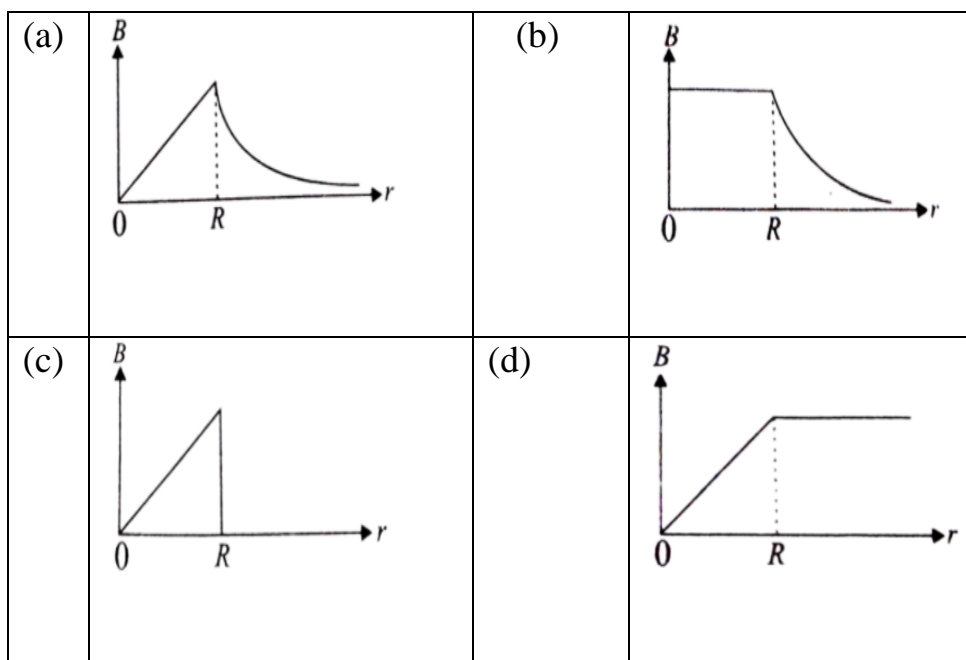
41 A circular coil of 50 turns and radius 7cm is placed in a uniform magnetic field of 4T normal to the plane of the coil. If the current in the coil is 6A, then torque acting on the coil is
    (a) 14.78 Nm   (b) 0 Nm   (c) 7.39 Nm   (d) 3.69 Nm

42 A pair of adjacent coils has a mutual inductance of 1.5 H. If the current in one coil changes from
0 to 20A in 0.5s, what is the change of flux linkage with the other coil?
    (a) 30 Wb   (b) 15 Wb   (c) 60 Wb   (d) 15 Wb

43 The instantaneous current and voltage of an ac circuit are given by I = (20 sin 314t) A and V = (30 sin 314t) V. Power dissipation in the circuit is
    (a) 500W   (b) 250W   (c) 300W   (d) 550W

44 The reactance of a capacitor at 50Hz is 30Ω. If the frequency is increased to 150 Hz, the new reactance is
    (a) 10 Ω   (b) 20 Ω   (c) 30 Ω   (d) 90 Ω

45   Given below are two statements labelled as Assertion (A) and Reason (R)
Assertion (A): Two parallel conducting wires carrying currents in same direction, come close to each other.
Reason (R): Parallel currents carrying conductors attract and anti-parallel current carrying conductors repel.
 Select the most appropriate answer from the options given below:
(i)   Both A and R are true and R is the correct explanation of A
(ii)   Both A and R are true but R is not the correct explanation of A.
(iii)   A is true but R is false.
(iv)   A is false and R is also false

46   **Given below are two statements labelled as Assertion (A) and Reason (R)**
Assertion (A): Electrons move from a region of lower potential to a region of higher potential.
Reason (R)   : An electron has a negative charge.
Select the most appropriate answer from the options 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

47   **Given below are two statements labelled as Assertion (A) and Reason (R)**
Assertion(A): The poles of a magnet cannot be separated by breaking into two pieces.
Reason (R)   : The magnetic moment will be reduced to half when a magnet is broken into two equal pieces.
Select the most appropriate answer from the options 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.

48   **Given below are two statements labelled as Assertion (A) and Reason (R)**
Assertion(A): If a proton and an alpha particle enter a uniform magnetic field perpendicularly with the same speed, the time period of revolution of alpha particle is double that of proton.
 Reason(R): In a magnetic field, the period of revolution of a charged particle is directly proportional to the mass of the particle and is inversely proportional to charge of particle.
Select the most appropriate answer from the options 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.

49   **Given below are two statements labelled as Assertion (A) and Reason (R)**
      Assertion (A): Galvanometer cannot be used as an ammeter to measure the value of
      current in a given circuit.
      Reason (R): It gives a full scale deflection for a current of the order of microampere.
      Select the most appropriate answer from the options 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.

                                    SECTION C
      **This section consists of 6 multiple choice questions with an overall choice to attempt
      any 5. In case more than desirable number of questions are attempted, ONLY first 5
      will be considered for evaluation.**

50   A dipole of dipole moment 'p' is placed parallel to electric field $\vec{E}$. Work done in rotating
      it from
      0^0 to 180^0 is
         (a) 2pE   (b) pE   (c) zero   (d) pE/2

51   A point charge +Q is placed at point O as shown in the given figure. The potential
      difference
      V_A-V_B is



         (a) Zero   (b) positive   (c) negative   (d) neither positive nor negative

      Case study:
      Read the following paragraph and answers the questions
      At power plant, a transformer increases the voltage of generated power by thousands of
      volts so that it can be sent of long distances through high-voltage transmission power
      lines. Transmission lines are bundles of wires that carry electric power from power plants
      to distant substations. At substations, transformers lower the voltage of incoming power
      to make it acceptable for high- volume delivery to nearby end-users. Electricity is sent at
      extremely high voltage because it limits so-called line losses. Very good conductors of
      electricity also offer some resistance and this resistance becomes considerable over long
      distances causing considerable loss.
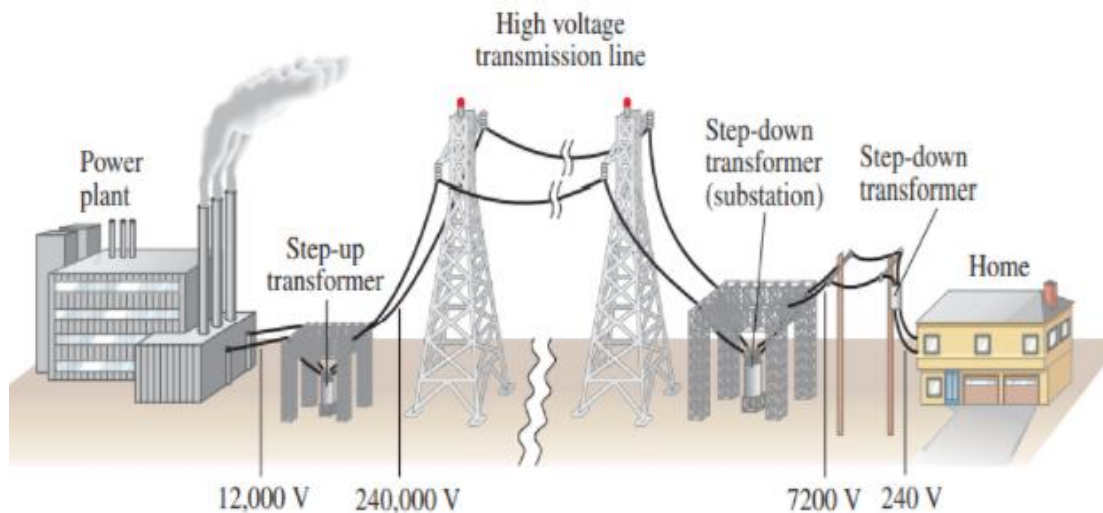
At generating station, normally voltage is stepped up to around thousands of volts. Power losses increase with the square of current. Therefore, keeping voltage high current becomes low and the loss is minimized.

52   The metal/alloy that is more suitable for making cores of transformers is
         (a) Steel   (b) Soft iron   (c) Copper   (d) Brass

53   Which of the following statement is true for long distance transmission of electricity?
         (a) Step-down transformer is used at generating station and step-up transformer is used at destination substation.
         (b) Step-down transformers are used at generating station and destination substation.
         (c) Step-up transformers are used at generating station and destination substation
         (d) Step-up transformer is used at generating station and step-down transformer is used at destination substation.

54   Why does stepping up voltages reduce power loss?
         (a) Since resistance of conductor decreases with increase of voltage
         (b) Since current decreases with increase of voltage at constant power
         (c) Both of the above
         (d) Since current increases with increase of voltage

55   The core of a transformer is laminated as
         (a) it improves the ratio of voltage in the primary and secondary may be increased.
         (b) it checks rusting of the core may be stopped.
         (c) it reduces energy losses due to eddy currents.
         (d) it increases flux linkage

End of the Question Paper