Class:XII ISC   **Subject: Physics (science)**

TIME: 1 Hr 30 mins   **M MARKS:70**

PHYSICS PAPER - 1 (THEORY)——

General Instructions
1. **There are 50 Questions.**
2.**ALL QUESTIONS ARE COMPULSORY**
3.**The marks intended for questions are given in brackets [ ].**
4. **Please fill OMR sheet with pencil.**
5. (**Candidates are allowed additional 15 minutes for only reading the paper.**)

Select the correct option for each of the following questions

(Q1 to Q38 – 1 mark each)

   Q1. An electro magnetic wave propagating along north has its electric field vector upwards. Its magnetic field vector point upwards:

(a) north

(b) east

(c) west

(d) downwards

Q2. Which value of the current do you measure with an a.c ammeter?

(a) Instantaneous current

(b) Root mean square value

(c) Electromotive force

(d) Peak current

Q3. The current in self inductance L= 40 mH is to be increased uniformly from 1 amp to 11 amp in 4 milliseconds.The e.m.f induced in inductor during process is

(a) 100 volt
(b) 0.4 volt
(c) 4.0 volt
(d) 440 volt

Q4. In a moving coil galvanometer , we use a radial magnetic field so that the galvanometer scale is:

(a) exponential
(b) linear
(c) algebraic
(d) logarithmic

Q5. A cubical region of space is filled with some uniform electric and magnetic fields. An electron enters the cube across one of its faces with velocity v and a positron enters via opposite face with velocity -v. At this instant,

(a) the electric forces on both the particles cause identical accelerations.
(b) the magnetic forces on both the particles cause equal accelerations.
(c) Only electron gains or looses energy.
(d) the motion of the centre of mass (CM) is determined by E alone.

Q6. Choose the correct option
Assertion: Free electrons always keep on moving in a conductor even then no magnetic force act them in magnetic field unless a current is passed through it.
**Reason : The average velocity of free electron is zero.**

(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(c) Assertion is correct, reason is incorrect
(d) Assertion is incorrect, reason is correct.

Q7. The current passing through a resistor in a circuit is 1 A when the voltage across the same resistor is 10 V. What is the value of Current when the voltage across the resistor is 8 V

(a) 0.8 A

(b) 8 A

(c) 80 A

(d) 18 A

Q8. A parallel plate capacitor is connected to a battery as shown below:
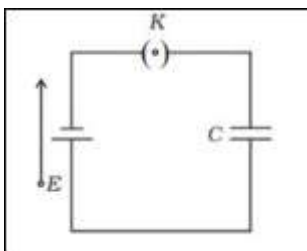
Consider two situations:

A. Key K is kept closed and plates of capacitors are moved apart using insulating handle.

B. Key K is opened and plates of capacitors are moved apart using insulating handle. Choose the correct option(s) 1

(a) In A : Q remains same but C changes.
(b) In B : V remains same but C changes.
(c) In A : V remains same and hence Q changes.
(d) In B : Q remains same and hence V changes.

Q9. A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is 10 V. The potential at a distance of 2cm from the centre of sphere is:

(a) Zero

(b) 10 V

(c) 5 V

(d) 10/3 V

Q10. Three charges Q ,+q , and+q are placed at the vertices of an equilateral triangle of side I shown in the figure. If the net electrostatic energy of the system is zero, then Q is equal to
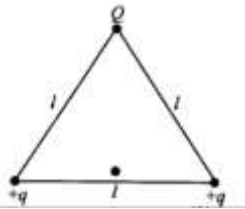
(a) -q
(b) +q
(c) zero
(d) $-\frac{q}{2}$

Q11. A thin , metallic , spherical shell contains a charge Q on it. A point charge q is placed at the centre of the shell and another charge q_1 is placed outside it as shown in the following figure. All the three charges are positive. The force on the charge at the centre is :
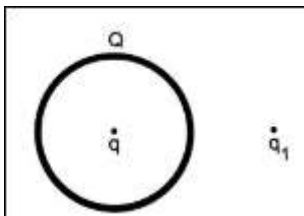
(a) toward left

(b) towards right

(c) upward

(d) zero

Q12.Corona discharge takes place:

(a) at the surface of a conductor

(b) near the sharp points of a conductor

(c) outside the conductor

(d) at the centre of the conductor

Q13. .According to Lenz's law there is a conversion of

(a) momentum
(b) collision
(c) voltage
(d) energy

Q14. The magnetic flux threading a coil changes from 12 Wb to 6 Wb in 1 second. What is the induced emf?

(a) 3 volt

(b) – 3 volt

(c) 6 volt

(d) – 6 volt

Q15. A current carrying a circular loop of radius R is placed in x-y plane with centre at the origin. Half of the loop x> 0 is now bent so that it now lies in y-z plane

(a) The magnitude of magnetic moment now diminishes
(b) The magnetic moment does not change
(c) The magnitude of B at $(0, 0, z)$, $z > R$ increases
(d) The magnitude of B at $(0, 0, z)$, $z \gg R$ is unchanged

Q16. The Gaussian Surface

(a) can pass through a continuous charge distribution.

(b) cannot pass through a continuous charge distribution.

(c) can pass through any system of discrete charges.

(d) can pass through a continuous charge distribution as well as any system of discrete charges.

Q16. What will be the value of sinØ when we use soft iron core in moving coil galvanometer(where Ø is the angle between the radial magnetic field and the surface of soft iron core)

(a) $\sin\theta = 0$.

(b) $\sin\theta = \infty$

(c) $\sin\theta = 1$

(d) None of these.

Q 17. The SI unit of electric flux is

(a) $N\ C^{-1}\ m^{-2}$

(b) $N\ C\ m^{-2}$

(c) $N\ C^{-2}\ m^{2}$

(d) $N\ C^{-1}\ m^{2}$

Q18. Radio waves do not penetrate in the band of

(a) ionosphere

(b) mesosphere

(c) troposphere

(d) stratosphere

Q19. In the case of an inductor

(a) voltage lags the current by $\pi/2$

(b) voltage leads the current by $\pi/2$

(c) voltage leads the current by $\pi/3$

(d) voltage leads the current by $\pi/4$

Q20. Direction of current induced in a wire moving in a magnetic field is found using

(a) Fleming's left hand rule
(b) Fleming's right hand rule
(c) Ampere's rule
(d) Right hand clasp rule

Q21. Which of the following materials is the most suitable for making a permanent magnet?

(a) Soft Iron

(b) Nickel

(c) Copper

(d) teel

Q22.The deflection θ is related to the electric current I in a galvanometer by the relation

(a) $I \propto \theta$

(b) $I \propto \tan \theta$

(c) $I \propto \sin \theta$

(d) $I \propto \cos \theta$

Q23. A short bar magnet has a magnetic moment of 0.65 JT^{-1}, then the magnitude and direction of the magnetic field produced by the magnet at a distance 8 cm from the centre of magnet on the axis is

(a) 2.5×10^{-4} T, along NS direction
(b) 2.5×10^{-4} T along SN direction
(c) 4.5×10^{-4} T, along NS direction
(d) 4.5×10^{-4} T, along SN direction

Q24. In a potentiometer of 10 wires , the balance point is obtained on the 7th wire. To shift the balance point to 9th wire, we should

(a) decrease resistance in the main circuit.
(b) increase resistance in the main circuit.
(c) decrease resistance in series with the cell whose emf is to be measured.
(d) increase resistance in series with the cell whose emf is to be determined.

**Q25.Four capacitors are connected as shown below in the figure:**
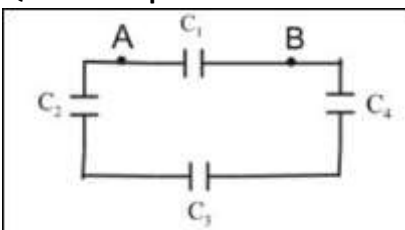
Here $C_1=2\mu F$, $C_2=3\mu F$, $C_3=4\mu F$ and $C_4=5\mu F$. The equivalent capacitance between A and B is

a 1.245 µF

b 4.446 µF

c 9 µF

d 3.27 µF

Q26. The electric potential V at any point O (x,y,z all in metres) in space is given by V = 4x² volt. The electric field at the point (1 m ,0, 2m) in volt/metre is

(a) 8 along negative x-axis

(b) 8 along positive x-axis

(c) 16 along negative x-axis

(d) 16 along positive z-axis

Q27. A charge q is placed at the centre of the open end of a cylindrical vessel (see the figure). The flux of the electric field through the surface of the vessel is
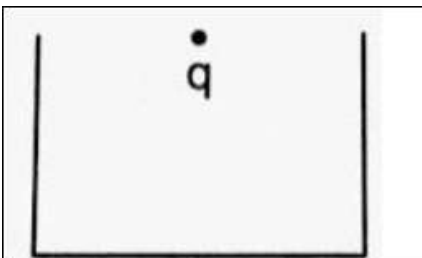
(a) zero

(b) q/ε_v

(c) $q/2\varepsilon_v$

(d) $2q/\varepsilon_v$

Q28. Ä unit Coulomb charge is one which placed in air at a distance of 1 m from an equal and similar charge repel it with a force of

(a) 9×10^9 N

(b) 1 N

(c) 1 dyne

(d) None of these.

Q29.The range of wavelength of visible light is

(a) 50 Å to 500 Å

(b) 4000 Å to 8000 Å

(c) 9000 Å to 25,000 Å

(d) 15,000 Å to 25,000 Å

Q30. An inductive circuit contains resistance of 10 ohms and an inductance of 2 henry. If an A.C voltage of 120 volts and frequency 60 Hz is applied to this circuit , the current would be nearly

(a) 0.32 A

(b) 0.16 A

(c) 0.48 A

(d) 0.80 A

Q31. What is the time period of visible light for which human eye is the most sensitive?

(a) 1.85×10^{15} s

(b) 1.85×10^{-15} s

(c) 3×10^8s

(d) 5×10^{16} s

Q32. The loss of energy in the form of heat in the iron core of a transformer is

(a) iron loss

(b) copper loss

(c) mechanical loss

(d) None of these

Q33. The self -inductance L of a solenoid of length I and area of cross section A, with a fixed number of turns N increases as

(a) I and A increase.
(b) I decreases and A increases.
(c) I increases and A decreases.
(d) both I and A decrease.

Q34. On what basis is the classification of electromagnetic waves done?

(a) Electromagnetic spectrum

(b) Electric field

(c) Magnetic field

(d) Propagation constant

Q35.The unit of intensity of electric field is:

(a) metre/volt

(b) Joule/newton

(c) Coulomb/newton

(d) Newton/coulomb

Q36. A magnetic nar of M magnetic moment is placed m the field of magnetic strength B, the torque acting on it is

(a) $\vec{M}.\vec{B}$
(b) $-\vec{M}.\vec{B}$
(c) $\vec{M} \times \vec{B}$.
(d) $\vec{B} \times \vec{M}$

Q37. Which of the folllowing type of radiation are radiated by an oscillating electric charge?

(a) Electric

(b) Magnetic

(c) Thermoelectric

(d) Electromagnetic

Q38. What is the time period of visible light for which human eye is most sensitive?

(a) 1.85×10^{15} s

(b) 1.85×10^{-15} s

(c) 3×10^{8} s

(d) 5×10^{16} s

(Q39 to Q44 --- 2 marks each)

Q39. (i) What is the rms value of the current , if its instantaneous current value is 8 sin314 t?

(a) $2\sqrt{4}$ A

(b) 10 A

(c) $4\sqrt{2}$ A

(d) 50 A

(b) What will be the rms value of the voltage , if the sinisoidal value voltage is given as E = 100 sin 314 t applied across a resistor of resistance 15 ohms?

(a) 200 V

(b) 70.71 V

(c) 100 V

(d) 33.87 V

40 (i)What is increased in step down transformer?

(a) Voltage

(b) Current

(c) Power

(d) Current density

(ii) In a transformer, number of turns in the primary coil are 140 and that in the secondary coil are 280. If the current in primary is 4 A then that in secondary is

(a) 4 A

(b) 2 A

(c) 6 A

(d) 10 A

41. (i) Which of the following statements is true about magnetic field intensity?

(a) Magnetic field intensity is the number of lines of force crossing per unit volume.

(b) Magnetic field intensity is the number of lines of force crossing per unit area.

(c) Magnetic field intensity is the magnetic induction force acting on a unit magnetic pole.

(d) Magnetic field intensity is the magnetic moment per unit volume.

(b) Let the magnetic field on the earth be modelled by that of a point magnetic dipole at the centre of earth. The angle of dip at a point on the geographical equator is

(a) always zero
(b) positive, negative or zero
(c) unbounded
(d) always negative

42. (a) What should be the order of current so that galvanometer gives full scale deflection?

(a) milli-ampere.

(b) kilo-ampere.

(c) mega-ampere.

(d) micro-ampere.

(b) Phospher-bronze wire is used in suspension because it has

(a) A large couple per unit twist

(b) A small couple per unit twist

(c) Low conductivity

(d) High Sensitivity

43. (a) Two protons move parallel to each other with equal speeds 3×10^2 m/s. The ratio of magnetic and electrical forces between them is :

(a) 10^{-6}
(b) 10^{-3}
(c) 10^{-9}
(d) 1

(b) A proton and a particle enter in a uniform magnetic field with the same velocity. The period of rotation of the α-Particle will be:

(a) four times that of the proton.
(b) three times that of the proton.
(c) two times that of the proton.
(d) same as that of the proton.

44 (i) Identify the principle behind the working of an a.c generator

(a) Eddy currents

(b) Faraday's law

(c) Lenz's law

(d) Electromagnetic induction

(ii)Identify the function of the phasor from the following

(a) Phasor is a vector quantity used to represent a sinusoidal signal

(b) Phasor is a scalar quantity used to represent a sinusoidal signal

(c) Phasor is a vector quantity used to represent a cosine signal

(d) Phasor is a scalar quantity used to represent a cosine signal

(Q 45 to Q 48 ---- 3 marks each)

45 (i)The Gaussian surface

(a) can pass through a continuous charge distribution.

(b) cannot pass through a continuous charge distribution.

(c) can pass through any system of discrete charges.

(d) can pass through a continuous charge distribution as well as any system of discrete charges.

(ii) Charge motion within the Gaussian surface gives changing physical quantity

(a) electric field

(b) electric flux

(c) charge

(d) gaussian surface area

(iii) Gauss's law is true only if the force due to a change varies as

(a) r^{-1}

(b) r^{-2}

(c) r

(d) r^{-4}

46 (i)Pick the correct statement from the following:

(a) If the point has a charge then the electric field is discontinuous at the point.

(b) Continuous electric field at a point

(c) Continuous electric field at a point if a charge is present at the point.

(d) At the point, the electric field is discontinuous if a negative charge is present at the point.

(ii)Pick the correct

(a) The glass rod gives protons to silk when they are rubbed against each other.

(b) The glass rod gives electrons to silk when they are rubbed against each other.

(c) The glass rod gains protons from silk when they are rubbed against each other.

(d) The glass rod gains electrons when they are rubbed against each other.

(iii) The conservation of electric charge implies:

(a) Charge can't be created

(b) Charge can't be destroyed

(c) The number of charged particle in the universe is constant

(d) Simultaneous creation of equal and opposite charges is permissible

47. (i) The polarisation of electromagnetic wave is in

(a) the directions of electric and magnetic field

(b) the directions of electric field

(c) the direction of magnetic field

(d) can not be polarized

(ii) Select the wrong statement,. EM waves

(a) are transverse in nature.

(b) travel in free space at a speed of light.

(c) are produced by accelerating charges.

(d) travel in all media with same speed.

(iii)The electromagnetic waves do not support

(a) energy

(b) charge

(c) momentum

(d) information

48.

(i) The coefficient of the self inductance of a solenoid is 0.18 m H. If the rod of soft iron of relative premeability 900 is inserted , then the coefficient of self-inductance will become nearly

(a) 5.4 mH
(b) 162 mH
(c) 0.006 mH
(d) 0.0002 mH

(ii) In an AC generator , a coil with N turns , all the same area A and total resitance R, rotates with freduency w in a magnetic field B. The maximum value of emf generated in the coil id

(a) N.A.B.R.w
(b) N.A.B.
(c) N.A.B.R.
(d) N.A.B.w

(iii) The radius of curvature of the path of charged particle in a uniform magnetic file is directly proportion to the

(a) charge on fie particle
(b) Momentum of particle
(c) energy of particle
(d) Strength of field

Q49-Q50 (4 marks each)

The teacher of Priti's school took the students on a study trip to a power generating station, [4] located nearly 250 km away from the city. The teacher explained that electrical energy is transmitted over such a long distance to their city, in the form of alternating current (ac) raised to a high voltage. At the receiving end in the city, the voltage is reduced to operate the devices. As a result, the power loss is reduced. Priti listened to the teacher and asked questions about how the ac is converted to a higher or lower voltage.

(i) What is the device used to change the alternating voltage to a higher or lower value?

   (a) Transformer   (b) Rectifier

   (c) Ammeter   (d) Voltmeter

(ii) What is the cause for power dissipation in the device referred to above?

   (a) Hysteresis   (b) Eddy current

   (c) Flux loss   (d) All of these

(iii) In the device used above, what is the relation between the power output and power input for an ideal case?

   (a) Power output is less than power input.   (b) Power output is greater than power input

   (c) Power output is equal to power input.   (d) It depends upon the situation

(iv) What source input should be used in this device?

   (a) A C source   (b) D C source

   (c) Half wave rectifier   (d) Full wave rectifier

49.

50.

An alternating e.m.f of 100V is applied to a circuit containing a resistance of 40 Ω [4]
and an inductance L in series. The current is found to lag behind the voltage by an
angle a = tan⁻¹ ¾.

(i) The inductive reactance in this case is:

(a) 40 Ω (b) 30 Ω

(c) 50 Ω (d) $10\sqrt{5}$ Ω

(ii) The impedance of the circuit is:

(a) 40 Ω (b) 30 Ω

(c) 50 Ω (d) $10\sqrt{5}$ Ω

(iii) The current flowing through the circuit is:

(a) 2.5 A (b) 3.33 A

(c) 2.0 A (d) $2\sqrt{5}$ A

(iv) If the inductance has a value of 0.096 H, and π = 3.14, the appro:
applied e.m.f.

(a) 40 Hz (b) 50 Hz

(c) 30 Hz (d) None of these