B-8-Z

Total No. of Questions : 4]   [Total No. of Printed Pages : 7

12ᵗʰARM(SZ)JKUT2024
1108-Z
PHYSICS

Time : 3 Hours]   [Maximum Marks : 70

SECTION-A   1 each

1. (i) A stationary charge produces :

    (A) An electric field

    (B) A magnetic field

    (C) Both electric and magnetic fields

    (D) An electromagnetic wave

    (ii) A soap bubble is given negative charge. Then its radius :

    (A) Decreases

    (B) Increases

    (C) Remains same

    (D) Nothing can be predicted

Turn Over

(iii) The reciprocal of resistance is :

(A) Conductance

(B) Specific resistance

(C) Voltage

(D) Current

(iv) Susceptibility is positive and small for :

(A) Paramagnetic

(B) Ferromagnetic

(C) Diamagnetic

(D) Non-magnetic

(v) The core used in transformer is laminated so as to :

(A) Reduce the magnetism in the core

(B) Reduce eddy current losses

(C) Increase the magnetic field

(D) Increase the magnetic flux

(vi) For a wave propagation in a medium, identify the property that is independent of the others :

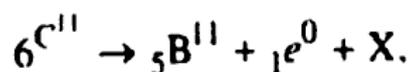(A) Velocity

(B) Wavelength

(C) Frequency

(D) All of these

(vii) Huygen's principle of secondary waves is used to :

(A) Obtain the new position of wavefront

(B) Explain principle of superposition of waves

(C) Explain interference phenomenon

(D) Explain polarisation

(viii) The unit of Planck's constant is :

(A) Nm

(B) eV

(C) JS^{-1}

(D) JS

(ix) In the nuclear reaction

$$_6C^{11} \rightarrow {}_5B^{11} + {}_1e^0 + X.$$

what does X stand for :

(A) An electron

(B) A proton

(C) A neutron

(D) A neutrino

(x) The barrier potential of silicon diode at room temperature is :

(A) 0.3 V

(B) 0.7 V

(C) 1 V

(D) 2 mV

(4)

SECTION-B

2. (a) Distinguish between electric potential and potential energy and state the relation between these.

(b) Explain why the inductance coils are made of copper.

(c) How are infrared waves produced ? Write their two important uses.

(d) Why does a tank filled with water appear shallow ?

(e) For glass-air interface, the critical angle is C. Will the critical angle for glass-water interface be greater or less than C ? Explain.

(f) A ray of light incident on an equilateral glass prism ($\mu_g = \sqrt{3}$) moves parallel to the base line of the prism inside it. Find the angle of incidence for this ray.

(g) Why do we fail to observe the diffraction from a wide slit illuminated by monochromatic light ?

(h) What are nuclear forces ? State their three properties.

(i) Write two important significances of binding energy per nucleon curve.

SECTION-C

3 each

3. (a) Using Kirchhoff's laws, derive the condition for balance of Wheatstone bridge.

(b) A 10 C charge flows through a wire in 5 minutes. The radius of the wire is 1 mm. It contains 5×10^{22} electrons per centimeter^3. Calculate current and drift velocity.

(c) What is an ammeter ? How can a galvanometer be converted into an ammeter ?

(d) State Lenz's law and show that it does not violate the law of conservation of energy. https://www.jkboseonline.com

(e) A capacitor of 1 μF is connected to source of a.c. having e.m.f. given by equation $E = 200 \cos 120 \pi t$. Find r.m.s. value of current through the capacitor.

(f) Calculate de-Broglie equation for a material particle.

(g) On the basis of Bohr's atomic model, find an expression for radius of nth orbit of a hydrogen atom.

(h) Explain the forward and reverse bias characteristic curve of a p-n junction.

(i) Distinguish between intrinsic and extrinsic semiconductors.

5 each

SECTION-D

4. (a) State Gauss's law in electrostatics. Derive an expression for the electric field due to an infinitely long straight charged wire at a point distant r from it. Plot a graph showing the variation of electric field with r.

Or

What is a capacitor ? Derive an expression for total capacitance when three capacitors of capacitances C_1, C_2 and C_3 are connected in (i) series (ii) parallel.

(b) What is magnetic dipole and magnetic field intensity ? Derive an expression for the torque acting on a bar magnet placed in a uniform magnetic field.

Or

Derive an expression for the force per unit length experienced by each of the two long current carrying conductors placed parallel to each other in air. Hence, define one ampere of current.

(c) What is interference of light ? Deduce the conditions for constructive and destructive interference in Young's double slit experiment.

Or

What is compound microscope ? With the help of ray diagram, explain the working of compound microscope. Find an expression for its magnifying power.

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