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PREBOARD EXAMINATION -II (2022-23)

SUBJECT : PHYSICS

CLASS : XII

Time : 3 hours Marks : 70

GENERAL INSTRUCTIONS-

1. *There are 35 questions in all. All questions are compulsory.*
2. *This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.*
3. *Section A contains eighteen MCQs of 1 mark each, Section B contains seven questions of 2 marks each, Section C contains five questions of 3 marks each, Section D contains three questions of 5 marks each and section E contains two case study based questions of 4 marks each.*
4. *There is no overall choice. However internal choice has been provided in section B, C and D. you have to attempt only one of the choices in such questions.*
5. *Use of is calculator is not allowed.*

SECTION A

1. Electric field at the surface of a black box indicates that the net outward flux through the surface of the box is 8.0×10^3 Nm /C. What is the net charge inside the box?

   a) 7 C b) 0.7 C

   c) 7 μC d) 0.07 μC

2. Electric potential at a point located far away from the charge is taken as:

   a) Unity b) Infinity

   c) Zero d) Finite value

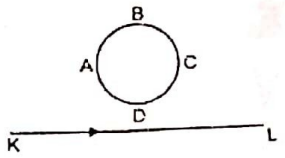
3. What is the value of potential difference across the ends of conductor of length L, when electric field E is applied in conductor?

a) E/L b) EL
c) L/E d) None of these

4. Which is the correct relation in vector form of Ohm's Law?

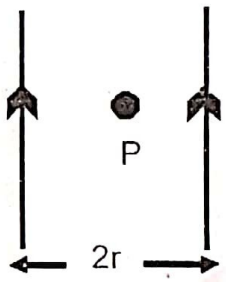
a) $\boldsymbol{E} = \boldsymbol{j}\ \sigma$ b) $\boldsymbol{j} = \sigma \boldsymbol{E}$
c) $\sigma = \boldsymbol{E}\ \boldsymbol{j}$ d) $\sigma = \boldsymbol{j}/\boldsymbol{E}$

5. The current flows from K to L as shown in figure. The direction of induced current in the loop is:



a) Clockwise b) Anticlockwise
c) Straight line d) No

6. Two long wires are set parallel to each other. Each carries a current I in the same direction and separation between them is 2r. The strength of magnetic field at a point P mid-way between the wire is.



a) $\mu_0 I/r$ b) $4\mu_0\ I/r$
c) zero d) $\mu_0 I/4r$

7. Which of the following statements is wrong for magnetic flux?

a) Magnetic flux can be negative.
b) Magnetic flux can be positive.
c) Magnetic flux can be zero.
d) Magnetic flux is always positive or negative.

8. The nature of parallel and antiparallel currents are

a) parallel currents repel and anti-parallel currents attract.
b) parallel currents attract and anti-parallel currents repel.
c) both currents attract.
d) both currents repel.

9. Induced emf in a coil can be increased by:

a) increasing the magnetic field b) decreasing the no of turns
c) increasing the no of turns d) both a and c

10. Which among the following is not a cause for power loss in a transformer?

a) Eddy currents are produced in the soft iron core of transformer.

b) Electric flux sharing is not properly done in primary and secondary coil.

c) Humming sound produced in the transformer due to magnetostatic.

d) Primary coil is made up of a very thin copper wire.

11. The phase difference between electric and magnetic field vectors in an em wave is:

a) zero b) 90°

c) 180° d) 360°

12. The intensity of bright and dark fringes are 9I and I respectively. The ratio of amplitude of two waves is given by:

a) 1 : 1 b) 1 : 4

c) 3 : 1 d) 2 : 1

13. The rest mass of a photon of wavelength λ is:

a) zero b) $h/c\lambda$

c) h/λ d) hc/λ

14. If 13.6 eV energy is required to ionise the hydrogen atom, then energy required to remove an electron fromn = 2 is

a) 10.2eV b) 0 eV

c) 3.4eV d) 6.8 eV

15. in Bohr's model of an atom which of the following is an integral multiple of $h/2\pi$?

a) Kinetic energy b) Radius of an atom

c) Potential energy d) Angular momentum

16. ASSERTION (A) and REASON (R) Type Question

Read the Assertion (A) and Reason (R) carefully and mark the correct option out of the options given below.

(a) If both Assertion (A) and Reason (R) are true and the reason is the correct explanation of the Assertion.

(b) If both Assertion (A) and Reason (R) are too true but reason is not the correct explanation of the Assertion.

(c) If Assertion (A) is true but Reason (R) is false.

(d) If the Assertion (A) is false and Reason (R) is also false.

Assertion (A): The width of central maxima of diffraction is 2 times as compared to other maxima.

Reason (R): Diffraction is superposition of a continuous family of waves originating from each point of single slit.

17. Assertion (A): Kinetic energy of photoelectrons emitted by a photo sensitive surface depends upon the intensity of incident photons.

Reason (R): The emission of electrons from metallic surface is possible with frequency of incident photon above the threshold frequency.

18. Assertion: Conductivity of an n-type semiconductor is greater than that of p-type semiconductor.

Reason: Electrons have greater mobility than holes.

SECTION B

19. Two-point charges 2μC and -2μC are placed at points A and B, 6 cm apart.

(i) Draw the equipotential surfaces of the system.

(ii) Why do the equipotential surfaces get closer to each other near the point charges?

20. Show diagrammatically the behavior of magnetic field lines in the presence of diamagnetic substance. Howdoes one explain this distinguishing feature?

21. Gamma rays and radio waves travel with the same velocity in free space.

Give one point of distinction between them and write any one application of each.

22. Write two characteristics of image formed when an object is placed between the optical centre and focus of a thin convex lens. Draw the graph showing variation of image distance 'v' with object distance u in this case.

23. A narrow slit is illuminated by a parallel beam of monochromatic light of wavelength λ equal to 6000 $\overset{0}{A}$ and the angular width of the central maximum in the resulting diffraction pattern is measured. When the slit is next illuminated by light of wavelength λ', the angular width decreases by 30%. Calculate the value of the wavelength λ'.

24. Draw energy level diagram for hydrogen atom and show the various line spectra originating due to transition between energy levels.

OR

The total energy of an electron in the first excited state of the hydrogen atom is about 3.4 eV. What is

a) the kinetic energy?

b) the potential energy of the electron?

25. Draw the energy band diagram when intrinsic semiconductor (Ge) is doped with impurity atoms of Phosphorous (P). Name the extrinsic semiconductor so obtained and majority charge carriers in it.

OR

a) How does the width of a depletion region of a p-n junction vary if doping concentration is increased?

b) In half wave rectification, what is the output frequency if input frequency is 25 Hz?

SECTION C

26. Write three points of differences between para-, dia- and ferro-magnetic materials, giving one example for each.

27. Explain with the help of a labelled diagram the principle, construction and working of a transformer.

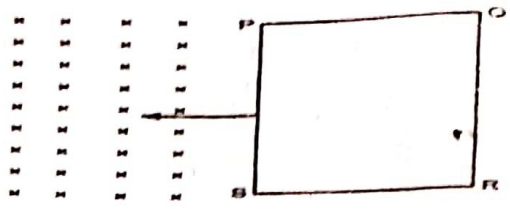
OR

Show that average power transferred to an alternating current carrying circuit is in general given by $P=E_{rms}I_{rms}\cos\Phi$ where the symbols have their usual meaning.

28. (a) A series LCR circuit is connected to an a.c. source whose frequency is less than the resonant frequency of the circuit. Which

one will you increase to improve the power factor of the circuit, L or C? Justify your answer.

(b) The closed loop PQRS is moving into a uniform magnetic field acting at right angle to the plane of the paper as shown in figure. State the direction in which the induced current flows in the loop.



29. (a) Explain de Broglie argument to propose his hypothesis. Show that de-Broglie wavelength of photon equals electromagnetic radiation.

(b) If. deuterons and alpha particle are accelerated through same potential, find the ratio of the associated de-Broglie wavelengths of two.

OR

State the main implications/Conclusion of observations obtained from various photoelectric experiments. Can these implications/ Conclusion be explained by wave nature of light? Justify your answer.

30. (a) What will be the ratio of the radii of two nuclei of mass number A_1 and A_2?

(b) What is the ratio of radii of the orbits corresponding to first excited state and ground state in a hydrogen atom?

SECTION D

31. (a) State Gauss's theorem in electrostatics. Apply Gauss's theorem to calculate electric field of a thin infinitely long straight line of charge, with a uniform charge density of λ c/m.

(b) In the figure there are three infinite long thin sheets having surface charge density $+2\sigma$, -2σ and $+\sigma$ respectively. Give the magnitude and direction of electric field at a point to the left of sheet of charge density $+2\sigma$ and to the right of sheet of charge density $+\sigma$.

OR

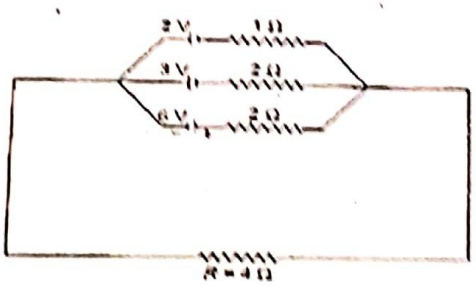
(a) Define an ideal electric dipole. Give an example.

(b) Derive an expression for the torque experienced by an electric dipole in a uniform electric field. What is net force acting on this dipole.

(c) An electric dipole of length 2 cm is placed with its axis making an angle of 60° with respect to uniform electric field of 10 N/C. If it experiences a torque of $8\sqrt{3}$ Nm, calculate the magnitude of charge on the dipole, and its potential energy.

32. (a) Two cells of emfs E1 and E2having internal resistances r_1, and r, are joined in parallel. Find out an expression for an equivalent emf and an internal resistance.

(b) Find out the current drawn by the circuit as shown below.



OR

(a) Distinguish between the emf and the potential difference across a cell.

(b) For two nichrome wires connected in series with a battery, how does the ratio of drift velocity of electronsin them depend on their (i) lengths and (ii) diameters.

33. Draw a schematic diagram of a reflecting telescope. Write down its construction and working. Also write two important advantages that the reflecting type telescope has over a refracting type.

OR

(a) Explain the basic difference between the construction and working of a telescope and a microscope.

(b) Draw a labelled diagram showing the formation of image of an object in microscope and also derive the formula for its magnifying power.

SECTION E

34. Read the following paragraph and answer the following questions.

When light travels from an optically denser medium to rarer medium at the interface, it is partly reflected back into the same medium and partly refracted to the second medium. This reflection is called total internal reflection. When light gets reflected by a surface, normally some fraction of it gets transmitted. Reflected ray is always less intense than the incident ray. Optical fiber is one the best example of total internal reflection.

(1) The light pipe is one of the examples of optical fibers. Which phenomena is used in it?

(2) What is the cause of sparkling of a diamond?

(3) Write the necessary conditions for the phenomenon of total internal reflection to occur.

(4) Define critical angle. What is the relation between critical angle and refractive index of a material?

35. Read the following paragraph and answer the following questions.

In forward bias arrangement, the p-side of a p-n junction is connected to the positive terminal of battery and n-side to negative terminal of battery, the current first increases very slowly till a certain threshold voltage is reached. Beyond this value, the diode current increases exponentially even for a very small increment in diode bias voltage. In reverse bias, the current suddenly increases at very high reverse bias. This is called breakdown voltage.

(1) Name a semiconductor device which emits visible light when it is forward biased.

(2) What is the approximate value of threshold voltage for a silicon diode?

(3) How does current under reverse bias of p-n junction depend on applied voltage?

(4) Draw V-I characteristic curve for p-n junction in forward bias.