



SECTION A

1. Select and write the correct answer for the following multiple choice type of 3 questions:

- i. The energy of photon of wavelength λ is _____.
[h = Planck's constant, c = speed of light in vacuum]
- (A) $hc\lambda$ (B) $\frac{h\lambda}{c}$
(C) $\frac{\lambda}{hc}$ (D) $\frac{hc}{\lambda}$
- ii. Cylindrical wavefront can be obtained from
- (A) point source of light. (B) light source like slit.
(C) light source like circle. (D) point source of light at infinity.
- iii. If Young's double slit experiment is done with white light, which of the following statements will be true?
- (A) All the bright fringes will be coloured. (B) All the bright fringes will be white.
(C) The central fringe will be white. (D) No stable interference pattern will be visible.

2. Answer the following questions: 3

- i. State Biot-Savart law.
- ii. Why was the wave theory of light accepted as a correct theory?
- iii. What is photoelectric effect?

SECTION B

Attempt any TWO questions of the following: 4

3. Explain what you understand by the de-Broglie wavelength of an electron. Will an electron at rest have an associated de-Broglie wavelength? Justify your answer.
4. Obtain expression for magnetic field at a distance r from straight current conducting wire using Ampere's law.
5. Explain the inverse linear dependence of stopping potential on the incident wavelength in a photoelectric effect experiment.
6. A. What is the shape of the wavefront at a point far away from the source of light?
B. Using the values of work function given in the following table, tell which metal will require the highest frequency of incident radiation to generate photocurrent.
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Metal	Work function	Metal	Work function
Potassium	2.3	Aluminium	4.3
Sodium	2.4	Tungsten	4.5
Calcium	2.9	Copper	4.7
Zinc	3.6	Nickel	5.0
Silver	4.3	Gold	5.1

SECTION C

Attempt any TWO questions of the following:

6

7. What are the conditions for obtaining good interference pattern? Give reasons.
8. Apply Biot-Savart law to infinitely long current carrying conductor.
9. The magnetic field at the centre of a circular current carrying loop of radius 12.3 cm is 6.4×10^{-6} T. What will be the magnetic moment of the loop?

SECTION D

Attempt any ONE question of the following:

4

10. Derive the conditions for bright and dark fringes produced due to diffraction by a single slit.
- 11.A. Mention some applications of photocell.
- B. A magnetic dipole of moment 40 mJ/T is free to rotate in a uniform magnetic field of induction 50 mT. When released from rest in the magnetic field, the dipole rotates to align with the field. At the instant the dipole moment is parallel to the field, its kinetic energy is $800 \mu\text{J}$. What was the initial angle between the dipole moment and the magnetic field?