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PRE-BOARD 3 EXAMINATION: 2024-25

SUBJECT: PHYSICS THEORY (second book) (042) TIME: 3 HOURS

CLASS: XII MM: 70

Section A: 1 mark (1 to 16 = 16 marks)

Q.1. The formation of depletion region in a p-n junction diode is due to
a) Movement of dopant atoms
b) Diffusion of both electrons and holes
c) drift of electrons only
d) drift of holes only

Q.2. A semiconductor device is connected in series with a battery, an ammeter and a resistor. A current flows in the circuit. If the polarity of the battery is reversed, the current in the circuit almost becomes zero. The device is
a) intrinsic semiconductor
b) n-type semiconductor
c) p-type semiconductor
d) p-n junction diode

Q.3. A hydrogen atom makes a transition from n = 5 to n = 1 orbit. The wavelength of photon emitted is 'A. The wavelength of photon emitted when it makes a transition from n = 5 to n = 2 orbit is

(a) $\frac{8}{7}\lambda$ (b) $\frac{16}{7}\lambda$

(c) $\frac{24}{7}\lambda$ (d) $\frac{32}{7}\lambda$

Q.4. The curve of binding energy per nucleon as a function of atomic mass number has sharp peak for helium nucleus. This implies that helium nucleus is
(a) Radioactive
(b) Unstable
(c) Easily fissionable
(d) More stable nucleus than its neighbors

Q.5. A photon of wavelength 663 nm is incident on a metal surface. The work function of the metal is 1.50 eV. The maximum kinetic energy of the emitted photo electrons is
(a) 3.0×10^{-20} J
(b) 6.0×10^{-20} J
(c) 4.5×10^{-20} J
(d) 9.0×10^{-20} J

Q.6. A ray of monochromatic light propagating in air, is incident on the surface of water. Which of the following will be the same for the reflected and refracted rays?

(a) Energy carried (b) Speed

(c) Frequency (d) Wavelength

Q.7. Specify the transition of electron in the wavelength of the line in the Bohr model of hydrogen atom which gives rise to the spectral line of highest wavelength

(a) n = 3 to n = 1 (b) n = 3 to n = 2

(c) n = 4 to n = 1 (d) n = 4 to n = 2

Q.8. In n type semiconductor the donor energy level lies at

(a) At the center of forbidden energy gap

(b) Above the conduction band

(c) below the valence band

(d) inside the conduction band

Q.9. Two nuclei fused (A<10) together to create a heavy nuclei, the

(a) Binding energy per nucleon increases

(b) Binding energy particular decreases

(c) Binding energy does not change

(d) total binding energy decreases

Q.10. What is necessary condition for interference of light?

a) same frequency

b) Coherent sources

c) Same direction

d) all of the above

Q.11. Which of the following experiment was not explained by wave theory ?

a) interference

b) Photoelectric effect

c) Diffraction

d) polarization

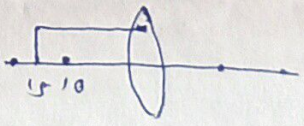
Q.12. When object is placed between F and 2F of convex lens Image is

a) Real and magnified

b) Virtual and magnified

c) Virtual and small

d) Real and small



For question 13- 16

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

(b) Both Assertion (A) and Reason (R) are true and Reason (R) is NOT the correct explanation of Assertion (A).

(c) Assertion (A) is true and Reason (R) is false.

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

Q.13. Assertion (A): In Young's double slit experiment all fringes are of equal width.

Reason (R): The fringe width depends upon wavelength of light used, distance of Screen from plane of slits (D) and slits separation (d).

Q.14. Assertion: Most of the mass of the atom is concentrated in its nucleus.
Reason: All alpha particles striking a gold sheet are scattered in different directions

Q.15. Assertion : the wave theory was able to explain the photoelectric effect
Reason: there is threshold Intensity which must be match for photoelectric effect to occur

Q.16. Assertion : If electron transfer from 1st to 2nd orbit of hydrogen it is speed will become four time
Reason: The speed of orbiting electron is proportional to principal quantum number n

Section B: 2 marks each, 5 questions (17 -21)

Q.17. What is effect of temperature on conductivity of conductor, insulator and semiconductor? ? Also draw simple diagram of forward and reverse type of biasing?

Q.18. When a biconvex lens of refractive index 1.25 is immersed into a liquid of refractive index 1.33 it becomes diverging explain why?

Q.19. Write formula for radius and velocity for electron revolving in the nth orbit of hydrogen like atoms?

Q.20. What is Einstein mass energy relation?

Q.21. Draw the diagram of photoelectric experimental setup?

Section C: 3 marks, 7 questions (22-28)

Q.22. Draw the wave front for point source, spherical source and source at infinite?

Q.23. Write all the hypothesis of Bohr?

Q.24. Distinguish between P type and N type semiconductor and explain why they are neutral?

Q.25. In a Young's double slit experiment, the separation between the two slits is d and distance of the screen from the slits is 1000 d. If the first minima falls at a distance d from the central maximum, obtain the relation between d and wavelength of light.

Q.26. Young double slit experiment write the condition for constructive and destructive interference and draw the curve of intensity with position on the screen.

Q.27. Write Huygens principle. Prove reflection by Huygens principle.

Q.28. What is refraction write snell's law and define total internal reflection.

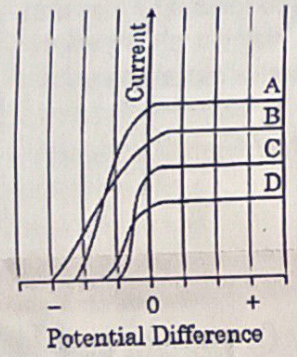
Section D: 4 marks 2 questions (29-30)

Q.29. Derive the Mirror formula.

Q.30. Define the mass defect and the binding energy per nucleon? How does it correlate with stability of nucleus? Draw the binding energy per nucleon versus the atomic mass number graph? and explain which material will go under nuclear fission and fusion reaction

Section E: 5 marks 3 question (31-33)

Q.31. Figure shows the variation of photoelectric current measured in a photo cell circuit as a function of the potential difference between the plates of the photo cell when light beams A, B, C and D of different wavelengths are incident on the photo cell. Examine the given figure and answer the following questions:



(a) Which light beam has the highest frequency and why?

(b) Which light beam has the longest wavelength and why?

(c) Which light beam ejects photoelectrons with maximum momentum and why?

(d) What is the effect on threshold frequency and stopping potential on increasing the frequency of incident beam of light? Justify your answer

Q.32. Draw a labelled ray diagram showing the image formation by a refracting telescope. Define its magnifying power. Write two limitations of a refracting telescope over a reflecting telescope.

Q.33. Derive for prism

A) Deviation formula

B) Deviation formula for small prism

C) Refractive index formula

Also draw the curve for incident angle and angle of minimum deviation?