FIRSTS PRE- BOARD EXAMINATION 2020-2021

Class: XII | **Time: 3hrs**
Subject: Physics | **Mark: 80**

Section A (1x12=12)
Answer all questions.

A. i) A lens which can be form virtual as well as real image

a) Concave
b) Convex
c) Plano convex
d) Concavo convex

ii) In Young's double slit experiment, the slit separation is made 3-fold. The fringe width becomes:

a) 1/3 times
b) 1/9 times
c) 3 times
d) 9 times

iii) In photoelectric emission process from a metal of work function 1.8 eV, the Kinetic energy of most energetic electrons is 0.5eV. The corresponding stopping potential is

a) 2.3V
b) 1.8V
c) 1.3V
d) 0.5V

iv) The total energy of electron in nth stationary orbit of hydrogen atom is,

a) $13.6/n^2$ J
b) $13.6/n^2$ eV
c) $-13.6/n^2$ eV
d) $-13.6/n^2$ J

v) When an impurity is doped in to an intrinsic semiconductor, the resistance of the semiconductor

a) increase
b) decrease
c) remains unchanged
d) becomes zero

B. i) What is the effect in fringe width if the distance between the coherent source is decreased?

ii) According to Huygens's which factor depends the colour of a wave

iii) Name the effect which couldn't be explained by Huygens's wave theory?

iv) Does each and every incident photon essentially eject an electron?

v) Define stopping or cut off potential

vi) What is the order of magnitude of the radius of an atomic nucleus

vii) Write any two examples for donor and acceptor impurities

Section B(2x12=24)
Answer all questions

1. a) Although the surface of goggles' lens(sun glasses) is curved, it does not have any optical power. Why?

OR

b) Show with the help of a diagram, the deviation produced by a prism.

2. What is dispersion and angular dispersion? Derive an expression for the angular dispersion produced by small angled prisms

3. The diffraction pattern becomes invisible when the slit is very wide. Why?

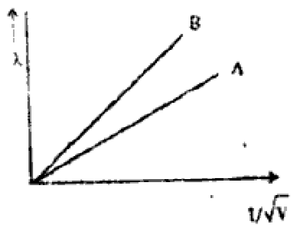
4. If the frequency of the incident radiation on the cathode of a photocell is doubled, how will the following change?

   (a) Kinetic energy of electrons

   (b) Photoelectric current. State reasons to justify your answer.

5. a) Two lines A and B shown in the graph represent the de Broglie wavelength(λ) as a function of

$\sqrt{V}$ (V is the accelerating potential) for two particles having the same charge. Which of the two represents the particle of smaller mass?



OR

b) Explain the meaning of photoelectric work function of a metal. How does it's value effect the kinetic energy of the liberated photoelectron

6. What is meant by pair production? Explain with the help of an example and a balanced equation.

7. Why neutron is more effective as bombarding particle?

8. Find the angular momentum of an electron when it is in the second orbit of hydrogen atom.

9. Distinguish between nuclear fission and fusion

10. How p-type semiconductors are produced?

11. Define V-I characteristics of a junction diode.

12. Mention advantages of LEDs over an incandescent lamp

Section C(3x8=24)
Answer all questions

13. Derive the Gaussian form of lens equation

14. a) Derive the formula connecting the object distance u, image distance v and radius of curvature R of spherical refracting surface.

b) Derive an expression for the angle of deviation of a small angled prism in terms of the refractive index and angle of prism. Give a proper diagram.

15. Derive Snell's law of refraction using Huygens's principle.

16. Draw a sketch to show the variation of binding energy per nucleon with mass number. What special features of this curve predict the possibility of energy release in nuclear fusion and fission reactions?

17. What do you mean by the distance of closest approach of an alpha particle in Rutherford experiment. Derive the expression.

18. Describe de-Broglie concept of matter waves and obtain an expression for the momentum and wavelength of the particle.

19. State any three Bohr's postulates and write the energy value of the ground state of the hydrogen atom.

20. a) Explain the formation of energy bands in solids and also explain the features of energy band diagram of n-type and p-type semiconductors.

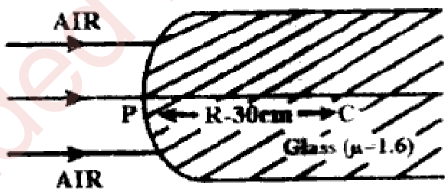
OR

b) The number of silicon atoms per m^3 is 5×10^{28}. This is doped simultaneously with 5×10^{22} atoms per m^3 of Arsenic and 5×10^{20} per m^3 atoms of Indium. Calculate the number of electrons and holes. Given that $n_i = 1.5\times10\ 16\ /m^3$. Is the material n-type or p-type?

Section D(4x5=20)

Answer all questions

21. a)Figure shows a parallel beam of monochromatic light incident on a convex spherical surface, radius of curvature R=30cm, which separates glass(refractive index =1. 6) from air. Find the position of the image formed due to refraction of light at this single spherical surface.



OR

b) i. Define dispersive power of the material of the prism.

ii. The refractive indices of a prism for violet, yellow, red colours are 1.632, 1.620, and 1.613 respectively. Calculate the dispersive power of material of the prism.

22. a) i. In Young's double slit experiment the monochromatic source of light is replaced by white light source. The central fringe will be bright or dark?

ii. The distance between the first and the sixth bright fringes formed in Young's double slit experiment (measured by a spectrometer) is found to be 12.5 mm. The separation between the s' is 0.12 mm and the distance of the screen from the slits is 60 cm. Calculate ,the fringe width a the wavelength of the light used (in nm).

b) i. What is de-Broglie wavelength?

ii. Electrons initially at rest are passed through a potential difference of 2kV. Calculate their, final velocity and de-Broglie wavelength

23. a) i. How intensity of radiation affect the KE and photo current

ii. The threshold frequency for a certain metal is 3.3×10^{14} Hz is incident on the metal, predict the cut off voltage for the photoelectric emission.

OR

b. i) Express the relation between binding energy and mass defect

ii) Calculate the energy equivalent (in MeV) of 1/12th of the mass of C-12.

24. i) Explain Full wave rectification of an AC with proper diagram.

ii) What is the necessity of center taping?