

Reg. No

Name

22U336

B. Sc. DEGREE END SEMESTER EXAMINATION : OCTOBER 2022

SEMESTER 3 : COMPLEMENTARY PHYSICS FOR CHEMISTRY

COURSE : 19U3CPPHY6 : MODERN PHYSICS AND MAGNETISM

(For Regular - 2021 Admission and Improvement / Supplementary - 2020 / 2019 Admissions)

Time : Three Hours

Max. Marks: 60

PART A

Answer any 8 (2 marks each)

1. Give the spectral terms corresponding to $L=2$ and $S=1/2$.
2. Distinguish between group velocity and wave velocity.
3. What makes the nucleus positively charged? Will it retain its positive charge even after positron emission?
4. Give Rydberg's formula to calculate the wavenumber of spectral lines of Hydrogen.
5. Give the diode equation.
6. Write down Schrödinger's time independent wave equation in three dimensions and mention the symbols.
7. What are magnetographs?
8. What is meant by a normalised wave function?
9. Comment about horizontal and vertical components of earth's magnetic field, at poles.
10. What is radioactive equilibrium?

(2 x 8 = 16)

PART B

Answer any 6 (4 marks each)

11. Estimate the de Broglie wavelength associated with an electron having kinetic energy 15 eV.
12. The work function of barium and tungsten are 2.5eV and 4.2eV respectively. Check whether these materials are useful in a photocell, which is to detect visible light.
13. In a CE configuration, current amplification factor is 60. Find emitter current for a base current of 20 micro amperes.
14. Obtain the B.E. of the nuclei of ${}_{26}\text{Fe}^{56}$ and ${}_{83}\text{Bi}^{209}$ from the following data: $m_{\text{H}} = 1.007825 \text{ u}$, $m_{\text{N}} = 1.008665 \text{ u}$, $m({}_{26}\text{Fe}^{56}) = 55.934939 \text{ u}$, $m({}_{83}\text{Bi}^{209}) = 208.980388 \text{ u}$.
15. Calculate the mean life and half life of a radioactive sample whose disintegration constant happens to be 0.0021/years.
16. A center tap fullwave rectifier has diodes with 20 ohm internal resistance, each. The rms secondary voltage with respect to center tap to each end is 50 V and the load resistance is 980 ohms. Find the mean and rms load currents

17. Explain dia, para and ferromagnetic materials. Distinguish between them in terms of susceptibility and relative permeability.
18. From a sodium surface, light of wave length 3125\AA and 3650\AA causes emission of electrons whose kinetic energy is 2.128 eV and 1.595 eV, respectively. Estimate Planck's constant .
(4 x 6 = 24)

PART C

Answer any 2 (10 marks each)

19. Make a brief note on earth's magnetism and elements of earth's magnetism. Explain the construction of a dip circle and how it can be used to determine the elements of earth's magnetism at a location.
20. Briefly describe the properties of various radiation emitted by a radioactive sample. State the law of radioactive disintegration. Arrive at the expression for the number of radioactive atoms of a radioactive material remaining after an interval of time.
21. Discuss the three transistor configurations as well as obtain expressions and relations between the associated amplification factors.
22. Set up the schrodinger equation for a particle in a cubical box and obtain its energy eigen value.

(10 x 2 = 20)