TB213475V **Reg. No :.....**

Name :.....

B. Sc. DEGREE (C.B.C.S) EXAMINATION, NOVEMBER 2022

(2021 Admissions Regular,2020 Admissions Supplementary/Improvement,2019 & 2018 Admissions Supplementary)

SEMESTER III - COMPLEMENTARY COURSE 2(PHYSICS)

PH3C01B18 - MODERN PHYSICS, BASIC ELECTRONICS AND DIGITAL ELECTRONICS

(For Maths)

Time : 3 Hours **Maximum Marks : 60**

Part A

I. Answer any Ten questions. Each question carries 1 mark. **(10x1=10)**

1. Mention the spectral series of Hydrogen atom.
2. Give the expression for the two momenta associated with an electron.
3. Give the selection rules by Vector atom model.
4. Write the term symbol of a state with L = 1 and S=½
5. Briefly explain the failures of Classical Mechanics in explaining the black body spectrum.
6. Define matter wave. Calculate the de Broglie wavelength associated with a ball of mass 46g moving with a velocity of 2500cm/s.
7. Explain how Davisson Germer experiment proved the existence of matter wave.
8. An electron has a speed 1.05×10^{4}m/s within an accuracy of 0.01%. Calculate the uncertainty in the position of the electron. Given mass of electron = 9.1×10^{-31} kg, Planck's constant, h = 6.625×0^{-34}Js.
9. Distinguish between isotopes and isobars.
10. List any three properties of alpha rays.
11. Distinguish between N type and P type semiconductors.
12. List the OR rules of Boolean algebra.

Part B

II. Answer any Six questions. Each question carries 5 marks. **(6x5=30)**

13. Calculate (a) the wave number (b) wavelength and (c) frequency of Hα line of Hydrogen. Find the wavelength of Balmer series limit.
14. Explain L-S coupling with its vector diagram.
15. In the CO molecule the wave number differrence between the successive absorption lines in the pure rotational spectrum is $384m^{-1}$, Calculate the moment of inertia and equlibrium bond length of the molecule. Masses of $C^{12}$and O^{16} atoms are respectively 1.99×10^{-26} kg and 2.66×10^{-26} kg .
16. Review the Einstein's explanation for photoelectric phenomena. Photoelectrons are emitted from Potassium with a speed of 10^{4} ms^{-1}. If the photoelectric work function of Potassium is 2.3eV, calculate the frequency of incident radiation.
17. Calculate the binding energy of an α particle. Assume the mass of α particle as 4.001506 u. Masses of proton and neutron are 1.007276 u and 1.008665 u respectively.
18. A half wave rectifier uses a transformer of turn ratio 10:1. An ac voltage of 220V (rms), 50Hz is applied to the primary. The diode resistance is 100 ohms and load resistance is 900 ohms. Find the average load current and dc output voltage.
19. A transistor with α = 0.998 is connected in CE mode. The potential difference across 10 kΩ resistance connected in the collector circuit is 10 V. Find base current, emitter current, collector current and current gain.

20. Discuss the XOR and XNOR gates.
21. State and prove De Morgan's theorems.

Part C

III. Answer any Two questions. Each question carries 10 marks. (2x10=20)

22. Derive rotational energy of a rigid diatomic molecule and hence explain its rotational spectrum with energy level diagram.
23. Express the Schrodinger equation for a particle in a box and obtain the expression for energy.
24. Discuss the properties of nucleus.
25. Describe the working of a full wave centre tap rectifier with the help of a neat diagram. Give the input and output waveforms and obtain the expression for its efficiency and ripple factor.