BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)
B. Tech. Sem - I CHEMICAL : WINTER- 2022
SUBJECT : MATERIAL & WAVE PHYSICS

Day : Friday | Time : 10:00 AM-01:00 PM

Date : 13-01-2023 | W-24047-2022 | Max. Marks : 60

N.B.

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable calculator is allowed.
4) Assume suitable data wherever necessary.
5) Draw neat and labelled diagrams **WHEREVER** necessary

Constant:

$e = 1.6 \times 10^{-19}$ C
$m_e = 9.1 \times 10^{-31}$ kg
$h = 6.63 \times 10^{-34}$ J–s
$m_p = 1.66 \times 10^{-27}$ kg
$N_a = 6.025 \times 10^{23}$ atoms/gm-mole

Q.1 Explain in detail LS and JJ coupling. Draw the necessary diagrams. **(10)**

OR

With neat labelled diagram explain in detail vector atom model.

Q.2 State and explain physical significance of wave function ψ. **(10)**

An electron is bound by a potential box of infinite height. The width of box is $1.5A^0$. Calculate uncertainty in its velocity.

OR

Derive the necessary derivation for Schrödinger's time dependent wave equation.

Q.3 State and explain any two crystal defects in detail. **(10)**

OR

State and explain Moseley's law for characteristics x-ray spectrum. Explain any two applications of x-rays.

Q.4 Explain any five applications of nanoparticles. **(10)**

OR

Write a short note on: i) Top-down Nano-fabrication method.
ii) Direct and indirect band gap semiconductors.

Q.5 What is Non-Destructive Testing (NDT). Explain A, B and C-scan display in NDT. **(10)**

OR

Explain in detail production of ultrasonic waves by magnetostriction method.

Q.6 Explain any three applications of interference. **(10)**

A grating has 15000 lines/inch. Calculate the angular separation of two yellow spectral lines of wavelength $5890\ A^0$ and $5896\ A^0$ in second order spectrum.

OR

Write a note on: i) Positive crystal ii) Dichroism.

A slit is illuminated by a wavelength of 690 nm. Calculate the slit width if first minima is observed at 30^0.

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