

FYUGP/4th Sem/26(NEP)New

2026

Four Year Under Graduate Programme (FYUGP)

4th Semester Examination (Under NEP)

(New Session 2024-25)

CHEMISTRY (Major)

Paper Code : CEMMJ DC-402

(Inorganic-IV)

Full Marks : 30

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

1. Answer any four questions :

1×4=4

- ☒ (a) What is the bond order of (C_2^{2-}) ion?
- ☒ (b) Solubility of ortho-nitrophenol and para-nitrophenol in water are different. Explain.
- (c) Define extrinsic semiconductor. Give one example.
- (d) What do you mean by nuclear spallation reaction? Cite one example.

P.T.O.

(2)

- (e) How many α - and β -particles will be emitted when ${}^{238}_{92}\text{U}$ is changing to an isotope of ${}^{210}_{82}\text{Pb}$?

(f) Why combination of two s orbitals cannot form a π -bond?

2. Answer any six questions : $2 \times 6 = 12$

(a) Why is germanium preferred over ^{Ge 32}silicon as semiconductor materials? ^{4Si}

(b) Write down four important differences between chemical equilibrium and radioactive equilibrium.

(c) Of the three hydrogen species H_2 , H_2^+ and H_2^- ; which one is least stable and why?

(d) ${}^{218}_{84}\text{Po}$ undergoes one α emission and followed by two successive β particle emissions. What is the final product nuclide and also mention the relationship between the initial and final nucleus?

(e) Differentiate between Schottky defect and Frenkel defect. B

(f) Write down the consequence of metal-deficiency defect.

(g) Explain the conduction of electricity in Be and Li metals with the help of band theory. VB, CB

Be

Li

(3)

(h) Differentiate between transient and secular radioactive equilibrium.

(i) With suitable explanation, arrange O_2 , O_2^{2-} , O_2^{2+} , O_2^+ in order of their increasing bond strength.

(j) 'White ZnO turns yellow on heating' — Explain.

3. Answer any two questions : $7 \times 2 = 14$

(a) (i) Write down the fundamental assumptions of 'Liquid drop model' of nuclear stability.

(ii) HF_2^- exists while other halogens cannot form such stable species. Explain. $\checkmark$

(iii) Explain the effect of increase in temperature on the conductance of metals and semiconductors. $3+2=5$

(b) (i) Based on MO theory compare the relative bond dissociation energies of NO and N_2 . $\checkmark$

(ii) Which radioactive decay series is known as artificial disintegration series and why?

(iii) A sample of uranium ($t_{1/2} = 4.5 \times 10^9$ years) ore is found to contain 11.9g of ${}^{238}\text{U}$ and 10.3g of ${}^{206}\text{Pb}$. Calculate the age of the ore. $3+2=5$

$t = ?$

P.T.O.

GN-8/20 - 500

$B.O \propto \text{stability}$

(4)

- (c) (i) What do you mean by packing fraction? What is its significance related to the nuclear stability?
- (ii) What is the n/p ratio in ^{24}Na ? How do you expect it to decay?
- (iii) HF forms stronger H-bonds than H_2O , though ΔH_{vap} of HF is lower than that of H_2O . Explain. 3+2+2
- (d) ~~(i)~~ Draw the MO diagram of HF and calculate its bond order. ✓
- ~~(ii)~~ Write down the essential conditions for the linear combination of atomic orbitals relating to the formation of molecular orbital. ✓
- (iii) Mention the important characteristics of nuclear forces. 3+2+2
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