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Time: 1.30 hours.

Part - I

15 x 1 = 15

I. Choose the correct answer:

- The reduction process used for Hg from HgS is
 - reduction by carbon
 - reduction by hydrogen
 - reduction by metal
 - auto reduction
- Which of the following is used for concentrating ore in metallurgy?
 - leaching
 - roasting
 - Forth floatation
 - both (a) and (c)
- Which of the metal is extracted by Hall-Heroult process?
 - Al
 - Ni
 - Cu
 - Zn
- Which is employed as a styptic agent to arrest bleeding?
 - borax
 - alum
 - boric acid
 - HF₄
- Thermodynamically the most stable form of carbon is
 - diamond
 - graphite
 - fullerene
 - none of these
- The basic structural unit of silicates is
 - (SiO₃)²⁻
 - (SiO₄)²⁻
 - (SiO)⁻
 - (SiO₄)⁴⁻
- An example for tecto silicates is
 - quartz
 - mica
 - asbestos
 - thortveitite
- The ratio of radius of cation and anion $\left(\frac{r_c}{r_a}\right)$ is 0.548, then the structure is
 - cube
 - octahedral
 - tetrahedral
 - trigonal planar
- In CsCl unit cell edge length is 400 pm, its inner atomic distance is
 - 400 pm
 - 800 pm
 - $\sqrt{3} \times 100$ pm
 - $\frac{\sqrt{3}}{2} \times 400$ pm
- An example for hydrogen bonded molecular solids
 - solid NH₃
 - naphthalene
 - glucose
 - diamond
- The vacant space in bcc lattice unit cell is
 - 48%
 - 23%
 - 32%
 - 26%
- The addition of a catalyst during a chemical reaction alters which of the following quantities?
 - enthalpy
 - activation energy
 - entropy
 - internal energy
- An example for a zero order reaction
 - isomerisation of cyclopropane to propene
 - decomposition of N_2O on hot platinum surface
 - decomposition of dinitrogen pentoxide
 - decomposition of thionyl chloride
- The rate constant of a reaction is $5.8 \times 10^{-2} \text{ s}^{-1}$. The order of the reaction is
 - first order
 - zero order
 - second order
 - third order
- What is the activation energy for a reaction, if its rate doubles when the temperature is raised from 200 K to 400 K? ($R = 8.314 \text{ J K}^{-1} \text{ Mol}^{-1}$)
 - 234.65 KJ Mol⁻¹ K⁻¹
 - 434.65 KJ Mol⁻¹ K⁻¹
 - 434.65 J Mol⁻¹ K⁻¹
 - 334.65 J Mol⁻¹ K⁻¹

Part - II

II. Answer any 4 questions: (Ques.No.21 is compulsory)

4 x 2 = 8

16. Distinguish minerals and ores.
17. Explain calcination with an example.
18. Draw the structure of CO and CO₂.
19. Write a note on the assignment of atoms per unit cell in fcc.
20. Write Arrhenius equation and explains the term involved.
21. Atom 'X' is present at the corners of the cube and atom 'Y' is at the centre of the cube in bcc crystalline structure. What is the formula of the compound?

Part - III

III. Answer any 4 questions: (Ques.No.27 is compulsory)

4 x 3 = 12

22. Explain the principle of electrolytic refining with an example.
23. Write a note on Zeolites.
24. Give an example for the following bonds containing molecules.
 - a) 2c - 2e⁻ bond
 - b) 3c - 2e⁻ bond
 - c) 3c - 4e⁻ bond
25. Explain briefly seven types of unit cell.
26. Write the rate law for the following reactions:
 - a) A reaction that is $\frac{3}{2}$ order in 'X' and zero order in 'Y'
 - b) A reaction that is second order in 'NO' and first order in 'Br₂'
27. The rate constant for a first order reaction is $1.54 \times 10^{-3} \text{ s}^{-1}$. Calculate its half life time.

Part - IV

IV. Answer all the questions:

3 x 5 = 15

28. a) Explain concentration by magnetic separation with diagram.
(or)
b) i) How is borax extracted from colemanite?
ii) How will you identify borate radical?
29. a) Derive integrated rate law for a first order reaction.
(or)
b) i) Define Unit cell.
ii) Calculate the percentage efficiency of packing in case of simple cubic crystal.
30. a) i) How are point defects classified?
ii) Give the differences between order and molecularity of a reaction.
(or)
b) i) Out of coke and CO, which is better reducing agent for the reduction of ZnO?
ii) Give the uses of carbon dioxide.