

A**7035**Register
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Part III — CHEMISTRY

(English Version)

Time Allowed : 3 Hours]

[Maximum Marks : 150

Note : Draw diagrams and write equations wherever necessary.

PART - I

Note : i) Answer all the questions.

ii) Choose and write the correct answer. $30 \times 1 = 30$

- Which compound is formed when excess of KCN is added to an aqueous solution of copper sulphate ?
 - $\text{Cu}(\text{CN})_2$
 - $\text{K}_2[\text{Cu}(\text{CN})_6]$
 - $\text{K}[\text{Cu}(\text{CN})_2]$
 - $\text{Cu}_2(\text{CN})_2 + (\text{CN})_2$
- Alloys of Lanthanides are called as
 - Mish metals
 - Metalloids
 - Plate metal
 - actinides.
- Lanthanide contraction is due to
 - perfect shielding of 4f electrons
 - imperfect shielding of 4f electrons
 - perfect shielding of 3d electrons
 - imperfect shielding of 3d electrons.
- An example of a chelating ligand is
 - nitro
 - chloro
 - bromo
 - en.

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5. ${}_{92}\text{U}^{235}$ nucleus absorbs a neutron and disintegrates into ${}_{54}\text{Xe}^{139}$, ${}_{38}\text{Sr}^{94}$ and X. What is X ?
- a) 3 neutrons
b) 2 neutrons
c) α -particle
d) β -particle.
6. The $t_{1/2}$ of a first order reaction is 100 minutes. The rate constant of the reaction is
- a) $6.93 \times 10^3 \text{ min}^{-1}$
b) $0.693 \times 10^{-3} \text{ min}^{-1}$
c) $6.93 \times 10^{-3} \text{ min}^{-1}$
d) $69.3 \times 10^{-2} \text{ min}^{-1}$.
7. Colloidal medicines are more effective because
- a) they are clean
b) they are easy to prepare
c) the germs move towards them
d) they are easily assimilated and adsorbed.
8. The decomposition of hydrogen peroxide in the presence of colloidal platinum is a / an
- a) positive catalysis
b) negative catalysis
c) auto-catalysis
d) induced catalysis.
9. For chemisorption which is wrong ?
- a) It is irreversible
b) It requires activation energy
c) It forms multilayers on adsorbate
d) Surface compounds are formed.
10. For the titration between oxalic acid and sodium hydroxide, the indicator used is
- a) potassium permanganate
b) phenolphthalein
c) litmus
d) methyl orange.
11. Nitromethane condenses with acetaldehyde to give
- a) nitropropane
b) 1-nitro-2-propanol
c) 2-nitro-1-propanol
d) 3-nitropropanol.

12. Which one of the following is a secondary amine ?
- a) Aniline b) Diphenyl amine
c) Secondary butyl amine d) tertiary butyl amine.
13. When aqueous solution of benzene diazonium chloride is boiled, the product formed is
- a) Benzyl alcohol b) Benzene + N₂
c) Phenol d) Phenyl hydroxyl amine.
14. The amino acid without chiral carbon is
- a) Glycine b) Alanine
c) Proline d) Tyrosine.
15. Invert sugar is a mixture of equal amount of
- a) D (+) glucose and sucrose
b) D (-) fructose and sucrose
c) D (+) glucose and D (-) fructose
d) sucrose and maltose.
16. The intramolecular hydrogen bonding is present in
- a) *o*-nitrophenol b) *m*-nitrophenol
c) *p*-nitrophenol d) none of these.
17. The momentum of a particle which has de-Broglie wavelength of 1 Å
($h = 6.626 \times 10^{-34} \text{ kg m}^2 \text{ s}^{-1}$) is
- a) $6.63 \times 10^{-23} \text{ kg ms}^{-1}$ b) $6.63 \times 10^{-24} \text{ kg ms}^{-1}$
c) $6.63 \times 10^{-34} \text{ kg ms}^{-1}$ d) $6.63 \times 10^{34} \text{ kg ms}^{-1}$.
18. Effective nuclear charge can be calculated using the formula
- a) $Z^* = Z - S$ b) $Z^* = Z + S$
c) $Z^* = S - Z$ d) $Z = Z^* - S$.

19. Inert gas used in beacon lights for safety of air navigation is
- a) Helium b) Argon
c) Neon d) Xenon.
20. Which one of the following will have maximum magnetic moment ?
- a) $3d^2$ b) $3d^6$
c) $3d^7$ d) $3d^9$.
21. The Bragg's equation is
- a) $\lambda = 2d \sin \theta$ b) $nd = 2\lambda \sin \theta$
c) $2\lambda = nd \sin \theta$ d) $n\lambda = 2d \sin \theta$.
22. According to Trouton's rule, the value of change in entropy of vaporisation is
- a) $21 \text{ cal. deg}^{-1} \text{ mole}^{-1}$ b) $12 \text{ cal. deg}^{-1} \text{ mol}^{-1}$
c) $21 \text{ k.cal. deg. mole}^{-1}$ d) $12 \text{ kcal. deg. mol}^{-1}$.
23. In which of the following processes, the process is always non-feasible ?
- a) $\Delta H > 0, \Delta S > 0$ b) $\Delta H < 0, \Delta S > 0$
c) $\Delta H > 0, \Delta S < 0$ d) $\Delta H < 0, \Delta S < 0$.
24. In the manufacture of ammonia by Haber's process, the maximum yield of ammonia will be obtained with the process having
- a) low pressure and high temperature
b) low pressure and low temperature
c) high pressure and high temperature
d) high pressure and low temperature.
25. The relationship between K_p and K_c for the equilibrium
- $$2 \text{ H}_2\text{O} (g) + 2 \text{ Cl}_2 (g) \rightleftharpoons 4 \text{ HCl} (g) + \text{ O}_2 (g)$$
- is
- a) $K_p = K_c$ b) $K_p = K_c (RT)^2$
c) $K_p = K_c (RT)^1$ d) $K_p = K_c (RT)^{-2}$.

26. Compound which is used as medicine for Asthma and Whooping cough is
- a) Benzyl acetate b) Ethyl acetate
 c) Benzyl benzoate d) Benzyl formate.
27. Number of ether isomers possible for the molecular formula $C_4H_{10}O$ is
- a) one b) two
 c) three d) four.
28. When ether is exposed to air for some time, an explosive substance produced is
- a) Peroxide b) Oxide
 c) TNT d) Superoxide.
29. A Cyanohydrin of a compound X on hydrolysis gives lactic acid. X is
- a) HCHO b) CH_3CHO
 c) $(CH_3)_2CO$ d) $C_6H_5CH_2CHO$.
30. The compound found in some stony deposit in kidneys is
- a) potassium oxalate b) oxalic acid
 c) potassium succinate d) calcium oxalate.

PART - II

- Note : i) Answer any fifteen questions.
 ii) Each answer should be in one or two sentences. $15 \times 3 = 45$

31. State Heisenberg's uncertainty principle.
32. Calculate the electronegativity value of fluorine on Mullikan's scale from the following data :
- Ionisation potential of F = 17.4 eV/atom, Electron affinity of F = 3.62 eV/atom.
33. Why HF cannot be stored in glass bottles ?
34. What is the action of heat on orthophosphoric acid ?
35. Why do d-block elements exhibit variable oxidation states ?
36. Write the reaction of gold with aqua regia.

37. Write the uses of Radio carbon dating.
38. What is molecular crystal ? Give an example.
39. Calculate the maximum % efficiency possible from a thermal engine operating between 110°C and 25°C.
40. Define reaction quotient.
41. What is pseudo first order reaction ? Give example.
42. Write the Arrhenius equation and explain the terms.
43. Write any three general characteristics of catalytic reaction.
44. What is common ion effect ? Give example.
45. Distinguish racemic mixture from mesoform.
46. How can Terylene be prepared ?
47. How is tertiary butyl alcohol converted to isobutylene ?
48. How can acetophenone be prepared by Friedel-Crafts reaction ?
49. What is aspirin ? How is it prepared ?
50. An organic compound A of molecular formula C_2H_5ON treated with bromine and KOH gives B of molecular formula CH_5N . Identify A and B. Write the equation involved.
51. Write any three characteristics of dyes.

PART - III

Note : Answer any seven questions choosing at least two questions from each Section. 7 × 5 = 35

SECTION - A

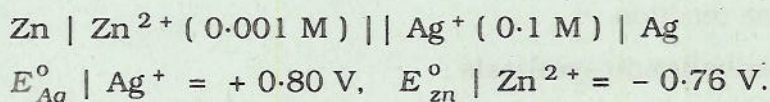
52. Derive de-Broglie's equation.
53. Explain the extraction of zinc from its ore.
54. Write any five differences between lanthanides and actinides.

55. For the complex $K_4 [Fe (CN)_6]$ mention the following :

- IUPAC name
- Central metal ion
- Ligand
- Co-ordination number
- Charge on the complex ion.

SECTION - B

- Write the characteristics of free energy G .
- Derive the expressions for K_c and K_p for decomposition of PCl_5 .
- Write the characteristics of order of reaction.
- Calculate the e.m.f. of the cell :



SECTION - C

- Distinguish aliphatic and aromatic ethers.
- How is acetone converted to —
 - mesityl oxide
 - mesitylene ?
- Write the mechanism of esterification reaction.
- Explain briefly on characteristics of rocket propellants.

PART - IV

Note : i) Question No. 70 is compulsory and answer any *three* from the remaining questions.

ii) Answer *four* questions in all.

$4 \times 10 = 40$

- How do electronegativity values help to find out the nature of bonding between atoms ?
 - How are noble gases separated by Dewar's method ?

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65. a) Write the application of VB theory on the following complexes :
- $[\text{Fe}^{\text{II}}(\text{F})_6]^{4-}$
 - $[\text{Fe}^{\text{II}}(\text{CN})_6]^{4-}$.
- b) Differentiate between chemical reaction and nuclear reaction.
66. a) Write the properties of ionic crystals.
- b) How can colloidal solutions be purified by dialysis ?
67. a) Derive Henderson equation.
- b) Write IUPAC representation of a cell.
68. a) Explain geometrical isomerism with example.
- b) How to do the following conversions ?
- Lactic acid to lactide
 - Salicylic acid to methyl salicylate.
69. a) Write the following reactions :
- Carbylamine reaction
 - Gabriel's phthalimide synthesis .
- b) How are carbohydrates classified ? Give example for each.
70. a) An organic compound A ($\text{C}_2\text{H}_6\text{O}$) liberates hydrogen with sodium metal. A when heated with alumina at 620 K gives an alkene B which when passed through Bayer's reagent gives C ($\text{C}_2\text{H}_6\text{O}_2$). C reacts with PI_3 and gives back B. Identify A, B and C. Write the reactions.
- b) The chief ore of chromium A on roasting with molten sodium carbonate gives compound B. Compound B on acidification with conc. H_2SO_4 gives compound C. Compound C on treatment with KCl gives compound D. Identify A, B, C and D. Explain the reactions.
- OR
- c) An organic compound A (C_7H_8) on oxidation by air in the presence of V_2O_5 at 773 K gives B ($\text{C}_7\text{H}_6\text{O}$), which reduces Tollen's reagent. B when heated with acetic anhydride and sodium acetate gives C ($\text{C}_9\text{H}_8\text{O}_2$). Identify A, B and C. Write the reactions.
- d) Calculate the pH of 0.1 M acetic acid solution. Dissociation constant of acetic acid is 1.8×10^{-5} M.