

CHEMISTRY

(Theory)

SERIES—A

Time Allowed : 3 Hours

Maximum Marks : 60

Candidates are required to give their answers in their own words as far as practicable.
Marks allotted to each question are indicated against it.

Special Instructions :

- (1) You must write Question Paper Series in the circle at top left side of title page of your Answer-book.
- (2) While answering your Questions, you must indicate on your Answer-book the same Question No. as appears in your Question Paper.
- (3) Do not leave blank page/pages in your Answer-book.
- (4) All questions are compulsory. Internal choices have been given in some questions.
- (5) Question Nos. 1 to 6 are multiple choice type questions (MCQ) carrying 1 mark each. Choose one correct answer among four options.
- (6) Question Nos. 7 to 10 are very short answer type questions carrying 1 mark each. Answer these in about one word or in one line.
- (7) Question Nos. 11 to 17 are short answer type questions carrying 2 marks each. Answer these questions in about 30 words each.
- (8) Questions Nos. 18 to 25 are short answer type questions carrying 3 marks each. Answer these questions in about 40 words each.
- (9) Questions Nos. 26 to 28 are long answer type questions carrying 4 marks each. Answer these questions in about 50 words each.

1. The number of atoms in bcc arrangement is :

- | | | |
|-------|--------|---|
| (a) 1 | (b) 2 | 1 |
| (c) 4 | (d) 6. | |

2. The units of cell constant are :

- | | | |
|--------------------------------------|------------------------|---|
| (a) $\text{ohm}^{-1} \text{cm}^{-1}$ | (b) cm | 1 |
| (c) $\text{ohm}^{-1} \text{cm}$ | (d) cm^{-1} . | |

3. Which of the following are positively charged sols ?

- | | | |
|------------------------------|-----------------------------|---|
| (a) $\text{Fe}(\text{OH})_3$ | (b) Sb_2S_3 | 1 |
| (c) TiO_2 | (d) Silver sol. | |

4. Which of the following ore is best concentrated by froth floatation process ?

- | | | |
|---------------|------------------|---|
| (a) Magnetite | (b) Galena | 1 |
| (c) Malachite | (d) Cassiterite. | |

5. The molarity of pure water is :

- | | | |
|----------|----------|---|
| (a) 18 | (b) 5.56 | 1 |
| (c) 55.6 | (d) 100. | |

6. Renitidine is used as :

- | | | |
|-------------------|-------------------|---|
| (a) Antiseptic | (b) Antacid | 1 |
| (c) Antihistamine | (d) Disinfectant. | 1 |

7. What is roasting ? 1

8. What is the order of a reaction whose rate constant has same units as the rate of reactions ? 1

9. What are the most common coordination numbers encountered in coordination complexes ? 1
10. Name a synthetic polymer which is an amide. 1
11. (a) What are Freons ? 1, 1
(b) Why HF is weaker acid than HCl ?
12. (a) OF_6 is not known whereas SF_6 is known. Explain it. 2
(b) Define inert pair effect.
13. With the help of valence bond theory, explain that tetracyanonickelate (II) ion is square planar or tetrahedral in nature. 2
14. What happens when phenol is treated with aqueous bromine water ? 2
15. Write four differences between adsorption and absorption. 2
16. What happens when potassium dichromate is heated with sodium chloride and conc. H_2SO_4 ? 2
17. Write a short note on Cannizzaro's reactions. 2
18. (a) In a cold climate water gets frozen causing damage to the radiator of a car. Ethylene glycol is used as an antifreezing agent. Calculate the amount of ethylene glycol to be added to 4 kg of water to prevent it from freezing at -6°C (K_f for water 1.85 km^{-1}). 2, 1
(b) Write the structure and IUPAC name of Aspirin.
- Or
- (a) Give the four points of differences between Ideal and Non-ideal solution. 2, 1
(b) What are the main constituents of Dettol ?
19. Write short notes of the following : 1, 1, 1
(a) Hoffmann's bromamide reaction
(b) Carbylamine reaction
(c) Schotten Baumann reaction.
20. (a) Derive the following relation :

$$\log \frac{k_2}{k_1} = \frac{E_a}{2.302 R} \left[\frac{T_2 - T_1}{T_1 T_2} \right]$$
(b) The half-life for radioactive decay of ^{14}C is 5730 years. An archaeological artifact containing wood had only 80% of the ^{14}C found in a living tree. Estimate the age of the sample. 1½, 1½
21. (a) Why NCl_5 is not known while PCl_5 is known ? Explain. 1½, 1½
(b) Why oxygen is gas while sulphur is a solid at room temperature ?
- Or
- Describe Ostwald's process for the manufacture of nitric acid. 3
22. (a) What is Nernst equation ? Write the mathematical relation.
(b) How many coulombs of electricity are required for reduction of 1 mol of Cu^{2+} to Cu ? 1½, 1½
23. (a) What happens when ammonia is treated with formaldehyde ?
(b) Complete the following reaction : 2, 1

$$\text{RCOOH} + \text{PCl}_3 \rightarrow \text{?} + \text{?}$$
24. (a) Why transition metals form coloured ions or salts ? Explain.
(b) Which of two ferrous or ferric ion has larger magnetic moment ? Explain. 1½, 1½
25. (a) What are reducing and non-reducing sugars ? What is the structural feature characterising reducing sugars ? 2, 1
(b) What are the constituents of starch ?
26. (a) Write the difference between Schottky and Frenkel defects.
(b) How will you convert Aniline to Chlorobenzene ? 2, 1, 1
(c) What is an Azo dye ?

Or

- (a) Arrange the following in increasing order of their basic strength : $C_2H_5NH_2$, $C_6H_5NH_2$, $C_6H_5CH_2NH_2$ and $(C_2H_5)_2NH$.
- (b) Write short note on Mendius reaction.
- (c) Methyl amine in water reacts with ferric chloride to precipitate ferric hydroxide. Explain.
27. (a) Why is chloroform stored in dark coloured bottles ? 1, 1, 2
- (b) How will you convert chlorobenzene to phenol ?
- (c) (i) What are thermoplastics ?
- (ii) What are isotonic solutions ?
28. (a) What is the effect of temperature and pressure on conductivity ? 1, 1, 2
- (b) How will you prepare Glyptal polymer ? Give its chemical reaction.
- (c) How phenol is stronger acid than alcohol ? Explain. 1, 1, 2

CHEMISTRY

(Theory)

SERIES—B

Time Allowed : 3 Hours

Maximum Marks : 60

Special Instructions : Same as in Series-A.

- If the alignment of magnetic moments in a substance is in a compensatory way so as to give zero net magnetic moment, then the substance is said to be :
 - Ferromagnetism
 - Anti-ferromagnetism
 - Ferrimagnetism
 - Diamagnetism. 1
- The units of conductivity are :
 - $ohm^{-1} cm^{-1}$
 - $ohm^{-1} cm^2$
 - ohm^{-1}
 - $ohm^{-2} cm^2 equiv^{-1}$. 1
- The colloidal system in which the disperse phase and dispersion medium are both liquids is known as :
 - a gel
 - an aerosol
 - an emulsion
 - a foam. 1
- Magnetic separation is used in the concentration of :
 - Copper pyrites
 - Chromite
 - Bauxite
 - Cinnabar. 1
- The basicity of phosphorus acid is :
 - Two
 - Three
 - One
 - Zero. 1
- Chloramphenicol is :
 - Antipyretic
 - Broad spectrum antibiotic
 - Azo dye
 - Tranquillizer. 1
- Why Aluminium cannot be reduced by Carbon ? 1
- Can overall order of a reaction be negative ? Explain. 1
- Name the central atom present in haemoglobin and chlorophyll. 2
- Give the common and IUPAC name of the monomer of natural rubber. 2
- What is the difference between Schottky and Frenkel defect ? 2
- What is Van't Hoff's factor ? Under what conditions Van't Hoff's factor "i" is less than 1 and greater than 1 ? Explain.
- Account for the following :

$[Fe(CN)_6]^{3-}$ is weakly paramagnetic while $[Fe(CN)_6]^{4-}$ is diamagnetic in nature. Explain. 2

14. How phenol is stronger acid than alcohol ? Explain. 2
 15. What is Tyndall effect ? Give its causes. 2
 16. What is Lanthanoid contraction ? What are the consequences of lanthanoid contraction ? 2
 17. What happens when ethanoyl chloride is reduced with H_2 in the presence of $Pd | BaSO_4$? 2

18. (a) A solution containing 12.5 g of a non-electrolyte substance in 175 g of water gave boiling point elevation of 0.70 K. Calculate the molar mass of the substance. (K_b for water = $0.52 \text{ K Kg mol}^{-1}$). 2, 1

(b) What are antacids ? Give one example.

Or

(a) Define the following terms :

(1) Mole fraction (2) Molality. 2, 1

(b) What are antiseptics ? Give one example.

19. Write short notes on the following :

(a) Hunsdiecker reaction

(b) Elastomers

(c) Sandmeyer reaction. 1, 1, 1

20. (a) Give four differences between rate of reaction and rate constant.

(b) Calculate two-thirds life of a first order reaction having $k = 5.48 \times 10^{-14} \text{ s}^{-1}$. 1½, 1½

21. (a) Why electron affinity of F is less than that of Cl ? Explain.

(b) How are XeO_3 and XeO_2F_2 prepared ? Describe their molecular shapes. 1½, 1½

Or

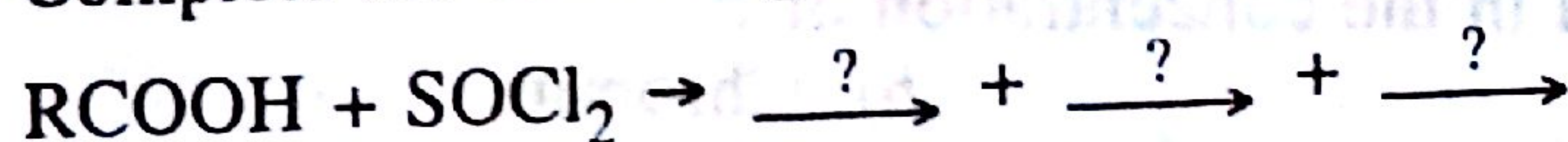
Describe the contact process for the manufacture of Sulphuric acid. 3

22. (a) State reason for the following "Rusting of Iron" is said to be an electrochemical theory. Explain.

(b) How many coulombs of electricity are required for oxidation of 1 mol of FeO to Fe_2O_3 ? 1½, 1½

23. (a) Give aldol condensation reaction of acetaldehyde and explain, why formaldehyde does not give this reaction.

(b) Complete the following reaction :



24. (a) Give three differences between Lanthanoids and Actinoids. 2, 1

(b) Why do Zr and Hf exhibit similar properties ? 1½, 1½

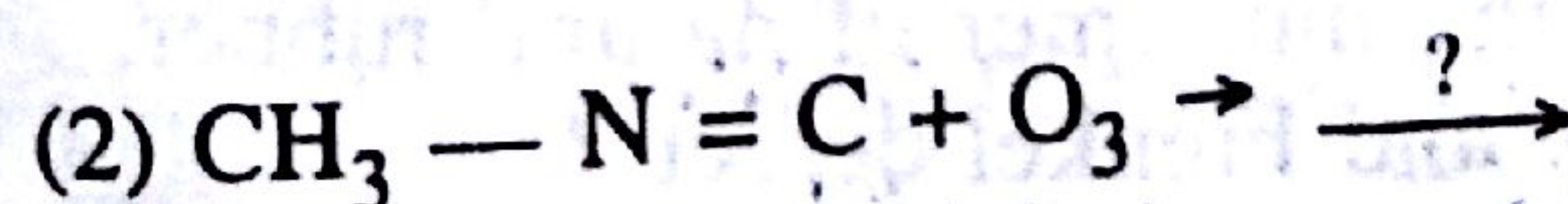
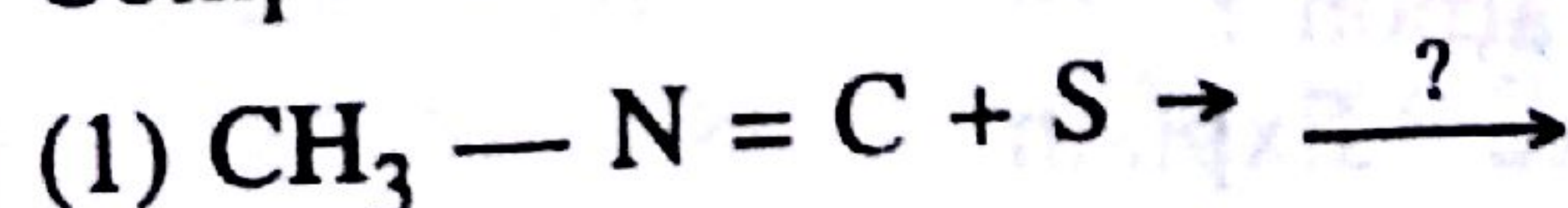
25. (a) What are the essential and non-essential amino acids ? 2, 1

(b) What is the biotin Vitamin ?

26. (a) Which is more basic, Aliphatic amines or Ammonia and why ?

(b) How Aniline will be converted into Acetanilide ?

(c) Complete the following addition reactions with Isocyanides :



Or

(a) Why boiling point of Alkyl cyanides are higher than those of Isomeric isocyanides ? 2, 1, 1

(b) Write a short note on carbylamine reaction.

(c) Why does the Silver chloride dissolve in Methylamine solution ? 1, 1, 2

27. (a) Haloarenes are insoluble in water but are soluble in benzene. Explain.
 (b) How will you convert Iodoform to Propyne?
 (c) (1) What is the hybridisation of Xenon in XeF_2 and XeF_4 ?
 (2) Write the structure of IF_7 .
28. (a) Write the mathematical relation for equivalent conductance.
 (b) How will you prepare polymer dacron? Give its chemical reaction.
 (c) Out of phenol and benzene, which is more easily nitrated and why?

1, 1, 2

1, 1, 2

CHEMISTRY (Theory)

SERIES—C

Time Allowed : 3 Hours

Special Instructions : Same as in Series-A.

Maximum Marks : 60

1. The number of atoms present in a F.C.C. unit cell is :
 (a) 6 (b) 8
 (c) 4 (d) 12. 1
2. For a redox reaction to proceed in a cell, the e.m.f. must be :
 (a) Positive (b) Negative
 (c) Fixed (d) Zero. 1
3. The Zig-zag motion of colloidal particles was first observed by :
 (a) John Tyndall (b) Robert Brown
 (c) Zsigmondy (d) Ostwald. 1
4. Which of the following is magnetite ?
 (a) Fe_3O_4 (b) Fe_2O_3
 (c) $\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ (d) Fe_2CO_3 . 1
5. Which one of the following is tailing of mercury ?
 (a) N_2O (b) SiO_2
 (c) Hg_2O (d) None of these. 1
6. Which of the following is not an antipyretic ?
 (a) Paracetamol (b) Aspirin
 (c) Phenacetin (d) Chloramphenicol. 1
7. What is the composition of "Bell Metal" ? 1
8. A reaction if found to be zero order, will its molecularity be zero ? 1
9. Name the compound used for measuring the hardness of water i.e. for estimation of Ca^{2+} and Mg^{2+} ions. 1
10. Give the name of the polymer which is used for making non-stick utensils. 2
11. Write short notes on the following:
 (a) What are F centres ?
 (b) What is a space lattice ? 2
12. State Raoult's law. Using this law how would you distinguish between an ideal solution and non-ideal solution ? 2
13. By using Valence bond theory discuss the geometry and magnetic nature of $[\text{Cr}(\text{NH}_3)_6]^{3+}$ given the atomic number of Cr = 24. 2
14. What happens when a freshly precipitated $\text{Fe}(\text{OH})_3$ is shaken with little amount of dilute solution of FeCl_3 ? 2
15. What happens when phenol is treated with concentrated HNO_3 ? Explain. 2
16. (a) What is the basic difference between the electronic configuration of transition and inner transition elements ? 1, 1
 (b) Why O_2 exists as a gas whereas Sulphur as a solid ? 2
17. Write short note on Hoffmann bromamide reaction.

18. (a) A Sugar syrup of weight 214.2 gm contains 34.2 gm of sugar ($C_{12}H_{22}O_{11}$), calculate the mole fraction of sugar. 2, 1
 (b) What are Antioxidants ? Give one example.

Or

- (a) What is the effect of temperature on the solubility of a gas in a liquid ?
 (b) What are Tranquillizers ? Give one example. 2, 1
 19. (a) How is DDT prepared from Chlorobenzene ? Give the chemical equation only.
 (b) What happens when Iodoform is heated with Silver powder ? Give equation. $1\frac{1}{2}$, $1\frac{1}{2}$

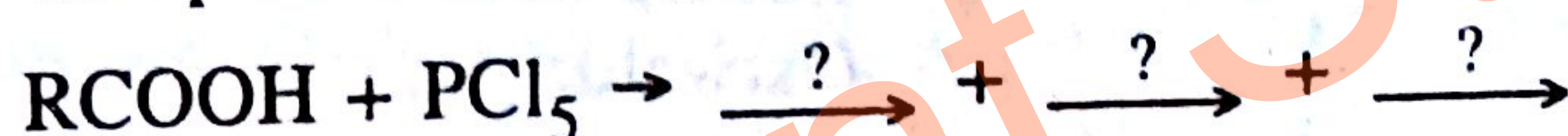
20. (a) Distinguish between order of a reaction and molecularity.
 (b) The rate of a particular reaction triples, when temperature changes from $50^{\circ}C$ to $100^{\circ}C$. Calculate the activation energy of the reaction. $1\frac{1}{2}$, $1\frac{1}{2}$

21. (a) Why Ammonia is good complexing agent ? Explain. $1\frac{1}{2}$, $1\frac{1}{2}$
 (b) Discuss the structures of Phosphorus trichlorides.

Or

- (a) Explain the preparation of Ozone from Siemen's ozoniser. 2, 1
 (b) How does ozone react with (i) $FeSO_4$ and (ii) PbS ?
 22. (a) Give three differences between e.m.f. and potential difference.
 (b) How many coulombs of electricity are required for reduction of 1 mol of Al^{3+} to Al ? $1\frac{1}{2}$, $1\frac{1}{2}$

23. (a) Why acid amides are amphoteric in nature ? Explain.
 (b) Complete the following reaction :



24. (a) Why do transition elements exhibit variable oxidation states and form complex compounds ? 2, 1
 (b) Fe^{3+} is more stable than Fe^{2+} . Explain. $1\frac{1}{2}$, $1\frac{1}{2}$

25. (a) State the difference between primary and secondary structure of proteins. 2, 1
 (b) What is Zwitter ion ?

26. (a) Explain by giving reason that Aniline is weaker base than Ethylamine.
 (b) How will you convert Methylamine into Ethylamine ?
 (c) Describe Gattermann reaction. 2, 1, 1

Or

- (a) How will you distinguish between primary, secondary and tertiary amines ?
 (b) How is aniline diazotised ? Write chemical reactions. How does aniline react with nitrous acid at $5^{\circ}C$?

- (c) Why is Methylamine stronger base than Ammonia ? 2, 1, 1
 27. (a) Why chloroform contains chlorine but gives no reaction with $AgNO_3$ solution ?
 (b) How will you convert ethyl alcohol to propanoic acid ?
 (c) Write notes on the following :

- (1) Thermosetting polymers
 (2) Reimer-Tiemann reaction. 1, 1, 2

28. (a) Define galvanisation of iron.
 (b) How will you prepare polymer PAN (Polyacrylonitrile) ? Give its chemical reaction.
 (c) Why is $R-O-R$ bond angle in ether is more than $H-O-H$ bond angle in water, though oxygen atom is sp^3 hybridised in both the cases ? Explain. 1, 1, 2