

CHEMISTRY

THEORY

Full Marks: 70**Pass Marks: 21****General Instructions :**

- (i) All questions are compulsory.
- (ii) Marks for each question are indicated against it.
- (iii) Answers should be specific and to the point.
- (iv) Question numbers **1 to 8** consist of eight very short answer type questions and carry **1** mark each.
- (v) Question numbers **9 to 18** consist of ten short answer type questions and carry **2** marks each.
- (vi) Question numbers **19 to 27** consist of nine short answer type questions and carry **3** marks each.
- (vii) Question numbers **28 to 30** consist of three long answer type questions and carry **5** marks each.

$$1 \times 8 = 8$$

$$2 \times 10 = 20$$

$$3 \times 9 = 27$$

$$5 \times 3 = 15$$

$$\text{Total} = 70$$

1. State whether true *or* false : 1
In Schottky defect, in order to maintain electroneutrality, the number of missing cations and anions are equal.
2. Define molality of a solution. 1
3. Why is N_2 less reactive at room temperature ? 1
4. In the first transition series of elements, which element shows highest oxidation state ? 1
5. Arrange the following compounds in increasing order of their boiling points : 1
 CH_3CHO , CH_3CH_2OH , CH_3-O-CH_3 , $CH_3CH_2CH_3$.
6. Give *one* example of globular protein. 1
7. What are essential amino acids ? 1
8. What are the monomers of Buna-S rubber ? 1

9.

State Henry's law.

At the same temperature, hydrogen gas is more soluble in water than helium gas.

Which one of them will have higher value of K_H ?

2

10. Calculate the mass of compound (molar mass = 256 g mol^{-1}) to be dissolved in 75 g of benzene to lower its freezing point by 0.48 K ($K_f = 5.12 \text{ K kg mol}^{-1}$).

2

11. Starting from the integrated rate law of a zeroth order reaction, $R \rightarrow P$, show that half life time of the reaction is directly proportional to the initial molar concentration of the reactant.

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12.

2

13. For a reaction $A + B \longrightarrow P$, the rate is given by — $1\frac{1}{2} + \frac{1}{2} = 2$

$$\text{Rate} = [A][B]^2$$

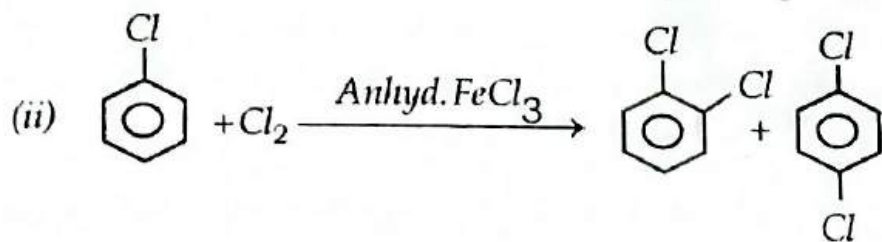
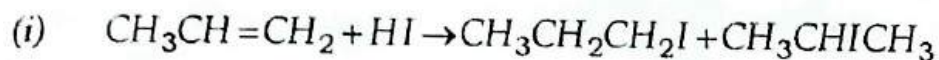
- (i) How is the rate of reaction affected if the concentration of B is doubled ?
(ii) What is the overall order of reaction if A is present in large excess ?

14. What are alloys ? Name the metals used for the formation of bronze. 1+1=2

15. Zn^{2+} salts are colourless while Cu^{2+} salts are coloured. Give reason. 2

16.

Identify the major product in the following reactions : 1×2=2



17. Give reasons : 2

(a) *n*-Butyl bromide has higher boiling point than *t*-Butyl bromide.

(b) Racemic mixture is optically inactive.

18. Answer *any one* of the following : 2

(i) What are antagonist and agonist drugs ?

(ii) Give *one* example each of bactericidal and bacteriostatic antibiotics.

19. (a) A compound forms hexagonal close packed (hcp) structure. What is the total number of voids in 0.5 mol of it? How many of these are tetrahedral voids? 2
- (b) What is the formula of a compound in which the element Y forms cubic closed packed (ccp) lattice and atoms of X occupy $1/3^{\text{rd}}$ of tetrahedral voids? 1

Or/অথবা

Calculate the packing efficiency of a simple cubic lattice. 3

20. (i) The rate constant for a chemical reaction at a given temperature is $2.3 \times 10^{-5} \text{ L mol}^{-1} \text{ s}^{-1}$. What is the order of the reaction? 1
- (ii) Show that in a 1st order reaction, time required for completion of 99.9% is 10 times of half life time of the reaction. 2

21. What are the differences between physisorption and chemisorption? Give reason why a finely divided substance is more effective as an adsorbent.

2+1=3

Or/অথবা

What is an adsorption isotherm? In reference to Freundlich adsorption isotherm write the expression for absorption of gases on solids in the form of an equation.

1+2=3

22. (a) What is the basic difference between a double salt and a co-ordination complex?

1

- (b) Give chemical tests to show that $[Co(NH_3)_5Cl]SO_4$ and $[Co(NH_3)_5SO_4]Cl$ are ionisation isomers.

1

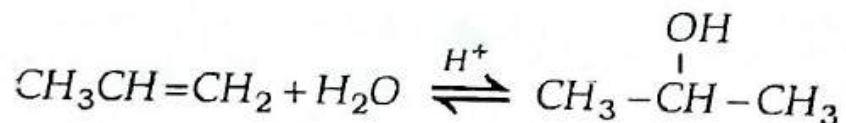
23. Answer *either* (a) *or* (b)

- (a) (i) Give a method of preparation of 3° alcohol.

1

(ii) State the mechanism of the reaction.

2



24. Explain the following with an example :

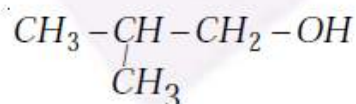
1½+1½=3

(i) Kolbe's reaction.

(ii) Reimer-Tiemann reaction.

Or/অথবা

(i) A Grignard reagent reacts with methanal to form

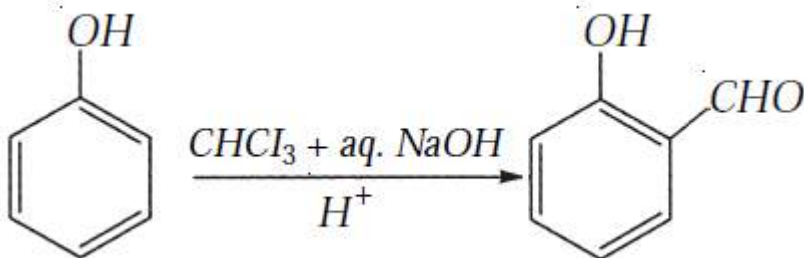


Identify the Grignard reagent.

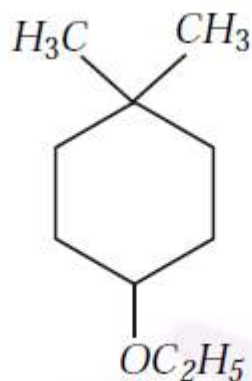
1

(ii) Name the reaction :

1



(iii) Write IUPAC names of the following ether. 1

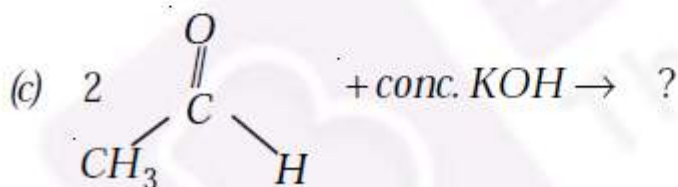
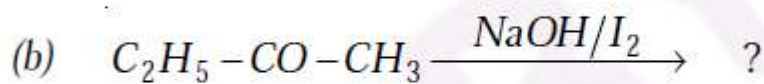
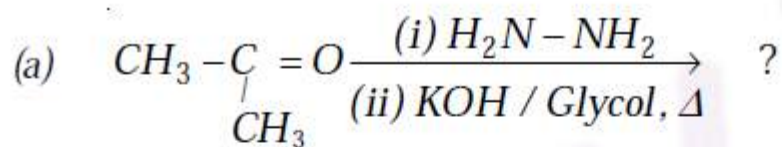


25. (a) Give a chemical test for primary amines. 1

(b) What happens when aniline reacts with bromine water at room temperature? 1

(c) Write the diazotisation reaction of aniline. 1

26. Identify the product of the following reactions : (any two) $1\frac{1}{2}+1\frac{1}{2}=3$



27. (a) Give *one* example of homopolymer and *one* example of co-polymer.

1

(b) Mention the structural difference between thermoplastic polymer and thermosetting polymer.

1

(c) Give *one* use of high density polythene (HDP).

1

28. Answer the following questions :

(a) In which classes, the polymers are classified on the basis of molecular forces ? 2

(b) Sleeping pills are recommended to patient suffering from sleeplessness but it is not advisable to take them without consulting the doctor. Justify. 1

(c) What are tranquilizers ? Give an example. 1

(d) Name *one* chemical responsible for the antiseptic property of Dettol. 1

OR/ অথবা

What is battery ? Give *one* example each of primary battery and secondary battery. 1+1+1=3

29. Answer *any five* of the following :

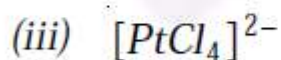
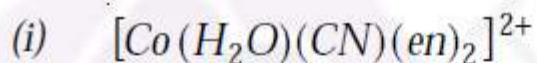
1×5=5

- (i) Explain why NO_2 dimerises.
- (ii) Why is H_2O a liquid and H_2S a gas at normal temperature ?
- (iii) What happens when potassium chlorate is heated with manganese dioxide ?
- (iv) What is Oleum ?
- (v) Fluorine exhibits only -1 oxidation state, whereas other halogens also exhibit +1, +3, +5 and +7 oxidation states. Explain.

30. Answer the following questions :

(a) Specify the oxidation numbers of the metals in the following coordination entities :

$\frac{1}{2} \times 4 = 2$



- (b) What are carbohydrates ? Give the general formula of carbohydrates.
Why polysaccharides are called non-sugars ? 3

