

2020/TDC/ODD/SEM/  
CHMP-301/289

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TDC Odd Semester Exam., 2020  
held in July, 2021

CHEMISTRY

( Pass )

( 3rd Semester )

Course No. : CHMP-301

( Inorganic, Organic and Physical Chemistry )

$\frac{\text{Full Marks : 35}}{\text{Pass Marks : 12}}$

Time : 2 hours

The figures in the margin indicate full marks  
for the questions

GROUP—A

( Inorganic Chemistry )

( Marks : 12 )

Answer **four** questions, taking **one** from each Unit

UNIT—I

1. (a) Write the IUPAC name of  
[CoCl<sub>2</sub>(NH<sub>3</sub>)<sub>4</sub>] . 1

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( Turn Over )

- (b) How will you distinguish between the following two isomeric pairs? 2  
(i) [CoBr(NH<sub>3</sub>)<sub>5</sub>]SO<sub>4</sub>  
(ii) [Co(SO<sub>4</sub>)(NH<sub>3</sub>)<sub>5</sub>]Br

2. (a) What is an ambidentate ligand? 1  
(b) Draw the geometrical and optical isomers of [Co(en)<sub>2</sub>Cl<sub>2</sub>] . 1+1=2

UNIT—II

3. (a) Write the differences between the artificial transmutation and artificial radioactivity. 1  
(b) Complete the following reactions : 1×2=2  
(i)  ${}_{11}\text{Na}^{23} ( \text{---}, n ) {}_{12}\text{Mg}^{24}$   
(ii)  ${}_{13}\text{Al}^{27} ( , n ) \text{---}$

4. (a) Define (4n - 1) radioactive series. 1  
(b) Write two applications of radioactive isotopes in medicine. 2

UNIT—III

5. (a) Briefly discuss the biological function of iron. 2  
(b) What is 'heme' group? 1

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6. (a) Name the heaviest metal and heaviest non-metal in biological system.  $\frac{1}{2} + \frac{1}{2} = 1$
- (b) Describe the toxic effects of CO on human health. 2

UNIT—IV

7. (a) Describe briefly the manufacture of urea. 2
- (b) Write one essential requirement of good fertilizers. 1
8. (a) What are the advantages of urea over other synthetic fertilizers?  $1\frac{1}{2}$
- (b) Explain how triple superphosphate of lime is prepared.  $1\frac{1}{2}$

GROUP—B

( Organic Chemistry )

( Marks : 12 )

Answer **four** questions, taking **one** from each Unit

UNIT—V

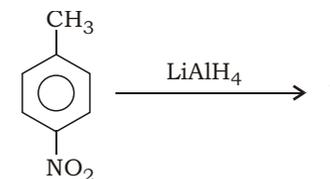
9. (a) Why does the electron withdrawing group in a carboxylic acid increase its acidic character? 2

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( Turn Over )

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- (b) Write a method for the preparation of benzoic acid. 1
10. (a) What happens when—
- (i) succinic acid is heated above its melting point;
- (ii) phthalic acid is heated with soda lime?  $1 + 1 = 2$
- (b) Write the product of the reaction given below : 1



UNIT—VI

11. (a) Write one method of synthesis of one essential amino acid. 1
- (b) Define the term 'zwitterion' of  $\alpha$ -amino acid. 2
12. (a) What are amino acids? Why are they important?  $1 + 1 = 2$
- (b) Name one method how you can separate a mixture of amino acids. 1

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( Continued )

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UNIT—VII

13. (a) How can nitrobenzene be converted into benzoic acid? 2  
(b) Give one method of synthesis of isocyanides. 1
14. What happens when nitrobenzene is reduced under (a) acidic, (b) basic and (c) neutral media? 3

UNIT—VIII

15. (a) What are sugars? Cite one example. 1+1=2  
(b) What happens when glucose is treated with excess phenylhydrazine? 1
16. (a) Define epimerization of carbohydrates with suitable example. 2  
(b) Write a short note on mutarotation. 1

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GROUP—C

( Physical Chemistry )

( Marks : 11 )

Answer **four** questions, taking **one** from each Unit

UNIT—IX

17. What are the limitations of first law of thermodynamics? 2
18. Enthalpy change ( $H_{\text{vap}}$ ) for the transition of liquid water to steam at 100 °C is 40.8 kJ mol<sup>-1</sup>. Calculate the entropy change for the process. 2

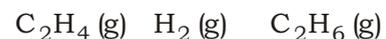
UNIT—X

19. (a) Show that at constant temperature and pressure  $G = T S_{\text{total}}$ . 2  
(b) Write the physical significance of Gibbs' free energy function. 1
20. (a) State which of the following will lead to increase in entropy and why : 1×2=2  
(i)  $\text{H}_2(\text{g}) + \text{Br}_2(\text{l}) \rightarrow 2\text{HBr}(\text{g})$   
(ii) Water at 100 °C or steam at 100 °C  
(b) At what temperature, the entropy of a perfectly crystalline substance is zero? 1

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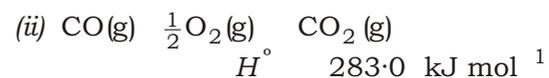
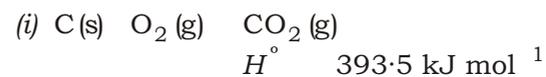
UNIT—XI

21. (a) What is standard heat of formation? 1  
(b) Calculate the enthalpy change for the reaction



at 298 K. Given that the enthalpies of combustion of ethylene, hydrogen and ethane are  $-1410.0 \text{ kJ mol}^{-1}$ ,  $-286.2 \text{ kJ mol}^{-1}$  and  $1560.6 \text{ kJ mol}^{-1}$  respectively, at 298 K. 2

22. (a) Write Hess's law of constant heat summation. 1  
(b) Calculate the enthalpy of formation of carbon monoxide from the following data : 2



UNIT—XII

23. What do you mean by—  
(a) optical activity;  
(b) molar refractivity;  
(c) paramagnetic substances? 1×3=3

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24. (a) What is parachor? 1  
(b) What is the cause of optical activity in a compound? Explain with example. 2

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