2020/TDC/ODD/SEM/
CHMP–101/288

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

CHEMISTRY

(Pass)

(1st Semester)

Course No. : CHMP–101

(Inorganic, Organic and Physical Chemistry)

Full Marks : 35
Pass Marks : 12

Time : 2 hours

The figures in the margin indicate full marks for the questions

GROUP—A

(Inorganic Chemistry)

(*Marks* : 11)

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

UNIT—I

1. *(a)* Calculate the product of uncertainty in position and velocity for an electron of mass $9{\cdot}1\times10^{-31}$ kg. 1

(b) Derive the de Broglie relationship. 1

2. *(a)* Write the expression for the radius of H-atom applying Bohr's theory. 1

(b) Write down the expression for wavelength of 3rd line of Brackett series using Rydberg equation. 1

UNIT—II

3. *(a)* What are redox reactions? 1

(b) Balance the following equations by ion-electron method : 1+1=2

(i) $Cr_2O_7^{2-}$ Fe^{2+} H^+ Cr^{3+} Fe^{3+} H_2O

(ii) $FeCl_3$ $SnCl_2$ $SnCl_4$ $FeCl_2$

4. *(a)* What is the limitation of Brönsted-Lowry theory of acids and bases? Give example of a cation Brönsted acid and its conjugate base. 1+1=2

(b) Predict whether the following reaction is spontaneous under standard condition :

$$Cd^{2+}(aq) + Cu(s) \rightleftharpoons Cu^{2+}(aq) + Cd(s)$$

Given

$E^{\circ}_{Cd^{2+}|Cd}$ 0·40 V and $E^{\circ}_{Cu^{2+}|Cu}$ 0·34 V 1

UNIT—III

5. *(a)* How is XeF_6 prepared? Draw the structure of XeF_6. 1+1=2

(b) Explain the linear shape of XeF_2. 1

6. Give one method of preparation of $HClO_4$. What happens when $HClO_4$ reacts with Zn metal? 2+1=3

UNIT—IV

7. *(a)* What happens when diborane reacts with *(i)* ammonia and *(ii)* chlorine? 1+1=2

(b) Draw the structure of diborane. 1

8. *(a)* Calculate the magnetic moment using spin-only formula for Ti^3 ion. 1

(b) What is inorganic benzene? How is it prepared? 2

GROUP—B

(Organic Chemistry)

(*Marks* : 12)

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

UNIT—I

9. *(a)* Draw the orbital diagram of acetylene. 2

(b) What is Hückel's (4*n* 2) rule? 1

10. *(a)* Arrange the following in order of decreasing stability : 1

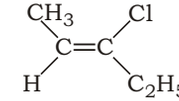
$$Ph_3C^{\ominus},\ PhCH_2^{\ominus},\ Ph_2CH^{\ominus}$$

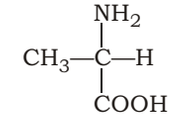
(b) Which of the following compounds is more acidic and why? 2

$$CH_3COOH,\ ClCH_2COOH$$

UNIT—II

11. *(a)* Assign *E*/*Z* and *R*/*S* configurations respectively to the following compounds : 2

(i) 

(ii) 

(b) What are diastereomers? Give example. 1

12. *(a)* Write a short note on elements of symmetry. 2

(b) What are enantiomers? Give example. 1

UNIT—III

13. *(a)* What is peroxide effect? Explain with example. 2

(b) What is epoxide? Give one example. 1

14. *(a)* What is Markownikoff's rule? Give example. 1½

(b) Discuss the mechanism for the reaction of 2-pentene with bromine. 1½

UNIT—IV

15. *(a)* Mention two differences between S_N1 and S_N2 reactions. 2

(b) What is Hofmann rule? 1

16. *(a)* Write the product and the mechanism of the following reaction : 2

$$CH_3—CH_2—\underset{\displaystyle Cl}{\underset{|}{CH}}—CH_3 \xrightarrow{\text{alc. KOH}} ?$$

(b) Explain why aryl halides are less reactive than alkyl halides. 1

GROUP—C

(Physical Chemistry)

(*Marks* : 12)

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

UNIT—I

17. *(a)* How can you explain the deviation of real gases from Boyle's law? 1

(b) Critical temperature and critical pressure of CO_2 gas are 31 °C and 72 atm respectively. Find the van der Waals' constant for the gas. 2

18. *(a)* At high temperature and low pressure, van der Waals' equation reduces to ideal gas equation. Justify. 1

(b) Draw the *P-V* curve for CO_2 at 13·1 °C, 21·5 °C and 31·1 °C. State the principle of continuity of state. 1+1=2

UNIT—II

19. Define the terms collision number, collision frequency and collision diameter. 1+1+1=3

20. *(a)* What is equipartition of energy? 1

(b) Prove that $C_P \quad C_V \quad R$. 2

UNIT—III

21. *(a)* What is coefficient of viscosity? What are the factors affecting the viscosity of a liquid? 1+1=2

(b) Mention the different types of intermolecular forces in liquids. 1

22. *(a)* Explain why water has higher surface tension than ethanol. 1

(b) How can you determine the surface tension of a liquid? Explain. 2

UNIT—IV

23. *(a)* What is the law of rational indices? 1

(b) The density of crystalline sodium chloride is $2{\cdot}165\ g\,cm^{3}$. What is the edge length of the cubic unit cell if it has an f.c.c. lattice structure? 2

24. *(a)* Define crystal lattice and unit cell. What are the seven crystal systems? (½+½)+1=2

(b) Find out the number of atoms in f.c.c. and b.c.c. lattices. 1

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