TDC Even Semester Exam., 2019

CHEMISTRY

(Pass)

(6th Semester)

Course No. : CHMP–601

(Inorganic, Organic and Physical)

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* : 12)

Answer **one** question from each Unit

UNIT—I

1. *(a)* What is meant by the term 'electronegativity'? 1½

(b) How is the concept of electronegativity used to predict the nature of the covalent bond? 1½

2. *(a)* CO_2 is linear but SO_2 is bent. Explain. 1½

(b) Calculate the percentage of ionic character in HCl molecule if the observed dipole moment is 1·08D.
(Bond length = 1·276 Å,
1D = $3{\cdot}336\times10^{-30}$ coulomb-meter) 1½

UNIT—II

3. *(a)* Write two assumptions of the VSEPR theory. 1

(b) Apply VSEPR theory to explain the geometrics of H_2O and CH_4 molecule. 1+1=2

4. Using VSEPR theory, predict and draw the shapes of the following molecules : 1×3=3

(i) NH_4

(ii) SF_4

(iii) ICl_2

UNIT—III

5. *(a)* Write a short note on Born-Haber cycle. 2

(b) What is non-stoichiometric defect? 1

6. *(a)* Write the consequence of Schottky defects. 1

(b) Write a note on metal deficiency defect and mention one consequence of this defect. 1+1=2

UNIT—IV

7. Briefly describe the extraction of manganese from its chief ore. 3

8. How is $K_2Cr_2O_7$ prepared? Mention one use of it. 2+1=3

GROUP—B

(Organic Chemistry)

(*Marks* : 12)

Answer **one** question from each Unit

UNIT—I

9. *(a)* Explain the following terms : 1×2=2

(i) Acidic dyes

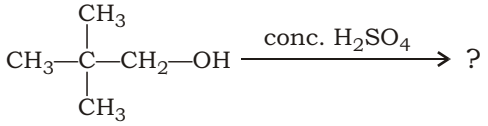
(ii) Basic dyes

(b) What are azo dyes? 1

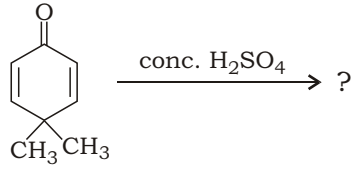
10. How will you prepare methyl orange? In which class does this dye belong? 2+1=3

UNIT—II

11. Complete and write the mechanism of the following reaction : 1+2=3



12. Complete and write the mechanism of the following reaction : 3



UNIT—III

13. *(a)* Write one method of preparation of organolithium compound. 1

(b) How will you prepare—

(i) succinic acid from ethyl-acetoacetate;

(ii) , -unsaturated acid from diethyl malonate? 1+1=2

14. What happens when methyl magnesium bromide is treated with the following? 3

(i) CO_2

(ii) CH_3CHO

(iii) C_2H_5OH

UNIT—IV

15. *(a)* What are shielding and deshielding protons? 1+1=2

(b) How many ^{1}H-NMR signals do you expect in $CH_3—CH_2—CHO$? 1

16. Identify different types of proton in the following compounds : 3

(i) $CH_3—CBr_2—CH_3$

(ii) $CH_3—\overset{\overset{O}{\|}}{C}—CH_3$

(iii) $CH_3—CHCl—CH_3$

GROUP—C

(Physical Chemistry)

(*Marks* : 11)

Answer **one** question from each Unit

UNIT—I

17. What is photoelectric effect? Write the Einstein equation of photoelectric effect. 1+1=2

18. Calculate the energy of one mole of photon of radiations having wavelength 300 nm. 2

UNIT—II

19. *(a)* Write de Broglie's equation. 1

(b) Calculate the wavelength of an electron moving with a velocity of $2{\cdot}5\times10^{7}$ ms ^{1}. Given, h $6{\cdot}63\times10^{34}$ J-s, mass of electron = $9{\cdot}11\times10^{31}$ kg. 2

20. Write a note on Schrödinger wave equation and significance of and ^{2}. 3

UNIT—III

21. *(a)* Write the selection rules for rotational spectroscopy. 1

(b) Show that for a rigid diatomic rotator the moment of inertia is given by $I \quad r^2$. 2

22. *(a)* What is spectroscopy? 1

(b) Mention the different types of electromagnetic radiations along with frequency ranges. 2

UNIT—IV

23. Sketch the normal modes of vibrations of CO_2. State whether it is IR active or not. 2+1=3

24. Show diagrammatically the electronic transition for carbonyl (C═O) group in the electronic spectra. 3

★★★