Total No. of Printed Pages—13

HS/XII/Sc/Ch/13

2013

CHEMISTRY

Full Marks : 70

Time : 3 hours

General Instructions :

(i) Write all answers in the Answer Script.

(ii) Attempt all parts of a question together in one place.

(iii) All questions are compulsory.

(iv) Marks for each question are indicated against it.

(v) Question No. **1** of Part—I is of Multiple-choice Type, each of ½ mark. Choose and write the correct answer in the Answer Script from the four options given.

(vi) Question Nos. **2** to **9** of Part—II are very Short-answer Type Questions of 1 mark each. Answer these either in *one* sentence or in *one* word each.

(vii) Question Nos. **10** to **17** of Part—III are Short-answer Type–I Questions of 2 marks each. Answer these in about *20–30* words each.

(viii) Question Nos. **18** to **26** of Part—IV are Short-answer Type–II Questions of 3 marks each. Answer these in about *40–50* words each.

(ix) Question Nos. **27** to **29** of Part—V are Long-answer Type Questions of 5 marks each. Answer these in about *70–80* words each.

(x) Use of non-programmable ordinary Scientific Calculators and Log Tables is allowed.

(xi) Mobile phones and Pagers are not allowed inside the Examination Hall.

PART—I

1. Choose and write the correct answers for the following in the Answer Script : ½×8=4

(a) In a chemical reaction, a catalyst

(i) alters the amount of the products

(ii) decreases the H of forward reaction

(iii) lowers the activation energy

(iv) increases the H of forward reaction

(b) The cause of Brownian movement is

(i) heat change in liquid state

(ii) attractive force between colloidal particles and dispersion medium

(iii) bombardment of the colloidal particles by the molecules of the dispersion medium

(iv) interaction of charged particles

(c) Which of the following halogens shows only negative oxidation state?

(i) Chlorine

(ii) Bromine

(iii) Fluorine

(iv) Iodine

(d) Which of the following is the strongest acid?

(i) H_2O

(ii) H_2S

(iii) H_2Se

(iv) H_2Te

(e) -D (+) glucose and -D (+) glucose are

(i) enantiomers

(ii) geometrical isomers

(iii) epimers

(iv) anomers

(f) The linkage which holds various amino acid units in primary structure of proteins is

(i) glycosidic linkage

(ii) hydrogen bond

(iii) peptide linkage

(iv) ionic bond

(g) Antipyretics are medicinal compounds which

(i) lower body temperature

(ii) relieve pain

(iii) control malaria

(iv) kill microorganisms

(h) Saponification is the reaction between

(i) glyceride and HCl

(ii) glyceride and NaOH

(iii) soap and HCl

(iv) detergents and soaps

PART—II

2. A compound of *X* and *Y* crystallises in which *Y* occupies the corners and *X* occupies alternate faces of the cube. Find the formula of the compound. 1

3. What is Tyndall effect? 1

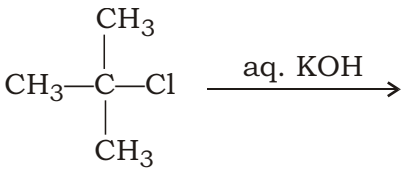
4. What is a chelating ligand? 1

5. Write the products of the following reactions : 1

(i) $C_2H_5I \quad KNO_2$

(ii) $C_2H_5I \quad AgNO_2$

6. Write the products formed in the following reaction : 1



7. Arrange the following in the increasing order of their reactivity in nucleophilic addition reactions : 1

$C_6H_5CHO, C_6H_5COCH_3, C_6H_5COC_6H_5$

8. How can you find out chemically whether a given amine is a primary aliphatic amine? 1

9. Name a polymer which is used as a substitute for wool. What is its monomer unit? ½+½=1

PART—III

10. A solution of $Ni(NO_3)_2$ is electrolysed between platinum electrodes using a current of 5 amperes for 20 minutes. What mass of nickel is deposited at the cathode? (Atomic mass of nickel = 58 7 g mol ^{1}) 2

11. In a reaction, 2*A* Products, the concentration of *A* decreases from 0 5 mol L ^{1} to 0 4 mol L ^{1} in 10 minutes. Calculate the rate during this interval. 2

12. Define the following : 1+1=2

(a) Krafft temperature

(b) Critical micelles concentration

13. *Either*

(a) Nitrogen shows covalency 3 whereas phosphorus shows covalencies 3 and 5. Explain. 2

Or

(b) *(i)* What do you mean by inert pair effect? 1

(ii) What is aqua regia? Why is it so called? ½+½=1

14. Out of Co^{2} , Sc^{3} and Cr^{3} , which ion will not give coloured aqueous solution? Calculate the spin-only magnetic moment value of any one of these three ions. (At. Nos. of Sc = 21; Cr = 24; Co = 27) 1+1=2

15. *Either*

(a) *(i)* *trans*-isomer of the complex $CoCl_2(en)_2$ is optically inactive. Why? 1

(ii) Draw the structure of *fac*-isomer of $[Co(NH_3)_3(NO_2)_3]$. 1

Or

(b) $[Ti(H_2O)_6]^{3}$ is coloured while $[Ti(H_2O)_6]^{4}$ is colourless. Why? 2

16. *(a)* What are natural and synthetic polymers? Give one example of each type. 1

(b) Discuss the main purpose of vulcanisation of rubber. 1

17. *(a)* What is the role of antioxidants in our living systems? Name one familiar antioxidant. 1+½=1½

(b) Give the name of any one neurotransmitter. ½

PART—IV

18. *(a)* An element X has f.c.c. lattice and edge of the unit cell is 400 pm. Find the distance between the nearest two X atoms and radius of the atom X. 2

(b) Why does ZnO appear golden yellow at high temperature? 1

19. *(a)* Can we keep $CuSO_4$ solution in a zinc container?

Given that

$$E_{Cu^{2}\ /Cu}\quad 0\ 34\ V,\ E_{Zn^{2}\ /Zn}\quad 0\ 76\ V$$ 1½

(b) Calculate the molar conductivity at infinite dilution of acetic acid from the following data : 1½

$_m$ (HCl) 426 S m^2 mol ^{1}

$_m$ ($H_3CCOONa$) 91 S m^2 mol ^{1}

$_m$ (NaCl) 126 S m^2 mol ^{1}

20. *(a)* Mention two factors which affect the rate of a chemical reaction. 1

(b) For the reaction, N_2O_5 (g) $2NO_2$ (g) $\frac{1}{2}O_2$ (g), the initial concentration of N_2O_5 was 1 24 10 ^{2} mol L ^{1} at 318 K. The concentration of N_2O_5 after 60 minutes was 0 20 10 ^{2} mol L ^{1}. Calculate the rate constant of the reaction at 318 K. 2

21. *Either*

(a) How is nickel purified by Mond's process? 2

(b) Give one example each of acidic flux and basic flux used in metallurgical processes. 1

Or

(c) Why are the graphite rods replaced periodically in the metallurgy of aluminium? 1

(d) Write the chemical reactions taking place in the extraction of zinc from zinc blende. 2

22. *Either*

(a) *(i)* What are the different oxidation states exhibited by the lanthanides? 1

(ii) Draw the structure of CrO_4^{2} . 1

(iii) Write the chemical reaction of H_2S with acidic $KMnO_4$. 1

Or

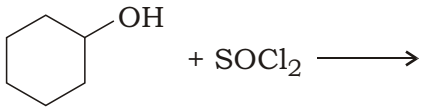
(b) *(i)* Lanthanides are much more paramagnetic than transition elements. Explain. 1

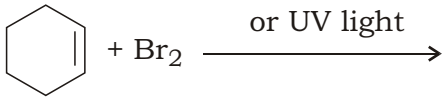
(ii) Draw the structure of $Cr_2O_7^{2}$. 1

(iii) Write the reaction of potassium iodide with acidified potassium dichromate. 1

23. *(a)* Why phenols do not react with HX, PX_3, PCl_5, $SOCl_2$? 1

(b) Draw the structures of major monohalo products in each of the following reactions : 2

(i) 

(ii) 

24. *(a)* Name the reagents and give the equation for the preparation of 2-methyl-2-methoxypropane [CH_3—$C(OCH_3)(CH_3)$—CH_3] by Williamson's method. 1+1=2

(b) Explain why 4-nitrophenol is more acidic than 4-methoxyphenol. 1

25. *Either*

(a) How will you achieve the synthesis of only 4-bromoaniline from aniline without production of the trisubstituted aniline? 3

Or

(b) *(i)* Why primary amines have higher boiling points than tertiary amines? 1

(ii) Write the products obtained in the nitration of aniline. 1

(iii) What is carbylamine reaction? 1

26. *Either*

(a) *(i)* Write the reaction of glucose with HI. 1

(ii) What is glycogen? Why is it called animal starch? ½+½=1

(iii) Name the vitamin responsible for the coagulation of blood. 1

Or

(b) *(i)* Write the reaction of glucose with NH_2OH. 1

(ii) What are aldoses and ketoses? 1

(iii) Name any two types of RNA found in cells. 1

PART—V

27. *Either*

(a) What is the effect of temperature on molality of a solution? 1

(b) O_2 is bubbled through water at 293 K. How many moles of O_2 will dissolve in 1 L of water, if partial pressure of O_2 is 2 kilobar and K_H is 34 86 kilobar? 2

(c) The vapour pressure of pure benzene at a certain temperature is 0 850 bar. 0 5 g of a non-electrolyte and non-volatile solid is added to 39 0 g of benzene (molar mass 78 g mol ^{1}). The vapour pressure of this solution is found to be 0 845 bar. Calculate the molecular mass of the substance. 2

Or

(d) Why is osmotic pressure considered to be a colligative property? 1

(e) Calculate the mole fraction of ethanol and water in a sample of rectified spirit which contains 95% of ethanol by weight. 2

(f) A solution containing 18 g of a non-volatile solute in 200 g of water freezes at 272 07 K. Find the molecular mass of the solute. (K_f 1 86 K mol ^{1}) 2

28. *Either*

(a) Write the principle and conditions involved, giving stepwise reactions, in the manufacture of H_2SO_4 by contact process. 2

(b) Give two examples of amphoteric oxide. 1

(c) HCl reacts with powdered Fe to give $FeCl_2$ and not $FeCl_3$. Why? 1

(d) Give the chemistry of brown-ring test. 1

Or

(e) Mention the conditions required to maximise the yield of ammonia in its synthesis by Haber's process. 2

(f) Which form of sulphur shows paramagnetism and why? ½+½=1

(g) Unlike HCl, why HBr cannot be prepared by the action of concentrated sulphuric acid on sodium bromide? Explain. 1

(h) Write the reaction of white P with NaOH solution. 1

29. *(a)* Why is -hydrogen in carbonyl compounds acidic? 1

(b) How can you distinguish between acetophenone and benzaldehyde? 1

(c) "Boiling points of carboxylic acid are higher than the corresponding alcohols." Explain. 1

(d) Identify compounds (*A*) to (*D*) in the following reactions : 2

(i) $CH_3CH= C(CH_3)_2 \xrightarrow[2)\ H_2O/Zn]{1)\ O_3} (A) + (B)$

(ii) $C_2H_5COOH \xrightarrow{SOCl_2} (C) \xrightarrow[H_2]{Pd/BaSO_4/S} (D)$

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