

ILBORU SECONDARY SCHOOL



FORM SIX (VI) HOLYDAY PACKAGE

QUESTIONS FOR SOLVING

CHEMISTRY 1

Answer all questions.

1. For calculations use the following

- Rydberg constant , $R_H = 1.09678 \times 10^7 m^{-1}$
- Gas constant , $R = 8.314 J mol^{-1} k^{-1}$ or $0.0821 atm mol^{-1} k^{-1} dm^3$
- GMV = $22.4 dm^3 mol^{-1}$ or $22400 cm^3 mol^{-1}$
- Standard temperature = 273k
- Standard pressure = 760 mmHg
- Plank's constant, $h = 6.63 \times 10^{-34} JS$
- Velocity of light , $C = 3.0 \times 10^8 m/s$
- Mass of electron, $m_e = 9.1 \times 10^{-31} kg$

$Cl = 35, Ba = 137, Fe = 56, Cr = 52, I = 127, Cu = 63.5,$

$Ag = 108, k = 39, Na = 23, N = 14, Br = 80, Kr = 84$

Answer all questions from this section

1. (a) Define the terms

- (i) Quantum Orbital
- (ii) Quantum numbers
- (iii) Quantization of energy
- (iv) Wave particle duality of matter

(b) (i) What is atomic spectrum?

(ii) How does an atomic spectrum differ from a continuous spectrum

(c) The wavelength of the lines in the Balmer series of the hydrogen spectrum is given by the expression

$$\frac{1}{\lambda} = RH \left(\frac{1}{2^2} - \frac{1}{n^2} \right)$$

Where R_H is constant and “n” is an interger greater than 2.

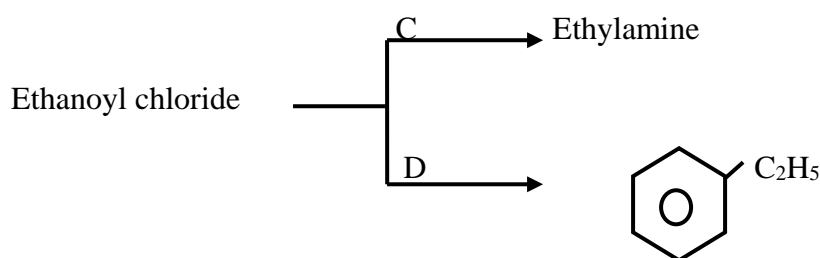
- (i) Draw an energy level diagram to show the origin of the first and third lines in the Balmer series.
 - (ii) Calculate the wave length of the first line in (c) (i) above
2. (a) Define the following terms:
- (i) Relative density of a gas
 - (ii) Normal density of gas
- (b) A 2000cm^3 bulb contains 1.197g of a gas at a standard pressure and a temperature of 20°C . Assuming the gas behaves ideally, calculate its
- (i) Relative density
 - (ii) Normal density
3. (a) Define Raoult’s law of vapour pressure
- (b) Heptane and octane form an ideal solution. Give a mathematical expression for Raoult’s vapour pressure law for a solution containing heptanes and octane.
- (c) (i) Under what circumstances will two liquid mixtures behave as an ideal solution? (Give three conditions).
- (ii) Calculate the vapour pressure of a solution containing 50g of heptane and 38g of octane at 20°C . Vapour pressures of heptane and octane at 20°C are 47.32 Pa and 139.8Pa , respectively.
4. (a) Name the follow complexes according to the IUPAC rules
- (i) $[\text{Ni} (\text{H}_2\text{N CH}_2\text{CH}_2\text{NH}_2)_2 \text{Cl}_2]$
 - (ii) $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]\text{Cl}$
 - (iii) $\text{K}_2[\text{Co} (\text{NO}_2)_4]$
 - (iv) $[\text{Pt} \text{Cl}_2]^{2-}$
- (b) The compound $[\text{Co} (\text{NH}_3)_5 \text{Cl}] \text{SO}_4$ is isomeric with $[\text{CO} (\text{NH}_3)_5 \text{SO}_4] \text{Cl}$
- (i) What ions will these two isomers yield in their aqueous solution?
 - (ii) Give one positive chemical test for each isomer
 - (iii) What is the Oxidation and Co-ordination numbers of the central atom in two isomers.
- (c) Explain why there is an increase in maximum oxidation state from scandium to manganese while there is a decrease of maximum oxidation state from manganese to zinc.
5. (a) What is the chief ore of zinc?
- (b) Outline the methods of extraction of the metal from zinc ore.
- (c) Why is the addition of excess coke essential in the reduction of zinc oxide (zno)?

6. Give the IUPAC names for the following organic compounds.

- (i) $\text{CH}_3 - \text{CH}_2 - \text{C}(\text{CH}_3)_2 - \text{CO}(\text{NH}_2)$
- (ii) $\text{CH}_3 - \text{CH}(\text{CH}_3) - (\text{CH}_2)_4 - \text{CO}(\text{OC}_2\text{H}_5)$
- (iii) $\text{C}_6\text{H}_5\text{COCl}$
- (iv) $(\text{C}_6\text{H}_5 - \text{CO}) - \text{O} - (\text{CO} - \text{C}_3\text{H}_7)$

(b) Study the following reactions

Ethanol $\xrightarrow{\text{A}}$ Ethanoic acid $\xrightarrow{\text{B}}$ Ethanoyl chloride



- Give the names of reagents A, B, C and D

(c) What types of reagents attack the benzene ring to form substitution product of benzene?

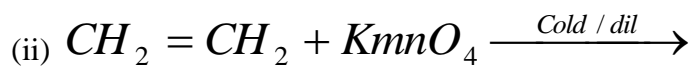
(d) Give the attacking reagents which are involved in the

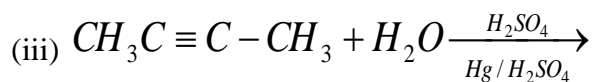
- (i) nitration of benzene
- (ii) Alkylation of benzene
- (iii) Acylation of benzene

7. (a) Define the following terms

- (i) Organic substitution reaction
- (ii) Addition reaction
- (iii) Nucleophilic substitution reaction
- (iv) Elimination reaction

(b) Complete the following reactions





8. (a) Define the following

- (i) Tertiary alkyl compound
- (ii) Carbocation
- (iii) Tautomerism
- (iv) Polar cleavage

(b) By giving the chemical reactions, explain the applications of the following organic reactions.

- (i) Sulphonation of alkenes
- (ii) Wurtz synthesis
- (iii) Grignard reagents reaction
- (iv) Cannizzaro reaction
- (v) Wacker's reaction process

(c) Show how $\text{CH}_3\text{C} \equiv \text{C} - \text{H}$ can be prepared from

- (i) Benzene
- (ii) Chloromethane

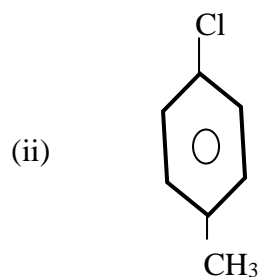
(d) How you can prepare

- (i) 1 – Bromobutane to 2 – Bromobutane
- (ii) Chlorocyclohexane to 2 – Chlorocyclohexane
- (iii) 2 – Bromobutane to 2 – Bromopropane

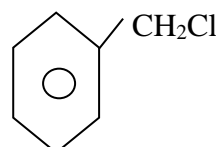
9. (a) Name a simple chemical test or reagent which will readily distinguish between each of the following pairs of compounds.

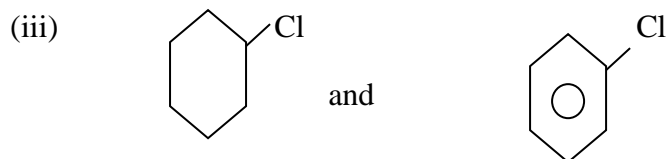
Indicate which member of the pair give the positive test or greater reactions

- (i) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}_2\text{Br}$



and





(b) Write down the equations for the conversion of toluene into 1 – Bromo-4-bromomethylbenzene

(c) Describe the features of benzene according to

(i) Kekule

(ii) Resonance theory

10. (a) Give the meaning of the following words as applied in the soil science.

- (i) Exfoliation
- (ii) Front shattering
- (iii) Soil colloids
- (iv) Soil reaction

(b) A Soil test shows the following

Nutrient soil	Meq/100g
Ca ²⁺	2.1
Mg ²⁺	2.0
NH ⁴⁺	0.6
K ⁺	9.9
Al ³⁺	7.6
Na ⁺	0.1

Calculate

- (i) C E C of the soil
- (ii) Percentage Aluminium saturation in the soil
- (iii) Percentage base saturation of the soil

(c) Briefly explain six advantages and four disadvantages of using manures.