

Mid-West University
Examinations Management Office
Semester End Examination 2080

Bachelor level/ B. Sc. /4th Semester

Time: 3 hours

Subject: Fundamentals of Chemistry IV (CHEM345/CHE445)

Full Marks: 60

Pass Marks: 30

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks. Use separate answer sheet for Inorganic, Organic and Physical parts.

Inorganic Chemistry

Group – A

Attempt *any five* questions. [5x2 = 10]

1. Define electronic configuration. Write electronic configurations of Cr and Zn.
2. What is paramagnetism? Why are Fe, Co and Ni ferromagnetic?
3. Write the reasons of complex formation by transition elements.
4. Differentiate between ionization potential and electron affinity.
5. What is isomerism? Show the cis-trans isomerism formed by complexes.
6. Give examples of similar compounds formed by copper and nickel.
7. How can you prepare chromyl chloride?

Group – B

Attempt *any two* questions. [2x5 = 10]

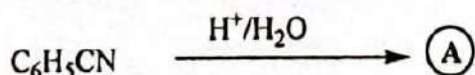
8. Why the transition elements form coloured ions? Explain with diagrams and examples. [2.5+2.5]
9. Describe Werner's theory of coordination compounds. Mention the limitations of this theory. [4+1]
10. Write in short (*any two*); [2.5+2.5]
 - a) Ziegler-Natta catalyst
 - b) Bio-inorganic importance of iron.
 - c) Bonding and structure in nickel carbonyl.

Organic Chemistry

Group – A

Attempt *any five* questions. [5x2 = 10]

1. What is diazotization reaction? Why this reaction should be carried out under highly acidic condition?
2. Identify the major product (A). Convert compound A into $C_6H_5COOC_2H_5$.



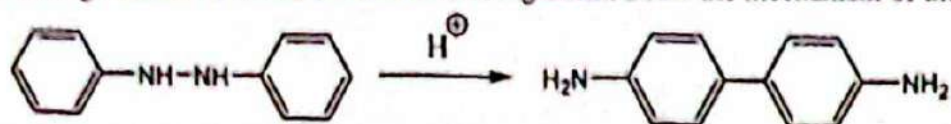
3. Give a brief account of Williamson ether synthesis.
4. You are given phenol and carboxylic acid. With the help of aqueous NaOH and aqueous $NaHCO_3$, how would you distinguish them? Which one can give azodye?
5. Identify the principal products in the given sequence of reactions.



What happens when CH_3CONH_2 is heated with Br_2 in presence of alc. KOH?

6. Write a method of preparation of phenol. Why phenol is more acidic than alcohol?

7. Following reaction is called benzidine rearrangement. Draw the mechanism of this reaction.



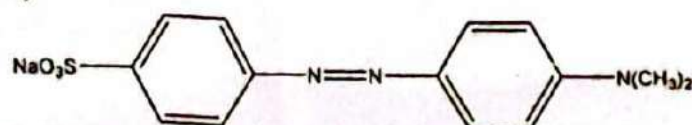
Group - B

Attempt any two questions. [2x5 = 10]

8. Ethylacetoacetate (EAA) is an active methylene compound. Write the role of this compound in acetoacetic ester synthesis. Starting from EAA, how would you synthesize 3-Methylbutanone? [2+3]

9. Give your familiarity with diazocoupling reaction. How would you synthesize the following compounds? [2+1.5+1.5]

i) *m*-Bromophenol ii)



10. Write short notes on: [2.5+2.5]

a) Reimer-Tiemann reaction

b) Effect of Substituents on acidic strength of carboxylic acids.

Physical Chemistry

Group - A

Attempt any five questions. [5x2 = 10]

1. Prove that $C_p - C_v = R$.

2. 8 gm of Oxygen at 27°C and under a pressure of 10 atm are permitted to expand adiabatically and reversibly until the final pressure is 1 atm. Find the final temperature and work done in the process. (For Oxygen $C_p = 7/2R$).

3. Make a representative electrochemical series.

4. The emf of the cell, $Zn(s) | Zn^{2+}(aq, 0.1M) || Cd^{2+}(aq, M_x) | Cd(s)$ is equal to 0.3305 volts at 298K. Calculate the value of M_x . Given that $E^\circ_{Zn^{2+}/Zn} = -0.76V$ and $E^\circ_{Cd^{2+}/Cd} = -0.40V$.

5. Construct a Lead storage battery. Write its advantages.

6. Calculate the work done for reversible adiabatic contraction of 2mols of an ideal gas on cooling from 270°C to 0°C. Given $\gamma = 5/3$, $R = 0.08247 \text{ atm mole}^{-1}$.

7. State Second law of thermodynamics. Illustrate it in terms of a reversible and irreversible thermodynamic process.

Group - B

Attempt any two questions. [2x5 = 10]

8. What is potentiometric titration? Derive an expression for the determination of the pH of an unknown solution by the potentiometric method. Write the advantages of potentiometric titration. [1+3+1]

9. State the Joule-Thomson effect. Explain the mathematical interpretation of the Joule-Thomson effect. [1+3+1]

10. Explain the Carnot cycle with an indicator diagram. A Carnot engine whose low-temperature reservoir at 7°C has an efficiency of 50%. If it is desired to increase the efficiency by 70%, how many degrees should the temperature of the high reservoir be increased? [3+2]

The End