

B.Sc. CHEMISTRY
SECOND SEMESTER
ORGANIC, INORGANIC & PHYSICAL THEORY
BSC – 721 [REPEAT] [OLD COURSE]
[USE OMR FOR OBJECTIVE PART]

**SET
A**

Duration: 3 hrs.

Full Marks: 70

Time: 30 min.


(Objective)

Marks: 20

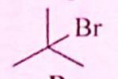
Choose the correct answer from the following:

1X20=20

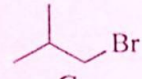
- An intensive property does not depend upon
 - Nature of the substance
 - Quantity of matter
 - External substance
 - Atmospheric pressure
- Which of the following is not correct?
 - $H=E+PV$
 - $H-E=PV$
 - $H-E-PV=0$
 - $H=E-PV$
- In a chemical process, the amount of total heat change is same no matter by which method the change is brought about. This is
 - Law of thermochemistry
 - Hess's law
 - Thermodynamic law
 - Law of heat of reaction
- When water is cooled to ice, its entropy
 - increases
 - decreases
 - Remains the same
 - Becomes zero
- In writing equilibrium constant expression, which of the following quantities can be used to represent the amounts of reactants and products?
 - concentrations
 - Partial pressures
 - Mole fractions
 - (a) and (b) only
- The quantity k in a rate law expression
 - Is independent of concentration
 - Called Arrhenius constant
 - Is dimensionless
 - Is independent of the temperature
- The second law of thermodynamics introduces the concept of
 - Internal energy
 - entropy
 - enthalpy
 - pressure
- The heat of reaction at constant pressure is given by
 - ΔE
 - ΔH
 - ΔG
 - ΔS
- The strongest acid among these is
 - HClO
 - HClO₂
 - HClO₃
 - HClO₄

1. The hybridization of XeF_6 is
- sp^3
 - sp^3d
 - sp^3d^2
 - sp^3d^3
2. The alkali metal halide with the highest value of lattice energy among the following is
- LiCl
 - NaCl
 - KCl
 - RbCl
3. Which molecule has sp^3d hybridization?
- BF_3
 - CH_4
 - XeF_4
 - PF_5
4. The oxidising agent in the following reaction is
- $$3\text{Fe} + 4\text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + 4\text{H}_2$$
- Fe
 - Fe_3O_4
 - H_2O
 - H_2
5. The oxidation number of Mn in KMnO_4 is
- +5
 - +7
 - +6
 - +8
6. Which among these is not an Arrhenius base?
- NaOH
 - KOH
 - Na_2CO_3
 - $\text{Ba}(\text{OH})_2$
7. Arrange the following in order of their boiling point.
- 

A

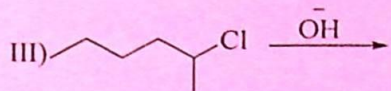
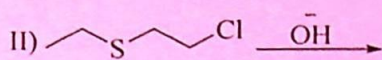
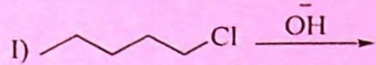


B



C
- $\text{A} > \text{B} > \text{C}$
 - $\text{A} > \text{C} > \text{B}$
 - $\text{B} > \text{A} > \text{C}$
 - $\text{B} > \text{C} > \text{A}$
8. In which of the following reaction pathway, carbocation is involved
- E1
 - E1_{CB}
 - E2
 - $\text{S}_{\text{N}}2$
9.
$$\text{CH}_3\text{COOH} + \text{CH}_3\text{CH}_2\text{OH} \xrightleftharpoons{\text{H}^+} \text{A} + \text{H}_2\text{O}$$
- In the above reaction, A is
- $\text{CH}_3\text{COOCH}_3$
 - $\text{CH}_3\text{CH}_2\text{OCH}_3$
 - $\text{CH}_3\text{COOC}_2\text{H}_5$
 - $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$

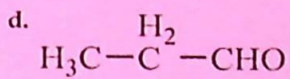
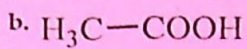
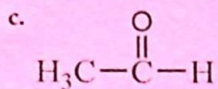
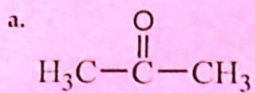
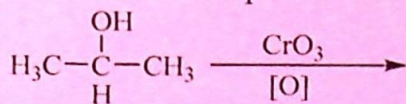
19. In the following reactions the order of S_N2 reaction is



- a. I>II>III
c. II>III>I

- b. II>I>III
d. III>II>I

20. What will be the product of the following reaction?



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(Descriptive)

Time : 2 hrs. 30 min.

Marks : 50

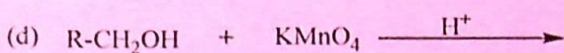
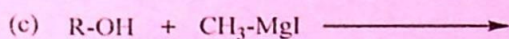
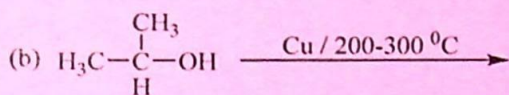
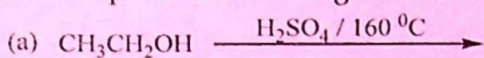
[Answer question no.1 & any four (4) from the rest]

1. a. i. State Hess's law of constant heat summation. 5+3+2
=10
ii. Write the mathematical expression of First and Third law of thermodynamics
b. Discuss how ionization energy and electron affinity influence the formation of an ionic bond.
c. State the Bronsted-Lowry concept of acid and base.
2. a. Integrate the rate expression for a first order reaction. What is the unit of rate constant for a first order reaction? 5+5=10
b. Explain Arrhenius equation. Give graphical representation of activation energy diagram.
3. a. Derive the condition of spontaneity and equilibrium in terms of Gibb's free energy change and Internal energy. 5+5=10
b. State Hess's law of constant heat summation. Calculate the enthalpy of formation of ethyl alcohol, given that ΔH for combustion of ethyl alcohol, ΔH for formation of carbon dioxide and water are -326.7, -94.05 and -68.3 kcal respectively.
4. a. Define heat capacity at constant volume and at constant pressure. 3+2+5
=10
b. Distinguish between isothermal and adiabatic process.
c. Derive an expression for the work done by a gas in isothermal reversible expansion of an ideal gas.
5. a. Discuss the Fajan's rules of polarization. 3+3+2+
2=10
b. Draw the Born-Haber cycle. How can we calculate the lattice energy from it?
c. Draw the energy level molecular orbital diagram of O_2 and find the bond order of the molecule.
d. What is radius ratio? What is its significance?

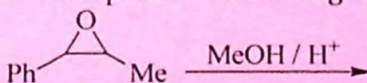
6. a. State HSAB principle. Give one application of HSAB principle. 3+2+2+
3=10
 b. What are Lewis acids? Give examples.
 c. In the given reaction, indicate oxidation, reduction, oxidising agent and reducing agent: $2 \text{FeCl}_3 + \text{SnCl}_2 \rightarrow 2 \text{FeCl}_2 + \text{SnCl}_4$
 d. Balance the following reaction by oxidation number method:
 $\text{Zn} + \text{HNO}_3 \rightarrow \text{Zn}(\text{NO}_3)_2 + \text{N}_2\text{O}$

7. a. Give one method of preparation of alcohols. 2+3+5
=10
 b. Discuss any method used to distinguish between primary, secondary and tertiary alcohols.

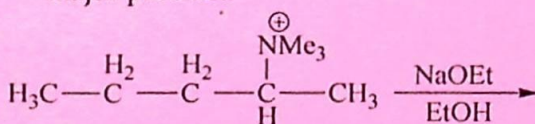
c. Complete the following reactions:



8. a. Write the difference between $\text{S}_\text{N}1$ and $\text{S}_\text{N}2$ reactions. 2+2+3+
3=10
 b. Give the conditions which favour E1_{CB} reactions.
 c. Complete the following reaction giving plausible mechanism



- d. What is Saytzeff rule? Complete the following reaction indicating the Saytzeff and Hoffmann product. Also identify the major product.



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