Second Year B.Sc. Degree Examination, Sept./Oct. 2012
Directorate of Distance Education
CHEMISTRY (Paper – II)

Time : 3 Hours   Max. Marks : 75/85

Instructions : 1) *This paper consists of **five** Sections. Answer **all** Sections.*
                 2) *Write equations and neat diagrams **wherever** necessary.*
                 3) *Section '**E**' is **compulsory** for **85** marks scheme.*

SECTION – A

Answer the following questions in **a word**, **a phrase** or in **a sentence**.   **(1×10=10)**

1. Write the molecular orbital electronic configuration for O_2.

2. Mention the temperature at which density of water is maximum.

3. Name the type of hydrogen bond in ortho-nitrophenol.

4. Write the type of hybridisation of Xe in Xe F4.

5. Define inversion temperature.

6. Complete the following nuclear reaction. $^{27}_{13}Al + ^{1}_{0}n \rightarrow ^{24}_{11}Na + ?$

7. What is an adiabatic process ?

8. Arrange the following compounds in increasing order of their basicity.

   i) Methylamine   ii) dimethylamine   iii) trimethylamine

9. What is Cannizzaro's reaction ?
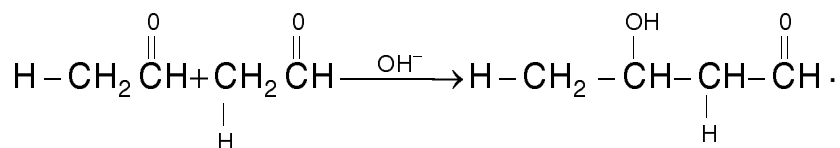
10. Write the IUPAC name of

$$CH_3 - CH - CH_2 - CH_2 - COOH.$$
$$|$$
$$CH_3$$

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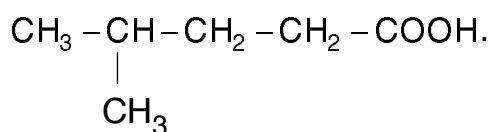
SECTION – B

Answer **any FIVE** of the following.   **(5×3=15)**

11. What conditions must be satisfied for an ionic bond to be formed between two elements A and B ?

12. Write a short note on "Basic character of Iodine".

13. Define molar heat capacity of a system. Derive the relationship between molar heat capacity at constant volume and constant pressure.

14. What is nuclear binding energy ? How does it vary with the stability of the nucleus ?

15. Explain Victor Meyer's test for alcohols.

16. Give the mechanism of the following reaction.

$$H-CH_2\overset{\overset{O}{\|}}{C}H + CH_2\overset{\overset{O}{\|}}{C}H \xrightarrow{\ OH^-\ } H-CH_2-\overset{\overset{OH}{|}}{C}H-\overset{|}{\underset{H}{C}}H-\overset{\overset{O}{\|}}{C}H .$$

17. Write a note on LCAO approximation.

SECTION – C

Answer **any FIVE** of the following.   **(5×6=30)**

18. a) Derive the expression for maximum work done when 'n' moles of an ideal gas are expanded isothermally and reversibly from V_1 to V_2 volume.

    b) Write the magic numbers for
       i) Protons and   ii) Neutrons   **(4+2)**

19. a) Derive the equation $pH = pKa + \log \dfrac{[Salt]}{[acid]}$.

    b) State the phase rule and explain the term : number of degrees of freedom.
                                                              (4+2)

20. a) Write a note on directive influence of

    i) Nitro group   ii) chloro group

   b) How are Nitroglycerine and Acrolein synthesised from glycerol ?   **(4+2)**

21. a) Discuss the structure and reactivity of carbonyl group.

   b) Explain why chloroacetic is a stronger acid than acetic acid.   **(4+2)**

22. a) Give the use of Grignard reagents in preparing

    i) a carboxylic acid

    ii) a secondary alcohol

    iii) an alkane

   b) Explain the effects of electron withdrawing and electron releasing groups on the acidity of phenols.   **(3+3)**

23. a) Discuss the shape and structure of water molecule using VSEPR theory.

   b) Define :

    i) Gravimetric analysis

    ii) Accuracy

    iii) Precision.   **(3+3)**

24. With the help of molecular orbital theory explain the following.

   a) H_2 molecule exists but He_2 molecule does not exist

   b) O_2 molecule shows paramagnetic property

   c) Bond order of O_2 is two while that of H_2 is one.   **(2+2+2)**

SECTION – D

Answer **any TWO** of the following.   **(2×10=20)**

25. a) Discuss the structure and bonding in diborane

   b) Explain the variation of percentage ionic character of bond with electronegativity difference.

   c) Differentiate between a sigma and a pi-bond.   **(4+4+2)**

26. a) Derive an expression for the rate constant of a second order reaction $P+Q \rightarrow$ products, when the initial concentrations are equal.$(a = b)$

   b) Derive the relationship between Kh, Kw and Kb for the salt of a weak base and strong acid.

   c) Explain Quinonoid theory of acid-base indicators. **(4+4+2)**

27. a) Give the general mechanism of nucleophilic addition reactions of carbonyl compounds.

   b) How is primary, secondary and tertiary amines distinguished from one another by nitrosation test ?

   c) Write a note on : Arndt-Eistert synthesis. **(4+4+2)**

SECTION – E

Answer **any one** of the following **(1×10=10)**

28. a) i) Define Lattice energy. How does it vary with charges on the ions of ionic crystal and with the internuclear distance between the oppositely charged ions ?

   ii) Explain coordinate bond taking the example of formation of NH_4^+ ion.

   (3+2)

   b) i) How Glycerol is synthesised from propylene ?

   ii) Give the mechanism of esterification reaction between acetic acid and ethyl alcohol. **(2+3)**

29. a) Explain

   i) Inductive effect

   ii) hyperconjugation effect with examples. **(2+3)**

   b) i) What is the action of heat on α, β and γ-hydroxy acids ?

   ii) Give the synthesis of aromatic primary amines by the reduction of nitro compounds. **(3+2)**