STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted during the academic year 2008–09 & thereafter)
SUBJECT CODE: CH/MC/GC14
B.Sc. DEGREE EXAMINATION, NOVEMBER 2009
BRANCH IV- CHEMISTRY
FIRST SEMESTER
REG.NO ……..

COURSE : MAJOR CORE
PAPER : GENERAL CHEMISTRY
TIME : 30 MINUTES **MAX.MARKS : 30**

SECTION – A (30x1=30)
ANSWER ON THE QUESTION PAPER ITSELF.
Answer all the questions.

I Choose the correct answer:

1. The Bohr's model can explain the spectrum of
a. the hydrogen atom only b. an atom or ion having one electron only
c. the hydrogen molecule only d. the sodium atom only

2. The atomic orbital that is not allowed in quantum theory is
a. 3*f* b. 4*p* c. 5*g* d. 4*d*

3. The highest electron affinity is shown by
a. O^- b. F^- c. Cl_2 d. F_2

4. The bond order in CO is
a. 2 b. 1 c. 3 d. 2.5

5. Among the following, the strongest base is
a. $C_6H_5NH_2$ b. *p*-NO_2-$C_6H_4NH_2$ c. *m*- NO_2-$C_6H_4NH_2$ d. $C_6H_5CH_2NH_2$

6. Which of the following is the correct order of stability of different conformations of n-butane?
a. Staggered > Gauche > Partially eclipsed > Fully eclipsed
b. Gauche > Staggered > Partially eclipsed >Fully eclipsed
c. Staggered > Fully eclipsed > Partially eclipsed >Gauche
d. Gauche > Fully eclipsed > Partially eclipsed > Staggered

II Match the following:

7. Ionization potential	a. hemolytic fission
8. Electronegativity	b. Li^+
9. Free radicals	c. decreases down the group
10. Inductive effect	d. I^-
11. Hard acid	e. increases from left to right of the periodic table
12. Soft base	f. polar effect

..2

III State whether the following statements are TRUE or FALSE:

13. The number of nodal planes present in a *d*-orbital is three.
14. The Lyman series of hydrogen spectrum lie in the UV region.
15. The H – O – H bond angle in water is $109^{o}28'$.
16. Soft Lewis bases have low polarisability and high electronegativity.
17. IUPAC nomenclature recommends that the longest continuous chain is the parent in naming branched alkanes.

IV Fill in the blanks:

18. In Rutherford's experiment, most of the α–particles passed through the foil _____ which shows that the most of the space in the atom is empty.
19. Ψ^2 measures the _____ at a given point in an atom.
20. The ionic compounds conduct electricity in _____ state.
21. In MOT, _____ method is followed to explain the overlapping of atomic orbitals.
22. The number of orbitals in a subshell is given by _____.
23. _____ and _____ effects could not be explained by Bohr's model.

V Answer the following in one / two lines:

24. State Hisenberg's principle of uncertainty.

25. Define an orbital.

26. Write the ℓ and m values for the electrons in $4d$.

27. Define Lattice Energy.

28. According to MOT, write the electronic configuration of He_2 molecule.

29. CH_3COOH is less acidic than HCOOH. Explain.

30. Give the IUPAC name of $CH_3 - CH = CH - CH_2 - COOH$.

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PAPER : GENERAL CHEMISTRY
TIME : 2½ HOURS **MAX.MARKS : 70**

SECTION – B

Answer any FIVE of the following: **(5 x 6 = 30)**

1. a. A cricket ball weighing 100g is to be located within $0.1A^{o}$. what is the uncertainty in its velocity? Comment on your result. ($h = 6.626 \times 10^{-34}$ Js)
   b. State the postulates of Planck's theory. (3 + 3)

2. What is Schordinger's wave equation? State the conditions under which the wave functions become acceptable. Can the equations be called eigen value equation?

3. Account for the following:
   a. In moving down a group, electron affinity decreases; but oxygen has lower electron affinity than that of sulphur.
   b. Even though fluorine has lower electron affinity than that of chlorine, fluorine is a powerful oxidizing agent. (3+3)

4. a. State Fajan's rule.
   b. Discuss the factors that affect the polarizability of an anion and polarity. (2 + 4)

5. a. Write the possible chain isomers of C_4H_{10}.
   b. Which of the following compounds show geometrical isomerism? Why?
   i. 2-butene ii. 2-methyl-2-butene (3+3)

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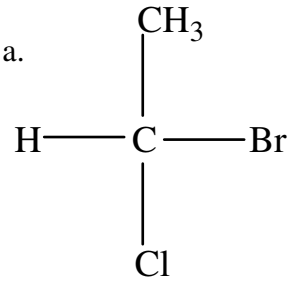
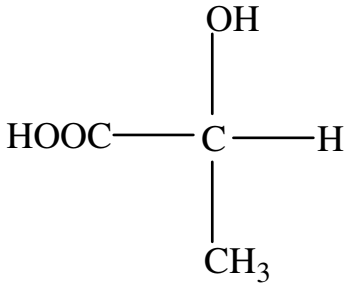
6. a. Assign R,S notation for the following:

a. 

b. 

b. State the conditions for a compound to exhibit optical isomerism. (4 + 2)

7. Account for the following:
   a. The stability order of carbonium ions is $3^o > 2^o > 1^o > CH_3^+$
   b. Benzyl carbanion is more stable than propyl carbanion.

(3+ 3)

SECTION – C

Answer any TWO of the following: **(2 x 20 = 40)**

8. a. Write a note on photoelectric effect.
   b. Derive an expression for the radius of an orbit using Bohr's postulates. Calculate the radius of the hydrogen atom using Bohr's equation.
   c. Explain hyperconjugation with an example. (6 + 8 + 6)

9. a. Calculate the lattice energy of NaCl crystal from the following data using Born – Haber cycle.
   Sublimation energy of Na = 26 kcal / mol
   Dissociation energy of Cl_2 = 54 kcal / mol
   Ionization potential for Na(s) = 117 kcal / mol
   Electron affinity for Cl(g)= 84 kcal / mol
   Heat of formation of NaCl = 99 kcal / mol
   c. Write briefly on: (i) HSAB Principle
   (ii) Partial ionic character of a covalent bond

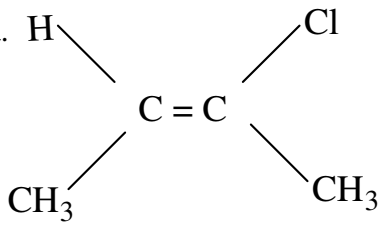
(8 + 6 + 6)

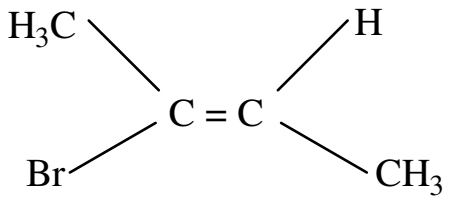
10. a. Explain the geometry of PCl_5 based on VB theory.

b. Describe the formation of CO using MOT.

c. The bascities of NH_3 and its methyl derivatives are in the following order in gas phase: $NH_3 < CH_3NH_2$, $(CH_3)_2NH$, $(CH_3)_3N$. But dimethyl amine is found to be more basic in solution. Why?

d. Assign E and Z configuration to the following compounds: (6 + 6 + 4 + 4)

a. 

b. 

11. a. With the energy profile diagram, discuss the conformation of n-Butane molecule.

b. Arrange the following in the increasing order of stability and justify: (i) $CH_3CH_2CH_2CH_2^+$ (ii) $(CH_3)_3C^+$ (iii) $CH_3CH_2CH^+CH_3$

c. Account for the following:

(i) Trichloroacetic acid is stronger than acetic acid.

(ii0 Aniline is a stronger base than p-nitro aniline. (8 + 6 + 6)