SUBJECT CODE: 15CH/MC/GC14

B.Sc. DEGREE EXAMINATION, NOVEMBER 2017
BRANCH IV- CHEMISTRY
FIRST SEMESTER

COURSE   : MAJOR CORE
PAPER   : GENERAL CHEMISTRY
TIME   : 3 HOURS   MAX.MARKS :100

Section- A

Answer all questions: (30 x 1 = 30)
Choose the correct answer:

1. Among the following compounds, the maximum covalent character is observed in
    a. LiCl   b. $BeCl_2$ c. BCl_3 d. CCl_4

2. Which of the following molecule does not have a linear arrangement of atoms?
    a. C_2H_2 b. BeF_2 c. CO_2 d. H_2O

3. If an isotope of Hydrogen has two neutrons in its atom, its atomic number and mass number respectively will be
    a. 2 and 1   b. 1 and 1   c. 3 and 1   d. 1 and 3

4. In the following radioactive decay, $_{92}X^{232} \rightarrow _{89}Y^{220}$, how many α and β particles are ejected from X to Y?
    a. 3α and 2β   b. 5α and 3β   c. 3α and 3β   d. 5α and 5β

5. Which among the following is the most stable carbocation?
    a. $(CH_3)_2HC^+$ b. $(CH_3)_3C^+$ c. H_3C^+ d. $H_3C-H_2C^+$

6. The IUPAC name of $(CH_3)_2CH-CH(CH_3)-CH_2-CH_2-CH(CH_3)_2$ is
    a. 1,3-isopropyl-3-methyl propane   b. 2,3,6-trimethyl heptane
    c. 2,5,6-trimethyl heptane   d. 2,6,3-trimethyl heptane

7. Van der Waals real gas acts as an ideal gas under which condition?
    a. low temperature, high pressure   b. high temperature, low pressure
    c. high temperature, high pressure   d. low temperature, low pressure

8. An ideal gas cannot be liquefied because
    a. critical temperature is always above 0^oC b. solidifies before becoming liquid
    c. molecules are relatively smaller in size   d. forces between molecules are negligible

9. Standard enthalpies(ΔH^o) of reactions are determined at
    a. 0^oC and 10 atm pressure   b. 25^oC and 10 KPa pressure
    c. 25^oC and 1 atm pressure   d. 0^oC and 1 atm pressure

10. The enthalpy change for the reaction $A_{(g)} + 3B_{(g)} \rightarrow 2C_{(g)}$ is -92 KJ mol^{-1}. The standard enthalpy of formation of substance 'C' is
    a. - 92 KJ mol^{-1} b. –46 KJ mol^{-1} c. +92 KJ mol^{-1} d. +46 KJ mol^{-1}

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Fill in the blanks:

11. The IUPAC name of neopentane is_____.
12. The reactive intermediate formed during homolytic fission of C-C bond in alkanes is_____.
13. Compression factor for an ideal gas is equal to_____.
14. Atoms of different elements with same mass number are called as_____.
15. The bond order of CO molecule is_____.
16. The most probable velocity of a gas increases with _____ in temperature.
17. Chlorination of methane in presence of UV light is an example for _____ reaction.
18. The shape of SF_4 molecule is_____.
19. The hybridization of Boron atom in BF_3 molecule is_____.
20. In the 4n+2 series, starting from ^{238}U through successive disintegrations a stable isotope of _____ is finally formed.

State whether true or false:

21. Ionic compounds conduct electricity in their solid state.
22. Hydrogen bomb works on the principle of nuclear fission.
23. H_2O and NH_3 are examples for nucleophiles.
24. According to kinetic theory of gases, molecular collisions are perfectly elastic.
25. The standard enthalpy of formation of oxygen molecule is equal to zero.

Answer in a single line:

26. When a chemical equation is reversed, what happens to the value of standard enthalpy for reaction? Write its unit.
27. Write the expression relating partial pressure of a gas in a mixture with total pressure.
28. Identify the electrophiles from the following molecules/ions:
     $(CH_3)_3N$, BF_3, CH_3CO^+, $H_5C_2O^-$
29. What is meant by binding energy of nucleus?
30. Why He_2 molecule does not exist?

Section B

Answer any five questions: (5×6=30)

31. Write a comparative account of solids, liquids and gases.
32. The enthalpy of reaction (ΔH) for the formation of ammonia according to the reaction,
     $N_2 + 3H_2 \rightarrow 2NH_3$ at 27^oC is -91.94 KJ. What will be the enthalpy of reaction (ΔH) at 50^oC?
     (Molar heat capacities of nitrogen, hydrogen and ammonia at 27^oC and at constant pressure are 28.45, 28.32 and 37.07 J, respectively)
33. Give a brief account of carbanions and free radicals with examples.
34. Justify the aromatic nature of cyclopropenylcation, tropyliumcation and naphthalene molecule.
35. Draw the MO diagram for oxygen molecule and determine the bond order and magnetic nature. Compare it with O_2^{2-}.

36. a) Discuss the factors which favour the formation of a covalent bond.   (4)
    b) What is a coordinate/dative bond? Give two examples of compounds having it.   (2)

37. a) Explain the use of Geiger-Muller counter for detection and measurement of radioactivity.
                                                                                          (4)
    b) What are isotones? Give examples.   (2)

Section C

Answer any two questions: **(2×20=40)**

38. a) Using VSEPR theory, deduce the shapes of NH_3, PCl_5 and ClF_3 molecules.   (7)
    b) Define lattice energy and write the Born-Lande equation.   (3)
    c) Explain the liquid drop model of the nucleus and use it to explain the mechanism of
       nuclear fission.   (6)
    d) Discuss the stability of atomic nuclei in terms of the ratio of neutrons and protons.   (4)

39. a) Find the error in the following names and write the correct structure and IUPAC names for
       the following: (6)
       i)   3-methyl-4-ethyl-2-hexanol
       ii)   3-butanol-1-oic acid
       iii)   2-methyl-1-carboxypentene-3
    b) Write briefly on Inductive effect and hyperconjugation.   (5+5)
    c) Determine the lattice enthalpy of NaCl.   (4)
       If $\Delta_{sub} H^o$ =108.4 KJmol^{-1}, $\Delta_i H^o$ = 496 KJmol^{-1} for sodium metal.
       $\Delta_{bond} H^o$ = 242 KJ mol^{-1} and $\Delta_{eg} H^o$ = - 348.6 KJ mol^{-1} for chlorine and
       $\Delta_f H^o$ NaCl is - 411.2KJ mol^{-1} for the reaction $Na_{(s)} +1/2Cl_{2(g)} \rightarrow NaCl_{(s)}$

40. a) For hydrogen gas (Mol.mass = 2.016 x10^{-3} Kg mol^{-1}), calculate average velocity and most
       probable velocity at 0°C.   (5)
    b) Write a short note on liquefaction of gases.   (5)
    c) Define the following terms: (10)
       i) Critical temperature   ii) Packing fraction
       iii) Standard enthalpy of vapourisation   iv) standard enthalpy of combustion
       v) Enthalpy of neutralisation

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