MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :……………………   Name :…………………

First Semester B.Sc. Degree Examination, November 2016
First Degree Programme under CBCSS
Complementary Course: Chemistry – I (for Physics)
AUCH131.2d: Principles of Chemistry I

(*Common for **Regular** – 2016 Admn. and **Improvement** – 2015 Admn.*)

Time: **3** Hours   Max. Marks: **80**

SECTION – A

*Answer **ALL** questions in a word or one or two sentences.*

1. The Brackett series of hydrogen spectrum falls in the _____ region of electromagnetic spectrum.

2. The l – value of 4f orbital is _____.

3. The most electronegative element after fluorine is _____.

4. The unit of dipole moment is _____.

5. The number of bond pairs and lone pairs in water molecule are respectively _____ and _____.

6. The bond order in CO molecule is _____.

7. For _____ substances in the standard state, enthalpy is equal to zero.

8. The amount of heat produced when one gram of a substance is completely burnt is called the _____ of the substance.

9. The entropy of the universe always tends towards _____.

10. For a reversible change taking place at a fixed temperature, the change in entropy is equal to the heat energy (absorbed or evolved) divided by _____.

(10 × 1 = 10 Marks)

SECTION – B

*Answer any **EIGHT** questions, not exceeding a paragraph.*

11. Explain why the energy of an electron in an atom is negative.

P.T.O.

12. State and explain Aufbau principle.

13. Write the Schrodinger equation and explain the terms involved.

14. Account for the wide difference in boiling points of o – nitrophenol and p – nitrophenol.

15. Explain why the dipole moment of NF_3 is much lower than that of NH_3.

16. Define electronegativity in Mullikan's approach. Mention an advantage of it over Pauling's approach.

17. What is meant by molar heat capacity of a gas ? What is the SI unit of the same ?

18. State and explain first law of thermodynamics.

19. Distinguish between extensive and intensive properties.

20. Define enthalpy of neutralisation. Explain why the enthalpy of neutralisation of strong acid or a strong base is always a constant.

21. Define bond energy. What are the factors on which it depend ?

22. Explain why ethanol is soluble in water while ethane is not.

(8 × 2 = 16 Marks)

SECTION – C

Short essay type / Problems : Answer any SIX questions.

23. A line of wavelength 656 nm in the Balmer series corresponds to a transition from n^{th} orbit. Find the value of n, given R= 109676 cm^{-1}.

24. State the postulates of Bohr's theory. What are its limitations ?

25. Derive the relationship between C_p and C_v.

26. What do you mean by the term hybridization ? With a suitable example each, explain the following types of hybridization.
    i). dsp^2 ii). dsp^3 iii). d^2sp^3

27. Explain the variation of bond angles in H_2O, NH_3, CH_4.

28. Discuss any four differences between reversible and irreversible processes.

29. Derive an expression for isothermal reversible expansion work of an ideal gas.

30. The heat of combustion of CO at constant pressure at 290K is −285kJ . Calculate the heat of combustion at constant volume.

31. Discuss the Fajan's rules.

(6 × 4 = 24 Marks)

SECTION – D

*Long essay type : Answer any **TWO** questions.*

32. Write an essay on quantum numbers.

33. Discuss the molecular orbital theory of chemical bonding. Apply it to compare the bond order, bond length, bond strength and magnetic behaviour of O_2, O_2^{2+} and O_2^{2-}.

34. State and explain Hess's law. Discuss Born – Haber cycle and show how it can be used to determine lattice energy of crystalline substances.

35. With suitable examples distinguish between equilibrium processes and spontaneous processes. Explain the criteria of spontaneity and equilibrium on the basis of entropy and free energy.

(2 × 15 = 30 Marks)

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