SUMMER FIELDS

Code No. –   Set -2

Roll No. | | | | | | | | 1 | 9 |

CHEMISTRY

Candidate must write the Code No. on the title page of the answer book.

- Please check that this question paper contains 3 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer – book by the candidate.
- Please check that this question paper contains 26 questions.
- Please write down the Serial Number of the question before attempting it.

FIRST TERM EXAMINATION 2015 – 16

SUBJECT CODE – 1104

Time allowed : 3 Hours **Maximum Marks : 70**

General Instructions:

(i)   All the questions are compulsory.
(ii) Questions numbers 1 to 5 are very short answer questions and carry 1 mark each.
(iii) Questions numbers 6 to 10 are short answer questions and carry 2 marks each.
(iv) Questions numbers 11 to 22 are also short answer questions and carry 3 marks each.
(v)   Question number 23 is value based question carrying 4 marks.
(vi) Questions numbers 24 to 26 are long answer questions and carry 5 marks each.
(vii) Use log tables if necessary, use of calculators is not allowed.

1.   Hydrogen peroxide can act both as oxidizing and reducing agent. Justify.

2.   Ozone is a toxic gas and is a strong oxidizing agent, even then its presence in stratosphere is very important. Explain what would happen if ozone from this region is completely removed?

3. NH_3 and NF_3 are isostructural (True/False). Give reason to support your answer.

4.   To which block, group and period does Zn (30) belong?

5.   Which oxidation states does oxygen show in peroxides and fluorides?

6.   Ice has lower density than water. Give reason for the statement and explain how this property is useful for survival of aquatic life.

7.   What are the harmful effects of photochemical smog? What are its major components? How can photochemical smog be controlled?

8.   What volume of 0.01 M H_2SO_4 is required to neutralize (i) 20mL of 0.01 M NaOH (ii) 10 mL of 0.02 M KOH?

9.   Calculate the mass of a molecule of Carbon dioxide. m gm

OR

If 20g of $CaCO_3$ is treated with 20g of HCl, how many grams of CO_2 will be produced?

10. Assign oxidation numbers to the underlined elements in each of the following species:

(i) $Ca_3(\underline{P}O_4)_2$ (ii) Ba$\underline{S}O_4$ (iii) $\underline{C}O_2$ (iv) Na$\underline{B}H_4$

11. What is the cause of permanent hardness of water? Explain any one method to remove permanent hardness?

Complete the following reactions:

$$Fe^{2+} + H^+ + H_2O_2 \rightarrow$$

$$MnO_4^- + H^+ + H_2O_2 \rightarrow$$

$$I_2 + H_2O_2 + OH^- \rightarrow$$
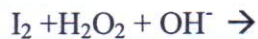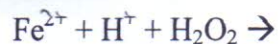
12. An organic compound contains 69.77 % carbon, 11.63 % hydrogen and the rest oxygen. The molecular mass of the compound is 86. What is the molecular formula of the compound?

13. What is meant by resonance? Explain using an example.

14. (a) Although both CO_2 and H_2O are triatomic molecules, H_2O molecule is polar while CO_2 is non-polar. Why?

    (b) Explain the shape of SF_4 using VSEPR theory.

15. (i) Give the IUPAC name and symbol of element with atomic number 115.

    (ii) Give two features of p block elements.

    (iii) Why are Van der Waal radii measured in case of noble gases?

16. Commercially available concentrated hydrochloric acid contains 38% HCl by mass. What is the molarity of this solution if the density of the acid is $1.19g\, m\, L^{-1}$?

17. Write electronic configuration of Cu (29). Give reasons to justify the configuration.

18. (i) Which of the following orbitals are possible?

    7p, 1p, 2s, 3f, 4g

    (ii) Give the quantum numbers for the electron with the highest energy in potassium atom. (atomic number of K = 19)

    (iii) What is the maximum number of electrons with n=3 and m =1?

19. Balance the following redox equation:

$$MnO_4^-\ (aq) + Sn^{2+}\ (aq) \rightarrow Mn^{2+}\ (aq) + Sn^{4+}(aq)\ \text{(in acidic solution)}$$

20. Arrange the following in increasing order of the property specified giving reasons for the order:

    (i) Al^{3+}, Na^+, O^{2-}, F^- (sizes)

    (ii) F, Cl, Br, I (electron gain enthalpy)

21. What is meant by hybridisation? Discuss the types of hybridisation involving s and p orbitals giving examples in each case.

22. Calculate the uncertainty in the velocity of an electron, if the uncertainty in its position is 3×10^{-9} m. (Given : h = 6.626×10^{-34} Js, mass of an electron = 9.1×10^{-31}kg)

23. During winter season, Ram's mother placed burning coal in the room to keep it warm. She closed all the doors and windows. Ram advised her to open the doors and keep the burning coal outside before they go to sleep.

    a. Why is it important to open the doors and windows in the above case?

    b. Which gas is produced in case doors are closed and what are its harmful effects?

    c. What values does Ram possess?

24. a. Distinguish between sigma and pi bond.

    b. Draw the molecular orbital diagram of O_2. Is the molecule paramagnetic or diamagnetic?

    OR

    a. Differentiate between bonding and antibonding molecular orbitals.

b.   What is formal charge? Calculate formal charge on each atom in ozone.

25. a.   The second electron gain enthalpy of O is positive, highly negative or less negative than the first electron gain enthalpy value? Justify your answer.

b.   Why is fluorine more electronegative than chlorine?

c.   The ionization enthalpy values (in kJ/mol) of group 13 elements are:

Element	B	Al	Ga	In	Tl
I.E./ kJ/mol	801	577	579	558	589

Explain the trend observed.

<div align="center">OR</div>

a.   Correct the statement if required:

Ionization enthalpy of an element is the minimum amount of energy required to remove the most loosely bound electron from an atom in its ground state.

b.   Why is the electron gain enthalpy of nitrogen positive, while that of carbon and oxygen negative?

c..   First and second ionization enthalpies in kJ/mol for a few elements are given below:

Element	IE_1	IE_2
A	419	3051
B	1251	2297
C	2372	5250
D	738	1451

Which of the above element is likely to be? Give reason to support your answer.
(i)   a reactive metal
(ii)   a noble gas
(iii)   an alkaline earth metal

26. a.   What are the frequency and wavelength of a photon emitted during a transition from n = 5 state to the n = 2 state in the hydrogen atom?

b.   Write the features of the Quantum Mechanical Model of Atom.

<div align="center">OR</div>

a.   What would be the maximum kinetic energy of an electron emitted by a light of wave length 2.0×10^{-8} cm from the surface of potassium metal whose work function is 3.62×10^{-19} J?

b.   What does the negative electronic energy (E_n) for hydrogen atom mean?

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