December 2015

BASIC CHEMISTRY

Time Allowed: 3 Hours *Full Marks: 70*

Answer to Question No.1 is compulsory and to be answered first.
This answer is to be made in separate loose script(s) provided for the purpose.
Maximum time allowed is 45 minutes, after which the loose answer scripts will be collected and fresh answer scripts for answering the remaining part of the question will be provided.
On early submission of answer scripts of Question No.1,
a student will get the remaining script earlier.
Answer any five questions from Group-A & B, taking at least two from each group.

1. Answer any TWENTY questions: 1x20

Choose the correct answer from the given alternatives:

i) For the titration of HCl and NH_4Cl, the suitable indicator is – (a) Methyl orange (b) Phenolphthalein (c) Eriochrome Black - T (d) None of these.

ii) Oxidation number of Mn in $KMnO_4$ is – (a) –1 (b) +3 (c) +5 (d) +7.

iii) Minimum amount of Carbon is present in – (a) Cast iron (b) Wrought iron (c) Pig iron (d) Steel.

iv) Bacteria free soft water may be obtained by – (a) permutit process (b) Calgon treatment (c) De-ionization (d) Distillation.

v) The quantity of electricity required to deposit 48 gm of Magnesium from its salt at cathode is – (a) 2F (b) 4F (c) 1F (d) 6F.

vi) The ion which contain 8 electrons in the outermost shell is – (a) Cl^- (b) O^{2-} (c) Mg^+ (d) none of these.

Fill in the blanks with suitable word(s):

vii) Number of electrons present in d-orbital of $_{26}Fe^{56}$ _____.
viii) $AlCl_3$ behaves as _____.
ix) Dry ice is an example of _____ solid.
x) _____ metal is extracted by carbon reduction process.
xi) IUPAC name of CH_3COOH is _____.
xii) Intra Molecular H-Bonding is found in _____.
xiii) Hybridization of N in NH_3 is _____.
xiv) Type of Hybridization present in diamond is _____.
xv) Geometrical Isomers of But-2-en is _____.
xvi) Electronic Configuration of Cl^- is _____.

Write down whether the following statements are True or False:

xvii) Oxalic acid may be used as a primary standard.
xviii) During electrolysis metallic ions in solution move towards the cathode.
xix) Demonized water and distilled water have no difference.
xx) Potassium Ferrocyanide is an example of complex salt.
xxi) Acetylene is used in oxy-acetylene torch for welding of metals.
xxii) When Ethyl Alcohol are heated with Conc.H2SO4 at 165-170°C, they lose a water molecule and form ethylene.
xxiii) Isotopes have same number of proton within the nucleus.
xxiv) Maximum number of electrons can be accommodated in d-orbital's of an atom is 6.
xxv) Bohr did experiment of alpha particle scattering on Gold foil.

Group-A

2. a) What is a buffer solution? Give an example.
   b) What amount of a dibasic acid (Mol Wt 120) will be required to prepare the following solutions? – (i) 250 cc 0.5M solution, (ii) 500 cc 0.2 N solution.
   c) What is meant by σ bond and π bond ? Which one is stronger?
   d) State Bohr's postulates of atomic model. 2+3+2+3

3. a) Lewis concept of acid and explain with example.
   b) Aqueous solution of $(NH_4)\ SO_4$ is acidic in nature. Justify.
   c) Name one ion which has no electron.
   d) Define Inter and Intra Molecular H-Bonding with examples.
   e) Draw the Orbital Picture of CH_4. 2+2+1+3+2

4. a) State Pauli's Exclusion Principle with example.
   b) Define PH of a solution? Find out the PH of 10-8(N) HCl solution?
   c) H_2O is liquid whereas H_2S is gas at ordinary temperature, explain? 3+2+3+2

Group-B

5. a) State Faraday's laws of electrolysis and hence deduce the relationship between electrochemical equivalent and chemical equivalent.
   b) Write down the physiochemical principles for the manufacturer of ammonia by Haber's process. (Description of the process is not required)
   c) What is oleum? How is it prepared? Write down the reaction of oleum with water. 2+3+3+2

6. a) What do you understand by the term auto catalyst? Give an example.
   b) Balance the following equation by ion electron method.
   $$Cr_2O_7^{2-} + I^- + H^+ \longrightarrow Cr^{3+} + I_2 + H_2O$$
   c) What is alloy steel? Why Al cannot be extracted by carbon reduction process?
   d) Write down the composition of the followings – (i) Gun metal, (ii) Duralumin, (iii) Nichrome. 2+3+2+3

7. a) Which is more acidic-acetylene or ethane?
   b) How would you detect the presence of unsaturation in organic compound?
   c) Write the IUPAC name of the following:
   (i) $CH_3CH_2CH_2COOH$ (ii) $CH_3–CH(OH)\ CH_3$ (iii) $CH_3–(CH_2)_3–CH_3$ (iv) $CH_3–CH=CH–CH_3$
   d) Write two uses of – (i) Phenol (ii) Naphthalene. 2+2+4+2

8. a) Write down the full name of EDTA. How is it used to estimate the total hardness of water? (Give principle and equations only)
   b) A zeolite softener was exhausted and then regenerated by passing 250 liter of NaCl solution containing 58.5 gm of NaCl per liter of solution. How many liter of a sample water of hardness 500 ppm can be softened by this softener?
   c) What is Calgon? Mention the principle of Calgon conditioning for prevention of scale.
   d) What are the disadvantages of using hard water in boiler? 1+2+2+1+2+2

9. a) Write short notes on (any three) – (i) Homologous Series, (ii) Geometrical Isomerism, (iii) Functional Group, (iv) Ozonolysis.
   b) Identify A, B, C from the following: (2x3)+4