# JEE(MAIN) – 2013 TEST PAPER WITH ANSWER (HELD ON SUNDAY 07th APRIL, 2013)

## PART B – CHEMISTRY

**31.** Which of the following complex species is not expected to exhibit optical isomerism ?

(1) $[Co(en)_3]^{3+}$ (2) $[Co(en)_2\ Cl_2]^+$

(3) $[Co(NH_3)_3\ Cl_3]$ (4) $[Co(en)\ (NH_3)_2Cl_2]^+$

**Ans. (3)**

**32.** Which one of the following molecules is expected to exhibit diamagnetic behaviour ?

(1) $C_2$ (2) $N_2$

(3) $O_2$ (4) $S_2$

**Ans. (2)**

**33.** A solution of (–) –1–chloro–1–phenylethane in toluene racemises slowly in the presence of a small amount of $SbCl_5$, due to the formation of :-

(1) carbanion (2) Carbene

(3) carbocation (4) free radical

**Ans. (3)**

**34.** Given :

$$E^0_{Cr^{3+}/Cr} = -0.74\,V\ ;\ E^0_{MnO_4^-/Mn^{2+}} = 1.51\,V$$

$$E^0_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33\,V\ ;\ E^0_{Cl/Cl^-} = 1.36\,V$$

Based on the data given above, strongest oxidising agent will be :

(1) $Cl^-$ (2) $Cr^{3+}$

(3) $Mn^{2+}$ (4) $MnO_4^-$

**Ans. (4)**

**35.** A piston filled with 0.04 mol of an ideal gas expands reversibly from 50.0 mL to 375 mL at a constant temperature of 37.0°C. As it does so, it absorbs 208 J of heat. The values of q and w for the process will be :-

(R = 8.314 J/mol K) (ln 7.5 = 2.01)

(1) q = + 208 J, w = – 208 J

(2) q = – 208 J, w = – 208 J

(3) q = – 208 J, w = + 208 J

(4) q = + 208 J, w = + 208 J

**Ans. (1)**

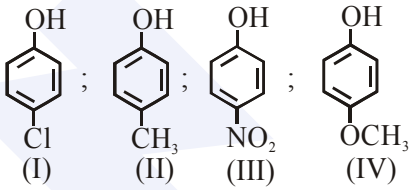
**36.** The molarity of a solution obtained by mixing 750 mL of 0.5(M)HCl with 250 mL of 2(M)HCl will be :-

(1) 0.875 M (2) 1.00 M

(3) 1.75 M (4) 0.975 M

**Ans. (1)**

**37.** Arrange the following compounds in order of decreasing acidity :




(1) II > IV > I > III

(2) I > II > III > IV

(3) III > I > II > IV

(4) IV > III > I > II

**Ans. (3)**

**38.** For gaseous state, if most probable speed is denoted by C*, average speed by $\bar{C}$ and mean square speed by C, then for a large number of molecules the ratios of these speeds are :-

(1) C* : $\bar{C}$ : C = 1.225 : 1.128 : 1

(2) C* : $\bar{C}$ : C = 1.128 : 1.225 : 1

(3) C* : $\bar{C}$ : C = 1 : 1.128 : 1.225

(4) C* : $\bar{C}$ : C = 1 : 1.225 : 1.128

**Ans. (3)**

**39.** The rate of a reaction doubles when its temperature changes from 300 K to 310 K. Activation energy of such a reaction will be

(R = 8.314 $JK^{-1}\ mol^{-1}$ and log 2 = 0.301)

(1) 53.6 kJ $mol^{-1}$ (2) 48.6 kJ $mol^{-1}$

(3) 58.5 kJ $mol^{-1}$ (4) 60.5 kJ $mol^{-1}$

**Ans. (1)**

**40.** A compound with molecular mass 180 is acylated with $CH_3COCl$ to get a compound with molecular mass 390. The number of amino groups present per molecule of the former compound is :-

(1) 2 (2) 5 (3) 4 (4) 6

**Ans. (2)**

**41.** Which of the following arrangements does not represent the correct order of the property stated against it ?

(1) $V^{2+} < Cr^{2+} < Mn^{2} < Fe^{2+}$ : paramagnetic behaviour

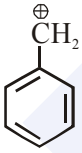
(2) $Ni^{2+} < Co^{2+} < Fe^{2+} < Mn^{2+}$ : ionic size

(3) $Co^{3+} < Fe^{3+} < Cr^{3+} < Sc^{3+}$ : stability in aqueous solution

(4) Sc < Ti < Cr < Mn : number of oxidation states

**Ans. (1)**

**42.** The order of stability of the following carbocations :

$CH_2=CH-\overset{\oplus}{C}H_2$ ; $CH_3-\underset{\text{II}}{CH_2}-CH_2$ ;  is :-

I III

(1) III > II > I (2) II > III > I

(3) I > II > III (4) III > I > II

**Ans. (4)**

**43.** Consider the following reaction:

$$xMnO_4^- + yC_2O_4^{2-} + zH^+ \rightarrow$$

$$xMn^{2+} + 2yCO_2 + \frac{z}{2} H_2O$$

The values of x, y and z in the reaction are respectively :-

(1) 5,2 and 16 (2) 2,5 and 8

(3) 2, 5 and 16 (4) 5,2 and 8

**Ans. (3)**

**44.** Which of the following is the wrong statement?

(1) ONCl and $ONO^-$ are not isoelectronic

(2) $O_3$ molecule is bent

(3) Ozone is violet-black in solid state

(4) Ozone is diamagnetic gas

**Ans. (1)**

**45.** A gaseous hydrocarbon gives upon combustion 0.72 g of water and 3.08 g of $CO_2$. The empirical formula of the hydrocarbon is

(1) $C_2H_4$ (2) $C_3H_4$ (3) $C_6H_5$ (4) $C_7H_8$

**Ans. (4)**

**46.** In which of the following pairs of molecules/ ions, both the species are not likely to exist ?

(1) $H_2^+, He_2^{2-}$ (2) $H_2^-, He_2^{2-}$

(3) $H_2^{2+}, He_2$ (4) $H_2^-, He_2^{2+}$

**Ans. (3)**

**47.** Which of the following exists as covalent crystals in the solid stae ?

(1) Iodine (2) Silicon

(3) Sulphur (4) Phosphorus

**Ans. (2)**

**48.** Synthesis of each molecule of glucose in photosynthesis involves :-

(1) 18 molecules of ATP

(2) 10 molecules of ATP

(3) 8 molecules of ATP

(4) 6 molecules of ATP

**Ans. (1)**

**49.** The coagulating power of electrolytes having ions $Na^+$, $Al^{3+}$ and $Ba^{2+}$ for aresenic sulphide sol increases in the order :-

(1) $Al^{3+} < Ba^{2+} < Na^+$

(2) $Na^+ < Ba^{2+} < Al^{3+}$

(3) $Ba^{2+} < Na^+ < Al^{3+}$

(4) $Al^{3+} < Na^+ < Ba^{2+}$

**Ans. (2)**

**50.** Which of the following represents the correct order of increasing first ionization enthalpy for Ca, Ba, S, Se and Ar ?

(1) Ca < S < Ba < Se < Ar

(2) S < Se < Ca < Ba < Ar

(3) Ba < Ca < Se < S < Ar

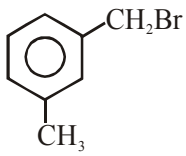
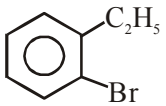
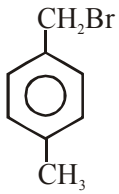
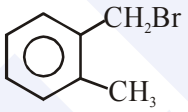
(4) Ca < Ba S < Se < Ar

**Ans. (3)**

**51.** Energy of an electron is given by $E = -2.178 \times 10^{-18}\ J \left(\frac{Z^2}{n^2}\right)$. Wavelength of light required to excite an electron in an hydrogen atom from level n = 1 to n = 2 will be :-
(h = $6.62 \times 10^{-34}$ Js and c = $3.0 \times 10^{8}$ $ms^{-1}$)
(1) $1.214 \times 10^{-7}$ m (2) $2.816 \times 10^{-7}$ m
(3) $6.500 \times 10^{-7}$ m (4) $8.500 \times 10^{-7}$ m

**Ans. (1)**

**52.** Compound (A), $C_8H_9Br$, gives a white precipitate when warmed with alcoholic $AgNO_3$. Oxidation of (A) gives an acid (B), $C_8H_6O_4$. (B) easily forms anhydride on heating. Identify the compound (A) :

(1) 
(2) 
(3) 
(4) 

**Ans. (4)**

**53.** Four successive members of the first row transition elements are listed below with atomic numbers. Which one of them is expected to have the highest $E^0_{M^{3+}/M^{2+}}$ value ?
(1) Cr(Z = 24) (2) Mn(Z = 25)
(3) Fe (Z = 26) (4) Co(Z = 27)

**Ans. (4)**

**54.** How many litres of water must be added to 1 litre of an aqueous solution of HCl with a pH of 1 to create an aqueous solution with pH of 2 ?
(1) 0.1 L (2) 0.9 L
(3) 2.0 L (4) 9.0 L

**Ans. (4)**

**55.** The first ionisation potential of Na is 5.1 eV. The value of electron gain enthalpy of $Na^+$ will be :-
(1) – 2.55 eV (2) – 5.1 eV
(3) – 10.2 eV (4) + 2.55 eV

**Ans. (2)**

**56.** An organic compound A upon reacting with $NH_3$ gives B. On heating, B gives C. C in presence of KOH reacts with $Br_2$ to give $CH_3CH_2NH_2$. A is :-
(1) $CH_3COOH$
(2) $CH_3CH_2CH_2COOH$
(3) $CH_3–\underset{\displaystyle CH_3}{\underset{|}{CH}}–COOH$
(4) $CH_3CH_2COOH$

**Ans. (4)**

**57.** Stability of the species $Li_2$, $Li_2^-$ and $Li_2^+$ increases in the order of :-
(1) $Li_2 < Li_2^+ < Li_2^-$ (2) $Li_2^- < Li_2^+ < Li_2$
(3) $Li_2 < Li_2^- < Li_2^+$ (4) $Li_2^- < Li_2 < Li_2^+$

**Ans. (2)**

**58.** An unknown alcohol is treated with the "Lucas reagent' to determine whether the alcohol is primary, secondary or tertiary. Which alcohol reacts fastest and by what mechanism :-
(1) secondary alcohol by $S_N1$
(2) tertiary alcohol by $S_N1$
(3) secondary alcohol by $S_N2$
(4) tertiary alcohol by $S_N2$

**Ans. (2)**

**59.** The gas leaked from a storage tank of the Union Carbide plant in Bhopal gas tragedy was:-
(1) Methylisocyanate (2) Methylamine
(3) Ammonia (4) Phosgene

**Ans. (1)**

**60.** Expermentally it was found that a metal oxide has formula $M_{0.98}O$. Metal M, is present as $M^{2+}$ and $M^{3+}$ in its oxide. Fraction of the metal which exists as $M^{3+}$ would be :-
(1) 7.01% (2) 4.08%
(3) 6.05% (4) 5.08

**Ans. (2)**