QUESTIONS & SOLUTIONS OF

AIPMT 2012 (MAINS)

Date : 13-05-2012 **Duration : 3 Hours** **Max. Marks : 480**

IMPORTANT INSTRUCTIONS

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **Side-1** and **Side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and Test Booklet contains 120 questions. Each question carries 4 marks. For each correct response, the candidate will get **4 marks**. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **480**.
3. Use **Blue/Black Ball Point Pen** only for writing particulars on this page/marking responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must havdover the Answer Sheet to the invigilator in the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is A. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklets and the Answer Sheets.
7. The Candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your roll no. anywhere else except in the specified space in the Test Booklet/Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.

Name of the Candidate (in Capitals): _____

Roll Number : in figures _____

Centre of Examination (in Capitals) : _____

Candidate's Signature: _____ Invigilator's Signature: _____

Fascimile signature stamp of
Centre Superintendent : _____

PART - B (CHEMISTRY)

31. Given that the equilibrium constant for the reaction $2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)$ has a value of 278 at a particular temperature. What is the value of the equilibrium constant for the following reaction at the same temperature ?

$SO_3(g) \rightleftharpoons SO_2(g) + \frac{1}{2} O_2(g)$

(1) 1.8×10^{-3} (2) 3.6×10^{-3} (3) 6.0×10^{-2} (4) 1.3×10^{-5}

Ans. **(3)**

Sol. $2SO_2 + O_2 \rightleftharpoons 2SO_3$ $K = 278$

$SO_3 \rightleftharpoons SO_2 + \frac{1}{2} O_2$ $k' = \frac{1}{K}$

$= \sqrt{\frac{1}{278}}$

$= \sqrt{35.97 \times 10^{-4}}$

$= 6 \times 10^{-2}$

32. Structure of a mixed oxide is cubic close - packed (c.c.p). The cubic unit cell of mixed oxide is composed of oxide ions. One fourth of the tetrahedral voids are occupied by divalent metal A and the octahedral voids are occupied by a monovalent metal B. The formula of the oxide is :

(1) ABO_2 (2) A_2BO_2 (3) $A_2B_3O_4$ (4) AB_2O_2

Ans. **(4)**

Sol. $A^{2+} = \frac{1}{4} \times 8 = 2$

$B^{+} = 4 \times 1 = 4$

$O^{2-} = 8 \times \frac{1}{8} + 6 \times \frac{1}{2} = 4$

$\Rightarrow A_2B_4O_4$ or AB_2O_2

33. Given the reaction between 2 gases represented by A_2 and B_2 to give the compound AB(g).

$A_2(g) + B_2(g) \rightleftharpoons 2\,AB(g)$.

At equilibrium, the concentration

of $A_2 = 3.0 \times 10^{-3}$ M
of $B_2 = 4.2 \times 10^{-3}$ M
of AB = 2.8×10^{-3} M.

If the reaction takes place in a sealed vessel at 527°C, then the value of K_C will be :

(1) 2.0 (2) 1.9 (3) 0.62 (4) 4.5

Ans. **(3)**

Sol. $A_2 + B_2 \rightleftharpoons 2AB$ K_C

$k_C = \frac{(2.8 \times 10^{-3})^2}{3 \times 10^{-3} \times 4.2 \times 10^{-3}} = \frac{(2.8)^2}{3 \times 4.2} = 0.62$

34. Activation energy (E_a) and rate constants (k_1 and k_2) of a chemical reaction at two different temperatures (T_1 and T_2) are related by :

(1) $\ln \frac{K_2}{K_1} = -\frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$ (2) $\ln \frac{K_2}{K_1} = -\frac{E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$

(3) $\ln \frac{K_2}{K_1} = -\frac{E_a}{R}\left(\frac{1}{T_2} + \frac{1}{T_1}\right)$ (4) $\ln \frac{K_2}{K_1} = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

Ans. **(2 or 4)**

Sol. $\ln \frac{k_2}{k_1} = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

35. During change of O_2 to O_2^- ion, the electron adds on which one of the following orbitals ?

(1) π^* orbital (2) π orbital (3) σ^* orbital (4) σ orbital

Ans. **(1)**

Sol. $\underbrace{\sigma 1s^2\ \sigma^* 1s^2\ \sigma 2s^2\ \sigma^* 2s^2\ \sigma 2p_z^2\ \pi 2p_x^2 = \pi 2p_y^2\ \pi^* 2p_x^2 = \pi^* 2p_y^1\ \sigma 2p_z^0}_{\text{For } O_2^-}$

36. Standard reduction potentials of the half reactions are given below :

$F_2(g) + 2e^- \rightarrow 2F^-(aq)$; $E^o = +2.85$ V

$Cl_2(g) + 2e^- \rightarrow 2Cl^-(aq)$; $E^o = +1.36$ V

$Br_2(l) + 2e^- \rightarrow 2Br^-(aq)$; $E^o = +1.06$ V

$I_2(s) + 2e^- \rightarrow 2I^-(aq)$; $E^o = +0.53$ V

The strongest oxidising and reducing agents respectively are :

(1) F_2 and I^- (2) Br_2 and Cl^- (3) Cl_2 and Br^- (4) Cl_2 and I_2

Ans. **(1)**

Sol. E^o more positive, reducing agent will be greater.

37. A certain gas takes three times as long to effuse out as helium. Its molecular mass will be :

(1) 27 u (2) 36 u (3) 64 u (4) 9 u

Ans. **(2)**

Sol. $r \propto \sqrt{\frac{1}{M}}$

$$\frac{r_2}{r_1} = \sqrt{\frac{M_2}{M_1}}$$

$$\frac{\frac{V_g}{3t}}{\frac{V_{He}}{t}} = \sqrt{\frac{4}{M}}$$

$$\frac{1}{9} = \frac{4}{M}$$

M = 36 g/mole

38. The orbital angular momentum of a p-electron is given as :

(1) $\frac{h}{\sqrt{2}\pi}$ (2) $\sqrt{3}\frac{h}{2\pi}$

(3) $\sqrt{\frac{3}{2}}\frac{h}{\pi}$ (4) $\sqrt{6}.\frac{h}{2\pi}$

Ans. **(1)**

Sol. Orbital angular momentum = $\frac{h}{2\pi}\sqrt{(+ 1)}$

= 1

So = $\frac{h}{2\pi}\sqrt{2}$

= $\frac{h}{\sqrt{2}\pi}$

39. Vapour pressure of chloroform ($CHCl_3$) and dichloromethane (CH_2Cl_2) at 25ºC are 200 mm Hg and 41.5 mm Hg respectively. Vapour pressure of the solution obtained by mixing 25.5 g of $CHCl_3$ and 40 g of CH_2Cl_2 at the same temperature will be : (Molecular mass of $CHCl_3$ = 119.5 u and molecular mass of CH_2Cl_2 = 85 u).

(1) 173.9 mm Hg (2) 615.0 mm Hg

(3) 347.9 mm Hg (4) 285.5 mm Hg

Ans. **Bonus**

Sol. $n_{CHCl_3} = \frac{25.5}{119.5} = 0.213$

$n_{CH_2Cl_2} = \frac{40}{85} = 0.47$

$P_T = P°_A X_{AB} + P°_B X$

$= 200 \times \frac{0.213}{0.683} + 41.5 \times \frac{0.47}{8.683}$

= 62.37 + 28.55

= 90.92

40. Molar conductivities ($\Lambda°_m$) at infinite dilution of NaCl, HCl and CH_3COONa are 126.4, 425.9 and 91.0 S cm^2 mol^{-1} respectIvely. $\Lambda°_m$ for CH_3COOH will be :

(1) 425.5 S cm^2 mol^{-1} (2)180.5 S cm^2 mol^{-1}

(3) 290.8 S cm^2 mol^{-1} (4) 390.5 S cm^2 mol^{-1}

Ans. **(4)**

Sol. $\lambda^0_M = \lambda^0_{CH_3COONa} + \lambda^0_{HCl} - \lambda^0_{NaCl}$

= 91 + 425.9 – 126.4

= 390.5

41. For real gases van der Waals equation is written as

$$\left(p + \frac{an^2}{V^2}\right)(V - nb) = n RT$$

where 'a'and 'b'are van der Waals constants. Two sets of gases are :

(I) O_2, CO_2, H_2 and He (II) CH_4, O_2 and H_2

The gases given in set-I in increasing order of 'b'and gases given in set-II in decreasing order of 'a', are arranged below. Select the correct order from the following :

(1) (I) He < H_2 < CO_2 < O_2 (II) CH_4 > H_2 > O_2

(2) (I) O_2 < He < H_2 < CO_2 (II) H_2 > O_2 > CH_4

(3) (I) H_2 < He < O_2 < CO_2 (II) CH_4 > O_2 > H_2

(4) (I) H_2 < O_2 < He < CO_2 (II) O_2 > CH_4 > H_2

Ans. (4)

Sol. Molar mass ↑, 'a'increases size of molecule ↑, 'b'increase

b (L/mol)		a (bar.L^2/mol^2)	
H_2	→ 0.02661	CH_4	→ 2.283
He	→ 0.0237	O_2	→ 1.378
O_2	→ 0.03183	H_2	→ 0.2476
CO_2	→ 0.04267		

42. Equal volumes of two monoatomic gases, A and B, at same temperature and pressure are mixed. The ratio of specific heats (C_p/C_v) of the mixture will be :

(1) 0.83 (2)1.50 (3) 3.3 (4) 1.67

Ans. (4)

Sol. $\frac{C_P}{C_V} = \frac{\frac{5}{2}R}{\frac{3}{2}R} = \frac{5}{3} = 1.67$

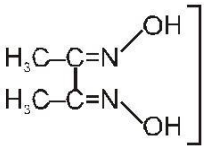
43. Red precipitate is obtained when ethanol solution of dimethylglyoxime is added to ammoniacal Ni(II). Which of the following statements is not true ?

(1) Red complex has a square planar geometry.

(2) Complex has symmetrical H-bonding

(3) Red complex has a tetrahedral geometry.

(4) Dimethylglyoxime functions as bidentate ligand.

dimethylglyoxime = 

Ans. (3)

Sol. $NiCl_2 + DMG \longrightarrow [Ni(dmg)_2]$; It is not tetrahydral square planer

44. Low spin complex of d^6-cation in an octahedral field will have the following energy :

(1) $\frac{-12}{5}\Delta_0 + P$ (2) $\frac{-12}{5}\Delta_0 + 3P$

(3) $\frac{-2}{5}\Delta_0 + 2P$ (4) $\frac{-2}{5}\Delta_0 + P$

(Δ_0= Crystal Field Splitting Energy in an octahedral field, P = Electron pairing energy)

Ans. **(2)**

Sol. $d^6 - t_{2g}^{2,2,2}\, e_g^{0,0}$ (in low spin)

C.F.S.E. = $-0.4 \times 6\,\Delta_0 + 3P$

$= -\frac{12}{5}\Delta_0 + 3P$

45. Which one of the following does not correctly represent the correct order of the property indicated against it?

(1) Ti < V < Cr < Mn : increasing number of oxidation states

(2) $Ti^{3+} < V^{3+} < Cr^{3+} < Mn^{3+}$: increasing magnetic moment

(3) Ti < V < Cr < Mn : increasing melting points

(4) Ti < V < Mn < Cr : increasing 2nd ionization enthalpy

Ans. **(3)**

Sol. Melting point of Mn and Zn has low M.P. than their adjacent element due to stable configuration.

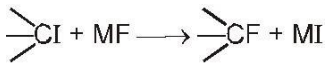
46. Four successive members of the first series of the transition metals are listed below. For which one of them the standard potential $\left(E^0_{M^{2+}/M}\right)$ value has a positive sign ?

(1) Co (Z = 27) (2) Ni (Z = 28) (3) Cu (Z = 29) (4) Fe (Z = 26)

Ans. **(3)**

Sol. $E^0_{Cu^{+2}/Cu}$ = 0.34 volt, other has –ve $E^0_{R.P.}$

47. In the replacement reaction



The reaction will be most favourable if M happens to be :

(1) Na (2) K (3) Rb (4) Li

Ans. **(3)**

Sol. Tertiary halide can show ionic reaction with MF so, MF should be most ionic for reaction to proceed forward. Hence 'M'should be 'Rb'.

48. In which of the following arrangements the given sequence is not strictly according to the property indicated against it ?

(1) HF < HCl < HBr < HI : increasing acidic strength

(2) $H_2O < H_2S < H_2Se < H_2Te$: increasing pK_a values

(3) $NH_3 < PH_3 < AsH_3 < SbH_3$: increasing acidic character

(4) $CO_2 < SiO_2 < SnO_2 < PbO_2$: increasing oxidising power

Ans. **(2)**

Sol. If acidic nature is high, Ka is high and PK_a is low

$H_2O < H_2S < H_2Se < H_2Te$ Acidic nature (Order of K_a)

$H_2O > H_2S > H_2Se > H_2Te$ Order of PK_a

49. Four diatomic species are listed below. Identify the correct order in which the bond order is increasing in them:

(1) $NO^- < O_2^{2-} < C_2 < He_2^+$

(2) $O_2^- < NO < C_2^{2-} < He_2^+$

(3) $C_2^{2-} < He_2^+ < O_2^- < NO$

(4) $He_2^+ < O_2^- < NO < C_2^{2-}$

Ans. **(4)**

Sol. He_2^+ B.O. = 0.5

O_2^- B.O. = 1.5

NO B.O. = 2.5

C_2^{2-} B.O. = 3.0

50. The catalytic activity of transition metals and their compounds is ascribed mainly to :

(1) their magnetic behaviour

(2) their unfilled d-orbitals

(3) their ability to adopt variable oxidation state

(4) their chemical reactivity

Ans. **(3)**

Sol. Has variable oxidation state

e.g. V_2O_5 catalyst in contact process.

51. Which of the following exhibit only + 3 oxidation state ?

(1) U (2) Th (3) Ac (4) Pa

Ans. **(3)**

Sol. Only Ac form Ac^{+3}

52. The Gibbs'energy for the decomposition of Al_2O_3 at 500°C is as follows :

$$\frac{2}{3}Al_2O_3 \longrightarrow \frac{4}{3}Al + O_2 \; ; \; \Delta_r G = +960 \text{ kJ mol}^{-1}$$

The potential difference needed for the electrolytic reduction of aluminium oxide (Al_2O_3) at 500°C is at least :

(1) 4.5 V (2) 3.0 V (3) 2.5 V (4) 5.0 V

Ans. **(3)**

Sol. $\Delta G = -nFE°$ $\quad n = \frac{2}{3} \times 2 \times 3$

$960 \times 10^3 = -4 \times 96.500 \times E° = 4$ for reaction

$E° = -2.5$ volt

So, it needed 2.5 volt for reduction

53. Chloroamphenicol is an :

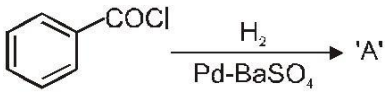
(1) antifertility drug (2) antihistaminic

(3) antiseptic and disinfectant (4) antibiotic-broad spectrum

Ans. **(4)**

Sol. Chloroamphenicol is a broad spectrum antibiotic.

54. Consider the following reaction :

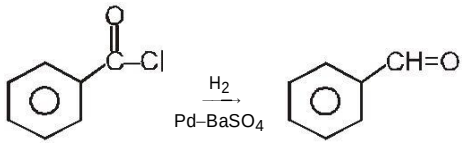


The product 'A'is :

(1) C_6H_5CHO (2) C_6H_5OH (3) $C_6H_5COCH_3$ (4) C_6H_5Cl

Ans. (1)

Sol.

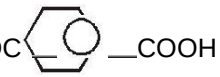


It is Rosenmund reaction.

55. Which one of the following sets forms the biodegradable polymer?

(1) CH_2=CH–CN and CH_2=CH–CH=CH_2

(2) $H_2N–CH_2–COOH$ and $H_2N–(CH_2)_5–COOH$

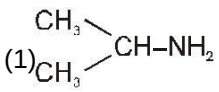
(3) $HO–CH_2–CH_2–OH$ and 

(4)  and CH_2=CH–CH=CH_2

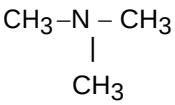
Ans. (2)

Sol. Biodegradable polymer is Nylon-2-Nylon-6 which is copolymer of glycine ($H_2N–CH_2–COOH$) and amino caproic acid ($H_2N–(CH_2)_5–COOH$).

56. An organic compound (C_3H_9N) (A), when treated with nitrous acid, gave an alcohol and N_2 gas was evolved. (A) on warming with $CHCl_3$ and caustic potash gave (C) which on reduction gave isopropylmethylamine. Predict the structure of (A).

(1) 

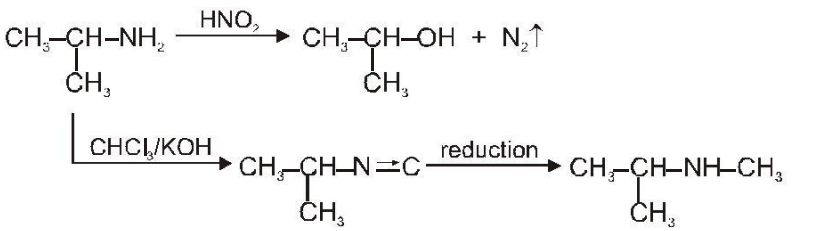
(2) CH_3CH_2—NH—CH_3

(3) 

(4) $CH_3CH_2CH_2$—NH_2

Ans.(1)

Sol.



Isopropyl methyl amine

57. Which of the following reagents will be able to distinguish between 1-butyne and 2-butyne?

(1) $NaNH_2$ (2) HCl (3) O_2 (4) Br_2

Ans. **(1)**

Sol. 1-Butyne and 2-butyne are distinguish by $NaNH_2$ because 1-Butyne react with $NaNH_2$ due to active hydrogen.

58. Consider the reaction :

$$RCHO + NH_2NH_2 \rightarrow RCH = N–NH_2$$

What sort of reaction is it ?

(1) Electrophilic addition - elimination reaction

(2) Free radical addition - elimination reaction

(3) Electrophilic substitution - elimination reaction

(4) Nucleophilic addition - elimination reaction

Ans. **(4)**

Sol. $R–CH = O + H_2N – NH_2 \longrightarrow R–CH = N – NH_2$

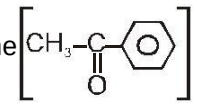
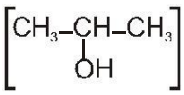
It is a Nucleophilic addition-elimination reaction.

59. Which of the following compounds will give a yellow precipitate with iodine and alkali ?

(1) Acetophenone (2) Methyl acetate

(3) Acetamide (4) 2-Hydroxypropane

Ans. **(1, 4)**

Sol. It is Iodoform reaction. Acetophenone  and 2-Hydroxypropane  both give a

yellow precipitate of CHI_3 (iodoform) with iodine & alkali.

60. Which of the following compounds can be used as antifreeze in automobile radiators ?

(1) Methyl alcohol (2) Glycol

(3) Nitrophenol (4) Ethyl alcohol

Ans. **(2)**

Sol. Glycol is used as an antifreeze in automobiles.