

## AIPMT - 2015

### Set – E, Chemistry

**Note:** Answers have been highlighted in “Yellow” color and Explanations to answers are given at the end

#### **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 180 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 720.
3. Use Blue/Black Ball Point 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 handover the Answer Sheet to the invigilator before leaving Room/Hall. The candidates are allowed to take away this Test Booklet with them.
6. The CODE for this Booklet is E. 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 Booklet and the Answer Sheet.
7. The candidate should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. DO write your roll no. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
8. Use of white fluid for correction NOT permissible on the Answer Sheet.
9. Each candidate must shown on demand his/her Admission Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. Cases where a candidate has not sign the Attendance Sheet second time will be deemed not be have handed over Answer Sheet and dealt with as an unfair means case.
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases or unfair means will be dealt with as per Rules and Regulations of the Board.

14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code is given in the Test Booklet/Answer Sheet in the Attendance Sheet.

**Note:** Answers have been highlighted in "Yellow" color and Explanations to answers are given at the end

**Q.46** Which of the following species contains equal number of  $\sigma$  - and  $\pi$  bonds?

- (1)  $\text{HCO}_3^-$   
(2)  $\text{XeO}_4$   
(3)  $(\text{CN})_2$   
(4)  $\text{CH}_2(\text{CN})_2$

**Q.47** The species Ar,  $\text{K}^+$  and  $\text{Ca}^{2+}$  contains the same number of electrons. In which order do their radii increase?

- (1)  $\text{Ar} < \text{K}^+ < \text{Ca}^{2+}$   
(2)  $\text{Ca}^{2+} < \text{Ar} < \text{K}^+$   
(3)  $\text{Ca}^{2+} < \text{K}^+ < \text{Ar}$   
(4)  $\text{K}^+ < \text{Ar} < \text{Cr}^{2+}$

**Q.48** The function of "sodium pump" is a biological process operating in each and every cell of all animals. Which of the following biologically important ions is also a constituent of this pump?

- (1)  $\text{Ca}^{2+}$   
(2)  $\text{Mg}^{2+}$   
(3)  $\text{K}^+$   
(4)  $\text{Fe}^{2+}$

**Q.49** "Metals are usually not found as nitrates in their ores"

Out of the following two (a and b) reason which is/ are true for the above observation/

- (a) Metal nitrates are highly unstable.  
(b) Metal nitrates are highly soluble in water.
- (1) a and b are false  
(2) a and b are false  
(3) a is false but b is true  
(4) a is true but b is false

- Q.50** Solubility of the alkaline earth's metal sulphates in water decreases in the sequence:
- (1)  $Mg > Ca > Sr > Ba$
  - (2)  $Ca > Sr > Ba > Mg$
  - (3)  $Sr > Ca > Mg > Ba$
  - (4)  $Ba > Mg > Sr > Ca$
- Q.51** Because of lanthanoid contraction, which of the following pairs of elements have nearly same atomic radii? (Numbers in the parenthesis are atomic numbers).
- (1) Ti (22) and Zr (40)
  - (2) Zr (40) and Nb (41)
  - (3)  $Zr (40)$  and  $Hf (72)$
  - (4) Zr (40) and Ta (73)
- Q.51** Which of the following processes does not involve oxidation of iron?
- (1) Rusting of iron sheets
  - (2) Decolourization of blue  $CuSO_4$  solution by iron
  - (3)  $Formation\ of\ Fe(CO)_5\ from\ Fe$
  - (4) Liberation of  $H_2$  from steam by iron at high temperature
- Q.53** Which of the following pairs of ions are isoelectronic and isostructural?
- (1)  $CO_3^{2-}, SO_3^{2-}$
  - (2)  $ClO_3^-, CO_3^{2-}$
  - (3)  $SO_3^{2-}, NO_3^-$
  - (4)  $ClO_3^-, SO_3^{2-}$
- Q.54** Which of the following option represents the correct bond order?
- (1)  $O_2^- > O_2 > O_2^+$
  - (2)  $O_2^- < O_2 < O_2^+$
  - (3)  $O_2^- > O_2 < O_2^+$
  - (4)  $O_2^- < O_2 > O_2^+$
- Q.55** Nitrogen dioxide and sulphur dioxide have some properties in common. Which property is shown by one of these compounds, but not by the other?

- (1) forms 'acid -rain'
- (2) is a reducing agent
- (3) is soluble in water
- (4) is used as a food - preservative

**Q.56** maximum bond angle at nitrogen is present in which of the following?

- (1)  $\text{NO}_2$
- (2)  $\text{NO}_2^-$
- (3)  $\text{NO}_2^+$
- (4)  $\text{NO}_3^-$

**Q.57** Magnetic moments  $2.84 \text{ B.M.}$  is given by (At nos, Ni= 28, Ti = 22, Cr= 24, CO= 27)

- (1)  $\text{Ni}^{2+}$
- (2)  $\text{Ti}^{3+}$
- (3)  $\text{Cr}^{2+}$
- (4)  $\text{CO}^{2+}$

**Q.58** Cobalt (III) chloride forms several octahedral complexes with ammonia. Which of the following will not give test for chloride ions with silver nitrate at  $25^\circ\text{C}$ ?

- (1)  $\text{CoCl}_3 \cdot 3\text{NH}_3$
- (2)  $\text{CoCl}_3 \cdot 4\text{NH}_3$
- (3)  $\text{CoCl}_3 \cdot 5\text{NH}_3$
- (4)  $\text{CoCl}_3 \cdot 6\text{NH}_3$

**Q.59** Which of these statements about  $[\text{Co}(\text{CN})_6]^{3-}$  is true?

- (1)  $[\text{Co}(\text{CN})_6]^{3-}$  has no unpaired electrons and will be in a low-spin configuration.
- (2)  $[\text{Co}(\text{CN})_6]^{3-}$  has four unpaired electrons and will be in a low-spin configuration.
- (3)  $[\text{Co}(\text{CN})_6]^{3-}$  has four unpaired electrons and will be in a high-spin configuration.
- (4)  $[\text{Co}(\text{CN})_6]^{3-}$  has no unpaired electrons and will be a high-spin configuration.

**Q.60** The activation energy of a reaction can be determined from the slope of which of the following graphs?

- (1)  $\ln K$  vs.  $T$

(2)  $\frac{\ln K}{T}$  vs. T

(3)  $\ln K$  vs.  $\frac{1}{T}$

(4)  $\frac{T}{\ln K}$  vs.  $\frac{1}{T}$

**Q.61** Which one is not equal to zero for an ideal solution?

(1)  $\Delta H_{\text{mix}}$

(2)  $\Delta S_{\text{mix}}$

(3)  $\Delta V_{\text{mix}}$

(4)  $\Delta P = P_{\text{observed}} - P_{\text{Raoult}}$

**Q.62** A mixture of gases contains  $\text{H}_2$  and  $\text{O}_2$  gases in the ratio of 1:4 (w/w). what is the molar ratio of the two gases in the mixture.

(1) 1:4

(2) 4:1

(3) 16:1

(4) 2:1

**Q.63** A given metal crystallizes out with a cubic structure having edge length of 361 pm. If there are four metal atoms in one unit cell, what is the radius of one atom?

(1) 40 pm

(2) 127 pm

(3) 80 pm

(4) 108 pm

**Q.64** When initial concentration of a reactant doubles in a reaction, its half-life period is not affected. The order of the reaction is:

(1) Zero

(2) First

(3) Second

(4) More than zero but less than first

**Q.65** If the value of an equilibrium constant for a particular reaction is  $1.6 \times 10^{12}$ , then at equilibrium the system will contains:

- (1) all reactants.
- (2) mostly reactants
- (3) **mostly products**
- (4) similar amount of reactants and products

**Q.66** A device that convert energy of combustion of fuels like hydrogen and methane, directly into electrical energy is known as:

- (1) **Fuel Cell**
- (2) Electrolytic Cell
- (3) Dynamo
- (4) Ni-Cd cell

**Q.67** The boiling point of 0.2 mol kg<sup>-1</sup> solution of X in water is greater than equimolal solution of Y in water. Which one of the following statements is true in this case?

- (1) **X is undergoing dissociation in water.**
- (2) Molecular mass of X is greater than the molecular mass of Y.
- (3) Molecular mass of X is less than the molecular mass of Y.
- (4) Y is undergoing dissociation in water while X undergoes no change.

**Q.68** Which one the following electrolytes has the same value of van't factor (i) as that of Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> (if all are 100% ionised)?

- (1) K<sub>2</sub>SO<sub>4</sub>
- (2) K<sub>3</sub>[Fe(CN)<sub>6</sub>]
- (3) Al(NO<sub>3</sub>)<sub>3</sub>
- (4) **K<sub>4</sub>[Fe(CN)<sub>6</sub>]**

**Q.69** The number of d-electrons in Fe<sup>2+</sup> (Z = 26) is not equal to the number of electrons in which one of the following?

- (1) s-electrons in Mg (Z = 12)
- (2) **p - electrons in Cl (Z = 17)**
- (3) d - electrons in Fe (Z = 26)
- (4) p - electrons in Ne (Z = 10)

**Q.70** The correct bond order in the following species is:

(1)  $O_2^{2+} < O_2^+ < O_2^-$

(2)  $O_2^{2+} < O_2^- < O_2^+$

(3)  $O_2^+ < O_2^- < O_2^{2+}$

(4)  $O_2^- < O_2^+ < O_2^{2+}$

**Q.71** The angular momentum of electron in 'd' orbital is equal to:

(1)  $\sqrt{6} \hbar$

(2)  $\sqrt{2} \hbar$

(3)  $\sqrt[3]{3} \hbar$

(4)  $0 \hbar$

**Q.72** The  $K_{sp}$  of  $Ag_2CrO_4$ ,  $AgCl$ ,  $AgBr$  and  $AgI$  are respectively,  $1.1 \times 10^{-12}$ ,  $1.8 \times 10^{-10}$ ,  $5.0 \times 10^{-13}$ ,  $8.3 \times 10^{-17}$ . Which one of the following salts will precipitate last if  $AgNO_3$  solution is added to the solution containing equal moles of  $NaCl$ ,  $NaBr$ ,  $NaI$  and  $Na_2CrO_4$ ?

(1)  $AgI$

(2)  $AgCl$

(3)  $AgBr$

(4)  $Ag_2CrO_4$

**Q.73** Which property of colloidal solution is independent of charge on the colloidal particles.

(1) Coagulation

(2) Electrophoresis

(3) Electro-osmosis

(4) Tyndall effect

**Q.74** Which of the following statements is correct for a reversible process in a state of equilibrium?

(1)  $\Delta G = 2.30 RT \log K$

(2)  $\Delta G = 2.30 RT \log K$

(3)  $\Delta G^\circ = -2.30 RT \log K$

(4)  $\Delta G^\circ = 2.30 RT \log K$

**Q.75** Bithional is generally added to the soaps as an additive function as a /an:

(1) Softener

- (2) Dryer
- (3) Buffering agent
- (4) **Antiseptic**

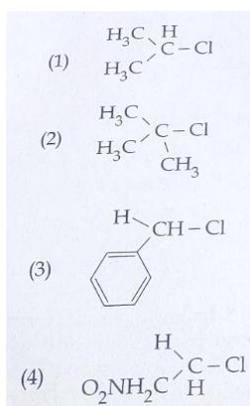
**Q.76** The electrolytic reduction of nitrobenzene in strongly acidic medium produces:

- (1) **p-Aminophenol**
- (2) Azoxybenzene
- (3) Azobenzene
- (4) Aniline

**Q.77** In Duma's method for estimation of nitrogen, 0.25 g of an organic compound gave 40 mL of nitrogen collected at 300 K temperature and 725 mm pressure. If the aqueous tension at 300 K is 25 mm, the percentage of nitrogen in the compound is :

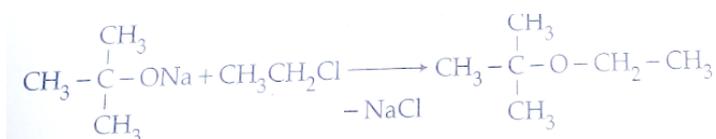
- (1) 17.36
- (2) 18.20
- (3) **16.76**
- (4) 15.76

**Q.78** In which of the following compounds, the C - Cl bond ionization shall give most stable carbonium ion?



**(3) is the correct option**

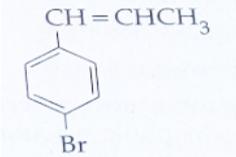
**Q.79** The reaction



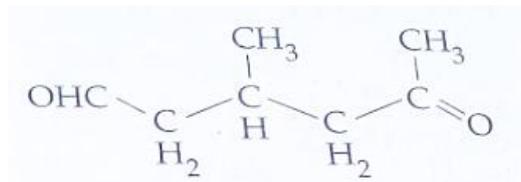
is called:

- (1) Williamson synthesis
- (2) Williamson continuous etherification process
- (3) Etard reaction
- (4) Gatterman-Koch reaction

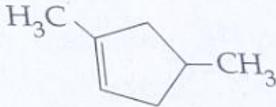
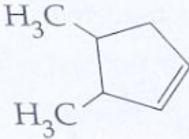
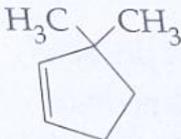
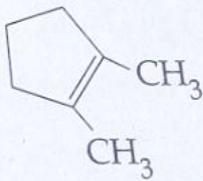
**Q.80** The reaction of  $C_6H_5CH = CHCH_3$  with HBr produces:

- (1)  $C_6H_5 \underset{\text{Br}}{\text{CH}}CH_2CH_3$
- (2)  $C_6H_5CH_2 \underset{\text{Br}}{\text{CH}}CH_3$
- (3)  $C_6H_5CH_2CH_2CH_2Br$
- (4) 

**Q.81** A single compound of the structure



is obtained from ozonolysis of which of the following cyclic compounds?

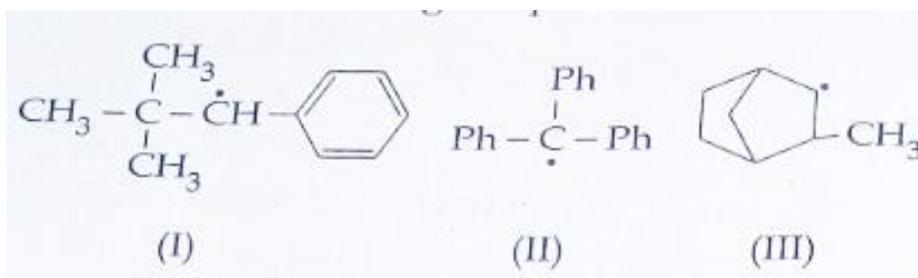
- (1) 
- (2) 
- (3) 
- (4) 

(1) is the correct option

Q.82 Treatment of cyclopentanone  with methyl lithium gives which of the following species?

- (1) Cyclopentanonyl anion
- (2) Cyclopentanonyl cation
- (3) Cyclopentanonyl cation
- (4) Cyclopentanonyl biradical

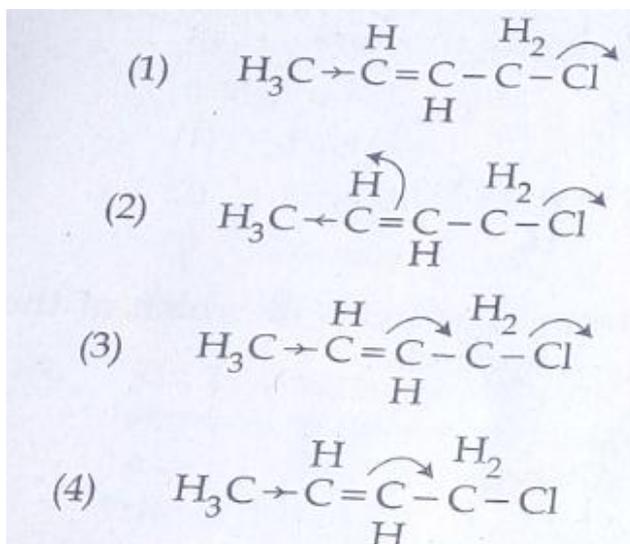
Q.83 Consider the following compounds



Hyperconjugation occurs in:

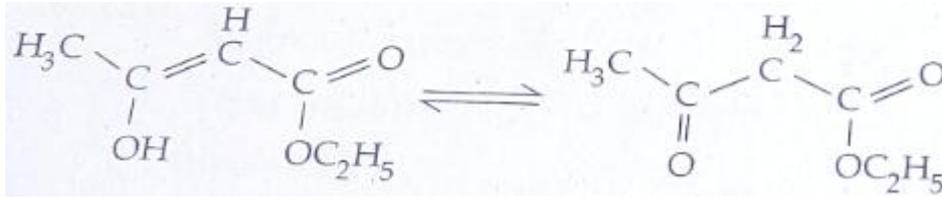
- (1) I only
- (2) II only
- (3) III only
- (4) I and III

Q.84 Which of the following is the most correct electron displacement for a nucleophilic reaction to take place?



(3) is the correct option

Q.85 The enolic of ethyl acetoacetate as below has:



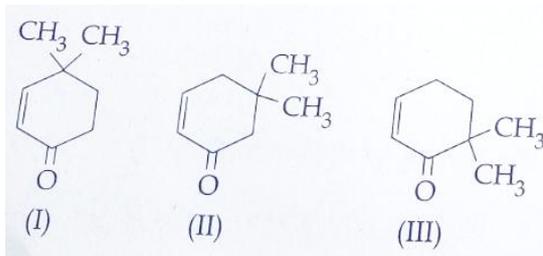
(1) 18 sigma bonds and 2 pi- bonds

(2) 16 sigma bonds and 1 pi- bond

(3) 9 sigma bonds and 2 pi- bonds

(4) 9 sigma bonds and 1 pi-bonds

Q.86 Given:



Which of the given compounds can exhibit tautomerism?

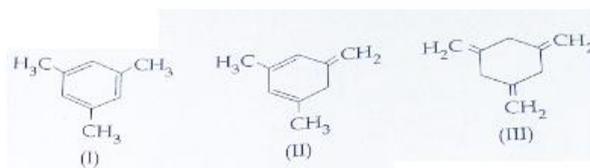
(1) I and II

(2) I and III

(3) II and III

(4) I, II and III

Q.87 Given:



The enthalpy of hydrogenation of these compounds will be in the order is:

(1) I > II > III

(2) III > II > I

(3) II > III > I

(4) II > I > III

**Q.88** Biodegradable polymer which can be produced from glycine and aminocaproic acid is:

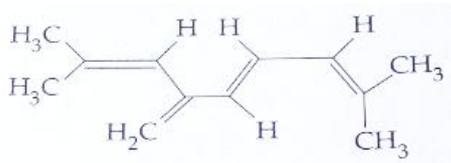
(1) Nylon 2 - Nylon 6

(2) PHBV

(3) Buna - N

(4) Nylon 6, 6

**Q.89** The total number of  $\pi$  - bond electrons in the following structure is :



(1) 4

(2) 8

(3) 12

(4) 16

**Q.90** An organic compound 'X' having molecular formula  $C_5H_{10}O$  yields phenyl hydrazine and gives negative response to the Iodoform test and tollen's test. It produces n-pentane on reduction. 'X' could be:

(1) pentanal

(2) 2- pentanone

(3) 3- pentanone

(4) n- amylalcohol

## Answer Key and Explanations

Sol.46 (2)



XeO<sub>4</sub> consists of equal no  $\pi$  and  $\sigma$  bonds i.e. 4

Sol. 47 (3)

Based upon effective nuclear charge

$$\text{Ca}^{2+} \rightarrow n_p = 20, n_e = 18$$

$$\text{K}^+ \rightarrow n_p = 19, n_e = 18$$

$$\text{Ar} \rightarrow n_p = 18, n_e = 18 \rightarrow \text{largest}$$

Sol.48 (3)

K<sup>+</sup> & Na<sup>+</sup> are present in inside & outside the cell which maintains gradient.

Sol.49 (3)

Metal nitrates are highly unstable.

Sol.50 (1)

Solubility of alkaline earth metal decreases down the group because their hydration enthalpy decreases.

Sol.51 (3)

Zr & Hf are also known as chemical twins because of same size.

Sol.52 (3)

In Fe(Co)<sub>5</sub> iron does not oxidize.

Sol.53 (4)

$$\text{ClO}_3^- \text{ \& \; } \text{SO}_3^{2-} \cdot n_e = 26, \text{ Same no. of electrons}$$

Sol.54 (2)

$$\text{B.O. } \text{O}_2 = \frac{1}{2} (6-2) = 2$$

$$\text{B.O. } \text{O}_2^- = \frac{1}{2} (6 - 3) = 1.5$$

$$\text{B.O. } O_2^+ = \frac{1}{2}(6 - 1) = 2.5$$

$$\Rightarrow O_2^+ > O_2 > O_2^-$$

**Sol.55** (4)

SO<sub>2</sub> is used as food preservative.

NO<sub>2</sub> is not used instead N<sub>2</sub> is used.

**Sol.56** (3)

NO<sub>2</sub><sup>+</sup> because there is no. e<sup>-</sup> here on nitrogen atom.

**Sol.57** (1)

$$\text{B.M.} = \sqrt{n(n+2)}$$

$$Ni^{2+} \rightarrow 2 \text{ unpaired } e^- \sqrt{2(4)} = \sqrt{8} = 2.84 \text{ BM}$$

$$Ti^{3+} \rightarrow 1 \text{ unpaired } e^-$$

$$Cr^{2+} \rightarrow 4 \text{ unpaired } e^-$$

$$CO^{2+} \rightarrow 3 \text{ unpaired } e^-$$

**Sol.58** (1)

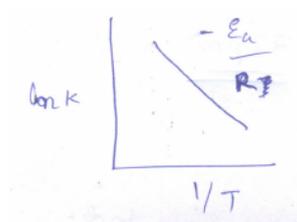
In [Co(NH<sub>3</sub>)<sub>3</sub>Cl<sub>3</sub>] i.e. [CoCl<sub>3</sub> · 3NH<sub>3</sub>] the no. Cl<sup>-</sup> anions will be 0, so it will not give test for chloride with AgNO<sub>3</sub> at 25°C.

**Sol.59** (1)

In [Co(CN)<sub>6</sub>]<sup>3-</sup> CO<sup>+3</sup> forms d<sup>2</sup>sp<sup>3</sup> configuration CN is strong lig and responsible for no unpaired e<sup>-</sup> and low spin complex.

**Sol.60** (3)

$$K = Ae^{-E_a/RT}$$



**Sol.61** (2)

For ideal solution entropy increases  $\Delta S_{\text{mix}} \neq 0$

**Sol.62** (2)

$$\frac{wh_2}{WO_2} = \frac{1}{4}$$

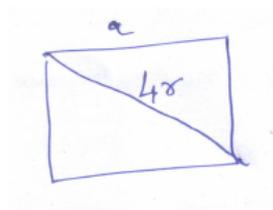
$$\frac{nH_2}{nO_2} = \frac{Wn_2}{WO_2} \times \frac{MO_2}{MH_2} = \frac{1}{4} \times \frac{32}{2}$$

$$\frac{nH_2}{nO_2} = \frac{4}{1}$$

$$= 4:1$$

**Sol.63** (2)

The given crystal is face centered cubic



$$4r = \sqrt{2} a$$

$$a = 2\sqrt{2} r$$

$$r = \frac{a}{2\sqrt{2}} = \frac{361}{2\sqrt{2}} = 127$$

**Sol. 64** (2)

$t_{1/2} = \frac{\ln 2}{K}$  which is independent of concentration of A thus first order

**Sol.65** (3)

$$K_c = \frac{[P]}{[R]} = 16 \times 10^{12}$$

$K_c$  is very high so reaction is about to complete and consists mostly products will be there.

**Sol.66** (1)

Fuel cell is used for combustion of  $H_2$  and  $CH_4$

**Sol.67** (1)

$$(\Delta T_b) = K_x m_x \quad | \quad (\Delta T_b)_x > (\Delta T_b)_y$$

If x under goes dissociation so  $i > 1$

$$\therefore (\Delta T_b)_x > (\Delta T_b)_y$$

**Sol.68** (4)

$i$  depends on ions number

$\text{Al}_2(\text{SO})_3$  - 5 ions

$\text{K}_4 [\text{Fe}(\text{CN})_6]$  - 4 + 1 = 5 ions

**Sol.69** (2)

No. of Cl electrons in  $\text{Fe}^{2+} = 4s^0 3d^6 = 6$

P electron in Cl =  $1s^2 2s^2 2p^6 3s^2 3p^5$

Total no  $e_{np} = 11$

**Sol.70** (4)

BO of  $\text{O}_2^{2+} = \frac{1}{2}(6 - 0) = 3$

$\text{O}_2^+ = \frac{1}{2}(6 - 1) = 2.5$

$\text{O}_2^- = \frac{1}{2}(6 - 3) = 1.5$

**Sol.71** (1)

Angular momentum =  $\sqrt{l(l+1)}\hbar$

$l = 2$  for d orbital

$= \sqrt{2(2+1)}\hbar$

$= \sqrt{6}\hbar$

**Sol.72** (4)

$\text{Ag}_2\text{CrO}_4$  will precipitate last

**Sol.73** (4)

Tyndall effect is independent of charge

**Sol.74** (3)

at equilibrium

$\Delta G^\circ = -2.303 RT \log K$

**Sol.75** (4)

Bithional is antiseptic

**Sol.76** (1)

In strongly acidic medium nitrobenzene produces p-amino phenol

**Sol.77** (3)

$$\%N = \frac{\text{molar mass of } N_2 \times \text{vol of } N_2 \times 100}{22400 \times \text{wt of organic compound}}$$

$$= 16.76$$

Sol.78 (3)



Is most stable carbonium

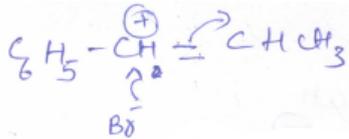
Sol.79 (1)

Williamson's Synthesis is not a continuous esterification process reaction involved

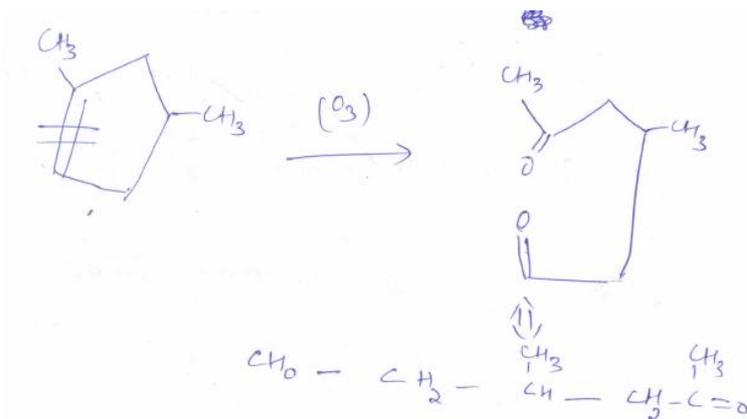


Sol.80 (1)

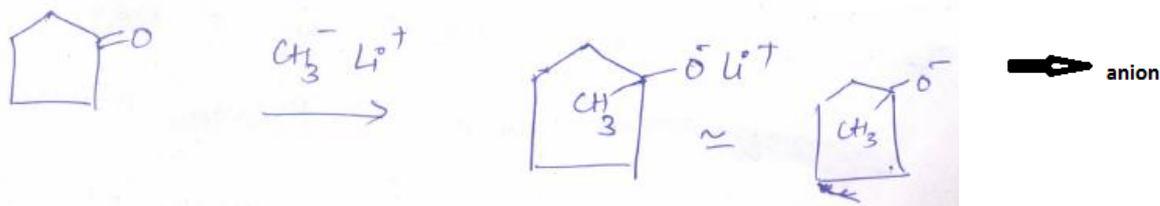
$C_6H_5-CH=CHCH_3$  follow Markovnikov's Rule with



Sol.81 (1)



Sol.82 (1)



Sol.83 (3)

Only in (3) there are  $\alpha$ -H atoms, so hydroconjugation occurs in III only.

Sol.84 (3)



So in (3) you will get stable contribution for nucleophile reaction

Sol.85 (1)

Enolic form consists of

18  $\sigma$  & 2 $\pi$  bonds

Sol.86 (4)

In (I, II,III) Consists of  $\alpha$  H atoms hence shows tautomerism

Sol.87 (2)

Enthalpy of (III) is more than all

Sol.88 (1)

Nylon -2 Nylon -6 is an alternating polynomial copolymers of glycine ( $\text{NH}_2\text{-CH}_2\text{-COOH}$ ) & aminocaproic acid [ $\text{NH}_2(\text{CH}_2)_5\text{COOH}$ ] & is biodegradable.

Sol.89 (2)

4 $\pi$  bonds - 8 $\pi$  e-s

Sol.90 (3)



3-pentanone gives negative iodoform test and tollens test.