

<u>AIPMT - 2015</u>

<u>Set – E, Chemistry</u>

<u>Note</u>: 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 coll 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 handling 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.

<u>Note</u>: 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 σ and π bonds?
 - $(1) HCO_{3}^{-}$
 - $(2) \frac{\text{XeO}_4}{\text{XeO}_4}$
 - (3) (CN)₂
 - (4) CH₂(CN)₂
- **Q.47** The species Ar, K⁺ and Ca²⁺ contains the same number of electrons. In which order do their radii increase?
 - (1) $Ar < K^+ < CA^{2+}$
 - (2) $Ca^{2+} < Ar < K^+$
 - (3) $Ca^{2+} < K^+ < Ar$
 - (4) $K^+ < Ar < Cr^{2+}$
- **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 a also a constitute of this pump?
 - (1) Ca²⁺
 - (2) Mg²⁺
 - (3) <mark>K+</mark>
 - (4) Fe²⁺
- **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) <mark>a is false but b is true</mark>

(4) a is true but b is false

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- **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 CuSO₄ 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) CIO_3^-, CO_3^{2-}
 - (3) SO_3^{2-}, NO_3^{-}
 - (4) CIO_3^-, SO_3^{2-}
- **Q.54** Which of the following option represents the correct bond oreder?
 - $(1) \ \theta_2^- > \theta_2 > \theta_2^+$
 - $(2) \frac{0^{-}}{2^{-}} < 0^{+}_{2} < 0^{+}_{2}$
 - $(3) 0_2^- > 0_2 < 0_2^+$
 - $(4) \ \theta_2^- < \theta_2 > \theta_2^+$

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 bin which of the following?

- $(1) NO_2$
- $(2) NO_2^-$
- $(3) \frac{NO_{2}^{+}}{2}$
- $(4) NO_3^-$

Q.57 Magnetic moments 2.84 B.M> is given by (At nos, Ni= 28, Ti = 22, Cr= 24, CO= 27)

- (1) Ni²⁺
- (2) Ti³⁺
- (3) Cr²⁺
- $(4) CO^{2+}$
- **Q.58** Cobalt (III) chloride forms several octanedral complexes with ammonia. Which of the following will not give test for chloride ions with silver nitrate at 25 °C?
 - (1) CoCl₃·3NH₃
 - (2) CoCl₃ ·4NH₃
 - (3) CoCl₃·5NH₃
 - (4) $CoCl_3 \cdot 6NH_3$
- **Q.59** Which of these statements about $[Co(CN)_3]^{3-}$ is true?
 - (1) [Co (CN)]³⁻ has no unpaired electrons and will be in a low-spin configuration.
 - (2) [Co (CK)] has four unpaired electrons and will be in a low-spin configuration.
 - (3) $[C_0(CN)_6]^{3-}$ has four unpaired electrons and will be in a high-spin configuration.
 - (4) $[Co (CN)_6]^{3-}$ 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 which of the following graphs?

(1) In K vs. T



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

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

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

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

- (1) ΔH_{mix}
- (2) ΔS_{mix}
- (3) ΔV_{mix}
- (4) $\Delta P = P_{observed} P_{Raoult}$
- **Q.62** A mixture of gases contains H_2 and 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) <mark>4:1</mark>
 - (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) <mark>127 pm</mark>
 - (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 1.6×10^{12} , then at equilibrium the system will contains:

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- (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⁻¹ 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 $Al_2(SO_4)_3$ (if all are 100% ionised)?
 - $(1) K_2 SO_4$
 - (2) K₃]Fe(CN)₆]
 - (3) Al(NO₃)₃
 - (4) $K_4[Fe(CN)_6]$
- **Q.69** The number of d-electrons in Fe²⁺ (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)

The correct bond order in the following species is:



 $(1) \ \theta_2^{2+} < \theta_2^+ < \theta_2^-$

- $(2) \ \theta_2^{2+} < \theta_2^- < \theta_2^+$
- $(3) \ \theta_2^+ < \theta_2^- < \theta_2^{2+}$
- $(4) \ \frac{0^-_2 < 0^+_2 < 0^{2+}_2}{0^2_2}$
- **Q.71** The angular momentum of electron in 'd' orbital is equal to:
 - (1) <mark>√6 ħ</mark>
 - $(2)\sqrt{2}\hbar$
 - (3) $\sqrt[2]{3}\hbar$
 - (4) 0 ħ
- **Q.72** The K_{sp} of Ag₂CrO₄, AgCl, AgBr and Agl are respectively, 1.1×10^{-12} , 1.8×10^{-10} , 5.0×10^{-13} , 8.3×10^{-17} . Which one of the following salts will precipitate last if AgNO₃ solution is added to the solution containing equal moles of NaCl, NaBr, Nal and Na₂CrO₄?
 - (1) Agl
 - (2) AgCl
 - (3) AgBr
 - $(4) \operatorname{Ag_2CrO_4}$
- **Q.73** Which property of colloidal solution 15 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) $\Delta G^{(2)} = -2.30 \text{ RT } \log K$
 - (4) $\Delta G^{\circ} = 2.30 \text{ RT} \log K$

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

(1) Softener

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- (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) <mark>16.76</mark>
 - (4) 15.76
- **Q.78** In which of the following compounds, the C Cl bond ionization shall give most stable carbonium ion?







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) $C_6H_5CHCH_2CH_3$
 - (2) $C_6H_5CH_2CH_2H_3$
 - (3) $C_6H_5CH_2CH_2CH_2Br$
 - (4) $CH = CHCH_3$ Br
- Q.81 A single compound of the structure

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

DH

CH₃

H

 H_2

H₂

CH₃





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





(3) is the correct option

2) <mark>III > II > I</mark>

(3) II > III > I

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





C

(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 π bond electrons in the following structure is $\frac{1}{2}$



- (1) 4
- (2) <mark>8</mark>
- (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 lodoform test and tollen's test. It produces n-pentane on reduction. 'X' could be:
 - (1) pentanal
 - (2) 2- pentanone
 - (3) 3- pentanone
 - (4) n- amylalchohol



Answer Key and Explanations

Sol.46 (2)

Xeo_4 consists of equal no π and σ bonds i.e. 4

Sol. 47 (3)

Based upon effective nuclear charge

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Ca^{2+} \rightarrow n_p = 20, n_e = 18
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 $K^+ \rightarrow n_p = 19$, $n_e = 18$

 $Ar \rightarrow n_p = 18$, $n_e = 18 \rightarrow largest$

Sol.48 (3)

K+ & Na+ 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 $Fe(Co)_5$ iron does not oxidize.

Sol.53 (4)

 $ClO_3^- \& SO_3^{2-}$. n_e = 26, Same no. of electrons

Sol.54 (2)

BO
$$0_2 = \frac{1}{2}(6-2) = 2$$

B· 0. $0_2^- = \frac{1}{2}(6-3) = 1.5$



B·0.
$$O_2^+ = \frac{1}{2}(6-1) = 2.5$$

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

Sol.55 (4)

SO₂ is used as food preservative.

 NO_2 is not used instead N_2 is used.

Sol.56 (3)

 NO_2^+ because there is no. e⁻ here on nitrogen atom.

Sol.57 (1)

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

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

 $Ti^{3+} \rightarrow 1$ unpaired e⁻

 $Cr^{2+} \rightarrow 4$ unpaired e⁻

 $CO^{2+} \rightarrow 3$ unpaired e⁻

Sol.58 (1)

In $[Co(NH_3)_3Cl_3]$ i.e. $[CoCl_3 \cdot 3NH_3]$ the no Cl^- anions will be O, so it will not give test for chloride with AgNo₃ at 25°C.

Sol.59 (1)

In $[Co(CN)_6]^{3-}$ CO+³ forms d²sp³ configuration CN is strong lig and responsible for no unpaired eand low spin complex.

Sol.60 (3)

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

(2)

Sol.62

Sol.61 (2) \circ For ideal solution entropy increases $\Delta S_{mix} \neq 0$

Page | 14



 $\frac{wh_2}{WO_2} = \frac{1}{4}$ $\frac{nH_2}{nO_2} = \frac{Wn_2}{WO_2} \times \frac{MO_2}{MH_2} = \frac{1}{4} \times \frac{32}{2}$ $\frac{nH_2}{nO_2} = \frac{4}{1}$ = 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)

$$t_{1/2} = \frac{ln2}{K}$$
 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 H₂ and CH₄

Sol.67 (1)

 $(\Delta T_b) = K_x m_x I (\Delta T_b)_x > (\Delta T_b)_y$ If x under goes dissociation so i > 1

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

Sol.68 (4

i depends on ions number

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 $Al_2(SO)_3 - 5$ ions

 $K_4 [Fe(CN)_6] - 4 + 1 = 5$ ions

Sol.69 (2)

No, of Cl electrons in $Fe^{2+} = 4s^0 \ 3d^6 = 6$ P electron in $Cl = 1s^22s^22p^63s^23p^5$

Total no $en_p = 11$

Sol.70 (4)

```
B0 of O_2^{2+} = \frac{1}{2}(6 - 0) = 3
O_2^+ = \frac{1}{2}(6 - 1) = 2.5
O_2^- = \frac{1}{2}(6 - 3) = 1.5
```

Sol.71 (1)

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

$$l = 2$$
 for d orbital

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

```
=\sqrt{6}\hbar
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Sol.72 (4)
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 Ag_2CrO_4 will precipitate last

Sol.73 (4)

Tyndall effect is independent of charge

Sol.74 (3)

at equilibrium

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\Delta G^\circ = 2.303 RT logK
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Sol.75 (4)

Bithional is antiseptic

Sol.76 (1)

In strongly acidic medium nitrobenzene produces p-amino phenol

Sol.77 (3)



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

Sol.78 (3)

I) D



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Is most stable carbonium

Sol.79 (1)

Williamsons Synthesis is a not a continuous esterification process reaction involved

0

 $R - X + R - O Na \rightarrow R - O - Rl$

Sol.80 (1)

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





Sol.82 (1)

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Sol.83 (3)

Only in (3) there are α -H atoms, so hyproconjugation occurs in III only.

CH

0

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 α H atoms hence shows tautomerism

Sol.87 (2)

Enthapy of (III) is more then all

Sol.88 (1)

Nylon -2 Nylon -6 is an alternating polynomial copolymers of glycine (NH₂- CH₂- COOH) & aminocaprojc acid $[NH_2(CH_2)_5COOH]$ & is biodegradable.

Sol.89 (2)

 4π bonds – 8π e-s

Sol.90 (3)

C-C-C-C

3-pentanone gives negative iodoform test and tollens test.