JEE Main - 2015

Set – A, Chemistry

Note: Answers have been highlighted in "<mark>Yellow</mark>" color and Explanations to answers are given at the end

1. Immediately fill in the particulars on this page of the Test Booklet with Blue/ Black Ball Point Pen, Use of pencil is strictly prohibited,

2. The Answer Sheet is kept inside this Test Booklet. When you are directed to open the Test Booklet take out the Answer Sheet and fill in the particulars carefully.

3. The test is of **3 hours** duration.

4. The Test Booklet consists of 90 questions. The maximum marks are **360**

5. There are three parts in the question paper A, B, C consisting of Physics, Chemistry and Mathematics having 30 questions in each part of equal weightage Each question is allotted **4 (four)** marks for correct response.

6. Candidates will be awarded marks as stated above in instruction NO. 5 for correct response of each question. ¼ (one fourth) marks will be deducted for indicating incorrect response of each question, No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

7. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instruction 6 above.

8. Use blue/ Black Ball Point Pen only for writing particulars / marking response on side – 1 and side – 2 of the Answer Sheet. Use of Pencil is strictly prohibited.

9. No candidate is allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, any electronic device , etc, except the admit card inside the examination room/hall.

10. Rough work is to be done on the space provided for this purpose in the Test Booklet only. This space is given at the bottom of each page and in one page (i.e. Page 39) at the end of the booklet.

11. On completion of the test , the candidate must hand over the Answer Sheet to the Invigilator on duty in the Room/Hall. However , the candidates are allowed to take away this Test Booklet with them.

12. The CODE for this Booklet is **A**. Make sure that CODE printed on Side-2 of the Answer Sheet and also tally the serial number of the Test Booklet and Answer Sheet are the candidate should immediately report the matter to the invigilator for replacement of both the Test Booklet and the Answer Sheet.

13. Do not fold or make any stray mark on the Answer Sheet.

Note: Answers have been highlighted in "<mark>Yellow</mark>" color and Explanations to answers are given at the end

Q.31 The molecular formula of a commercial resin used for exchange ions in water softening is $C_8H_2SO_3Na$ (Mol. Wt. 206). What would be the maximum uptake of Ca^{2+} ions by the resin when expressed in mole per gram resin?

(1) $\frac{1}{103}$

(2) $\frac{1}{206}$

(3) $\frac{2}{309}$

(4) <mark>$\frac{1}{412}$</mark>

Q32. Sodium metal crystallizers in a body centered cubic lattice with a unit cell edge of 4.29Å. The radius of sodium atom is approximately:

(1) <mark>1.86Å</mark>

(2) 3.22Å

(3) 5.72Å

(4) 0.93Å

Q.33 Which of the following is the energy of a possible excited state of hydrogen.?

(1) +13.6 eV

(2) -6.8 eV

(3) <mark>-3.eV</mark>

(4) +6.8 eV

Q.34 The intermolecular interaction that is dependent on the inverse cube of distance between the molecules is:
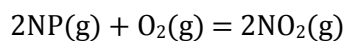
(1) ion-ion interaction

(2) <mark>ion- dipole interaction</mark>

(3) London force

(4) Hydrogen bond

Q.35 The following reaction is performed at 298K.

$2NP(g) + O_2(g) = 2NO_2(g)$

The standard free energy of formation of $NO(g)$ is 86.6KJ/mol at 298 K. What is the standard free energy formation of NO_2 (g) at 298 K? ($K_p = 1.6 \times 10^{12}$)

(1) R(298) $\hbar$n (1.6×10¹²)-86600

(2) 86600 + R(298) $\hbar$n(1.6 × 10¹²)

(3) 86600 - $\frac{\ln(1.6 \times 10^{12})}{R(298)}$

(4) 0.5[2×86,600 – R(298)$\hbar$n (1.6×10¹²)

Q.36 The vapour pressure of acetone at 20°C is 185 torr. When 1.2 g of a non-volatile substance was dissolved in 100 f of acetone at 20°C, its vapour pressure was 183 torr. The molar mass (g mol⁻¹) of the substance.

(1) 32

(2) 64

(3) 128

(4) 188

Q.37 The standard Gibbs energy at 300 K for the reaction 2A ⇋ B + C is 2494.2 J. At a given time, the composition of the reaction mixture is [A] = $\frac{1}{2}$, [B] = 2 and [C] = $\frac{1}{2}$. The reaction proceeds in the : [R ⇋ 8.314 J/K mol, e = 2.718]

(1) forward direction because Q > K$_c$

(2) reverse direction because Q > K$_c$

(3) forward direction because Q < K$_c$

(4) reverse direction because Q < K$_c$

Q.38 Two Faraday of electricity is passed through a solution of $CuSO_4$. The mass of copper deposited at the cathode is (at mass of Cu = 63.5 amu)

(1) 0g

(2) 63.5 g

(3) 2 g

(4) 127 g

Q.39 Higher order (>3) reaction are rare due to:

(1) low probability of simultaneous collision of all the reaction species.

(2) increase in entropy and activation energy as more molecules are involved

(3) Shifting of equilibrium towards reacts due to elastic collusion

(4) loss of active species on collision

Q.40 3 g of activated charcoal was added to 50 mL of acetic acid solution (0.06N) in a flask. After an hour it was filtered and the strength of the filtrate was found to be 0.042 N. The amount of acetic acid adsorbed (per gram of charcoal) is :

(1) 18 mg

(2) 36 mg

(3) 42 mg

(4) 54 mg

Q.41 The tonic radit (in Å) of N^{3-}, O^{2-} and F^- are respectively:

(1) 1.36, 1.40 and 1.71

(2) 1.36, 1.71 and 1.40

(3) 1.71, 1.40 and 1.36

(4) 1.71, 1.36 and 1.40

Q.42 In the context of the Hall- Heroult process for the extraction of Al. which which of the following statement is false?

(1) CO and CO_2 are produced in this process

(2) Al_2O_3 is mixed with CaF_2 which lowers the melting point of the mixture and brings conductively.

(3) Al^{3+} is reduced at the cathode to form Al

(4) Na_3AlF_6 serves as the electrolyte

Q.43 From the following statement regarding $H_2O_{2.}$ choose the incorrect statement.

(1) it can only as an oxidizing agent

(2) it decompose on exposure to light

(3) it has to stored in plastic or wax lined glass bottles in dark

(4) It has to be kept away from dust

Q.44 Which one the following alkaline earth metal sulphates has its hydration enthalpy greater than lattice enthalpy?

(1) $CaSO_4$

(2) $BeSO_4$

(3) BaSO₄

(4) SrSO₄

Q.45 Which among the following is the most reactive?

(1) Cl_2

(2) Br_2

(3) I_2

(4) ICl

Q.46 Match the catalyst to the correct process:

Catalyst	Process
(A) $TiCl_3$	(i) Wacker process
(B) $PdCl_2$	(ii) Ziegler – Natta polymerization
(C) $CuCl_2$	(iii) Contact process
(D) V_2O_5	(iv) Deacon's process

(1) (A) – (iii), (B)- (ii), (C)- (iv), (D)- (i)

(2) (A)- (ii), (B)- (i), (C)- (iv), (D)- (iii)

(3) (A)- (ii), (B)- (iii), (C)-(iv),(D)- (i)

(4) (A)- (iii), (B)- (i), (C)- (ii), (D)-(iv)

Q.47 Which one has the highest boiling point?

(1) He

(2) Ne

(3) Kr

(4) Xe

Q.48 Thew number of geometric isomers that can exist for square planar $[Pt(Cl)(py)(NH_3)(NH_2OH)]^+$ is (py = pyridine)

(1) 2

(2) 3

(3) 4

(4) 6

Q.49 The color of $KMnO_4$ is due to:

(1) M → L charge transfer transition

(2) d – d transition

(3) L → M charge transfer transition

(4) σ – σ transition

Q.50 **Assertion** : Nitrogen and Oxygen are the main components in the atmosphere but these do not react to form oxides of nitrogen.

Reason : The reaction between nitrogen and oxygen requires high temperature.

(1) Both assertion and reason are correct, and the reason is the correct explanation for the assertion.

(2) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion

(3) The assertion is incorrect, but the reason is correct.

(4) Both the assertion and reason are incorrect.

Q.51 In carius method of estimation of halogens. 250 mg of of an organic compound gave 141 mg of AgBr. The percentage of bromine in the compound is :

(at, mass Ag = 108; Br = 80)

(1) 24

(2) 36

(3) 48

(4) 60

Q.52 Which of the following compounds will exhibit geometrical isomerism?

(1) 1- Phenyl -2- butane

(2) 3- Phenyl – 1- butane

(3) 2- Phenyl – 1- butane

(4) 1,1 – Diphenyl – 1 - propone

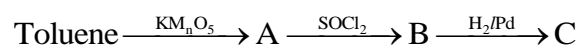Q.53 Which compound would give 5- keto – 2- methyl hexanal upon ozonolysis
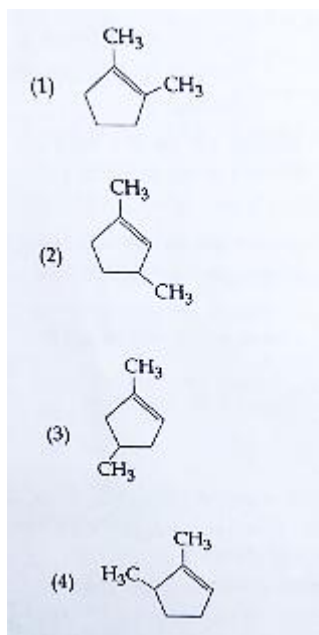
Answer: (2)

Q.54 The synthesis of alkyl fluorides is best accomplished by:

(1) Free redical flurination

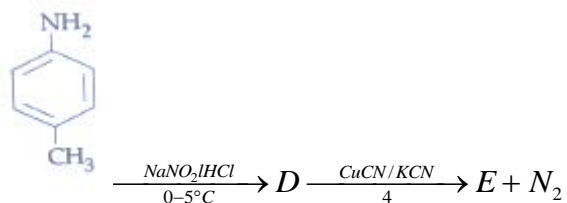(2) Sandmeyer's reaction

(3) Finkelstein reaction

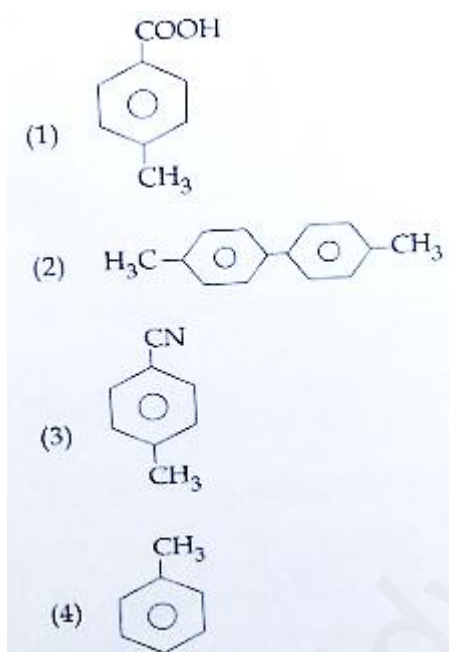(4) Swarts reaction

Q.55 In the following sequence of reactions :

$$Toluene \xrightarrow{KM_nO_5} A \xrightarrow{SOCl_2} B \xrightarrow{H_2/Pd} C$$

The product C is :

(1) C_6H_5COOH

(2) $C_6H_5CH_3$

(3) $C_6H_5CH_2OH$

(4) C_6H_5CHO

Q.56 In the reaction

$$\xrightarrow[0-5°C]{NaNO_2lHCl} D \xrightarrow[4]{CuCN/KCN} E + N_2$$

The product E is:

Answer: (3)

Q.57 Which polymer is used the manufacture of pains and laquers?

(1) Bakelite

(2) Glyptal

(3) Polypropene

(4) Poly viny Chloride

Q.58 Which of the vitamins given below is water soluble?

(1) Vitamin C

(2) Vitamin D

(3) Vitamin E

(4) Vitamin K

Q.59   Which of the following compounds is not an antacid?

(1) Aluminimum hydroxide

(2) Cimetidine

(3) Phenelzine

(4) Ranitidine

Q.60   Which of the following compounds is not colored yellow?

(1) $Zn_2[Fe(CN)_6]$

(2) $K_3[Co(NO_2)_6]$

(3) $(NH_4)_3[As(Mo_3O_{10})_4]$

(4) $BaCrO_4$

Answer Key and Explanations

Sol.31 (4)

$2C_8H_7SO_3Na + CaCl_2 \rightarrow 2NaCl + (C_8H_7SO_3)Ca_2$
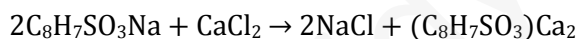
Maximum uptake of cat $= \dfrac{1}{2 \times 206}$

$= \dfrac{1}{412\,g}$

Sol.32 (1)

In B.C.C. $\rightarrow 4r = \sqrt{3}a$

$r = \sqrt{3} \times a$

$= \dfrac{\sqrt{3} \times 4.29}{4}$

Sol.33 (3)

Energy of $e^- = \frac{-13.6}{n^2}$

$= -13.6, \frac{-13.6}{4}$

$= -3.4eV$

Sol.34 (2)

In ion-dipole interaction

$F \times \frac{1}{r^3}$

Sol. 35 (4)

$\Delta 4°_{rxn} = 2\Delta ca°_p(NO_2) - 2\Delta 4°_R (No)$

$\Delta 4°_F (NO_2) = \frac{1}{2} [\Delta 4°_{rxn} + 2\Delta 4°_{cvo}]$

$\Delta 4°_F (NO_2) = 0.5 [2 \times 86,600 - R \times 298 \ln [1.6 \times 10^{12}]$

Since $\Delta 4_{Rn} = RT \ln k_p$

$= R \times 298 \ln (1.6 \times 10^{12})$

Sol.36 (2)

$Pf = x_{acetorr} \times P_r$

$\frac{183}{185} = \frac{\frac{100}{58}}{\frac{100}{58} + \frac{1.2}{x}}$

$183 \left[\left(\frac{100}{58} + \frac{1.2}{x}\right)\right] = \frac{185 \times 100}{58}$

$315.5 + \frac{219.6}{x} = 318.9$

$X = 64$

Sol. 37 (2)

$2A \rightleftarrows B + C$
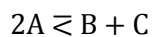
$[A] = \frac{1}{2} [B] = 2 [C] = \frac{1}{2}$

$Q_c = \frac{[B]^1[C]^1}{[A]^2} = 2 \times \frac{\frac{1}{2}}{\left[\frac{7}{2}\right]^2}$

$= 4$

$\Delta G = 2494.2 \quad R = 8.314$

$\Delta G = RT \, l_n \, K_e$

$2494.2 = - [8.314] \times 300 \, l_n \, K_e$

$- (1) \quad = \quad l_n \, k_e \quad k_e = e^{-1} = \dfrac{1}{e}$

$Q_c > K_c$: reaction proceed in reverse direction

Sol.38 (2)

1 Faraday $= \dfrac{63.5}{2}$

2 Faraday $= 63.5$

Sol. 39 (1)

Reaction of higher order are rare due to very less probability of many molecules to undergo effective collision.

Sol. 40 (1)

$n CH_3COOH$ adsorbed $= (0.06 - 0.042) \times \dfrac{50}{1000}$

$m CH_3COOH$ adsorbed per gm of charcoal $= \dfrac{0.018 \times 50}{1000} \times \dfrac{60}{3}$

$= 18$ mg

Sol.41 (3)

Ionic radius of

$N^{3-} = 1.71$ A°

$O^{2+} \cong 1.40$ A°

$F^- = 1.33$ A°

Sol. 42 (1)

CO is not produced in this process

Sol. 43 (1)

H_2O_2 can act as reducing agent

For example :-

$2 \, MNO_4^- + 6H^+ + 5H_2O_2 \rightarrow 2Mn^{2+} \, 8H_2O + 5O_2$
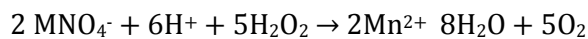
Sol. 44 (2)

In BeSO₄ hydration enthalpy is higher than lattice enthalpy because of its small size of (Be²⁺)

Sol.45 (4)

Inter halogen compound are highly reactive in nature.

Sol. 46 (2)

$TiCl_3 \rightarrow$ used is Ziegler – Natta polymerization

$PdCl_2 \rightarrow$ weaker process

$CuCl_2 \rightarrow$ Deocon's process

$V_2O_5 L \rightarrow$ contact process

Sol. 47 (4)

B.P. increases down the group
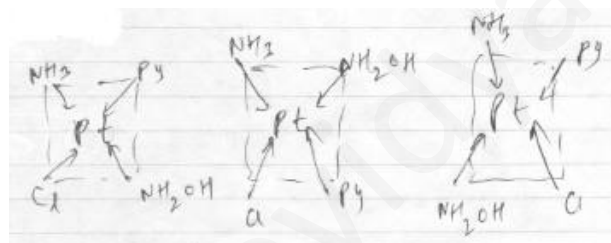
Hence Xenon will have highest B.P.

Sol. 48 (2)

[Pt (a) (py) (NH₃) (NH₂OH)]⁺ will have 3 i somes

Sol. 49 (3)

Its not d – d transition because there is no e^- in d orbital of Mn⁷⁺

Its L → M charge transfer transition.

Sol. 50 (1)

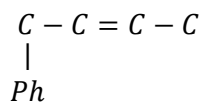Both assertion & reason are correct as N so do not combine easily.

Sol. 51 (1)

% halogen $= \frac{At.wt.of\ halogen}{Mol.lvt\ of\ Ag\ Br} \times \frac{Mass\ of\ Ag\ Br}{Mass\ of\ Orgainl\ Comp}$

$= \frac{80}{188} \times \frac{141}{250} \times 100$

$= 24\ \%.$

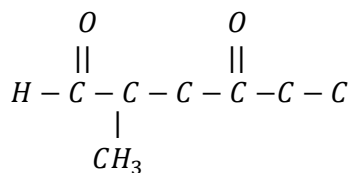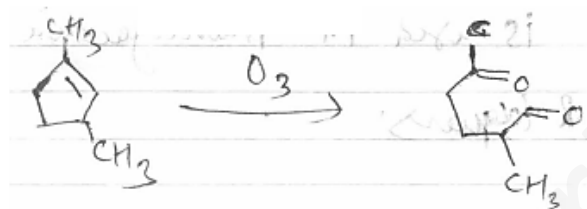**Sol. 52** (1)

$$C - C = C - C$$
$$\quad\quad |$$
$$\quad\quad Ph$$

Both the side chains of $C = C$ are different so it will shout geometrical isomerism.

Sol. 53 (2)

We have to forms 5 – keto – 2 methyle

$$\begin{array}{ccccccc} & & O & & O & & \\ & & || & & || & & \\ H - C & - & C - C - C & - & C - C & & \\ & & | & & & & \\ & & CH_3 & & & & \end{array}$$

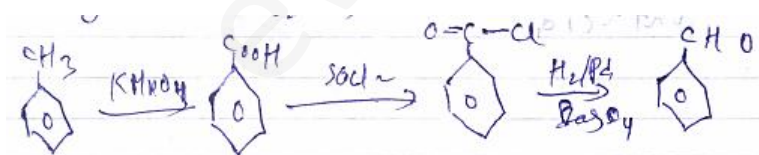Near out of the options it use check herand

$\Rightarrow$ (2) is correct answer

Sol. 54 (4)

Swarts Reaction includes fluorination by AgF, Hg_2F_2, CoF_2 & SbF_3

Sol. 55 (4)

So C_6M_5Cho is answer

Sol. 56 (3)
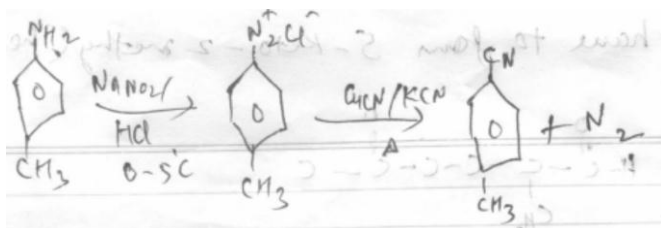
Sol. 57 (2)

Glyptal is used in manufacture of paints & lacquers.

Sol. 58 (1)

Fat Soluble Vitamins → Vit A, D, C & K

Water Soluble vitamins → Vit C

Sol. 59 (3)

Phenelgine is tranquilizer others are antacid.

Sol. 60 (1)

$Zn_2[Fe(CN)_6]$ is not yellow

All others are yellow in color.