DATE : 03/05/2026

Test Booklet Code

12

KAILASH

Corporate Office : 3rd Floor, Incuspaze Campus-2, Plot No. 13,
Sector-18, Udyog Vihar, Gurugram, Haryana - 122015.

Answers & Solutions for NEET (UG)-2026

Time : 3 hrs.

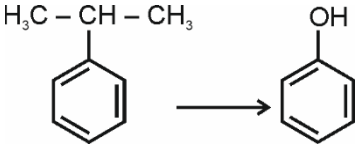
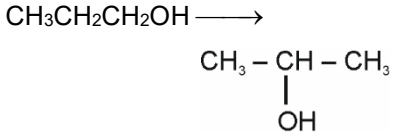
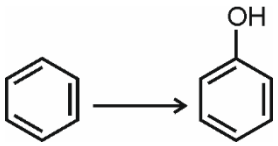
M.M. : 720

Important Instructions:

1. The test is of **3 hours** duration and the Test Booklet contains **180** multiple choice questions (Four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology).**
2. Each question carries **4 marks**. For each correct response, the candidate will get **4 marks**. For every wrong response, **1 mark** shall be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue / Black Ball Point Pen only** for writing particulars on this page / marking responses on Answer Sheet.
4. Rough work is to be done in 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 the Room / Hall. The candidates are allowed to take away this Test Booklet with them.
6. The CODE for this Booklet is **12**.
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. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
8. Each candidate must show on demand his/her Admission Card to the Invigilator.
9. No candidate, without special permission of the Centre Superintendent or Invigilator, would leave his/her seat.
10. Use of Electronic/Manual Calculator is prohibited.
11. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
12. No part of the **Test Booklet** and **Answer Sheet** shall be detached under any circumstances.
13. The candidates will write the Correct Test Booklet Code as given in the Test Booklet / Answer Sheet in the Attendance Sheet.

CHEMISTRY

46. Match List I with List II:

	List I		List II
A.		(I)	(i) Oleum; (ii) NaOH, Δ; (iii) H^+
B.	$CH_3COOH \longrightarrow CH_3CH_2OH$	(II)	(i) O_2; (ii) H_2O/H^+
C.		(III)	(i) CH_3OH, H^+; (ii) H_2, catalyst
D		(IV)	(i) conc. H_2SO_4, Δ; (ii) H^+/H_2O

Choose the **correct** answer from the options given below :

(1) A-I, B-III, C-IV, D-II

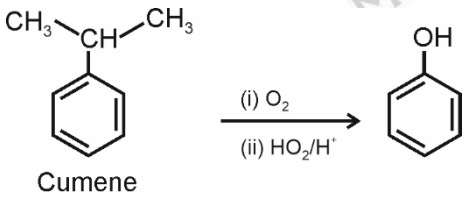
(2) A-II, B-IV, C-III, D-I

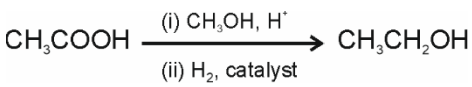
(3) A-II, B-III, C-I, D-IV

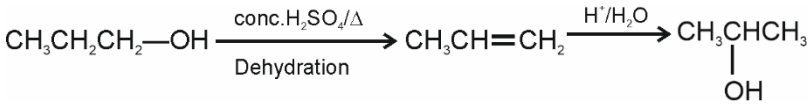
(4) A-II, B-III, C-IV, D-I

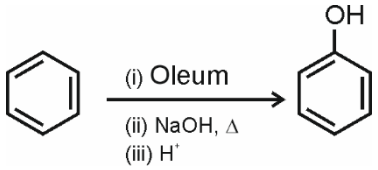
Answer (4)

Sol.

A. 

B. 

C. 

D 

47. The major product Z formed in the following sequence of reactions is

$$C_2H_6 \xrightarrow[\text{UV light}]{Cl_2} \underset{\text{(monochlorinated product)}}{X} \xrightarrow{NH_3} Y \xrightarrow[(ii)\ H_2O]{(i)\ NaNO_2,\ HCl} Z$$

(1) $C_2H_5 - N = N - OH$ (2) C_2H_5OH

(3) $C_2H_5NO_2$ (4) $C_2H_5NH_2$

Answer (2)

Sol.

$$C_2H_6 + Cl_2 \xrightarrow{UV} \underset{(X)}{C_2H_5Cl} + HCl$$

$$C_2H_5Cl \xrightarrow[-HCl]{NH_3} \underset{(Y)}{C_2H_5NH_2} \xrightarrow[HCl]{NaNO_2} [C_2H_5 + N_2^{\oplus}Cl^-] \xrightarrow{H_2O} \underset{(Z)}{C_2H_5OH} + N_2 + HCl$$

48. In a qualitative analysis, Bi^{3+} is detected by appearance of precipitate of BiO(OH)(s). Calculate pH when the following equilibrium exists at 298 K.

$BiO(OH)(s) \rightleftharpoons BiO^+(aq) + OH^-(aq)$, $K = 4 \times 10^{-10}$

(Given : log2 = 0.3010)

(1) 4.699 (2) 8.714

(3) 9.301 (4) 5.286

Answer (3)

Sol. $BiO(OH)(s) \rightleftharpoons \underset{s}{BiO^+}(aq) + \underset{s}{OH^-}(aq)$

$$K = \frac{[BiO^+][OH^-]}{[BiO(OH)(s)]}$$

$$K = \frac{[BiO^+][OH^-]}{1}$$

$K = s \times s = s^2$

$$s = \sqrt{K} = \sqrt{4 \times 10^{-10}} = 2 \times 10^{-5}\ M$$

$$[H^+] = \frac{K_w}{[OH^-]} = \frac{1}{2} \times 10^{-9},\ pH = -\log[H^+] = 9 + \log 2 = 9.301$$

49. When 1 dm^3 of CO_2 gas is passed over hot coke the volume of gaseous mixture after complete reaction at STP becomes 1.4 dm^3. The composition of the gaseous mixture at STP is:

(1) 0.6 dm^3 of CO, 0.8 dm^3 of CO_2

(2) 0.8 dm^3 of CO, 0.8 dm^3 of CO_2

(3) 0.8 dm^3 of CO, 0.6 dm^3 of CO_2

(4) 0.6 dm^3 of CO, 0.4 dm^3 of CO_2

Answer (3)

Sol.

$$CO_2 + C(s) \rightarrow 2CO$$

1

$1 - x$ $\qquad$ $2x$

$1 - x + 2x = 1 + x = 1.4$

$x = 0.4\ dm^3$

Volume of $CO_2 = 1 - 0.4 = 0.6\ dm^3$

Volume of $CO = 2 \times 0.4 = 0.8\ dm^3$

50. Match List I with List II :

	List I (Quantum Numbers)			**List II (Orbital)**
	'n'	'l'		
A.	2	1	I.	3d
B.	4	0	II.	2p
C.	5	3	III.	4s
D.	3	2	IV.	5f

Choose the **correct** answer from the options given below.

(1) A-II, B-III, C-IV, D-I

(2) A-I, B-II, C-III, D-IV

(3) A-IV, B-II, C-III, D-I

(4) A-II, B-III, C-I, D-IV

Answer (1)

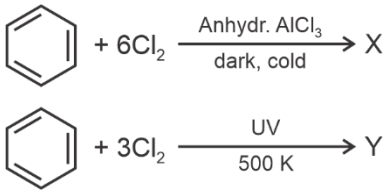
Sol.

	List-I (Quantum Numbers)		**List-II (Optical)**
	n	l	
A.	2	1	2p
B.	4	0	4s
C.	5	3	5f
D.	3	2	3d

l represents the subshell, for which the values are as following :

l	**Subshell**
0	s
1	p
2	d
3	f

51. The number of chlorine atoms present in the organic products X and Y of the following reactions, respectively, are :

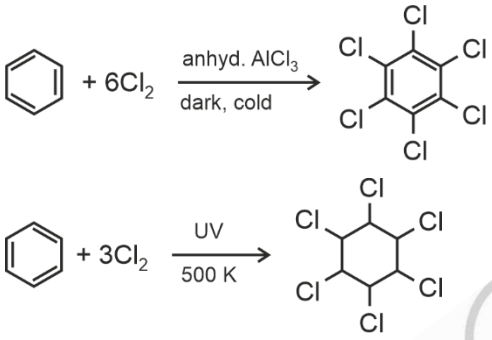


(1) 3 and 6 (2) 6 and 6

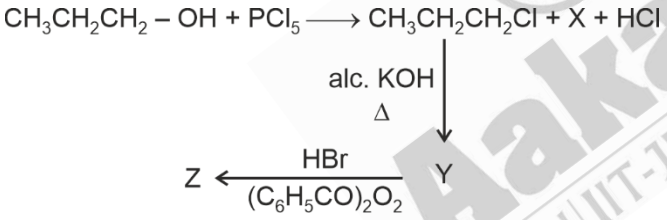
(3) 6 and 3 (4) 3 and 3

Answer (2)

Sol.



52. In the following reaction sequence, X and Z respectively are :



(1) X = $POCl_3$; Z = $CH_3 - \underset{\underset{Br}{|}}{CH} - CH_3$

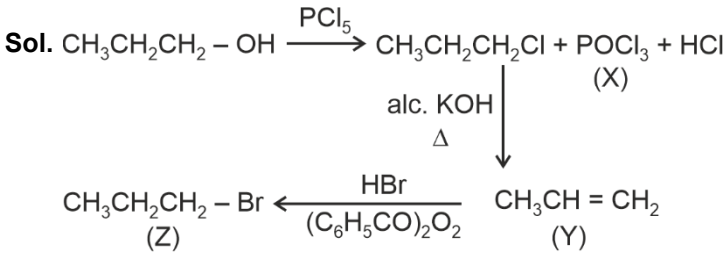
(2) X = H_3PO_3; Z = $CH_3CH_2CH_2 - Br$

(3) X = H_3PO_3; Z = $CH_3 - \underset{\underset{Br}{|}}{CH} - CH_3$

(4) X = $POCl_3$; Z = $CH_3CH_2CH_2 - Br$

Answer (4)

Sol.



So, X = $POCl_3$

Z = $CH_3CH_2CH_2Br$

53. Match List I with List II :

	List I (Transition metal/compound complex)		List II (Catalytic Role)
A.	V_2O_5	I.	Preparation of ammonia from N_2/H_2 mixture
B.	Fe	II.	Polymerisation of alkynes
C.	$PdCl_2$	III.	Preparation of H_2SO_4 and SO_2
D.	Ni complex	IV.	Oxidation of ethyne to ethanal

Choose the **correct** answer from the options given below.

(1) A-III, B-IV, C-I, D-II

(2) A-II, B-I, C-IV, D-III

(3) A-IV, B-I, C-III, D-II

(4) A-III, B-I, C-IV, D-II

Answer (4)

Sol. (A) $V_2O_5 \rightarrow$ Catalyses the oxidation of SO_2 into SO_3 in the manufacture of H_2SO_4. (III)

(B) Fe $\rightarrow$ Act as catalysts in preparation of ammonia from N_2/H_2 mixture. (I)

(C) $PdCl_2 \rightarrow$ Oxidation of ethyne to ethanal. (IV)

(D) Ni complex $\rightarrow$ Polymerisation of alkynes. (II)

A $\rightarrow$ III, B $\rightarrow$ I, C $\rightarrow$ IV, D $\rightarrow$ II

54. Identify the correct statement about ClF_3 from the following options :

(1) It has a trigonal pyramidal geometry with two lone pairs on Cl atom.

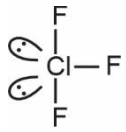
(2) It has T-shaped geometry with two lone pairs on Cl atom.

(3) It has a planar trigonal geometry with two lone pairs on Cl atom.

(4) It has T-shaped geometry with three lone pairs on Cl atom.

Answer (2)

Sol. ClF_3 has two lone pairs of electrons on Cl atom with bent T-shape structure (geometry)



55. Calculate emf of the half cell given below :

Pt (s) | H_2(g, 2 atm) | HCl (aq, 0.02 M)

$E^{\circ}_{H_2/H^+} = 0$ V

(Given: $\frac{2.303\,RT}{F} = 0.059$, log 2 = 0.3010)

(1) 0.109 V

(2) 0.035 V

(3) –0.035 V

(4) –0.109 V

Answer (1)

Sol. $H_2(g) \longrightarrow 2H^{\oplus}(aq) + 2e^{\ominus}$

$$\because E = E^{o} - \frac{2.303RT}{nF}\log\frac{[H^{+}]^2}{P_{H_2}}$$

$[H^+] = 0.02$ M (from HCl)

$P_{H_2} = 2$ atm

$$\frac{2.303RT}{F} = 0.059$$

$$E = 0 - \frac{0.059}{2}\log\frac{(0.02)^2}{2}$$

$$= -0.0295\log\left(\frac{0.0004}{2}\right)$$

$E = -0.0295 \log(2 \times 10^{-4})$

$= -0.0295 (\log 2 + \log 10^{-4})$

$= -0.0295 [0.301 - 4] = 0.109$ V

56. Match List I with List II :

	List-I (Order of reaction)		List-II (Unit of rate constant)
A.	Zero order	I.	$mol^{-1} L\ s^{-1}$
B.	First order	II.	$mol^{-2} L^2\ s^{-1}$
C.	Second order	III.	s^{-1}
D.	Third order	IV.	$mol\ L^{-1}\ s^{-1}$

Choose the **correct** answer from the options given below :

(1) A-IV, B-III, C-II, D-I

(2) A-I, B-II, C-III, D-IV

(3) A-IV, B-III, C-I, D-I

(4) A-IV, B-II, C-I, D-III

Answer (3)

Sol.

Unit for rate constant of n^{th} order reaction = $\left(\frac{mol}{L}\right)^{1-n}\ s^{-1}$

For zero order reaction $\Rightarrow$ n = 0; unit $\Rightarrow$ $mol\ L^{-1}\ s^{-1}$

For first order reaction $\Rightarrow$ n = 1; unit $\Rightarrow$ s^{-1}

For second order reaction $\Rightarrow$ n = 2; unit $\Rightarrow$ $mol^{-1} L\ s^{-1}$

For third order reaction $\Rightarrow$ n = 2; unit $\Rightarrow$ $mol^{-2} L^2\ s^{-1}$

57. The calculated 'spin-only' magnetic moment of Ti^{2+} $(3d^2)$ is :

(1) 2.84 BM

(2) 5.92 BM

(3) 4.90 BM

(4) 3.87 BM

Answer (1)

Sol. Spin only magnetic moment $\mu = \sqrt{n(n+2)}$ B.M

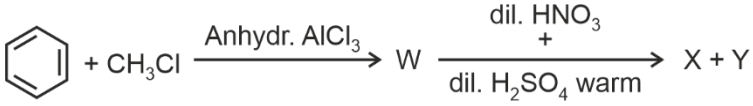
n = Number of unpaired e^-(s)

Electronic configuration of $Ti^{2+} \Rightarrow [Ar]4s^0 3d^2$

$$\mu = \sqrt{2 \times 4}$$

$$= 2.84 \text{ BM}$$

58. Two products X and Y are formed in the following reaction sequence.

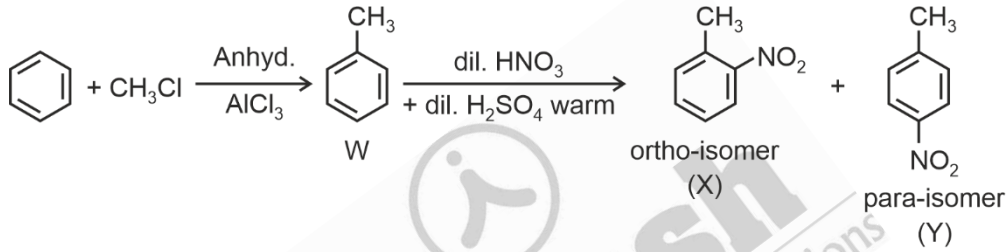


The suitable method that can be used for the separation of products X and Y is :

(1) Continuous extraction
(2) Differential extraction
(3) Fractional distillation
(4) Sublimation

Answer (3)

Sol.



The ortho and para isomers are separated by fractional distillation under reduced pressure.

o-isomer, (M.P. $\rightarrow$ –4°C, B.P. $\rightarrow$ 222°C)

p-isomer, (M.P. $\rightarrow$ 54°C, B.P. $\rightarrow$ 238°C)

59. A bulb is rated at 150 watt, converting 8% energy into light. If energy of one photon is 4.42×10^{-19} J, how many photons are emitted by the bulb per second?

(1) 1.35×10^{19}
(2) 4.06×10^{19}
(3) 2.71×10^{19}
(4) 27.2×10^{19}

Answer (3)

Sol.

Energy = Power × time

= 150 watt × 1 s

= 150 J

Energy converted to light = $\frac{150 \times 8}{100} = 12$ J

$E = nh\nu$

Energy of one photon = 4.42×10^{-19}

So, n = number of photons = $\frac{E}{h\nu} = \frac{12}{4.42 \times 10^{-19}}$

$= 2.715 \times 10^{19}$

60. In a test tube containing a salt, a few drops of dilute H_2SO_4 was added, which gave colourless vapours having the smell of vinegar. The vapours turned the blue litmus paper red.

Identify the **correct** anion from the following :

(1) Acetate, CH_3COO^-

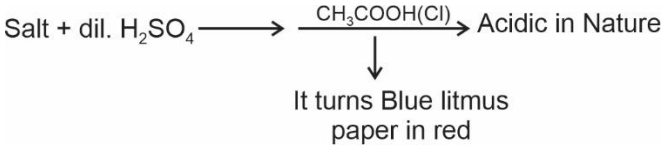
(2) Carbonate, CO_3^{2-}

(3) Sulphate, SO_4^{2-}

(4) Sulphide, S^{2-}

Answer (1)

Sol.



So, correct Answer is : Acetate, CH_3COO^-

61. Select the reagents that reduce nitriles to primary amines.

A. (i) $LiAlH_4$; (ii) H_2O

B. Sn + HCl

C. H_2/Ni

D. $Na(Hg)/C_2H_5OH$

E. Br_2/aq. NaOH

Choose the **correct** answer from the options given below.

(1) A, B and C only

(2) A, C and D only

(3) A, D and E only

(4) B, D and E only

Answer (2)

Sol.

- $R-CN \xrightarrow{Na(Hg)/C_2H_5OH} R-CH_2-NH_2$
- $R-CN \xrightarrow[(ii)\,H_2O]{(i)\,LiAlH_4} R-CH_2-NH_2$
- $R-CN \xrightarrow{Sn+HCl} R-CHO$
- $R-CN \xrightarrow{H_2/Ni} R-CH_2-NH_2$

62. Identify the **incorrect** statement from the following:

(1) Carbon has the ability to form $p\pi$-$p\pi$ multiple bond with itself.

(2) ECl_3 (E = B and Al) is a monomer when E = B and a dimer when E = Al.

(3) Oxygen exhibits only –2 oxidation state.

(4) The order of catenation property of Group 14 elements is C >> Si > Ge $\approx$ Sn.

Answer (3)

Sol.

(1) C can form $p\pi$-$p\pi$ multiple bond with itself.

It is observed when it forms C = C and C $\equiv$ C

(2) ECl_3 (E = B and Al)

BCl_3 does not form dimer.

$AlCl_3$ can form dimer in Al_2Cl_6.

(3) Oxygen exhibits oxidation state of 0 in O_2, –2 in oxides, –1 in peroxides. So this statement is incorrect.

(4) Catenation property of group 14 C >> Si > Ge ≈ Sn.

63. Although +3 oxidation state is most common in lanthanoids, cerium still shows +4 oxidation state because:

(1) Its nearest inert gas is Radon.

(2) After losing one more electron, it acquires $4f^{14}$ electronic configuration.

(3) Its atomic number is 61.

(4) After losing one more electron, it acquires $4f^0$ electronic configuration.

Answer (4)

Sol. Although +3 oxidation state is most common in lanthanoids, cerium still shows +4 oxidation state because after losing one more electron it acquires $4f^0$ electronic configuration.

64. During Lassaigne's test, the elements present in an organic compound are converted from :

(1) Covalent form to covalent form

(2) Ionic form to ionic form

(3) Covalent form to ionic form

(4) Ionic form to covalent form

Answer (3)

Sol. During Lassaigne's test, the element present in an organic compound are converted from covalent form to ionic form.

65. The number of hydrogen atoms present in 5.4 g of urea is:

(Given: Molar mass of urea : 60 g mol^{-1},

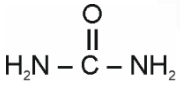
N_A : 6.022×10^{23} particles mol^{-1})

(1) 2.168×10^{23} (2) 2.168×10^{22}

(3) 1.084×10^{22} (4) 1.084×10^{23}

Answer (1)

Sol.

Structure of urea : 

Mole of urea = $\frac{5.4}{60} = 0.09$

Number of hydrogen atoms = $0.09 \times 4 \times 6.022 \times 10^{23}$

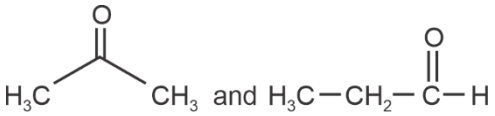
$= 2.1679 \times 10^{23}$

$\simeq 2.168 \times 10^{23}$

66. The pair of molecules that are metamers among the following is :

(1) $CH_3CH_2CH_2OH$ and $CH_3 - CH(OH) - CH_3$

(2) $CH_3OCH_2CH_2CH_3$ and $CH_3CH_2OCH_2CH_3$

(3)  and

(4) $CH_3CH_2CH_2CH_2CH_3$ and $(CH_3)_2CHCH_2CH_3$

Answer (2)

Sol.

Metamerism arises due to different alkyl chains on either side of the functional group in the molecule pair of molecules $CH_3OCH_2CH_2CH_3$ and $CH_3CH_2OCH_2CH_3$ are metamers of each other.

67. Identify the ***incorrect*** statement from the following:

(1) $P(C_2H_5)_3$ and $As(C_6H_5)_3$ form $d\pi$-$d\pi$ bond with transition metals.

(2) Nitrogen can form $d\pi$-$p\pi$ bond with oxygen.

(3) Nitrogen can form $p\pi$-$p\pi$ multiple bonds with itself.

(4) Phosphorus, arsenic and antimony show catenation property.

Answer (2)

Sol.

- Both nitrogen and oxygen do not contain d-orbitals so it cannot form $d\pi$-$p\pi$ bond.
- Phosphorus and Arsenic can form $d\pi$-$d\pi$ bond with transition metals. Since both have vacant d-orbitals by which it can interact with transition metals and can involve in $d\pi$-$d\pi$ interaction.
- Phosphorous, Arsenic and Antimony show catenation property.

68. Phenolphthalein is used as an indicator for the titration of sodium hydroxide solution against a standard solution of oxalic acid. The colour change that is observed at an alkaline pH close to the equivalence point during this titration is:

(1) pinkish red to yellow

(2) yellow to pinkish red

(3) colourless to pink

(4) pink to colourless

Answer (3)

Sol.

Colour of Phenolphthalein before the end point = colourless.

Colour of Phenolphthalein close to equivalence point = Pink.

$\therefore$ Colour change = Colourless to pink.

69. Match List I with List II :

	List I		List II
A.	C_2H_4	I.	3 σ bonds, 2 π bonds
B.	C_2H_2	II.	3 σ bonds, one lone pair
C.	CH_4	III.	4 σ bonds
D.	NH_3	IV.	5 σ bonds, 1 π bond

Choose the **correct** answer from the options given below :

(1) A-IV, B-I, C-III, D-II

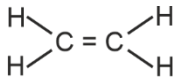
(2) A-III, B-IV, C-II, D-I

(3) A-I, B-II, C-IV, D-III

(4) A-II, B-III, C-I, D-IV

Answer (1)

Sol.

$C_2H_4 \Rightarrow$ 

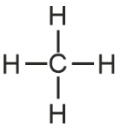
Number of σ bonds = 5

Number of π bond = 1

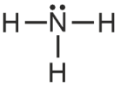
$C_2H_2 \Rightarrow H–C\equiv C–H$

Number of σ-bonds = 3

Number of π-bonds = 2

$CH_4 \Rightarrow$ 

Number of σ-bonds = 4

$NH_3 \Rightarrow$ 

Number of σ-bonds = 3

Number of lone pair = one

A-IV, B-I, C-III, D-II

70. At a certain temperature, T (K), during a process, 500 J is absorbed by the system and work of 200 J is done by the system. Then change in internal energy of the system is :

(1) 700 J (2) 300 J

(3) 400 J (4) 500 J

Answer (2)

Sol. From first law of thermodynamics

$\Delta U = q + w$

$q = +500$ J

$w = -200$ J

$\Delta U = 500 - 200$

$= 300$ J

71. Methane reacts with steam at 1273 K in the presence of nickel catalyst to form :

(1) CO and H_2

(2) CO and H_2O

(3) CO_2 and H_2O

(4) CO_2 and H_2

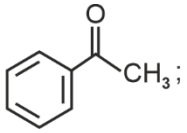
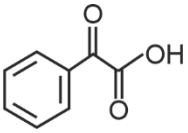
Answer (1)

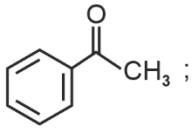
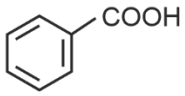
Sol.

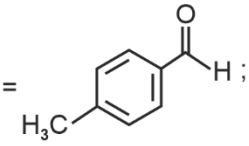
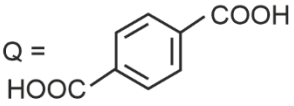
$$CH_4(g) + H_2O(g) \xrightarrow[(1273\,K)]{\overset{Ni}{\underset{\Delta}{}}} CO + 3H_2$$

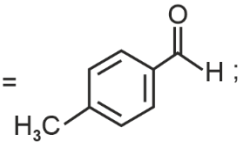
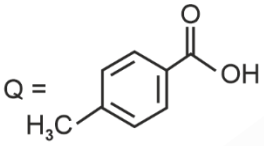
(Used for industrial preparation of dihydrogen gas)

72. Compound P(C_8H_8O) gives a red orange precipitate with 2,4-DNP reagent and it does not reduce Fehling's reagent. On drastic oxidation with chromic acid, P gives an aromatic product Q that produces effervescence on treating with aq. $NaHCO_3$. Compounds P and Q, respectively, are :

(1) P =  ; Q = 

(2) P =  ; Q = 

(3) P =  ; Q = 

(4) P =  ; Q = 

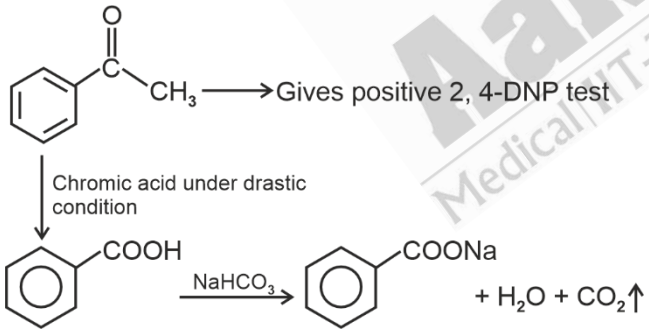
Answer (2 or 3)

Sol.

Degree of unsaturation = $(8 + 1) - \left(\frac{8}{2}\right)$

$= 9 - 4 = 5$

In question it is mentioned that oxidation under drastic condition, therefore it must be ketone



73. A solution of copper sulphate is electrolysed for 10 minutes with a current of 1.5 amperes. The mass of copper deposited at cathode is :

(Given : Molar mass of Cu = 63 g mol^{-1};

1 F = 96487 C mol^{-1})

(1) 2.4036 g (2) 1.7018 g

(3) 0.5876 g (4) 0.2938 g

Answer (4)

Sol. $CuSO_4 \longrightarrow Cu^{2+} + SO_4^{2-}$

$2e^- + Cu^{2+} \longrightarrow Cu(s)$

$W = zit$

$= \frac{E \times i\, t}{96500}$

$= \frac{63 \times 1.5 \times 10 \times 60}{2 \times 96500}$

$= \frac{56,700}{193000} = 0.2938$ g

74. The functional group that can be identified through phthalein dye test is :

(1) Phenolic (2) Alcohol

(3) Aldehyde (4) Carboxylic acid

Answer (1)

Sol. Phthalein Dye test: Phenol on heating with phthalic anhydride in presence of concentrated sulphuric acid forms a colourless condensation compound called phenolphthalein. On further reaction with NaOH it gives pink colour.

So phenolic group is correct answer.

75. The correct statement with regard to the secondary structure of DNA/RNA is

(1) DNA possesses a single strand helix structure and contains uracil as one of the four bases

(2) RNA possesses a single strand helix structure and contains thymine as one of the four bases

(3) DNA possesses a double strand helix structure and contains thymine as one of the four bases

(4) RNA possesses a double strand helix structure and contains uracil as one of the four bases

Answer (3)

Sol.

- RNA is typically single standard but it contains uracil, not thymine.
- DNA is secondary structure has a double strand helix consisting of two polynucleotide chains. Its four nitrogenous bases are adenine (A), guanine (G), cytosine (C) and thymine (T).

76. Identify the correct statements :

(A) The molality of 2.5 g of ethanoic acid (Molar mass : 60 g mol^{-1}) in 75 g of benzene solution is 0.556 m.

(B) The molarity of a solution containing 5 g of NaOH (molar mass : 40 g mol^{-1}) in 450 mL of solution is 0.278 M at 298 K.

(C) Aquatic species are more comfortable in cold water.

(D) The solubility of gas increases with decrease in pressure.

(E) For a binary mixture of A and B, the number of moles of A and B are n_A and n_B respectively. The mole fraction of B will be $x_B = \frac{n_A}{n_A + n_B}$.

Choose the **correct** answer from the options given below :

(1) A and C only

(2) A, B and C only

(3) A, D and E only

(4) A and B only

Answer (2)

Sol.

(A) Molality = $\frac{2.5}{60} \times \frac{1000}{75}$ = 0.556 molal

(B) Molarity = $\frac{5}{40} \times \frac{1000}{450} = 0.278\ M$

(C) Aquatic species are more comfortable in cold water

Henry's Law $K_H \propto$ Temp $\propto \frac{1}{\text{solubility}}$

(D) According to Henry's Law,

$P = K_H X$

$P \propto x$

$P \propto$ Solubility

So as P↑, solubility ↑

(E) $x_B = \frac{n_B}{n_A + n_B}$

77. Mixture of chloroform and acetone forms a solution with negative deviation from Raoult's law due to :

(1) Formation of hydrogen bonding between acetone and chloroform

(2) Increase in escaping tendency of molecules of each component.

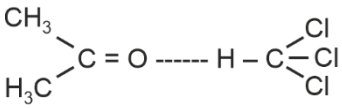
(3) Stronger intermolecular forces between chloroform molecules than those between chloroform and acetone molecules.

(4) Repulsive forces.

Answer (1)

Sol.

Acetone Chloroform



Acetone and chloroform show negative deviation from Raoult's law due to stronger H-bonding between acetone and chloroform mixture.

Hence, escaping tendency decreases

∴ Vapour pressure decreases

∴ Boiling point increases.

78. At 298 K, a certain buffer solution contains equal concentrations of X^- and HX, K_b for X^- is 10^{-10}.

What is the pH of this buffer solution?

(1) 2

(2) 10

(3) 4

(4) 6

Answer (3)

Sol. $HX \rightleftharpoons H^+ + X^-$

$K_a \times K_b = K_w$

$$K_a = \frac{K_w}{K_b} = \frac{10^{-14}}{10^{-10}} = 10^{-4}$$

$$pH = pK_a + \log\frac{[X^-]}{[HX]}$$

Given that : $[X^-] = [HX]$

$= 4 + \log(1)$

$= 4 + 0$

$= 4$

79. Identify the **incorrect** statement from the following :

(1) The IUPAC name of the element with atomic number 107 is Unnilseptium.

(2) The largest and the smallest species among Mg, Mg^{2+}, Al and Al^{3+} are Al and Mg^{2+} respectively.

(3) The similarity in behaviour of Li with Mg is referred to as 'diagonal relationship'

(4) The oxidation state and covalency of Al in $[AlCl(H_2O)_5]^{2+}$ are 3 and 6, respectively.

Answer (2)

Sol. The largest species is Mg and the smallest one is Al^{3+} among Mg, Mg^{2+}, Al and Al^{3+}.

- Unnilseptium element has atomic number 107.
- Li and Mg are diagonally related and have similar properties.
- The oxidation state and covalency of Al in $[AlCl(H_2O)_5]^{2+}$ are +3 and 6 respectively.

$\therefore$ Statement A is incorrect.

80. The correct order of increasing metallic character of Na, Be, P, Mg and Si is

(1) P < Si < Be < Mg < Na (2) Be < Si < P < Mg < Na

(3) P < Si < Na < Mg < Be (4) P < Mg < Be < Si < Na

Answer (1)

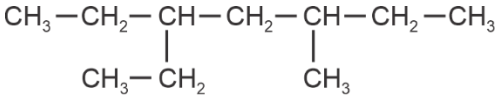
Sol. On moving left to right in a period, metallic character decreases and on moving top to bottom in a group, metallic character increases. So, the correct order of increasing metallic character is

P < Si < Be < Mg < Na

$$\text{Electronegativity} \propto \frac{1}{\text{Metallic character}}$$

	Na	Mg	Be	Si	P
Electronegativity (On Pauling scale)	0.9	1.2	1.5	1.8	2.1

81. The correct IUPAC name of the following compound is :

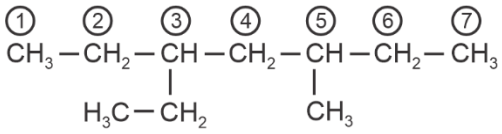


(1) 2,4-diethylhexane (2) 3,5-diethylhexane

(3) 3-ethyl-5-methylheptane (4) 3-methyl-5-ethylheptane

Answer (3)

Sol.



IUPAC name : 3-ethyl-5-methylheptane

- Numbering of parent chain should follow lowest locant rule.
- Prefixes should be written in alphabetical order.

82. Match **List I** with **List II** :

	List I (Complex/ion)		**List II (Shape/geometry)**
A.	$[Pt(Cl_2)(NH_3)_2]$	(I)	Octahedral
B.	$[Co(NH_3)_6]Cl_3$	(II)	Trigonal bipyramidal
C.	$[NiCl_4]^{2-}$	(III)	Square planar
D	$[Fe(CO)_5]$	(IV)	Tetrahedral

Choose the **correct** answer from the options given below :

(1) A-I, B-III, C-IV, D-II

(2) A-III, B-IV, C-I, D-II

(3) A-IV, B-I, C-III, D-II

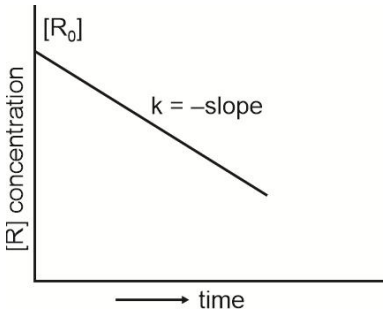
(4) A-III, B-I, C-IV, D-II

Answer (4)

Sol.

- In $[Pt(Cl_2)(NH_3)_2]$; Pt has dsp^2 hybridisation, so shape of complex is square planar.
- In $[Co(NH_3)_6]Cl_3$; Co has d^2sp^3 hybridisation so shape of complex is octahedral.
- In $[NiCl_4]^{2-}$; Ni has sp^3 hybridisation so shape of complex ion is tetrahedral.
- In $[Fe(CO)_5]$; shape of complex is trigonal bipyramidal.

83. For a certain reaction R $\rightarrow$ Product, the plot of concentration [R] vs time has a negative slope as shown. The order of reaction is :



(1) 0

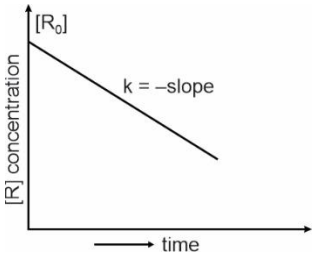
(2) 1

(3) 2

(4) 2.5

Answer (1)

Sol.



For zero order

$[R] = [R_0] - kt$

So –ve slope shows zero order reaction.

84. Which one of the following is an ambidentate ligand?

(1) Ethylenediaminetetraacetate ion

(2) Oxalate

(3) Ethane-1,2-diamine

(4) Thiocyanate

Answer (4)

Sol. An ambidentate ligand is a ligand which has two different donor atoms and either of the two ligates in complex.

(1) Ethylenediamine tetraacetate ion $\rightarrow$ hexadentate

(2) Oxalate $\rightarrow$ didentate

(3) Ethane-1,2-diamine $\rightarrow$ didentate

(4) Thiocyanate (SCN^-) $\rightarrow$ Ambidentate ligand.

85. Consider the following reaction :

$2A(g) + B(g) \rightarrow 2D(g)$

$\Delta U^{\ominus} = -10\ kJ\ mol^{-1}$ and $\Delta S^{\ominus} = -44\ JK^{-1}$ at 298 K.

Identify the **correct** option with $\Delta G^{\ominus}$ for the reaction and spontaneity of the reaction at 298 K.

(Given : R = 8.31 J mol^{-1} K^{-1})

(1) –1.635 kJ mol^{-1}, spontaneous

(2) +0.63568 kJ mol^{-1}, non-spontaneous

(3) –0.63568 kJ mol^{-1}, spontaneous

(4) +1.635 kJ mol^{-1}, non-spontaneous

Answer (2)

Sol. $2A(g) + B(g) \rightarrow 2D(g)$

$\Delta U° = -10$ kJ/mol

$\Delta S° = -44$ J/K

$\Delta H° = \Delta U° + \Delta n_g RT$

$$\Delta H^\circ = -10 - \frac{1\times 298\times(8.31)}{1000} = -10 - 2.48 = -12.48 \text{ kJ/mol}$$

$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$

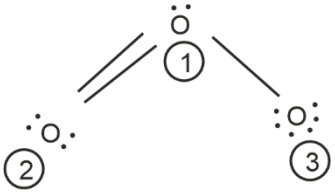
$= -12.48 - \frac{298\times(-44)}{1000}$

$= -12.48 + 13.112$

$= +0.632$ kJ/mol

Since ΔG° comes out to be positive, so given process is non-spontaneous.

86. The correct formal charges on oxygen atoms numbered 2, 1 and 3 respectively are :



(1) –1, 0, +1

(2) 0, +1, –1

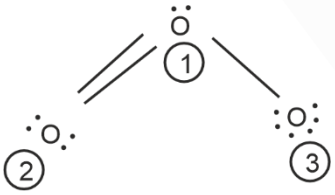
(3) 0, 0, 0

(4) +1, 0, –1

Answer (2)

Sol.

Formal charge = $\underset{(V)}{\text{Valence electrons}} - \frac{1}{2}\underset{(S)}{(\text{shared electrons})} - \underset{(L)}{(\text{non-bonding electrons})}$



Formal charge on 2nd oxygen atom $= 6 - \frac{1}{2}(4) - 4 = 0$

Formal charge on 1st oxygen atom $= 6 - \frac{1}{2}(6) - 2 = +1$

Formal charge on 3rd oxygen atom $= 6 - \frac{1}{2}(2) - 6 = -1$

87. Given below are certain reactions. Identify the reaction for which $K_P \neq K_C$.

(1) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

(2) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

(3) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

(4) $H_2O(g) + CO(g) \rightleftharpoons H_2(g) + CO_2(g)$

Answer (3)

Sol.

$K_P = K_C(RT)^{\Delta n_g}$

For $K_P = K_C$ ($\Delta n_g = 0$)

$K_P \neq K_C$ ($\Delta n_g \neq 0$)

(1) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

$\Delta n_g = 0$ ($K_P = K_C$)

(2) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

$\Delta n_g = 0$ ($K_P = K_C$)

(3) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

$\Delta n_g = -2$ ($K_P \neq K_C$)

(4) $H_2O(g) + CO(g) \rightleftharpoons H_2(g) + CO_2(g)$

$\Delta n_g = 0$ ($K_P = K_C$)

88. Given below is an expression for the rate constant of a first-order reaction occurring at a certain temperature, T (K).

$$\ln k = 14.34 - \frac{1.25 \times 10^4}{T}$$

The energy of activation in kcal mol^{-1} for the reaction is :

(Given: k in s^{-1}, R = 1.987 cal mol^{-1} K^{-1})

(1) 12.42 (2) 14.34

(3) 18.63 (4) 24.84

Answer (4)

Sol.

From Arrhenius equation

$$k = A\, e^{\frac{-E_a}{RT}}$$

$$\ln k = \ln A - \frac{E_a}{RT}$$

$$\frac{E_a}{R} = 1.25 \times 10^4$$

$E_a = 1.25 \times 10^4 \times 1.987$

$= 24.84$ k cal mol^{-1}

89. The following two reactions give the same foul smelling product Z.

$$C_2H_5Cl \xrightarrow{X} Z$$

$$C_2H_5\overset{\overset{O}{\|}}{C}NH_2 \xrightarrow{Br_2,\ NaOH} Y \xrightarrow[\Delta]{CHCl_3/\text{ethanolic KOH}} Z$$

X and Z, respectively, are :

(1) X = AgCN; Z = C_2H_5CN

(2) X = KCN; Z = C_2H_5CN

(3) X = KCN; Z = C_2H_5NC

(4) X = AgCN; Z = C_2H_5NC

Answer (4)

Sol.

$$C_2H_5Cl \xrightarrow{AgCN} \underset{\text{(foul smell compound)}}{C_2H_5NC\ (Z)}$$

$$C_2H_5\overset{\overset{O}{\|}}{C}NH_2 \xrightarrow{Br_2+NaOH} C_2H_5NH_2 \xrightarrow[\Delta]{CHCl_3/\text{ethanolic KOH}} \underset{(Z)}{C_2H_5NC}$$

So, X = AgCN

Z = C_2H_5NC

90. Match List I with List II :

	List-I (Complex)		List-II (Type of isomerism)
A.	$[Pt(NH_3)_2Cl_2]$	I.	Optical
B.	$[Co(en)_3]^{3+}$	II.	Solvate
C.	$[Co(NH_3)_5NO_2]Cl_2$	III.	Geometrical
D.	$[Cr(H_2O)_6]Cl_3$	IV.	Linkage

Choose the **correct** answer from the options given below :

(1) A-III, B-I, C-II, D-IV

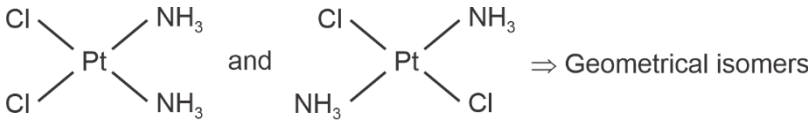
(2) A-I, B-III, C-II, D-IV

(3) A-III, B-I, C-IV, D-II

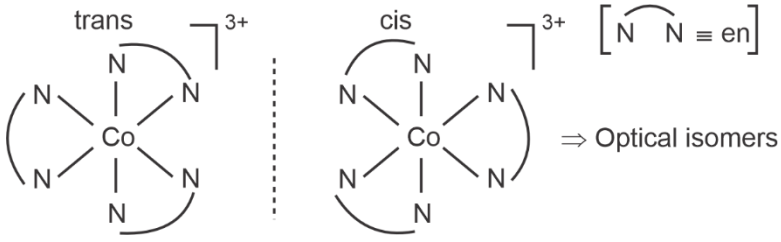
(4) A-II, B-IV, C-III, D-I

Answer (3)

Sol.

A. 

⇒ Geometrical isomers

B. 

⇒ Optical isomers

C. $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2$ are linkage isomers

D. $[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_5Cl]Cl_2 \cdot H_2O$ are solvate isomers