WB JEE-2019 (Chemistry)

Category - I (Q.41 to Q.70)

Carry 1 mark each and only one option is correct. In case of incorrect answer or any combination of more than one answer, ¼ mark will be deducted.

41. The H–N–H angle in ammonia is 107.6°, while the H–P–H angle in phosphine is 93.5°. Relative to phosphine, the p-character of the lone pair on ammonia is expected to be:
    a. Less
    b. More
    c. Same
    d. Cannot be predicted

42. The reactive species in chlorine bleach is
    a. Cl_2O
    b. OCl^-
    c. ClO_2
    d. HCl

43. The conductivity measurement of a coordination compound of Cobalt (III) shows that it dissociates into 3 ions in solution. The compound is
    a. Hexaamminecobalt(III) chloride
    b. Pentaamminesulphatocobalt(III) chloride
    c. Pentaamminechloridocobalt(III) sulphate
    d. Pentaamminechloridocobalt(III) chloride

44. In the Bayer's process, the leaching of alumina is done by using
    a. Na_2CO_3
    b. NaOH
    c. SiO_2
    d. CaO

45. Which atomic species cannot be used as a nuclear fuel?
    a. $^{233}_{92}U$
    b. $^{235}_{92}U$
    c. $^{239}_{94}U$
    d. $^{238}_{92}U$

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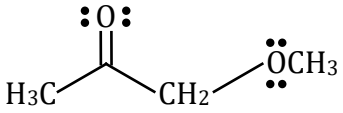
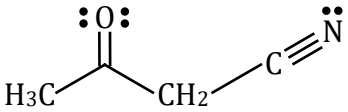
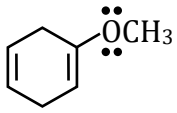
46. The molecule/molecules that has/have delocalised lone pair(s) of electrons is/are

(I) 

(II) 

(III) 

(IV) $CH_3CH=CHCH_2\ddot{N}HCH_3$

a. I, II and III

b. I, II and IV

c. I and III

d. only III

47. The conformations of n-butane, commonly known as eclipsed, gauche and anti-conformations can be interconverted by

a. rotation around C-H bond of a methyl group

b. rotation around C-H bond of a methylene group

c. rotation around C_1-C_2 linkage

d. rotation around C_2-C_3 linkage

48. The correct order of the addition reaction rates of halogen acids with ethylene is

a. hydrogen chloride > hydrogen bromide > hydrogen iodide

b. hydrogen iodide > hydrogen bromide > hydrogen chloride

c. hydrogen bromide > hydrogen chloride > hydrogen iodide

d. hydrogen iodide > hydrogen chloride > hydrogen bromide

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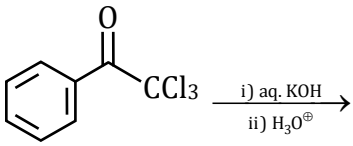
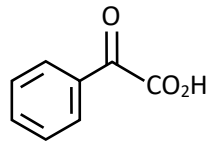
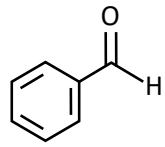
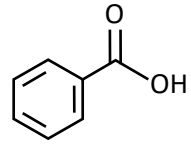
49. One of the products of the following reactions P.

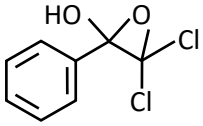


P ; Structure of P is

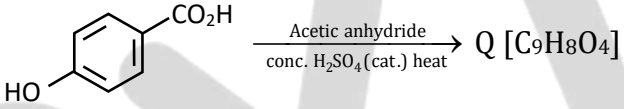
a. 

b. 

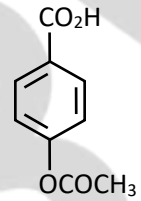
c. 

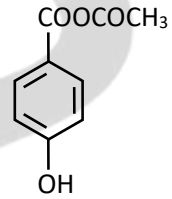
d. 

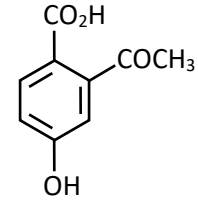
50. For the reaction below, the product is Q.

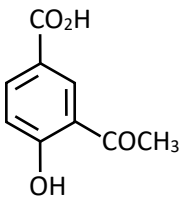


Q [$C_9H_8O_4$]

a. 

b. 

c. 

d. 

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WB JEE-2019 (Chemistry)

51. Cyclopentanol on reaction with NaH followed by CS_2 and CH_3I produces a/an
    a. ketone
    b. alkene
    c. ether
    d. xanthate

52. The compound, which evolves carbon dioxide on treatment with aqueous solution of sodium bicarbonate 25°C, is
    a. C_6H_5OH
    b. CH_3COCl
    c. CH_3CONH_2
    d. $CH_3COOC_2H_5$

53. The indicated atom is not a nucleophilic site in
    a. BH_4^-
       ↑
    b. CH_3MgI
       ↑
    c. CH_3OH
         ↑
    d. CH_3NH_2
         ↑

54. The charge carried by 1 millimole of Mn^+ ions is 193 coulombs. The value of n is
    a. 1
    b. 2
    c. 3
    d. 4

55. Which of the following mixtures will have the lowest pH at 298 K?
    a. 10 ml 0.05NCH_3COOH + 5 ml 0.1 NNH_4OH
    b. 5 ml 0.2NNH_4Cl + 5 ml 0.2 N NH_4OH
    c. 5 ml 0.1N CH_3COOH + 10 ml 0.05 N CH_3COONa
    d. 5 ml 0.1N CH_3COOH + 5 ml 0.1 N NaOH

56. Consider the following two first order reactions occurring at 298 K with same initial concentration of A:
    (1) A → B: rate constant, k = 0.693 min^{-1}
    (2) A → C: half – life, $t_{1/2}$ = 0.693 min^{-1}
    Choose the correct option:
    a. Reaction (1) is faster than Reaction (2).
    b. Reaction (1) is slower than Reaction (2).
    c. Both reaction proceed at the same rate.
    d. Since two different products are formed, rates cannot be compared.

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57. For the equilibrium $H_2O(\ell) \rightleftharpoons H_2O(g)$, which of the following is correct?
    a. $\Delta G = 0, \Delta H < 0, \Delta S < 0$
    b. $\Delta G < 0, \Delta H > 0, \Delta S > 0$
    c. $\Delta G > 0, \Delta H = 0, \Delta S > 0$
    d. $\Delta G = 0, \Delta H > 0, \Delta S > 0$

58. For a Vander Waal's gas, the term $\left(\frac{ab}{v^2}\right)$ represents some
    a. Pressure
    b. Energy
    c. Critical density
    d. Molar mass

59. In the equilibrium $H_2 + I_2 \rightleftharpoons 2HI$, if at a given temperature the concentrations of the reactants are increased, the value of the equilibrium constant, K_C, will:
    a. Increase
    b. Decrease
    c. Remain the same
    d. Cannot be predicted with certainty

60. If electrolysis of aqueous $CuSO_4$ solution is carried out using Cu-electrodes, the reaction taking place at the anode is
    a. $H^+ + e \rightarrow H$
    b. $Cu^{2+}(aq) + 2e \rightarrow Cu(s)$
    c. $SO_4^{2-}(aq) - 2e \rightarrow SO_4$
    d. $Cu(s) - 2e \rightarrow Cu^{2+}(aq)$

61. Which one of the following electronic arrangements is absurd?
    a. $n = 3, \ell = 1, m = -1$
    b. $n = 3, \ell = 0, m = 0$
    c. $n = 2, \ell = 0, m = -1$
    d. $n = 2, \ell = 1, m = 0$

62. The quantity $h\nu/k_B$ corresponds to

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a. Wavelength
b. Velocity
c. Temperature
d. Angular momentum

63. In the crystalline solid $MSO_4.nH_2O$ of molar mass 250 g mol^{-1}, the percentage of anhydrous salt is 64 by weight. The value of n is
a. 2
b. 3
c. 5
d. 7

64. At S.T.P., the volume of 7.5 g of a gas is 5.6 L. The gas is
a. NO
b. N_2O
c. CO
d. CO_2

65. The half–life period of $_{53}I^{125}$ is 60 days. The radioactivity after 180 days will be
a. 25 %
b. 12.5 %
c. 33.3 %
d. 3.0 %

66. Consider the radioactive disintegration

$_{82}A^{210} \rightarrow B \rightarrow C \rightarrow {}_{82}D^{206}$

The sequence of emission can be
a. β, β, β
b. α, α, β
c. β, β, γ
d. β, β, α

67. The second Ionisation energy of the following elements follows the order

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a. Zn > Cd < Hg

b. Zn > Cd > Hg

c. Cd > Hg < Zn

d. Zn < Cd < Hg

68. The melting points of (i) $BeCl_2$ (ii) $CaCl_2$ and (iii) $HgCl_2$ follows the order

a. i < ii < iii

b. iii < i < ii

c. i < iii < ii

d. ii < i < iii

69. Which of these species will have non-zero magnetic moment?

a. Na^+

b. Mg

c. F^-

d. Ar^+

70. The first electron affinity of C, N and O will be of the order

a. C < N < O

b. N < C < O

c. C < O < N

d. O < N < C

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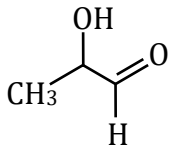
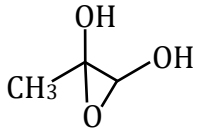
Category-II (Q.71 to Q75)

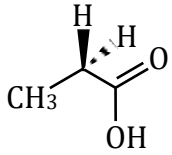
Carry 2 marks each and only one option is correct. In case of incorrect answer or any combination of more than one answer, ½ mark will be deducted.

71. Oxidation of allyl alcohol with a peracid gives a compound of molecular formula $C_3H_6O_2$, which contains an asymmetric carbon atom. The structure of the compound is

a. 

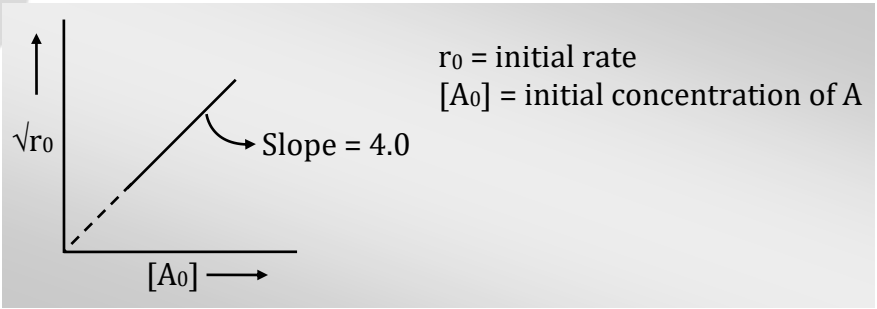
b. 

c. 

d. 

72. The total number of isomeric liner dipeptide which can be synthesized from racemic alanine is
    a. 1
    b. 2
    c. 3
    d. 4

73. The kinetic study of a reaction like $vA \rightarrow P$ at 300 K provides the following curve. Where concentration is taken in mol dm^{-3} and time in min.



    a. n = 0, k = 4.0mol dm^{-3} min^{-1}
    b. n = 1/2, k = 2.0 $mol^{1/2}$ $dm^{3/4}dm^{-3}$ min^{-1}
    c. n = 1, k = 8.0 min^{-1}
    d. n = 2, k = 16.0 dm^3 mol^{-1} min^{-1}

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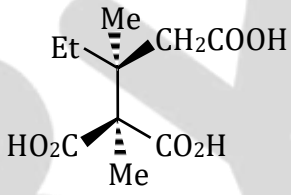
74. At constant pressure, the heat of formation of compound is not dependent on temperature, when
    a. $\Delta C_p = 0$
    b. $\Delta C_V = 0$
    c. $\Delta C_p > 0$
    d. $\Delta C_p < 0$

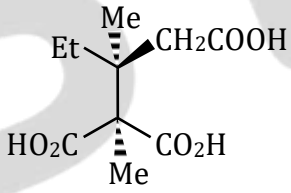
75. A copper coin was electroplated with Zn and then heated at high temperature until there is a change in colour. What will be the resulting colour?
    a. White
    b. Black
    c. Silver
    d. Golden

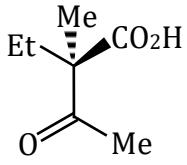
Category-III (Q.76 to Q.80)

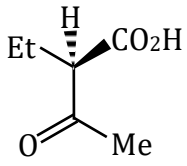
Carry 2 marks each one or more option(s) is/are correct. If all correct answer are not marked and also no incorrect answer is marked then score = 2 × number of correct answer marked + actual number of correct answers. If any wrong option is marked or if any combination including a wrong option is marked, the answer will considered wrong, but three is no negative marking for the same and zero mark will be awarded.

76. The compounds(s), capable of producing achiral compound on heating at 100°C is/are:

a. 

b. 

c. 

d. 

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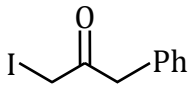
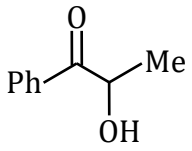
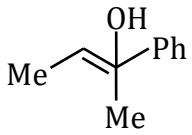
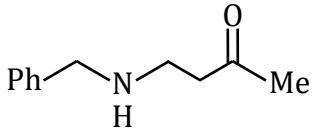
77. Haloform reaction with I_2 and KOH will be responded by

a. 

b. 

c. 

d. 

78. Identify the correct statement(s):
    a. The oxidation number of Cr in CrO_5 is +6.
    b. $\Delta H > \Delta U$ for the reaction $N_2O_4(g) \rightarrow 2NO_2(g)$. Provided both gases behave ideally.
    c. pH of 0.1N H_2SO_4 is less than that of 0.1 N HCl at 25°C
    d. $\left(\frac{RT}{F}\right)$ = 0.0591 volt at 25°C.

79. Compounds with spin-only magnetic moment equivalent to five unpaired electrons are:
    a. $K_4[Mn(CN)_6]$
    b. $[Fe(H_2O)_6]Cl_3$
    c. $K_3[FeF_6]$
    d. $K_4[MnF_6]$

80. Which of the following chemical may be used to identify three unlabelled beakers containing conc. NaOH, conc. H_2SO_4 and water?
    a. NH_4NO_3
    b. NaCl
    c. $(NH_4)_2CO_3$
    d. HCOONa

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WB JEE-2019 (Chemistry)

ANSWER KEYS

41. (a)	42. (b)	43. (d)	44. (b)	45. (d)	46. (d)	47. (d)	48. (b)	49. (c)	50. (a)
51. (d)	52. (b)	53. (a)	54. (b)	55. (c)	56. (b)	57. (d)	58. (b)	59. (c)	60. (d)
61. (c)	62. (c)	63. (c)	64. (a)	65. (b)	66. (d)	67. (a)	68. (b)	69. (d)	70. (b)
71. (a)	72. (d)	73. (d)	74. (a)	75. (b)	76. (c)	77. (a,b)	78. (a,b)	79. (b,c,d)	80. (a,c)

BYJU'S

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WB JEE-2019 (Chemistry)

SOLUTION

41. (a)

As %s-character increases, bond angle increases

As % p-character increases, bond angle decreases.

$\therefore$ p-character order will be: $PH_3 > NH_3$

$\therefore$ Bond angle order: $PH_3 < NH_3$

42. (b)

OCl^- is used as a bleaching agent. Its components will be: $OCl^- \longrightarrow [O] + Cl^-$

43. (d)

The compound is

Pentaaminechloridecobalt (III) chloride

$[Co(NH_3)_5Cl]Cl_2 \rightleftharpoons [Co(NH_3)_5Cl^-]^{+2} + 2Cl^-$

$\because$ Gives 3 ions in aqueous solution.

44. (b)

The separation of the alumina from impurities is usually accomplished by Bayer's process.

The reactions involved in this process are:

$$Al_2O_3.2H_2O + 2NaOH \xrightarrow[8\ atm]{190^\circ C} \underset{(Soluble)}{2NaAlO_2} + 3H_2O$$

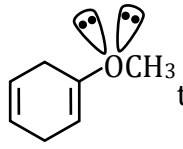
$$NaAlO_2 + H_2O \longrightarrow NaOH + Al(OH)_3\downarrow$$

$$2Al(OH)_3 \longrightarrow Al_2O_3 + 3H_2O$$

45. (d)

Since $^{238}_{92}U$ isotope of uranium does not participate in nuclear chain reaction, it cannot be used as nuclear fuel.

46. (d)

In  there is π bond and lone pair conjugation so, the lone pair of oxygen get delocalized on π bond located on next carbon.

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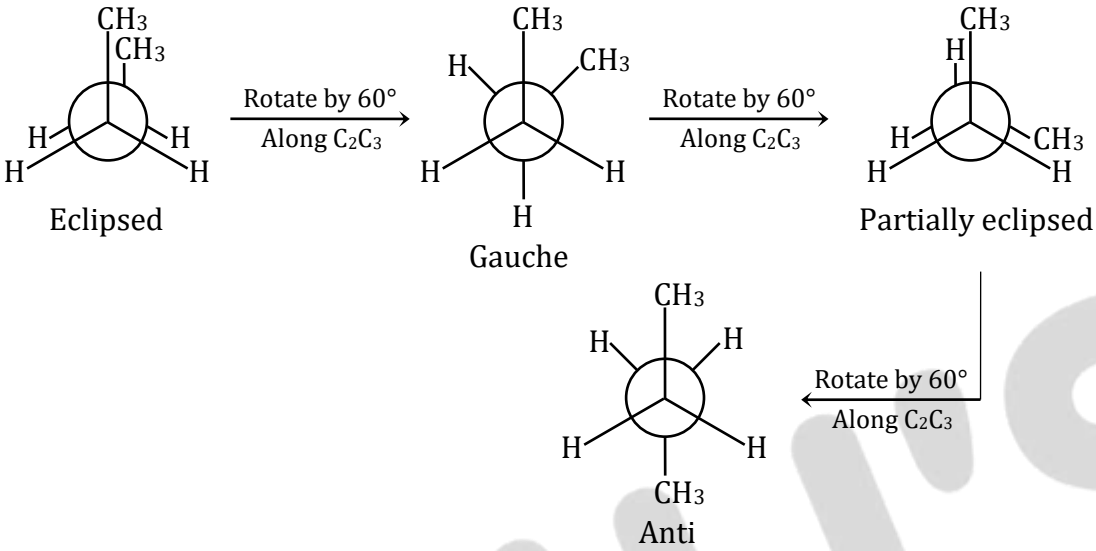
47. (d)

Rotation around C_2–C_3



48. (b)

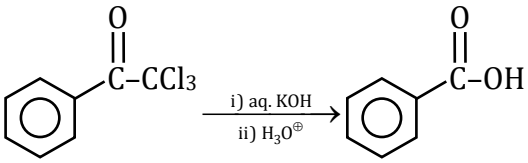
Reactivity order is

HI > HBr > HCl

∵ Leaving group order is I^- > Br^- > Cl^-

The compound that has more stable leaving group will be more reactive with ethylene.

49. (c)



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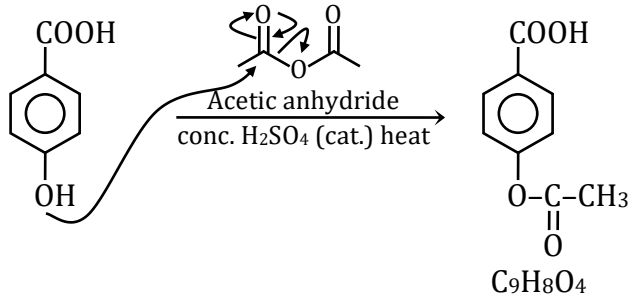
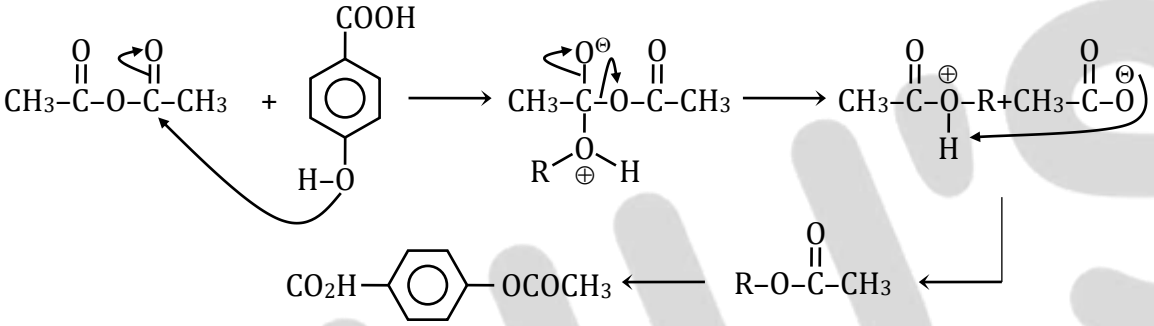
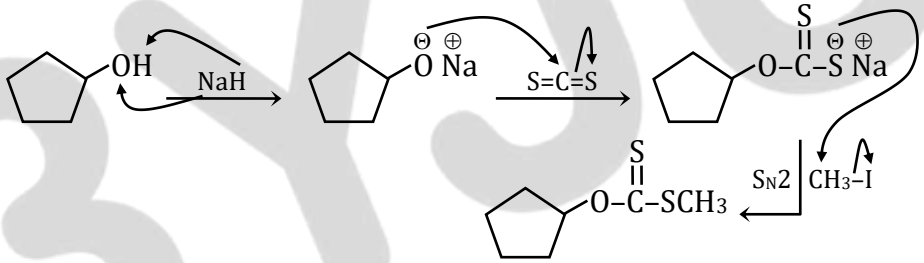
50. (a)





51. (d)



52. (b)

CH_3COCl hydrolyses to form CH_3COOH even at 25°C, which subsequently reacts with $NaHCO_3$ present in the same medium to form CO_2.

53. (a)

There is no lone pair on 'B' atom of $BH_4^{\ominus}$, hence it is not nucleophilic site.

54. (b)

Given: Charge on 1 milimole of Mn^{2+} ions = 193 C

So, $193 = \frac{n \times 96500}{1000}$

Rearranging, $n = \frac{193 \times 1000}{96500}$

So, $n = 2$

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55. (c)

(A) $CH_3COOH + NaOH \longrightarrow CH_3COO\,NH_4$

0.05 N, 10 ml, 0.5 + 0.1 N, 5 ml, 0.5 → WAWB salt

$pH = 7 - \frac{1}{2}pK_b + \frac{1}{2}pK_a \simeq 7$

(B) $(NH_4Cl + NH_4OH)$ Basic buffer solution

$pOH = pK_b + \log\frac{CA}{B}$

$pH > 7$

(D) $CH_3COOH + NaOH \longrightarrow CH_3COO\,Na$ (WAWB salt)

$pH = 7 + \frac{1}{2}pK_b = \frac{1}{2}\log C$

$pH > 7$

(C)

	CH_3COOH	+	CH_3COONa
	0.1 N		0.05 N
	5 ml		10 ml
milli eq.	0.5		0.5

It is acidic buffer solution $pH = pK_a + \log\frac{CH_3COO^{\ominus}}{CH_3COOH}$

$pH = pK_a$

This solution will have lower pH.

56. (b)

For 1st order reaction

Rate constant $K = \frac{0.693}{t_{1/2}}$ and Rate = K(A)'

For (I) reaction K = 0.6930 minute^{-1}

For (II) reaction $K = \frac{0.693}{t_{1/2}} = \frac{0.693}{0.693} = 1\ min^{-1}$

$\because$ given $t_{½} = 0.693$

So, $K_I < K_{II}$

Then, Rate I < Rate II

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57. (d)

For equilibrium $H_2O(l) \rightleftharpoons H_2O(g)$

$\Delta G = 0 \quad \because$ equilibrium

$\Delta H > 0$ (+ve), for $T = \frac{\Delta H}{\Delta S}$ the process will be spontaneous above the temperature of T

$\Delta S > 0$ (+ve)

$$\Delta S_{sys} = \underbrace{nC_V \ln\frac{T_2}{T_1}}_{0} + nR\ln\frac{V_2}{V_1}$$

$\Delta S_{sys} = nR \ln\frac{V_2}{V_1}$ at constant temperature.

58. (b)

Vander Waal's equation is given as:

$$\left[P\left(1+\frac{an^2}{V^2}\right)\right](V - nb) = nRT$$

$\frac{ab}{v^2}$ represent energy by dimensional analysis.

Unit of a (Vander Waal's constant) = atm.ℓ^2/mole^2

Unit of b (Vander Waal's constant) = l/mole

So, $\frac{ab}{v^2} = \frac{\frac{atm.\ell^2}{mole^2} \times \frac{\ell}{mole}}{\ell^2/mole^2} = \frac{atm.\ell}{mole}$

It is unit of energy per mole.

59. (c)

Equilibrium constant doesn't depend on the molar concentration of reactants. It is only affected by the change in temperature.

60. (d)

On electrolysis of aq. solution of $CuSO_4$ on using Cu electrode. According to SOP values at anode.

$2H_2O \longrightarrow O_2 + 4H^+ + 4e^- \qquad E^0 = -1.23$ v

$Cu \longrightarrow Cu^{2+} + 2e^- \qquad E^0 = -0.34$ v

So, reaction carried out on anode, which has high SOP value.

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61. (c)
Quantum number set n = 2, l = 0, m = –1 is not possible (not valid) since value of m ≤ +l to –l.

62. (c)
$\frac{h\nu}{k_B} = \frac{3}{2}T$ (it represents temperature)

63. (c)
Mass of anhydrous MSO_4 salt = $250 \times \frac{64}{100} = 160$ gm/mole
Total mass of H_2O is $MSO_4.nH_2O$
= 250 – 160 = 90 gm/mole
So value of n = $\frac{90}{18} = 5$

64. (a)
(A) For finding which gas is it, we have to find molar mass.
∵ At STP weight of 5.6 L gas = 7.5 gm (given)
At STP weight of 22.4 L gas = $\frac{7.5}{5.6} \times 22.4 = 30$ gm/mole
And we know, molar mass of NO is 30 gm/mole
So answer (A).

65. (b)
$t_{1/2}$ = 60 days (given)
Radioactivity after t time $N_t = \frac{N_o}{(2)^n}$ ... (1)
& we know, $n = \frac{t}{t_{1/2}}$
So, $n = \frac{180}{60}$; n = 3
Putting value of n in eq. (1)
$N_t = \frac{N_o}{(2)^3} = \frac{N_o}{8} = 0.125\ N_o$
So, radioactivity after 180 days = 12.5 %

66. (d)
$_{82}A^{210} \xrightarrow{\beta} {}_{83}B^{210} \xrightarrow{\beta} {}_{64}C^{210} \xrightarrow{\alpha} {}_{82}C^{206}$
$_ZX^A \longrightarrow {}_{Z+1}Y^A$ + β-particle
$_ZX^A \longrightarrow {}_{Z-2}Y^{A-4}$ + α-particle

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67. (a)

2^{nd} I.E. order: Cd < Zn < Hg

So, Zn > Cd < Hg

Element	2^{nd} I.E. (kJ/mole)
Zn	1734
Cd	1631
Hg	1809

68. (b)

According to covalent character

$$\text{Melting points} \propto \frac{1}{\text{Covalent character}}$$

Melting points $HgCl_2$ = 276°C

$BeCl_2$ = 399°C

$CaCl_2$ = 775°C

Melting point order = $HgCl_2 < BeCl_2 < CaCl_2$

69. (d)

By writing configurations we can find number of unpaired electrons.

If number of unpaired electrons is 0

Then, magnetic moment will also be 0

	Number of unpaired e^-
$_{11}Na^+ \rightarrow 1s^2 2s^2 2p^6$	0
$_{12}Mg \rightarrow 1s^2 2s^2 2p^6 3s^2$	0
$_{9}F^- \rightarrow 1s^2 2s^2 2p^6$	0
$_{18}Ar^+ \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^5$	1

70. (b)

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1st electron affinity order: N < C < O

According to electronic configuration,

N = $1s^2\ 2s^2\ 2p^3$ Half filled orbitals are more stable.

E.A. kJ/mole [C = 121.77, N = –6.8, O = 140]

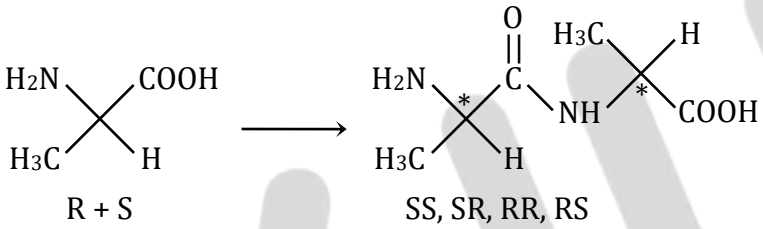
71. (a)

$CH_2{=}CH{-}CH_2{-}OH \xrightarrow[RCO_3H]{[O]} CH_2{-}\underset{\diagdown\ \diagup}{CH}{-}CH_2{-}OH$ (O bridge)

$(C_3H_6O_2)$

An epoxide ring formation will take place.

72. (d)



Dipeptide has two chiral carbons and both side unsymmetrical. Hence RR, RS, SR, SS is possible.

73. (d)

Rate = $k(A)^n$

According to graph (n = 2)

Slope = $\frac{(Rate)^{1/2}}{(A)} = 4$

$K = \frac{Rate}{(A)^2}$; $\frac{Rate}{(A)^2} = (4)^2$

$\frac{Rate}{(A)^2} = 16$

74. (a)

For reaction: (According to Kirchhoff's equation)

$\Delta H_2 = \Delta H_1 + \Delta C_p(\Delta T)$

When $\Delta C_p = 0$

Then, ΔH_f will not depend on temperature.

75. (b)

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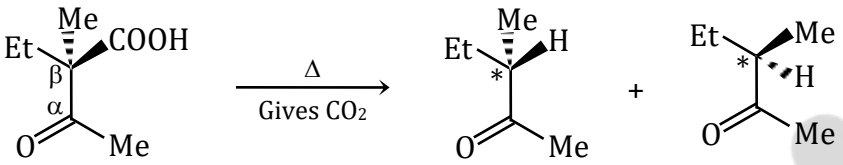
If these coins are heated, the zinc will diffuse into the copper layer, producing a surface alloy of zinc and copper. These alloys are brasses. Copper also oxidizes when heated in air, producing a black layer of copper-oxide (CuO).

76. (c)

On heating the compound CO_2 gas will evolve out.

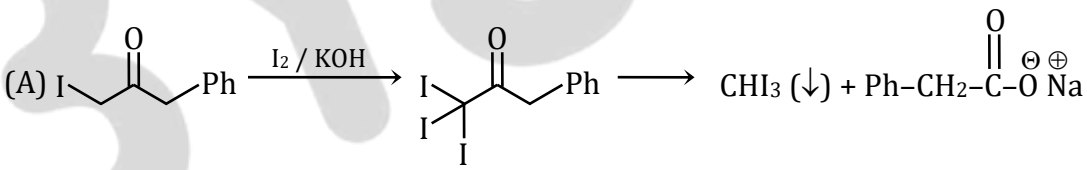


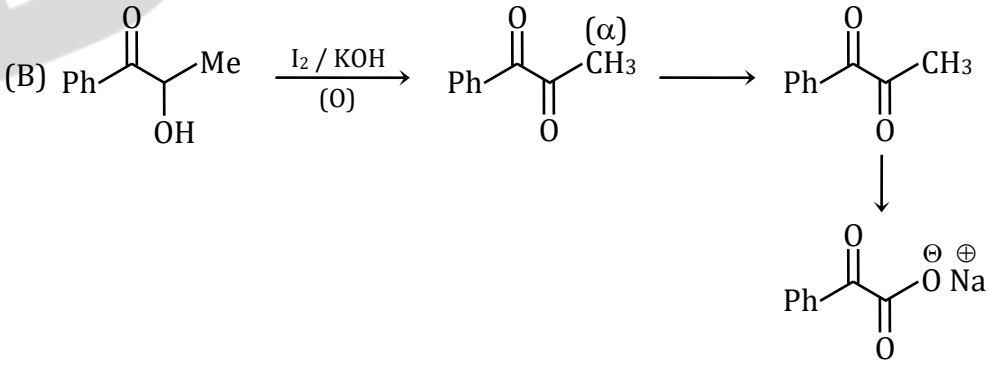
Achiral mixture

In product chiral carbon atom is present hence, R and S structure will be there.

77. (a,b)

I_2/KOH reacts on methyl ketones or 2° alcohols.





2° alcohols can be converted to ketones.

78. (a,b)

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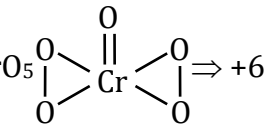
(A) Oxidation number of Cr of CrO_5  $\Rightarrow +6$

(B) $N_2O_4\,(g) \longrightarrow 2NO_2\,(g)$ $\quad \Delta H = \Delta U + \Delta ngRT$

$\Delta ng = 2 - 1 = 1$

$\Delta n = +ve$

So, $\Delta H > \Delta U$

(C) pH of 0.1 N $H_2SO_4 \Rightarrow [H^+]$ 0.1 N

$pH = -\log[H^+] = \log(10^{-1})$

pH of 0.1 N HCl = $[H^+] = 0.1$ N

$pH = \log [H^+]$

$= -\log(10^{-1}) \Rightarrow 1$

(D) $\frac{RT}{F} = \frac{8.314 \times 298}{96500} = 0.0256$

79. (b,c,d)

(A) In $K_4[Mn(CN)_6]$, Mn has +20.5 and Mn^{2+} = [Ar] $3d^5 4s^0$, and CN^- is a strong field ligand pairing takes place and the complex has only one unpaired electron.

(B) In $[Fe(H_2O)_6]Cl_3$, Fe has +30.5 and Fe^{3+} = $[Ar]3d^5 4s^0$, the number of unpaired electron = 5. (H_2O is a weak field ligand thus no pairing)

(C) In $K_3[FeF_6]$, Fe has +30.5 and Fe^{3+} = $[Ar]3d^5 4s^0$, thus number of unpaired electron = 5. (F^- is a weak field ligand thus no pairing).

(D) In $K_4[MnF_6]$, Mn has 0.5 of +2 thus Mn^{2+} = $[Ar]3d^5 4s^0$ is number of unpaired electron = 5.

F^- is a weak field ligand thus no pairing.

80. (a,c)

(A) NH_4NO_3 will evolve NH_3, pungent smelling gas with NaOH, NO_2 brown gas with conc. H_2SO_4 and no reaction in water, thus NH_4NO_3 can label all three beakers.

$$NH_4NO_3 \xrightarrow{\text{conc. NaOH}} NH_3\uparrow + NaNO_3 + H_2O$$

$$NH_4NO_3 \xrightarrow{\text{conc. } H_2SO_4} (NH_4)_2SO_4 + NO_2(\uparrow) + O_2 + H_2O$$

(C) $(NH_4)_2CO_3$ will evolve NH_3 pungent smelling gas with NaOH, effervescence of CO_2 with conc. H_2SO_4 and no reaction with water, thus $(NH_4)_2CO_3$ can label all three beakers.

$$(NH_4)_2CO_3 \xrightarrow{\text{conc. NaOH}} NH_3\uparrow + Na_2CO_3 + H_2O$$

$$(NH_4)_2CO_3 \xrightarrow{\text{conc. } H_2SO_4} (NH_4)_2SO_4 + CO_2(\uparrow) + H_2O$$

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