FINAL JEE–MAIN EXAMINATION – APRIL, 2023
Held On Saturday 08th April, 2023
TIME : 03:00 PM to 06:00 PM

SECTION - A

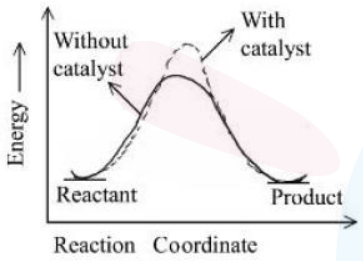
Topic: Chemistry in everyday life
Level: Med

61. The statement/s which are true about antagonists from the following is/are :
A. They bind to the receptor site
B. Get transferred inside the cell for their action
C. Inhibit the natural communication of the body
D. Mimic the natural messenger.
Choose the correct answer from the options given below:
(1) A and B (2) A and C (3) A, C and D (4) B only

Sol. **2**
Antagonists bind to receptor site and inhibit the natural communication of both

Topic: Chemical kinetics
Sub: collision theory
Level: Easy

62. The correct reaction profile diagram for a positive catalyst reaction.

(1)


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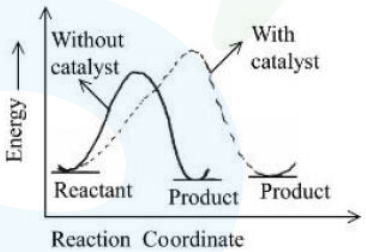

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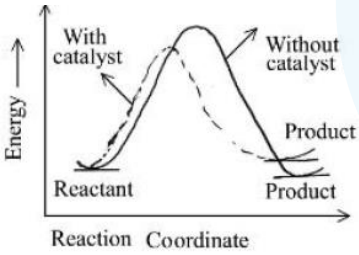

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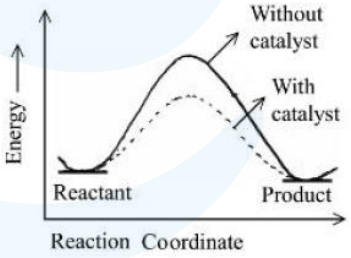


Sol. **4**
Catalysts decrease activation energy only.

Topic :
Sub Topic :
Level :

63. Given below are two statements : One is labelled as **Assertion A** and other is labelled as **Reason R**
Assertion A : Sodium is about 30 times as abundant as potassium in the oceans.
Reason R : Potassium is bigger in size than sodium.
In the light of the above statements, choose the correct answer from the options given below
(1) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**
(2) **A** is true but **R** is false
(3) **A** is false but **R** is true
(4) Both **A** and **R** are true and **R** is the correct explanation of **A**

Sol. **1**
Due to bigger size of potassium, it forms more efficient lattices as compared to sodium with silicates.
The abundance of sodium in ocean is more due to the more soluble nature of salt of sodium as compared to potassium salts.

Topic :
Sub Topic :
Level :

64. Which of these reactions is not a part of breakdown of ozone in stratosphere?

(1) $CF_2Cl_2(g) \xrightarrow{uv} \dot{C}l(g) + \dot{C}F_2Cl(g)$

(2) $\dot{C}l(g) + O_3(g) \rightarrow Cl\dot{O}(g) + O_2(g)$

(3) $2\,Cl\dot{O} \rightarrow ClO_2(g) + \dot{C}l(g)$

(4) $Cl\dot{O}(g) + O(g) \rightarrow \dot{C}l(g) + O_2(g)$

Sol. **3**

Ozone destruction

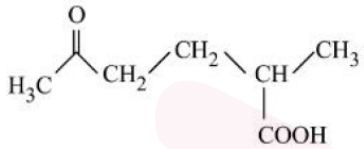
$CF_2Cl_2 \xrightarrow{hv} \dot{C}l + \dot{C}F_2Cl(g)$

$\dot{C}l + O_3 \rightarrow Cl\dot{O} + O_2$

$Cl\dot{O} + \dot{O} \rightarrow \dot{C}l + O_2$

Topic: Nomenclature
Level: Easy

65. The correct IUPAC nomenclature for the following compound is :



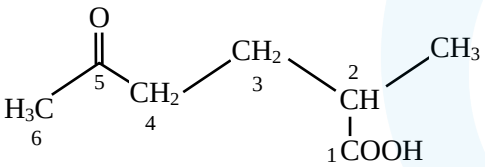
(1) 2-Methyl-5-oxohexanoic acid

(2) 2-Formyl-5-methylhexan-6-oic acid

(3) 5-Formyl-2-methylhexanoic acid

(4) 5-Methyl-2-oxohexan-6-oic acid

Sol. **1**



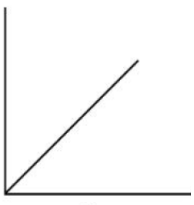
2-Methyl-5-oxohexanoic acid

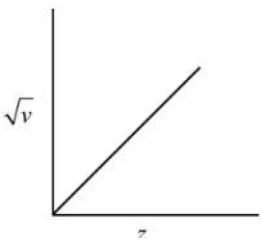
Topic :
Sub Topic :
Level :

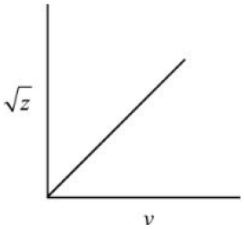
66. Henry Moseley studied characteristic X-ray spectra of elements. The graph which represents his observation correctly is

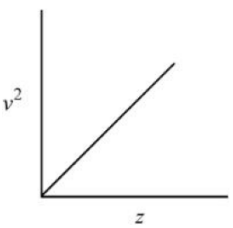
Given ν = frequency of X-ray emitted

Z = atomic number

(1) 

(2) 

(3) 

(4) 

Sol. **2**

$\sqrt{\nu} \alpha Z$

Topic :
Sub Topic :
Level :

67. Match list I with list II

List I Coordination complex		List II Number of unpaired electrons	
A.	$[Cr(CN)_6]^{3-}$	I.	0
B.	$[Fe(H_2O)_6]^{2+}$	II.	3
C.	$[Co(NH_3)_6]^{3+}$	III.	2
D.	$[Ni(NH_3)_6]^{2+}$	IV.	4

Choose the correct answer from the options given below:

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

Sol. 1

For option (A)

Cr^{+3} : $3d^3$

$CN^- \rightarrow$ SFL

$\Rightarrow$ No. of unpaired electrons = 3

For option (B)

Fe^{+2} : $3d^6$

H_2O : WFL

No. of unpaired electrons = 4

For option (C)

Co^{+3} : $3d^6$

NH_3 : SFL

No. of unpaired electrons = 0

For option (D)

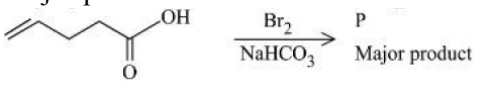
Ni^{+2} : $3d^8$

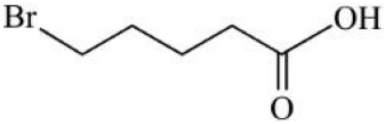
NH_3 : SFL

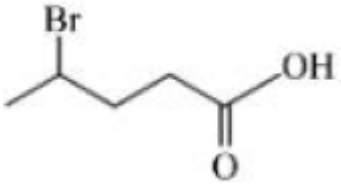
No. of unpaired electrons = 2

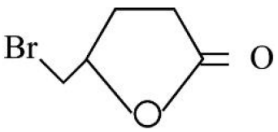
Topic: Hydrocarbon
Level: Med

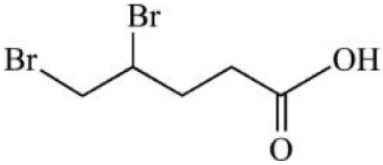
68. Major product 'P' formed in the following reaction is :



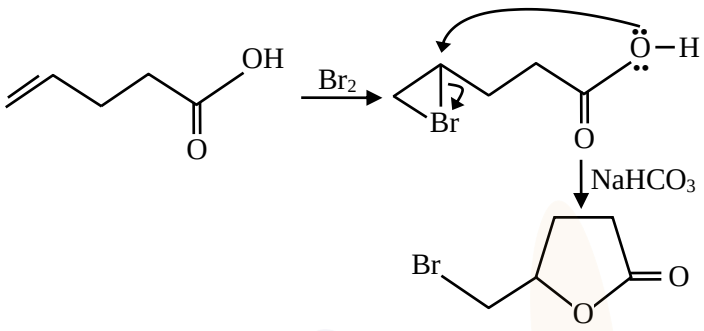
(1) 

(2) 

(3) 

(4) 

Sol. **3**



Topic :
Sub Topic :
Level :

69. For a good quality cement, the ratio of lime to the total of the oxides of Si, Al and Fe should be as close as to

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

Sol. **1**

$$\frac{\%CaO}{\%SiO_2+\%Al_2O_3+\%Fe_2O_3}=1.9-2.1$$

Option (1) is correct.

Topic: Biomolecule
Level: Easy

70. Match list I with list II

List I Natural amino acid		List II One letter code	
A.	Glutamic acid	I.	Q
B.	Glutamine	II.	W
C.	Tyrosine	III.	E
D.	Tryptophan	IV.	Y

Choose the correct answer from the options given below:

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

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

Sol. **1**

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

Fact

Topic: Mole concept
Sub: Significant figares
Level: F

71. Which of the following have same number of significant figures ?

A. 0.00253
B. 1. 0003
C. 15.0
D. 163

Choose the correct answer from the options given below

(1) B and C only (2) A, B and C only

(3) A, C and D only (4) C and D only

Sol. **3**

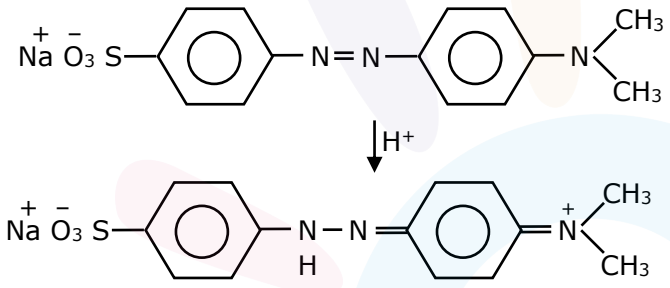
0.00253, 15.0, 163

All have three significant figures.

Topic: Qualitative
Sub:
Level:M

72. Given below are two statements :
Statement I : Methyl orange is a weak acid.
Statement II : The benzenoid form of methyl orange is more intense/deeply coloured than the quinonoid form.
In the light of the above statement, choose the most appropriate answer from the options given below:
(1) Both statement I and statement II are incorrect
(2) Both statement I and Statement II are correct
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

Sol. **1**
(i) Methy orange is weak base



(ii) Red color (quinonoid form)
So both statement are false

Topic: GOC
Level: Easy

73. The descending order of acidity for the following carboxylic acid is –
A. CH_3COOH B. $F_3C-COOH$ C. $ClCH_2-COOH$ D. $BrCH_2-COOH$
Choose the correct answer from the options given below:
(1) D > B > A > E > C (2) B > D > C > E > A
(3) E > D > B > A > C (4) B > C > D < E > A

Sol. **2**
Acidity α stability of conjugate base
Stability order
$$F_3C-COO^- > F-CH_2-COO^- > Cl-CH_2-COO^- > Br-CH_2-COO^- > CH_3COO^-$$

Topic :
Sub Topic :
Level :

74. In Hall-Heroult process, the following is used for reducing Al_2O_3 :-
(1) Magnesium (2) Graphite (3) Na_3AlF_6 (4) CaF_2

Sol. **2**
In case of Hall's process, reduction of Al_2O_3 to Al can be done using graphite.

Topicp: Real gas
Sub: Vanderwals costant
Level: M

75. Arrange the following gases in increasing order of van der waals constant 'a'

A. Ar B. CH_4 C. H_2O D. C_6H_6

Choose the correct options from the following

(1) A, B, C and D (2) B, C, D and A (3) C, D, B and A (4) D, C, B and A

Sol. 1

A α force of attraction vanderwaal force depends on molecular size and molecular mass and there is H-bonding in water, so correct option will be A < B < C < D.

Topic: Stoichiometry-II
Sub: titration
Level: M

76. Given below are two statement :

Statement I : In redox titration, the indicators used are sensitive to change in pH of the solution.

Statement II : In acid-base titration, the indicators used are sensitive to change in oxidation potential.

In the light of the above statement, choose the most appropriate answer from the options given below

(1) Both statement I and Statement II are incorrect
(2) Statement I is incorrect but Statement II is correct
(3) Statement I is correct but Statement II is incorrect
(4) Both Statement I and Statement II are correct

Sol. 1

Fact

Topic :
Sub Topic :
Level :

77. Which of the following can reduce decomposition of H_2O_2 on exposure to light

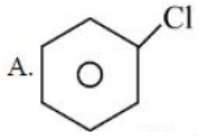
(1) Dust (2) Urea
(3) Glass containers (4) Alkali

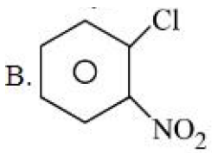
Sol. 2

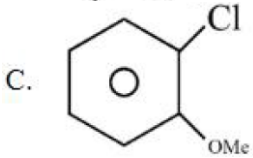
Urea acts as a stabilizer in the decomposition of H_2O_2

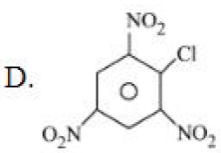
Topic: Alkyl Halide
Level: M

78. The correct order of reactivity of following haloarenes towards nucleophilic substitution with aqueous NaOH is

A. 

B. 

C. 

D. 

Choose the correct answer from the options given below:

(1) D > B > A > C (2) A > B > D > C
(3) C > A > D > B (4) D > C > B > A

Sol. **1**

$$\text{Rate } \alpha \text{ EWG } \alpha \frac{1}{\text{EDG}}$$

$NO_2 \rightarrow -M$ effect

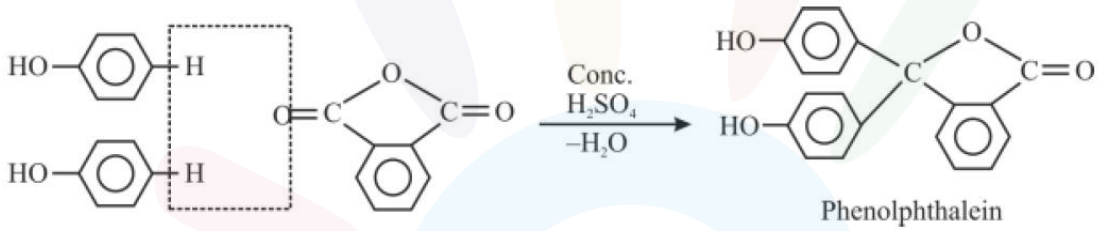
$OMe \rightarrow +M$ effect

Topic :
Sub Topic :
Level :

79. A compound 'X' when treated with phthalic anhydride in presence of concentrated H_2SO_4 yields 'Y'. 'Y' is used as an acid/base indicator. 'X' and 'Y' are respectively:

(1) Anisole, methyl orange
(2) Toludine, Phenolphthalein
(3) Carbolic acid, Phenolphthalein
(4) Salicylaldehyde, Phenolphthalein

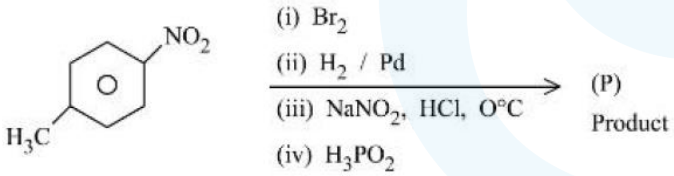
Sol. **3**

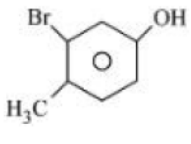


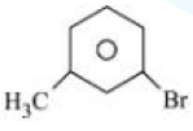
Phenolphthalein

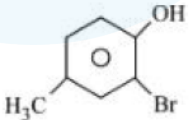
Topic: Nitrogen containg compound
Level: M

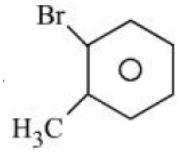
80. The product (P) formed from the following multistep reaction is :



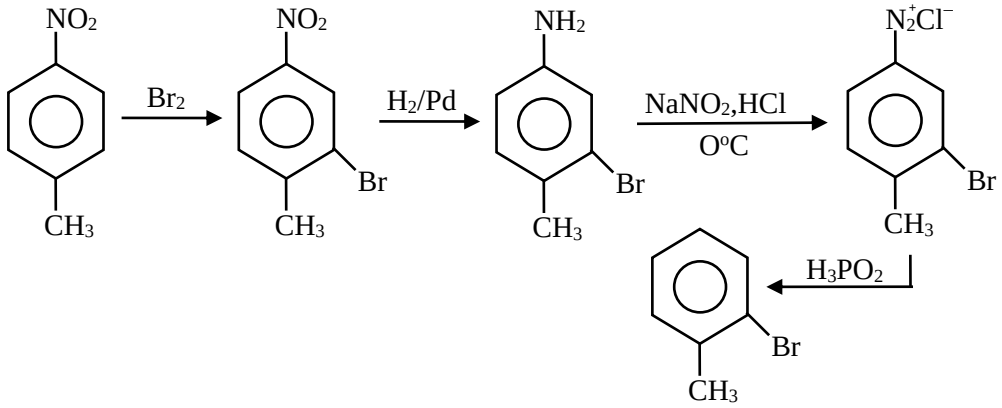
(1) 

(2) 

(3) 

(4) 

Sol. **4**



SECTION - B

Topic :
Sub Topic :
Level :

81. The observed magnetic moment of the complex $[Mn(\underline{N}CS)_6]^{x-}$ is 6.06 BM. The numerical value of x is_____

Sol. **4**

$[Mn(NCS)_6]^{x-}$

Number of unpaired electron = 5

So, Mn must be in +2 oxidation state (Mn^{+2})

$\Rightarrow 2 + (-6) = -x \qquad \Rightarrow -4 = -x \qquad \Rightarrow x = 4$

Topic: Thermochemistry
Sub: bomb calorimetery
Level: M

82. For complete combustion of ethane,

$C_2H_4(g)+3O_2(g) \rightarrow 2CO_2(g)+2H_2O(l)$

The amount of heat produced as measured in bomb calorimeter is 1406 KJ mol^{-1} at 300K. The minimum value of $T\Delta S$ needed to reach equilibrium is (–)_____KJ (Nearest integer)

Given : R = 8.3 $JK^{-1}mol^{-1}$

Sol. **1411**

$\Delta G = \Delta H - T\Delta S$ at equilibrium:-

$\Delta G = 0$

$T\Delta S = \Delta H = \Delta U + \Delta ngRT = -1406 + (-2) \times 8.3 \times 300 \times 10^{-3} = -1410.98 \approx 1411$

Topic: Ionic equilibrium
Sub: solubility produce
Level: Easy

83. The solubility product of $BaSO_4$ is 1×10^{-10} at 298 K. The solubility of $BaSO_4$ in 0.1 M K_2SO_4(aq) solut is_____$\times10^{-9}$ g L^{-1} (Nearest integer)

Given: Molar mass of $BaSO_4$ is 233 g mol^{-1}

Sol. **233**

$K_{sp} = x(x+0.1) = 10^{-10}$

$0.1x = 10^{-10}$

$x = 10^{-9} M$

$x(\text{in g/ l}) = 233\times10^{-9}$

Topic: Atomic Structure
Sub: wave mechanical model
Level: Easy

84. The number of atomic orbitals from the following having 5 radial nodes is_____

7s, 7p, 6s, 8p, 8d

Sol. **3**

No. of radial node

$= n - \ell - 1$

For $6S \rightarrow 6 - 0 - 1 = 5$,

$7P \rightarrow 7 - 1 - 1 = 5$

$8d \rightarrow 8 - 2 - 1 = 5$

Topic: Electrochemistry
Sub: Thermodynamics of cell
Level: T

85. The number of incorrect statement from the following is_____

(1) The electrical work that a reaction can perform at constant pressure and temperature is equal to the reaction Gibbs energy

(2) E^{o}_{cell} is dependent on the pressure

(3) $\frac{dE^{o}_{cell}}{dT} = \frac{\Delta_r S^{o}}{nF}$

(4) A cell is operating reversibly if the cell potential is exactly balanced by an opposing source of potential difference

Sol. **1**

$dG = vdp - sdT$

$dG = - sdT$

$\frac{dG}{dT} = -S \Rightarrow \frac{d\Delta G}{dT} = -\Delta S$

$\frac{dE^{o}}{dT} = \frac{-\Delta S}{-nF}$

Topic: Surface chemi.
Sub: coagulation
Level:E

86. Coagulating value of the electrolytes $AlCl_3$ and NaCl for As_2S_3 are 0.09 and 50.04 respectively. The coagulating power of $AlCl_3$ is x times the coagulating power of NaCl. The value of x is_____

Sol. **556**

$\text{Coagulating power} \propto \frac{1}{\text{coagulation value}}$

$\frac{(CP)_{AlCl_3}}{(CP)_{NaCl}} = \frac{50.04}{0.09} = 556$

Topic:Liquid solution
Sub: elvation ir boiling point
Level:E

87. If the boiling points of two solvents X and Y (having same molecular weights) are in the ratio 2 : 1 and their enthalpy of vaporizations are in the ratio 1 : 2, then the boiling point elevation constant of X is m times the boiling point elevation constant of Y. The value of m is_____(nearest integer)

Sol. **8**

$K_b = \frac{RT_b^2 m}{1000\,\Delta H_{vap}}$

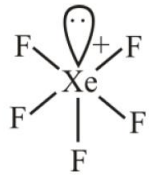
$\frac{(K_b)_x}{(K_b)_y} = \frac{(T_b^2 M)_x}{(T_b^2 M)_y} \times \frac{(\Delta H)_y}{(\Delta H)_x} = \left(\frac{2}{1}\right)^2 \times \left(\frac{2}{1}\right) = \frac{8}{1}$

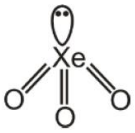
Topic :
Sub Topic :
Level :

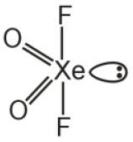
88. The number of species from the following carrying a single lone pair on central atom Xenon is_____

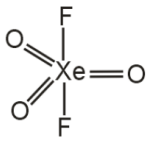
XeF_5^+, XeO_3, XeO_2F_2, XeF_5^-, XeO_3F_2,$XeOF_4$, XeF_4

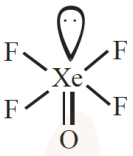
Sol. **4**

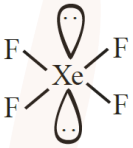
XeF_5^+ 

XeO_3 

XeO_2F_2 

XeO_3F_2 

$XeOF_4$ 

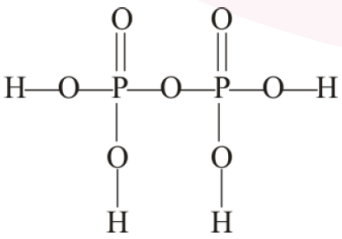
XeF_4 

So, Answer is 4

Topic :
Sub Topic :
Level :

89. The ratio of sigma and π bonds present in pyrophosphoric acid is_____

Sol. **6**



$$\frac{\sigma}{\pi} = \frac{12}{2} = 6$$

So, Answer is 6

Topic :
Sub Topic :
Level :

90. The sum of oxidation state of the metals in $Fe(CO)_5$, VO^{2+} and WO_3 is_____

Sol. **10**

$\overset{(0)}{Fe}(CO)_5$ $\quad$ $\overset{(+4)}{V}O^{2+}$ $\quad$ $\overset{(+6)}{W}O_3$

So, Sum of oxidation state = 0 + 4 + 6 = 10