JEE Main 2023 Feb 1 Shift-2 Chemistry Question Paper

Time Allowed :3 Hours	**Maximum Marks :**300	**Total Questions :**90

General Instructions

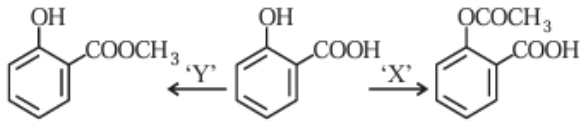
Read the following instructions very carefully and strictly follow them:

1. The Duration of test is 3 Hours.
2. This paper consists of 90 Questions.
3. There are three parts in the paper consisting of Physics, Chemistry and Mathematics having 30 questions in each part of equal weightage..
4. Each part (subject) has two sections.
   (i) Section-A: This section contains 20 multiple choice questions which have only one correct answer. Each carries 4 marks for correct answer and –1 mark for wrong answer..
5. (ii) Section-B: This section contains 10 questions. In Section-B, attempt any five questions out of 10. The answer to each of the questions is a numerical value. Each carries 4 marks for correct answer and –1 mark for wrong answer. For Section-B, the answer should be rounded off to the nearest integer.

Chemistry

Section A

Question 1: In a reaction,



reagents 'X' and 'Y' respectively are :

(1) $(CH_3CO)_2O/H+$ and $CH_3OH/H+$, Δ

(2) $(CH_3CO)_2O/H+$ and $(CH_3CO)_2O/H+$

(3) $CH_3OH/H+$, Δ and $CH_3OH/H+$, Δ

(4) $CH_3OH/H+$ Δ and $(CH_3CO)_2O/H+$

Question 2: The correct order of bond enthalpy (kJ mol^{-1}) is:

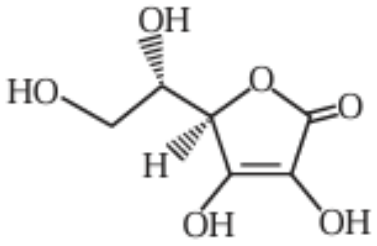
(1) Si – Si > C – C > Sn – Sn > Ge – Ge

(2) Si – Si > C – C > Ge – Ge > Sn – Sn

(3) C – C > Si – Si > Sn – Sn > Ge – Ge

(4) C – C > Si – Si > Ge – Ge > Sn – Sn

Question 3: All structures given below are of vitamin C. Most stable of them is :



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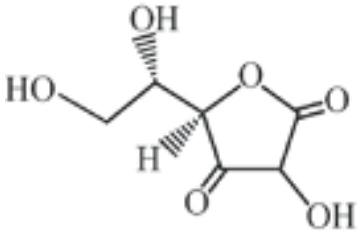

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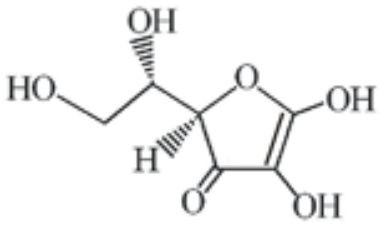

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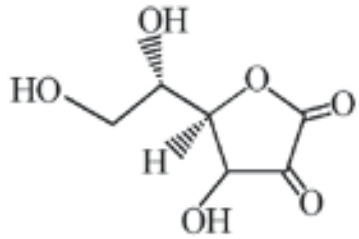


(4)

Question 4: The graph which represents the following reaction is:

$$(C_6H_5)_3C - Cl \xrightarrow[Pyridine]{OH^-} (C_6H_5)_3C - OH$$

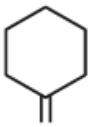
(1) [scale=0.4] [-¿] (0,0) – (5,0) node[below] $[(C_6H_5)_3C - Cl]$; [-¿] (0,0) – (0,5) node[left] rate; (0,3) – (4,3);

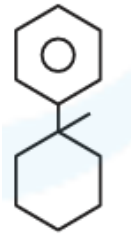
(2) [scale=0.4] [-¿] (0,0) – (5,0) node[below] $[OH^-]$; [-¿] (0,0) – (0,5) node[left] rate; (0,0) – (4,4);

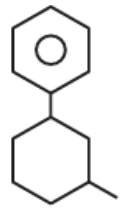
(3) [scale=0.4] [-¿] (0,0) – (5,0) node[below] $[(C_6H_5)_3C - Cl]$; [-¿] (0,0) – (0,5) node[left] rate; (0,0) – (4,4);

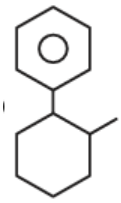
(4) [scale=0.4] [-¿] (0,0) – (5,0) node[below] [Pyridine]; [-¿] (0,0) – (0,5) node[left] rate; (0,0) – (4,4);

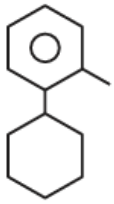
Question 5:

'X' is :  +  $\xrightarrow[\Delta]{HF}$ X
Major product

(1) 

(2) 

(3) 

(4) 

Question 6: The complex cation which has two isomers is:

(1) $[Co(H_2O)_6]^{3+}$

(2) $[Co(NH_3)_5Cl]^{2+}$

(3) $[Co(NH_3)_5NO_2]^{2+}$

(4) $[Co(NH_3)_5Cl]^{+}$

Question 7: Given below are two statements :

Statement I : Sulphanilic acid gives esterification test for carboxyl group.

Statement II : Sulphanilic acid gives red colour in Lassaigne's test for extra element detection.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Statement I is correct but Statement II is incorrect.

(2) Both Statement I and Statement II are incorrect.

(3) Both Statement I and Statement II are correct.

(4) Statement I is incorrect but Statement II is correct.

Question 8: Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : Gypsum is used for making fireproof wall boards.

Reason (R) : Gypsum is unstable at high temperatures.

In the light of the above statements, choose the correct answer from the options given below : (1) Both (A) and (R) are correct but (R) is not the correct explanation of (A).

(2) (A) is correct but (R) is not correct.

(3) (A) is not correct but (R) is correct.

(4) Both (A) and (R) are correct and (R) is the correct explanation of (A).

Question 9: Which element is not present in Nessler's reagent ?

(1) Mercury

(2) Potassium

(3) Iodine

(4) Oxygen

Question 10: Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : α-halocarboxylic acid on reaction with dil. NH_3 gives good yield of α-amino carboxylic acid whereas the yield of amines is very low when prepared from alkyl halides.

Reason (R) : Amino acids exist in zwitter ion form in aqueous medium.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).

(3) (A) is correct but (R) is not correct.

(4) (A) is not correct but (R) is correct.

Question 11: The industrial activity held least responsible for global warming is :

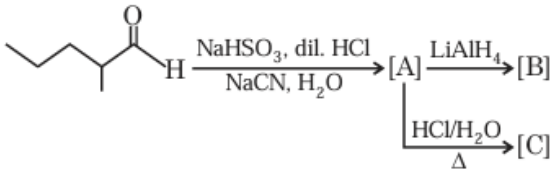
(1) manufacturing of cement

(2) steel manufacturing

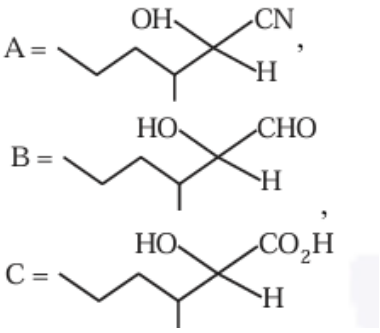
(3) Electricity generation in thermal power plants.

(4) Industrial production of urea

Question 12: The structures of major products A, B and C in the following reaction are sequence.



(1)



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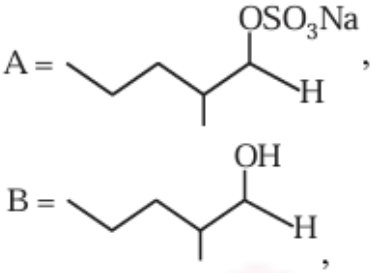

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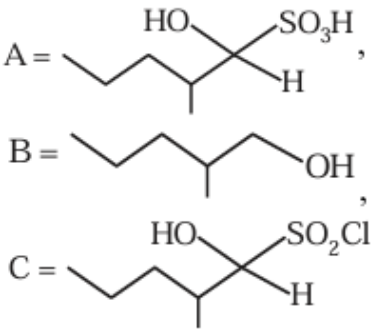
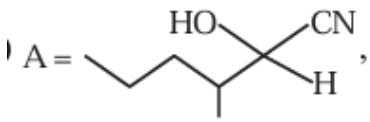


(4) A = 

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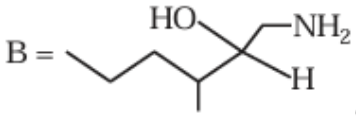
B = 

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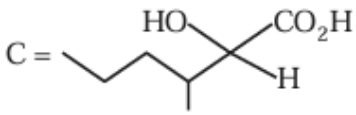
C = 

Question 13: Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : Cu^{2+} in water is more stable than Cu+.

Reason (R) : Enthalpy of hydration for Cu^{2+} is much less than that of Cu+.

In the light of the above statements, choose the **correct** answer from the options given below : (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(2) (A) is correct but (R) is not correct.

(3) (1) is not correct but (R) is correct.

(4) Both (A) and (R) are correct but (R) is not the correct explanation of (A).

Question 14: The starting material for convenient preparation of deuterated hydrogen peroxide (D_2O_2) in laboratory is:

(1) $K_2S_2O_8$

(2) 2-ethylanthraquinol

(3) BaO_2

(4) BaO

Question 15: In figure, a straight line is given for Freundrich Adsorption ($y = 3x + 2.505$). The value of $\frac{1}{n}$ and log K are respectively.

[scale=0.6] [-¿] (0,0) – (4,0) node[below] log P; [-¿] (0,0) – (0,4) node[left] $\log \frac{x}{m}$; (0,1) – (3,3); [¡-¿] (0.2,0) – (0.2,1) node[midway, right] log K; [¡-¿] (3,1.2) – (3,3) node[midway, left] 1; [¡-¿] (1.5,1.5) – (3,1.5) node[midway, below] $\frac{1}{n}$; at (4,-0.3) X; at (0,4.3) Y;

(1) 0.3 and log 2.505

(2) 0.3 and 0.7033

(3) 3 and 2.505

(4) 3 and 0.7033

Question 16: Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : An aqueous solution of KOH when for volumetric analysis, its concentration should be checked before the use.

Reason (R) : On aging, KOH solution absorbs atmospheric CO_2.

In the light of the above statements, choose the correct answer from the options given below.

(1) (A) is not correct but (R) is correct

(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(3) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(4) (A) is correct but (R) is not correct

Question 17: Which one of the following sets of ions represents a collection of isoelectronic species? (Given : Atomic Number : F :9, Cl : 17, Na = 11, Mg = 12, Al = 13, K = 19, Ca = 20, Sc = 21)

(1) ($Li+$, $Na+$, Mg^{2+}, Ca^{2+})

(2) (Ba^{2+}, Sr^{2+}, $K+$, Ca^{2+})

(3) (N^{3-}, O^{2-}, $F-$, S^{2-})

(4) (K^{+}, Cl^{-}, Ca^{2+}, Sc^{3+})

Question 18: The effect of addition of helium gas to the following reaction in equilibrium state, is :

$$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$$

(1) the equilibrium will shift in the forward direction and more of Cl_2 and PCl_3 gases will be produced.

(2) the equilibrium will go backward due to suppression of dissociation of PCl_5.

(3) helium will deactivate PCl_5 and reaction will stop.

(4) addition of helium will not affect the equilibrium.

Question 19: For electron gain enthalpies of the elements denoted as $\Delta_{eg}H$, the incorrect option is :

(1) $\Delta_{eg}H$ (Cl) $<$ $\Delta_{eg}H$ (F)

(2) $\Delta_{eg}H$ (Se) $<$ $\Delta_{eg}H$ (S)

(3) $\Delta_{eg}H$ (I) $<$ $\Delta_{eg}H$ (At)

(4) $\Delta_{eg}H$ (Te) $<$ $\Delta_{eg}H$ (Po)

Question 20: O-O bond length in H_2O_2 is _X_ than the O-O bond length in F_2O_2. The O – H bond length in H_2O_2 is ___Y__ than that of the O-F bond in F_2O_2. Choose the correct option for _X_ and _Y_ from the given below.

(1) X – shorter, Y – shorter

(2) X – shorter, Y – longer

(3) X – longer, Y – longer

(4) X – longer, Y – shorter

Section B

Question 21: 0.3 g of ethane undergoes combustion at 27°C in a bomb calorimeter. The temperature of calorimeter system (including the water) is found to rise by 0.5°C. The heat evolved during combustion of ethane at constant pressure is _____ kJ mol^{-1}. (Nearest integer)

[Given : The heat capacity of the calorimeter system is 20 kJ K^{-1}, R = 8.3 JK^{-1} mol^{-1}. Assume ideal gas behaviour. Atomic mass of C and H are 12 and 1 g mol^{-1} respectively]

Question 22: Among following compounds, the number of those present in copper matte is _____.

A. $CuCO_3$

B. Cu_2S

C. Cu_2O

D. FeO

Question 23: Among the following, the number of tranquilizer/s is/are _____.

A. Chlordiazepoxide

B. Veronal

C. Valium

D. Salvarsan

Question 24: A $\rightarrow$ B

The above reaction is of zero order. Half life of this reaction is 50 min. The time taken for the concentration of A to reduce to one-fourth of its initial value is ____ min. (Nearest integer)

Question 25: 20% of acetic acid is dissociated when its 5 g is added to 500 mL of water. The depression in freezing point of such water is ____ $\times 10^{-3}\,^{\circ}C$. Atomic mass of C, H and O are 12, 1 and 16 a.m.u. respectively.

[Given : Molal depression constant and density of water are 1.86 K kg mol^{-1} and 1 g cm^{-3} respectively.]

Question 26: The molality of a 10% (v/v) solution of di-bromine solution in CCl_4 (carbon tetrachloride) is 'x'. x = ____ $\times 10^{-2}$ M. (Nearest integer)

Given:

- Molar mass of Br_2 = 160 g mol^{-1}
- Atomic mass of C = 12 g mol^{-1}
- Atomic mass of Cl = 35.5 g mol^{-1}

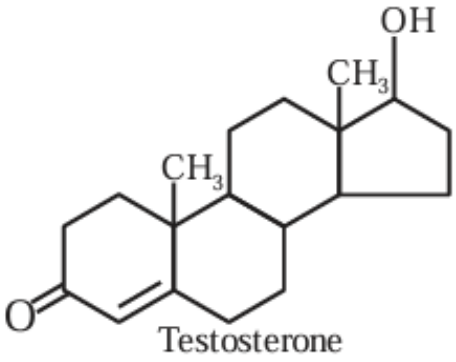
- Density of dibromine = 3.2 g cm^{-3}
- Density of CCl_4 = 1.6 g cm^{-3}

Question 27: 1 $\times 10^{-5}$ M $AgNO_3$ is added to 1 L of saturated solution of AgBr. The conductivity of this solution at 298 K is ____ $\times 10^{-8}$ S m^{-1}.

Given:

- K_{sp}(AgBr) = 4.9 $\times 10^{-13}$ at 298K
- $\lambda^0_{Ag^+}$ = 6 $\times 10^{-3}$ Sm^2 mol^{-1}
- $\lambda^0_{Br^-}$ = 8 $\times 10^{-3}$ Sm^2 mol^{-1}
- $\lambda^0_{NO_3^-}$ = 7 $\times 10^{-3}$ Sm^2 mol^{-1}

Question 28: Testosterone, which is a steroidal hormone, has the following structure.



Testosterone

The total number of asymmetric carbon atom/s in testosterone is _____

Question 29: The spin only magnetic moment of $[Mn(H_2O)_6]^{2+}$ complexes is _____ B.M. (Nearest integer)

Given: Atomic no. of Mn is 25

Question 30: A metal M crystallizes into two lattices: face centred cubic (fcc) and body centred cubic (bcc) with unit cell edge length of 2.0 and 2.5 $\AA$ respectively. The ratio of densities of lattices fcc to bcc for the metal M is _____. (Nearest integer)
