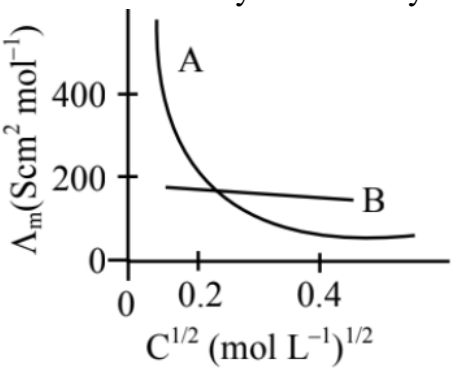
JEE Main (9 April Shift 1)

Total Time Allowed : 45 minutes	Maximum Marks : 200	Total Questions : 50	Questions to be answered : 40

1 Chemistry

Question 1.
The molar conductivity for electrolytes A and B are plotted against $C^{1/2}$ as shown below.



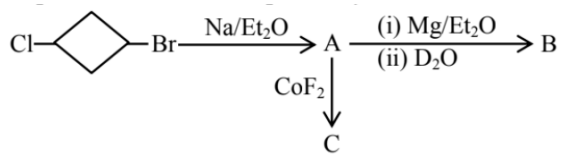
Electrolytes A and B respectively are:

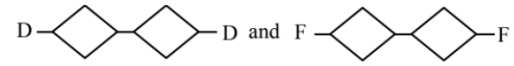
	A	B
(1)	Weak electrolyte	Weak electrolyte
(2)	Strong electrolyte	Strong electrolyte
(3)	Weak electrolyte	Strong electrolyte
(4)	Strong electrolyte	Weak electrolyte

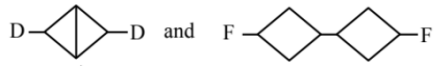
Question 2.
Methods used for purification of organic compounds are based on:

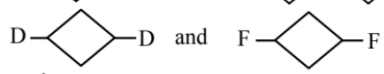
1. neither on nature of compound nor on the impurity present.
2. nature of compound only.
3. nature of compound and presence of impurity.
4. presence of impurity only.

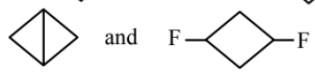
Question 3.
In the following sequence of reaction, the major products B and C respectively are:



(1) 

(2) 

(3) 

(4) 

Question 4.

The correct order of basic strength of Pyrrole  Pyridine  , and Piperidine  is:

1. Piperidine $>$ Pyridine $>$ Pyrrole
2. Pyrrole $>$ Pyridine $>$ Piperidine
3. Pyridine $>$ Piperidine $>$ Pyrrole
4. Pyrrole $>$ Piperidine $>$ Pyridine

Question 5.

In which one of the following pairs do the central atoms exhibit sp^2 hybridization?

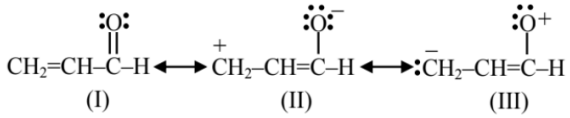
1. $\mathrm{BF_3}$ and $\mathrm{NO_2^-}$
2. $\mathrm{NH_2^-}$ and $\mathrm{H_2O}$
3. $\mathrm{H_2O}$ and $\mathrm{NO_2}$
4. $\mathrm{NH_2^-}$ and $\mathrm{BF_3}$

Question 6.

The $\mathrm{F^-}$ ions make the enamel on teeth much harder by converting hydroxyapatite (the enamel on the surface of teeth) into much harder fluoroapatite having the formula:

1. $[3(\mathrm{Ca_3(PO_4)_2 \cdot CaF_2})]$
2. $[3(\mathrm{Ca_2(PO_4)_2 \cdot Ca(OH)_2})]$
3. $[3(\mathrm{Ca_3(PO_4)_3 \cdot CaF_2})]$
4. $[3(\mathrm{Ca_3(PO_4)_2 \cdot Ca(OH)_2})]$

Question 7.
The relative stability of the contributing structures is:



1. (I) > (III) > (II)
2. (I) > (II) > (III)
3. (II) > (I) > (III)
4. (III) > (II) > (I)

Question 8.
Given below are two statements:

Statement (I): The oxidation state of an element in a particular compound is the charge acquired by its atom on the basis of electron gain enthalpy consideration from other atoms in the molecule.
Statement (II): $p\pi - p\pi$ bond formation is more prevalent in second period elements over other periods.

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

1. Both **Statement I** and **Statement II** are incorrect.
2. **Statement I** is correct but **Statement II** is incorrect.
3. Both **Statement I** and **Statement II** are correct.
4. **Statement I** is incorrect but **Statement II** is correct.

Question 9.
Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**:

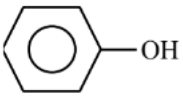
Assertion (A): S_N2 reaction of $C_6H_5CH_2Br$ occurs more readily than the S_N2 reaction of CH_3CH_2Br.
Reason (R): The partially bonded unhybridized p-orbital that develops in the trigonal bipyramidal transition state is stabilized by conjugation with the phenyl ring.

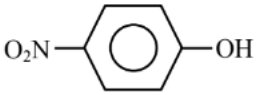
In the light of the above statements, choose the **most appropriate** answer from the options given below:

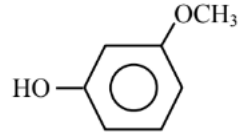
1. (A) is not correct but (R) is correct.
2. Both (A) and (R) are correct but (R) is not the correct explanation of (A).

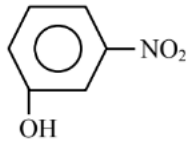
3. Both (A) and (R) are correct and (R) is the correct explanation of (A).
4. (A) is correct but (R) is not correct.

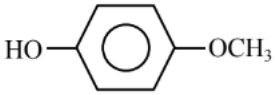
Question 10.
For the given compounds, the correct order of increasing pK_a value is:

(A) 

(B) 

(C) 

(D) 

(E) 

1. (E) < (D) < (C) < (B) < (A)
2. (D) < (E) < (C) < (B) < (A)
3. (E) < (D) < (B) < (A) < (C)
4. (B) < (D) < (A) < (C) < (E)

Question 11.
Assertion (A): Both rhombic and monoclinic sulphur exist as S_8, while oxygen exists as O_2.
Reason (R): Oxygen forms $p\pi$-$p\pi$ multiple bonds with itself and other elements having small size and high electronegativity like C, N, which is not possible for sulphur.

In the light of the above statements, choose the **most appropriate 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 12.
Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A): The total number of geometrical isomers shown by $[Co(en)_2Cl_2]^+$ complex ion is three.
Reason (R): $[Co(en)_2Cl_2]^+$ complex ion has an octahedral geometry.

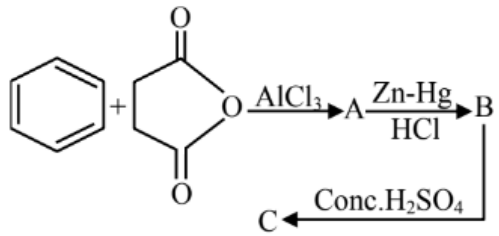
In the light of the above statements, choose the most appropriate answer from the options given below:

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

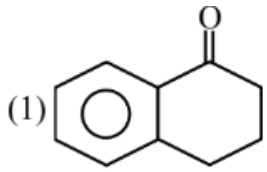
Question 13.
The electronic configuration of Cu(II) is $3d^9$, whereas that of Cu(I) is $3d^{10}$. Which of the following is correct?

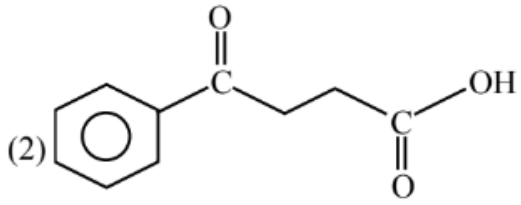
1. Cu(II) is less stable.
2. Stability of Cu(I) and Cu(II) depends on the nature of copper salts.
3. Cu(II) is more stable.
4. Cu(I) and Cu(II) are equally stable.

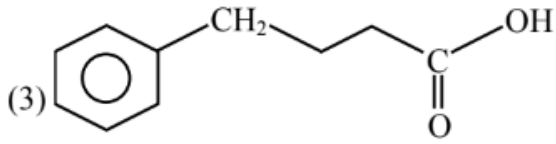
Question 14.

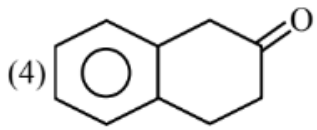


What is the structure of C?

(1) 

(2) 

(3) 

(4) 

Question 15.

Compare the energies of the following sets of quantum numbers for a multielectron system:

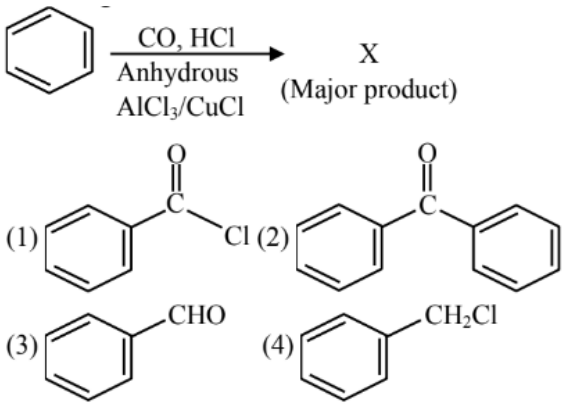
- (A) $n = 4, l = 1$
- (B) $n = 4, l = 2$
- (C) $n = 3, l = 1$
- (D) $n = 3, l = 2$
- (E) $n = 4, l = 0$

Choose the correct order of energies:

1. (B) > (A) > (C) > (E) > (D)
2. (E) > (C) < (D) < (A) < (B)
3. (E) > (C) > (A) > (D) > (B)
4. (C) < (E) < (D) < (A) < (B)

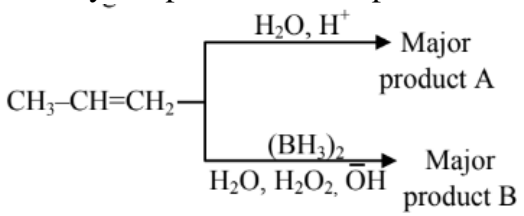
Question 16.

Identify the major product "X" formed in the following reaction:



Question 17.

Identify the product A and product B in the following set of reactions:



(1) A-$CH_3CH_2CH_2$–OH, B-$CH_3CH_2CH_2$–OH

(2) A-$CH_3CH_2CH_2$–OH, B-$CH_3\underset{\underset{OH}{|}}{CH}–CH_3$

(3) A- $CH_3\underset{\underset{OH}{|}}{CH}–CH_3$, B-$CH_3CH_2CH_2$–OH

(4) A-$CH_3CH_2CH_3$, B-$CH_3CH_2CH_3$

Question 18.

On reaction of Lead Sulphide with dilute nitric acid which of the following is **not** formed?

1. Lead nitrate
2. Sulphur
3. Nitric oxide
4. Nitrous oxide

Question 19.

Identify the **incorrect** statements regarding the primary standard of titrimetric analysis:

(A) It should be purely available in dry form.

(B) It should not undergo chemical change in air.

(C) It should be hygroscopic and should react with another chemical instantaneously and stoichiometrically.

(D) It should be readily soluble in water.

(E) $KMnO_4$ and NaOH can be used as primary standards.

Choose the correct answer from the options given below:

1. (C) and (D) only
2. (B) and (E) only
3. (A) and (B) only
4. (C) and (E) only

Question 80.
0.05M $CuSO_4$ when treated with 0.01M $K_2Cr_2O_7$ gives a green-colored solution of $Cu_2Cr_2O_7$.
[SPM: Semi-Permeable Membrane]

$K_2Cr_2O_7$	$CuSO_4$

Side X SPM Side Y

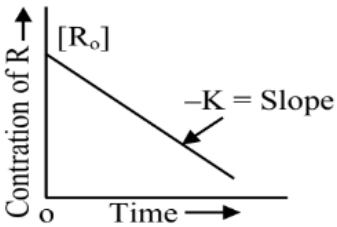
Due to osmosis:

1. Green color formation observed on side Y.
2. Green color formation observed on side X.
3. Molarity of $K_2Cr_2O_7$ solution is lowered.
4. Molarity of $CuSO_4$ solution is lowered.

Question 21.
The heat of solution of anhydrous $CuSO_4$ and $CuSO_4 \cdot 5H_2O$ are $-70\,\text{kJ mol}^{-1}$ and $+12\,\text{kJ mol}^{-1}$, respectively.
The heat of hydration of $CuSO_4$ to $CuSO_4 \cdot 5H_2O$ is $-x\,\text{kJ}$. The value of x is .....

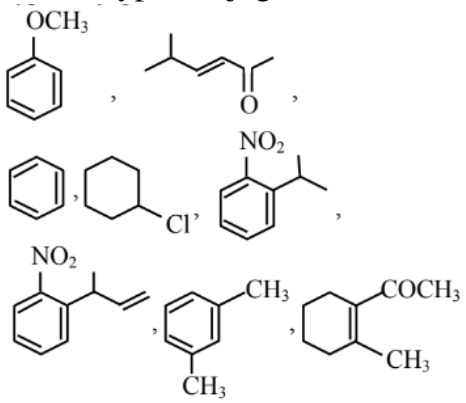
Question 22.
Statement I:
The rate law for the reaction $A + B \rightarrow C$ is rate $(r) = k[A]^2[B]$. When the concentration of both A and B is doubled, the reaction rate is increased "x" times.

Statement II:



The figure shows the variation in concentration against time (t) for a "y" order reaction. The value of $x + y$ is .....

Question 23.
How many compounds among the following compounds show inductive, mesomeric, as well as hyperconjugation effects?



Question 24.
The standard reduction potentials at 298 K for the following half-cells are given below:

$$Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O,\ E^\circ = 1.33\,V$$

$$Fe^{3+}(aq) + 3e^- \rightarrow Fe,\ E^\circ = -0.04\,V$$

$$Ni^{2+}(aq) + 2e^- \rightarrow Ni,\ E^\circ = -0.25\,V$$

$$Ag^+(aq) + e^- \rightarrow Ag,\ E^\circ = 0.20\,V$$

$$Au^{3+}(aq) + 3e^- \rightarrow Au,\ E^\circ = 1.40\,V$$

Consider the given electrochemical reactions. The number of metal(s) which will be oxidized by $Cr_2O_7^{2-}$ in aqueous solution is

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Question 25.
When equal volume of 1M HCl and 1M H_2SO_4 are separately neutralized by excess volume of 1M NaOH, X and Y kJ of heat is liberated respectively. The value of $\frac{Y}{X}$ is

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Question 26.
Molarity (M) of an aqueous solution containing x g of anhydrous $CuSO_4$ in 500 mL solution at 32°C is 2×10^{-1} M. Its molality will be ..... $\times 10^{-3}$ m (nearest integer). [Given: Density of the solution = 1.25 g/mL].

Question 27.
The total number of species from the following in which one unpaired electron is present, is .....

$$N_2,\ O_2,\ C_2^-,\ O_2^-,\ H_2^+,\ CN^-,\ He_2^+$$

Question 28.
Number of ambidentate ligands among the following is.....

NO_2^-, SCN^-, $C_2O_4^{2-}$, NH_3, CN^-, SO_4^{2-}, H_2O.

Question 29.
Total number of essential amino acids among the given list of amino acids is .....

Arginine, Phenylalanine, Aspartic acid, Cysteine, Histidine, Valine, Proline.

Question 30.
Number of colourless lanthanoid ions among the following is .....

Eu^{3+}, Lu^{3+}, Nd^{3+}, La^{3+}, Sm^{3+}.