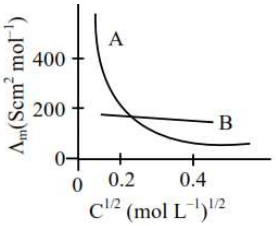
JEE-MAIN EXAM APRIL, 2024

Date: - 09-04-2024 (SHIFT-1)

CHEMISTRY

SECTION-A

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

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

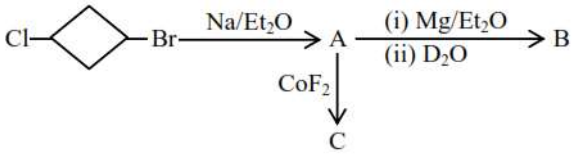
(1) neither on nature of compound nor on the impurity present.

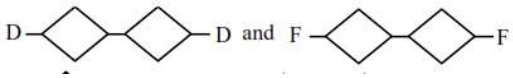
(2) nature of compound only.

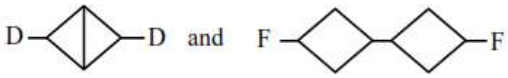
(3) nature of compound and presence of impurity.

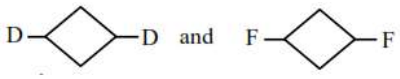
(4) presence of impurity only.

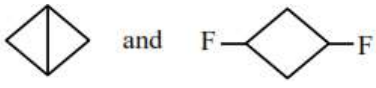
3. In the following sequence of reaction, the major products B and C respectively are :



(1) 

(2) 

(3) 

(4) 

4. 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

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

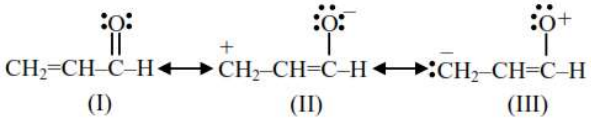
(1) BF_3 and NO_2^- (2) NH_2^- and H_2O (3) H_2O and NO_2 (4) NH_2^- and BF_3

6. The 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) $[3(Ca_3(PO_4)_2) \cdot CaF_2]$ (2) $[3(Ca_2(PO_4)_2) \cdot Ca(OH)_2]$

(3) $[3(Ca_3(PO_4)_3) \cdot CaF_2]$ (4) $[3(Ca_3(PO_4)_2) \cdot Ca(OH)_2]$

7. Relative stability of the contributing structures is :



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

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

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 :

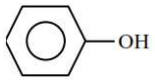
(1) (A) is not correct but (R) is correct

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

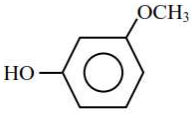
(3) Both (A) and (R) are correct and (R) is the correct explanation of (A)

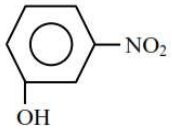
(4) (A) is correct but (R) is not correct

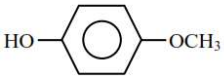
10. For the given compounds, the correct order of increasing pK_a value :

(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)

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

Assertion (A) : Both rhombic and monoclinic sulphur exist as S_8 while oxygen exists as O_2.

Reason (R) : Oxygen forms $p\pi$ - π 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 $(\mathbf{A})$.

(2) Both (A) and (R) are correct but (R) is not the correct explanation of $(\mathbf{A})$.

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

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

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 $(\mathbf{A})$.

(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 $(\mathbf{A})$.

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

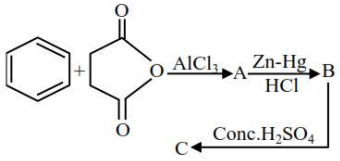
(1) $Cu(II)$ is less stable

(2) Stability of $Cu(I)$ and Cu (II) depends on nature of copper salts

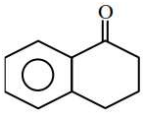
(3) $Cu($ II) is more stable

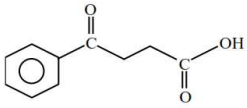
(4) $Cu(I)$ and Cu (II) are equally stable

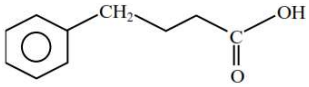
14.

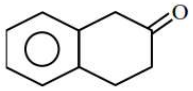


What is the structure of C ?

(1) 

(2) 

(3) 

(4) 

15. Compare the energies of following sets of quantum numbers for multielectron system.

(A) $n = 4, l = 1$ (B) $n = 4, l = 2$

(C) $n = 3, l = 1$ (D) $n = 3, l = 2$

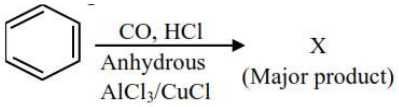
(E) $n = 4, l = 0$

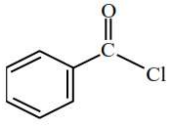
Choose the correct answer from the options given below :

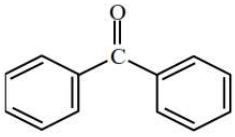
(1) (B) > (A) > (C) > (E) > (D) (2) (E) > (C) < (D) < (A) < (B)

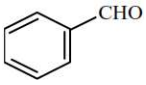
(3) (E) > (C) > (A) > (D) > (B) (4) (C) < (E) < (D) < (A) < (B)

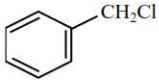
16. Identify major product " X " formed in the following reaction :



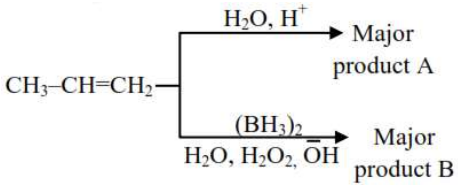
(1) 

(2) 

(3) 

(4) 

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) $A - CH_3CH_2CH_2 - OH, B - CH_3\overset{CH-CH_3}{\overset{|}{\widehat{OH}}}$

(3) $A - CH_3 - \overset{CH}{\underset{O}{\|}} - CH_3, B - CH_3CH_2CH_2 - OH$ (4) $A - CH_3CH_2CH_3, B - CH_3CH_2CH_3$

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

19. Identify the incorrect statements regarding 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) $KMnO_4$&$NaOH$ can be used as primary standard.

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

20. $0.05MCuSO_4$ when treated with $0.01MK_2Cr_2O_7$ gives green colour solution of $Cu_2Cr_2O_7$. The [SPM : Semi Permeable Membrane]

$K_2Cr_2O_7$	$CuSO_4$
Side X	SPM Side Y

Due to osmosis :

(1) Green colour formation observed on side Y. (2) Green colour formation observed on side X.

(3) Molarity of $K_2Cr_2O_7$ solution is lowered. (4) Molarity of $CuSO_4$ solution is lowered.

SECTION-B

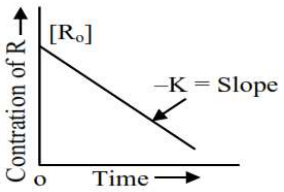
21. The heat of solution of anhydrous $CuSO_4$ and $CuSO_4 \cdot 5H_2O$ are -70 kJ mol^{-1} and $+12$ kJ mol^{-1} respectively.

The heat of hydration of $CuSO_4$ to $CuSO_4 \cdot 5H_2O$ is $-xk$ K. The value of x is_____.

22. Given below are two statements :

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.

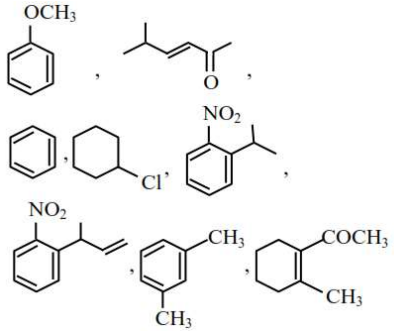
Statement II :



The figure is showing "the variation in concentration against time plot" for a " y " order reaction.

The value of $x + y$ is _____.

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



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

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

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

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

$Ag^+(aq) + e^- \rightarrow Ag \quad E^\circ = 0.80\ V$

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

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

25. When equal volume of $1MHCl$ and $1MH_2SO_4$ are separately neutralised by excess volume of $1M\ NaOH$ solution. X and ykJ of heat is liberated respectively. The value of y/x is _____.

26. Molarity (M) of an aqueous solution containing xg of anhyd. $CuSO_4$ in $500\ mL$ solution at $32\ ^\circ C$ is $2 \times 10^{-1}M$. Its molality will be _____ $\times 10^{-3}$ m (nearest integer).

[Given density of the solution $= 1.25\ g/mL$.]

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

$N_2, O_2, C_2^-, O_2^-, O_2^{2-}, H_2^+, CN^-, He_2^+$

28. Number of ambidentate ligands among the following is _____

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

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

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

30. Number of colourless lanthanoid ions among the following is_____.

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

NTA ANSWERS

1.	**(3)**	**2.**	**(3)**	**3.**	**(1)**	**4.**	**(1)**	**5.**	**(1)**	**6.**	**(1)**	**7.**	**(2)**
8.	**(4)**	**9.**	**(3)**	**10.**	**(4)**	**11.**	**(3)**	**12.**	**(3)**	**13.**	**(3)**	**14.**	**(1)**
15.	**(4)**	**16.**	**(3)**	**17.**	**(3)**	**18.**	**(4)**	**19.**	**(4)**	**20.**	**(4)**	**21.**	**(82)**
22.	**(8)**	**23.**	**(4)**	**24.**	**(3)**	**25.**	**(2)**	**26.**	**(81) BONUS**			**27.**	**(4)**
28.	**(3)**	**29.**	**(4)**	**30.**	**(2)**								