JEE-Main-27-07-2022-Shift-2 (Memory Based)

Chemistry

Question: The spin only magnetic moment of the metal in complex present in Fehling's reagent is ___ B.M.

Options:

(a) $\sqrt{3}$

(b) $2\sqrt{2}$

(c) 0

(d) $\sqrt{15}$

Answer: (a)

Solution: In Fehling solution, Cu is in +2 oxidation state

Electronic configuration of $Cu^{2+} \Rightarrow [Ar]\ 3d^9$

n = 1

$\mu = \sqrt{1(1+2)} = \sqrt{3}$ B M = 1.73 B.M.

Question: 5gm toluene reacts to form benzaldehyde with 92% yield. What is amount of benzaldehyde formed?

Options:

(a) 5.3 g

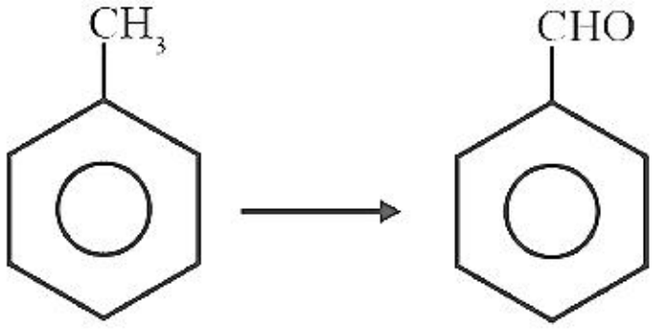
(b) 53 g

(c) 4.6 g

(d) 0.46 g

Answer: (a)

Solution:



(92% yield)

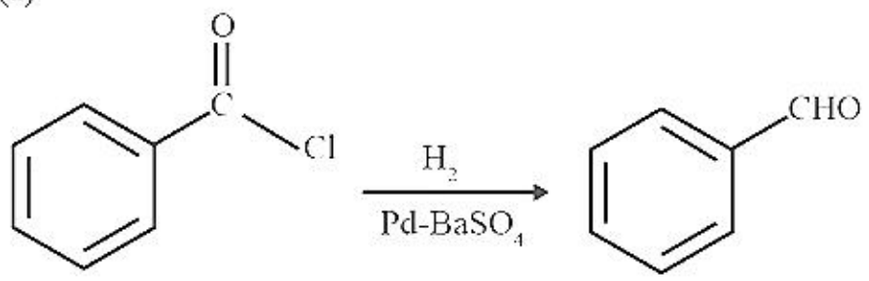
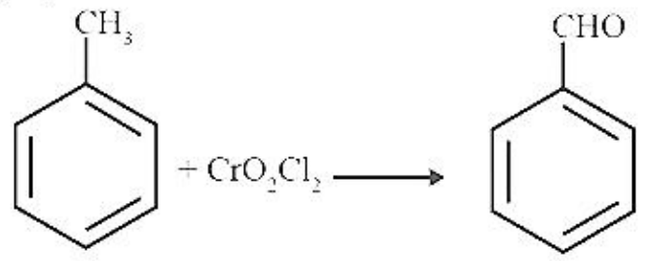
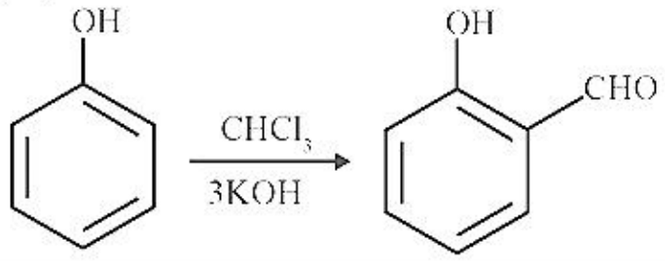
Molar mass of toluene = 92 g/mol

Number of moles of toluene = $\frac{5}{92}$

Moles of Benzaldehyde formed = $\frac{92}{100} \times \frac{5}{92} = 0.05$ mole

Amount of Benzaldehyde = $0.05 \times 106 = 5.3$ g

Question: Match the following.

(Column I) Name reaction	(Column II) Reaction
(A) Stephen reaction	(i) 
(B) Etard reaction	(ii) $RCN + SnCl_2 + HCl \rightarrow RCH{=}NH \xrightarrow{H_3O^+} RCHO$
(C) Reimer Tiemann	(iii) 
(D) Rosenmund reaction	(iv) 

Options:

(a) A → (ii); B → (iii); C → (iv); D → (i)

(b) A → (iv); B → (iii); C → (i); D → (ii)

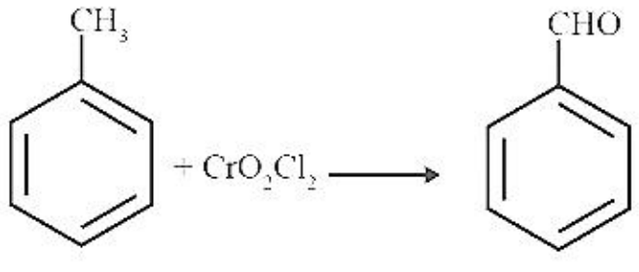
(c) A → (iii); B → (ii); C → (iv); D → (i)

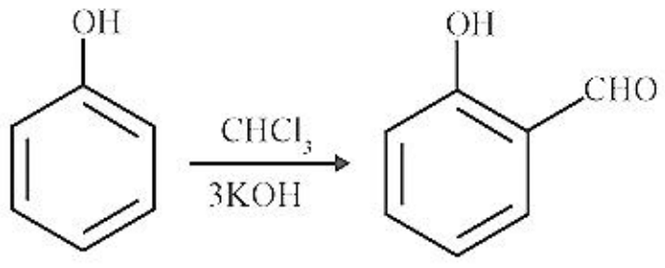
(d) A → (iii); B → (i); C → (ii); D → (iv)

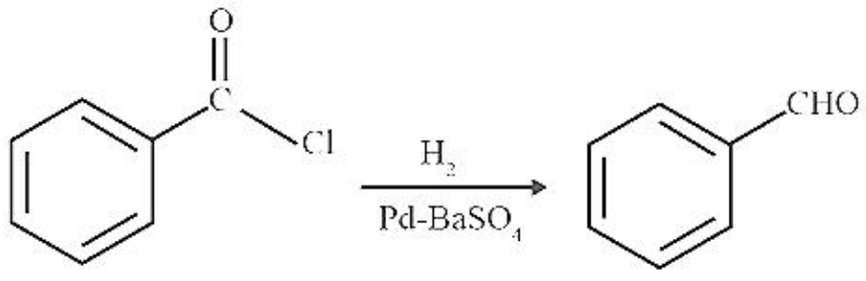
Answer: (a)

Solution:

Stephen reaction ⇒ $RCN + SnCl_2 + HCl \rightarrow RCH{=}NH \xrightarrow{H_3O^+} RCHO$

Etard reaction ⇒ 

Reimer Tiemann ⇒ 

Rosenmund reaction ⇒ 

Question: In neutral or alkaline solution, MnO_4^- oxidises thiosulphate to
Options:
(a) $S_2O_7^{2-}$
(b) $S_2O_8^{2}$
(c) SO_3^{2-}
(d) SO_4^{2-}
Answer: (d)
Solution: $8MnO_4^- + S_2O_3^{2-} + 5OH^- \rightarrow 8MnO_4^{2-} + 5H^+ + 2SO_4^{2-}$

Question: Which of the following enhances the lathering property of soap?
Options:
(a) Sodium stearate
(b) Sodium carbonate
(c) Sodium rosinate
(d) Trisodium phosphate
Answer: (c)
Solution: Sodium rosinate is the filler which enhances the lathering property of soap.

Question: Low oxidation state of metals in their complexes are common when ligands
Options:
(a) Have good π - accepting character
(b) Have good σ - donor character
(c) Having good π - donating ability
(d) Having poor σ - donating ability
Answer: (a)
Solution: Low oxidation states are found when a complex compound has ligands capable of π-accepting character in addition to the σ-bonding.
For example, in $Ni(CO)_4$ and $Fe(CO)_3$, the oxidation state of nickel and iron is zero.

Question: An element A of group 1 shows similarity to an element B belonging to group 2. If A has maximum hydration enthalpy in group 1 then B is
Options:
(a) Mg
(b) Be
(c) Ca
(d) Sr
Answer: (a)
Solution: Li has maximum hydration enthalpy in group 1. So, A is Li and Li shows diagonal relationship with Mg.
Hence, B is Mg

Question: Statement 1: KI molar conductivity increases steeply with increasing dilution.
Statement 2: Carbonic molar conductivity increase/slowly with dilution.
Options:
(a) Both statement 1 and 2 are correct
(b) Statement 1 is correct but statement 2 is incorrect

(c) Statement 1 is incorrect but statement 2 is correct
(d) Both statement 1 and 2 are incorrect.
Answer: (d)
Solution: The molar conductivity of KI increases slowly with dilution.
Molar conductivity of carbonic acid increases steeply with dilution
Therefore, both the statement are false

Question: Correct decreasing order of energy of the orbitals having following set of quantum numbers
A) n = 3, l = 0, m = 0
B) n = 4, l = 0, m = 0
C) n = 3, l = 1, m = 0
D) n = 3, l = 2, m = 1
Options:
(a) A > C > B > D
(b) D > B > C > A
(c) A > B > C > D
(d) D > C > B > A
Answer: (b)
Solution: Following the principle of $(n+l)$ rule, the correct order of energy is D > B > C > A
The subshells with the lowest $(n+l)$ value has the lowest energy. When two or more subshells have the same $(n+l)$ value, then the subshell with the lowest value of n have lowest energy

Question: Outermost electronic configuration of 4 elements A, B, C, D
A-$3s^2$, B-$3s^23p^1$, C-$3s^23p^3$, D-$3s^23p^4$
Correct order of 1st ionisation enthalpy
Options:
(a) B > A > C > D
(b) D > C > B > A
(c) C > D > B > A
(d) D > C > A > B
Answer: (c)
Solution: Ionization energy increases along a period
But ionisation energy of C-$3s^23p^3$ is more than D-$3s^23p^4$ as C has half-filled p subshells giving extra stability
∴ Correct order of first ionisation energy is C > D > B > A

Question: Match the reaction of glucose with their products.

(Column I) Reaction of Glucose	(Column II) Products
(A) With HI	(i) Gluconic acid
(B) With HNO_3	(ii) Glucose pentaacetate
(C) With Br_2	(iii) n - hexane

(D) With Ac_2O	(iv) Saccharic acid

Options:

(a) A → (i); B → (iii); C → (ii); D → (iv)

(b) A → (iv); B → (iii); C → (i); D → (ii)

(c) A → (iii); B → (ii); C → (iv); D → (i)

(d) A → (iii); B → (iv); C → (i); D → (ii)

Answer: (d)

Solution:

With HI ⇒ n - hexane

With HNO_3 ⇒ Saccharic acid

With Br_2 ⇒ Gluconic acid

With Ac_2O ⇒ Glucose pentaacetate

Question: Statement 1: True solution and colloidal solution can be separated using parchment paper.

Statement 2: Particles of true solution does not pass through parchment paper whereas colloidal solution passes.

Options:

(a) Both statement 1 and 2 are correct

(b) Statement 1 is correct but statement 2 is incorrect

(c) Statement 1 is incorrect but statement 2 is correct

(d) Both statement 1 and 2 are incorrect.

Answer: (d)

Solution: True solution cannot be separated using parchment paper

Particles of colloidal solution cannot pass through parchment paper

Therefore, both the statements are false

Question: Assertion: BF_6^{3-} does not exist.

Reason: It is because of small size of boron

Options:

(a) Both assertion and reason are true, reason is correct explanation of assertion.

(b) Both assertion and reason are true, but reason is not a correct explanation of the assertion.

(c) Assertion is true, but reason is false

(d) Assertion is false, but reason is true

Answer: (b)

Solution: BF_6^{3-} does not exist because of non availability of vacant d orbitals. Reason statement is also correct B has small size but it does not explain assertion. Hence, B is correct.

Question: Compound that is of Prussian Blue Colour?

Options:

(a) $Na_4[Fe(CN)_6S]$

(b) $Na_4[Fe(CN)_6NCS]$

(c) $Na_4[Fe(CN)_5NOS]$

(d) $Na_2[Fe(CN)_5NOS]$

Answer: (c)

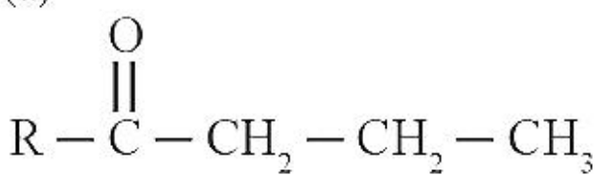
Solution: $Na_2S + Na_2[Fe(CN)_5NO] \rightarrow Na_4[Fe(CN)_5NOS]$
Sodium sulphide reacts with sodium nitroprusside to form a violet colour compound, which confirms the presence of sulfur.

Question: Match the following.

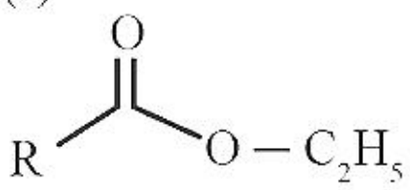
(Column I)	(Column II)
(A) Neoprene	(i) Prop-2-enal
(B) Isoprene	(ii) Chloroprene
(C) Teflon	(iii) Natural rubber
(D) Acrolein	(iv) Chlorofluoroethene

Options:
(a) A → (i); B → (iii); C → (ii); D → (iv)
(b) A → (iv); B → (iii); C → (i); D → (ii)
(c) A → (iii); B → (ii); C → (iv); D → (i)
(d) A → (ii); B → (iii); C → (iv); D → (i)
Answer: (d)
Solution:
Neoprene ⇒ Chloroprene
Isoprene ⇒ Natural rubber
Teflon ⇒ Chlorofluoroethene
Acrolein ⇒ Prop-2-enal

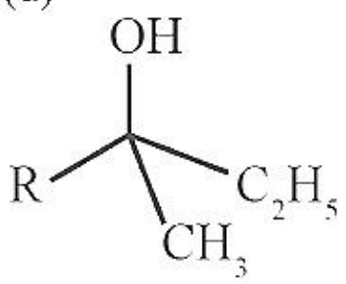
Question: $RCOCH_3 + NaOH \rightarrow A + C_2H_5Br \rightarrow$ Major product
Options:
(a)



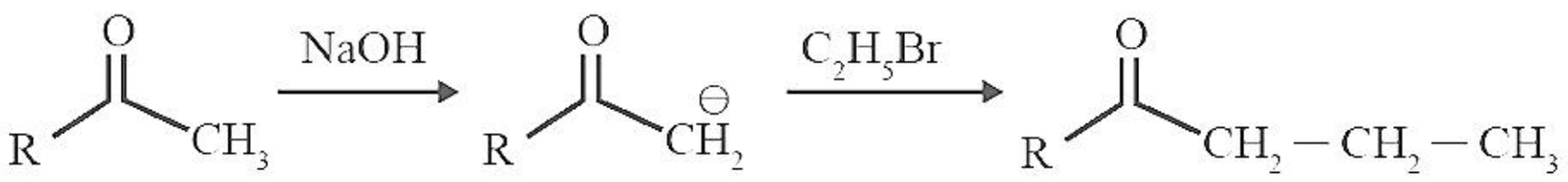
(b) R–COOH
(c)



(d)



Answer: (a)
Solution:



Question: H_2O_2 + potassium permanganate in basic medium. What's the magnetic moment of Mn? (Round off to nearest integer)
Answer: 4.00
Solution: $2K\overset{+7}{Mn}O_4 + 3H_2O_2 \rightarrow 2\overset{+4}{Mn}O_2 + 3O_2 + 2KOH + 4H_2O$
$Mn^{+4} \rightarrow [Ar]\ 3d^3$
$\mu = \sqrt{n(n+2)}$
where $n = 3$
$\mu = \sqrt{3(3+2)} = 3.87 \approx 4$ B M

Question: A solid 'A' (Molecular weight 280) is added to 100 g water to make solution dilute. The vapour pressure of solution becomes half of vapour pressure of pure water. If vapour pressure of pure water is 23.4 mm Hg. Find moles of solid 'A' added. (Round off to nearest integer)
Answer: 3.00
Solution:
$$\frac{P^o - P}{P^o} = \frac{n_2}{n_1}$$
$$\frac{23.4 - 11.7}{11.7} = \frac{n_2 \times 18}{100}$$
$n_2 = 2.7 \approx 3$

Question: The normality of H_2SO_4 in the solution obtained on mixing 100 ml of 0.1 M H_2SO_4 with 50 ml of 0.1 M NaOH is ___ $\times 10^{-1}$ N
Answer: 1.00
Solution:
$$N_{H_2SO_4} = \frac{N_{H_2SO_4}V_{H_2SO_4} - N_{NaOH}V_{NaOH}}{V_{H_2SO_4} + V_{NaOH}}$$
$$= \frac{(2 \times 0.1 \times 100) - (0.1 \times 50)}{150} = \frac{20 - 5}{150} = \frac{15}{150} = 0.1N$$
$= 1 \times 10^{-1}$ N

Question: Number of non-planar structures
NO_3^-, H_2O_2, BF_3, PCl_3, XeF_4, SF_4, XeO_3, PH_4^+, SO_3, $[Al(OH)_4]^-$.
Answer: 6.00
Solution: PCl_3, H_2O_2, SF_4, XeO_3, PH_4^+ and $[Al(OH)_4]^-$ are non-planar structures.

Question: Among the following, number of iron ores is/are:
Malachite, Siderite, Hematite, Magnetite, Bauxite, cryolite
Answer: 3.00
Solution: Magnetite(Fe_3O_4), Siderite($FeCO_3$), and Hematite(Fe_2O_3) are ores of iron