JEE-Main-28-07-2022-Shift-1 (Memory Based)

Chemistry

Question: Which of the following has least tendency to liberate H_2 from mineral acids.
Options:
(a) Cu
(b) Mn
(c) Ni
(d) Zn
Answer: (a)
Solution: Cu cannot displace H_2 from mineral acids because it is below hydrogen in electrochemical series.

Question: Match the gases evolved in following reaction

(Column I)	(Column II)
(A) $(NH_4)_2Cr_2O_7 \xrightarrow{\Delta}$	(i) H_2
(B) $KMnO_4 + HCl \rightarrow$	(ii) N_2
(C) $Al + NaOH + H_2O \rightarrow$	(iii) O_2
(D) $NaNO_3 + Heat \rightarrow$	(iv) Cl_2

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 → (iv); C → (i); D → (iii)
Answer: (d)
Solution:
$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} Cr_2O_3 + N_2 + 4H_2O$
$2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2$
$2KMnO_4 + 16HCl \rightarrow 2KCl + 2MnCl_2 + 5Cl_2 + 8H_2O$
$2Al + 2NaOH + 6H_2O \rightarrow 2Na[Al(OH)_4]^- + 3H_2$

Question: What are the monomers of terylene?
Options:
(a) Phenol and formaldehyde
(b) Ethylene glycol and phthalic acid
(c) Adipic acid and hexamethylenediamine
(d) Ethylene glycol and terephthalic acid
Answer: (d)
Solution: Ethylene glycol and terephthalic acid are monomers which on polymerization gives terylene.

Question: Correct statements for enzyme inhibitor drugs-
I. They are competitive and non-competitive drugs

II. They bind at active and allosteric sites
III. Competitive drugs inhibits active site
IV. Non-competitive drugs inhibits allosteric sites
Options:
(a) I and II
(b) II and III
(c) III and IV
(d) All are correct
Answer: (d)
Solution: Drugs compete with the natural substrate for their attachment on the active sites of enzymes. Such drugs are called competitive inhibitors
Some drugs do not bind to the enzyme's active site. These bind to a different site of enzyme which is called allosteric site.

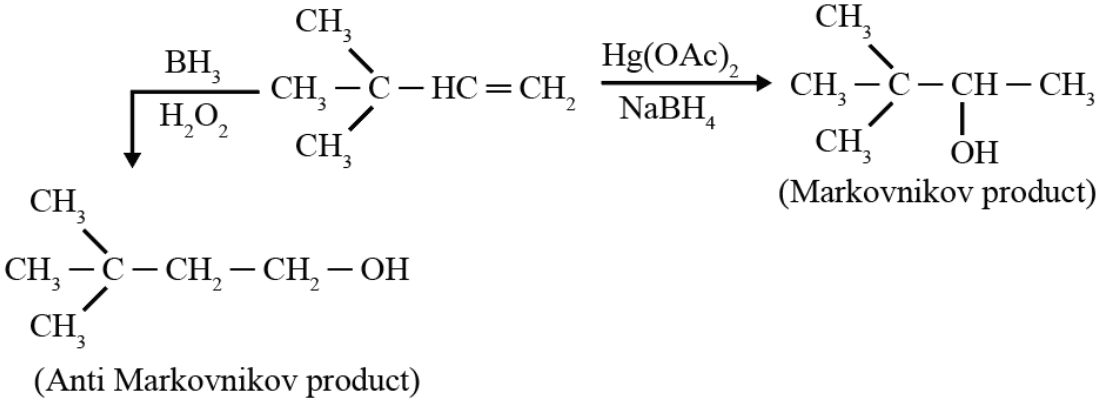
Question: Which pair has same or identical electron gain enthalpy?
Options:
(a) Rb, Cs
(b) I, At
(c) Ar, Kr
(d) Na, k
Answer: (c)
Solution: Ar & Kr have same electron gain enthalpy of 96 kJ/mol

Question: match the following.

(Column I) Reaction	(Column II) Catalyst
(A) Haber Process	(i) V_2O_5
(B) Contact process	(ii) Fe
(C) Ostwald process	(iii) Platinised asbestos

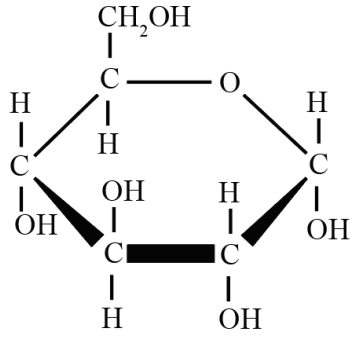
Options:
(a) A → (ii); B → (i); C → (iii)
(b) A → (ii); B → (iii); C → (i)
(c) A → (iii); B → (ii); C → (i)
(d) A → (i); B → (iii); C → (ii)
Answer: (a)
Solution: In Haber's process, catalyst used is Fe; In contact process catalyst used is V_2O_5.
In Ostwald's process catalyst used is platinised asbestos

Question: $(CH_3)_3C – CH = CH_2$ was reacted with $Hg(OAC)_2$ and on one side BH_3/H_2O_2 which of the following product will form?
Options:
(a) $Hg(OAC)_2$ – Markovnikov product; BH_3/H_2O_2 – anti Markovnikov product
(b) $Hg(OAC)_2$ – anti Markovnikov product; BH_3/H_2O_2 – Markovnikov product
(c) Both will give Markovnikov product
(d) Both will give anti Markovnikov product
Answer: (a)
Solution:

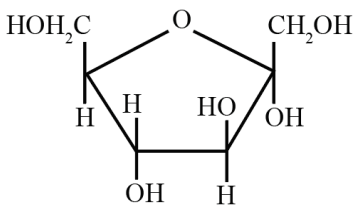


Question: Statement 1: BOD level in polluted water is more than clean water
Statement 2: Eutrophication leads to decrease in oxygen
Options:
(a) Both statement 1 and 2 are correct
(b) Statement 1 is correct but statement 2 is incorrect
(c) Statement 1 is incorrect but statement 2 is correct
(d) Both statement 1 and 2 are incorrect.
Answer: (a)
Solution: Both statements are correct.
Statement-1: BOD is directly proportional to the amount of pollution. So, High BOD indicates highly polluted water.
Statement 2: Oxygen depletion, or hypoxia, is a common consequence of eutrophication, both in fresh water and seawater.

Question: Structure of pyranose is
Options:
(a)



(b)



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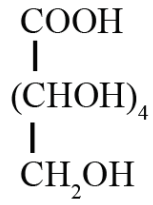
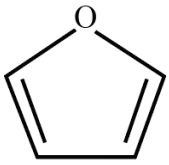


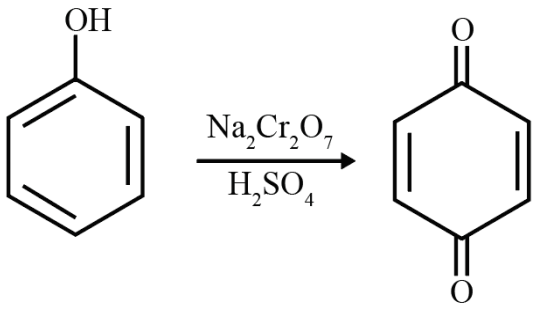
(d)



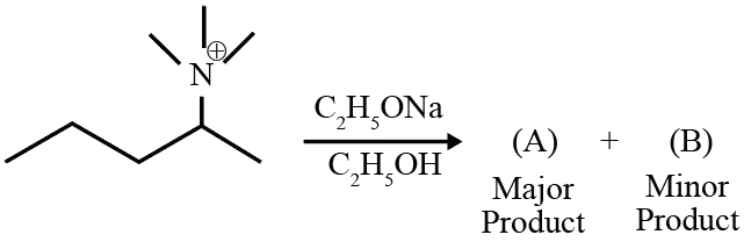
Answer: (a)
Solution: The six membered cyclic structure of glucose is called pyranose structure (α– or β–), in analogy with pyran.

Question: Which reaction is involved in leaching?
Options:
(a) $Al_2O_3 + 2NaOH + 3H_2O \rightarrow 2Na[Al(OH)_4]$
(b) $Al_2O_3 \cdot xH_2O \rightarrow Al_2O_3 + xH_2O$
(c) $Al_2O_3 + Mg \rightarrow MgO + Al$
(d) Both (a) and (b)
Answer: (d)
Solution:
$Al_2O_3(s) + 2NaOH(aq) + 3H_2O(l) \rightarrow 2Na[Al(OH)_4](aq)$
$2Na[Al(OH)_4](aq) + 2CO_2(g) \rightarrow Al_2O_3 \cdot xH_2O(s) + 2NaHCO_3(aq)$
$Al_2O_3 \cdot xH_2O(s) \xrightarrow{1470K} Al_2O_3(s) + xH_2O(g)$

Question: Phenol + $Na_2Cr_2O_7 \rightarrow$ Product
Options:
(a) Benzoquinone
(b) Picric acid
(c) Benzaldehyde
(d) None of these
Answer: (a)
Solution:

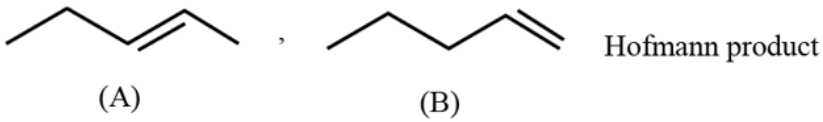


Question:

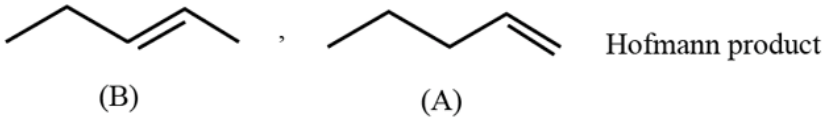


Options:

(a)



(b)



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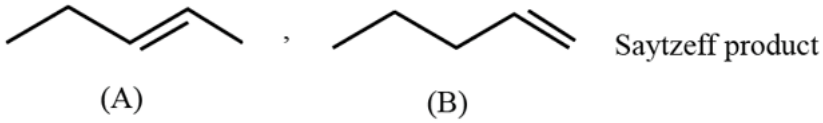
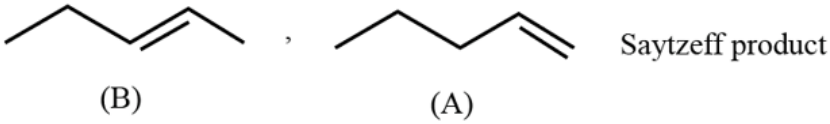
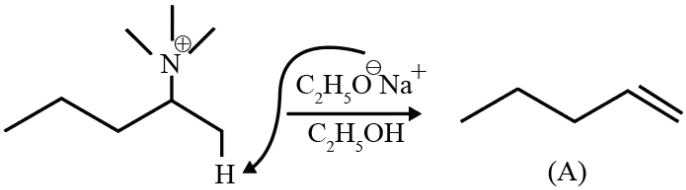


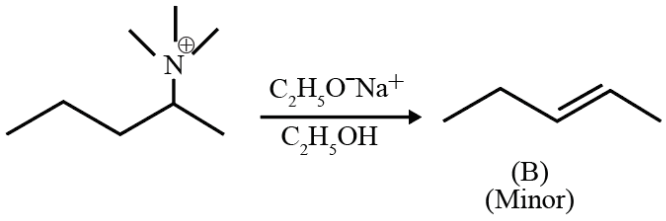
(d)



Answer: (b)

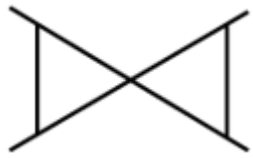
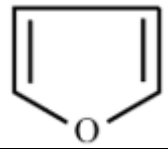
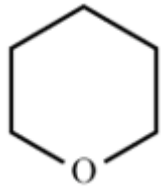
Solution:





Question: Match the following.

(Column I)	(Column II)
(A)	(i) Aromatic compound

	
(B) 	(ii) Spiro compound
(C) 	(iii) Bicyclic compound
(D) 	(iv) Non-planar heterocyclic compound

Options:

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

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

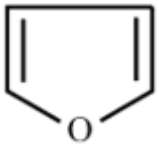
(c) A → (iii); B → (ii); C → (iv); D → (i)

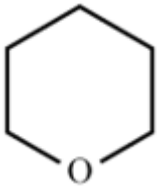
(d) A → (ii); B → (i); C → (iv); D → (iii)

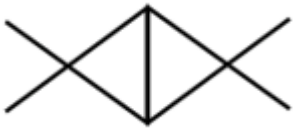
Answer: (d)

Solution:

 ⇒ Spiro compound

 ⇒ Aromatic compound

 ⇒ Non-planar heterocyclic compound

 ⇒ Bicyclic compound

Question: Batteries reaction matching

(Column I)	(Column II)
(A) Primary battery	(i) $Pb(s) + PbO_2(s) + 2H_2SO_4 \downarrow 2PbSO_4(s) + 2H_2O$
(B) Secondary battery	(ii) $Zn(s) + 2NH_4^+ + 2MnO_2 \downarrow [Zn(NH_3)_2]^{2+} + Mn_2O_3 + H_2O$
(C) Mercury cell	(iii) $Zn(Hg) + HgO(s) \downarrow ZnO(s) + Hg(l)$

Options:

(a) A → (iii); B → (ii); C → (i)

(b) A → (ii); B → (i); C → (iii)

(c) A → (i); B → (ii); C → (iii)

(d) A → (ii); B → (iii); C → (i)

Answer: (b)

Solution:

(A) Primary battery ⇒ **(ii)** $Zn(s) + 2NH_4^+ + 2MnO_2 \downarrow [Zn(NH_3)_2]^{2+} + Mn_2O_3 + H_2O$

(B) Secondary battery ⇒ **(i)** $Pb(s) + PbO_2(s) + 2H_2SO_4 \downarrow 2PbSO_4(s) + 2H_2O$

(C) Mercury cell ⇒ **(iii)** $Zn(Hg) + HgO(s) \downarrow ZnO(s) + Hg(l)$

Question: Consider the following reaction:

$$\underset{1\,mol}{X} + \underset{1\,mol}{Y} + \underset{0.05\,mol}{3Z} \rightarrow XYZ_3$$

Calculate the mass of XYZ_3 formed at the end of the reaction (in g).

[Given: molar masses of X, Y and Z are 10, 20, 30 g/mol respectively.]

Answer: 2.00

Solution:

$$\underset{1-\left(\frac{0.05}{3}\right)}{\underset{1\,mol}{X}} + \underset{\left(\frac{1-0.05}{3}\right)}{\underset{1\,mol}{Y}} + \underset{0}{\underset{0.05\,mol}{3Z}} \rightarrow \underset{\left(\frac{0.05}{3}\right)}{XYZ_3}$$

(Z is limiting reagent)

Molar mass of $XYZ_3 = 10 + 20 + (3 \times 30) = 120$ g/mol

Mass of $XYZ_3 = \frac{0.05}{3} \times 120 = 2$ g

Question: Half life of a reaction is 2 hr 30 min. Calculate the time (in min) required to reduce reactant concentration to $\frac{1}{64}$ (Round off to nearest integer)

Answer: 899.00

Solution:

$t_{1/2}$ = 2 hr 30 min

$$[A_{final}] = \frac{1}{64}[A_{initial}]$$

$$t = \frac{2.303}{k}\log\frac{[A_{initial}]}{[A_{final}]}$$

$$t = \frac{2.303}{0.693} \times (t_{1/2}) \log\left[\frac{64}{1}\right]\left[\because t_{1/2} = \frac{0.693}{k}\right]$$

t = 3.32 × (150) log(64)

= 498 × 1.8060

t = 899.38 min

Question: How many of the following are paramagnetic?

O_2^{2-}, He_2^+, C_2^-, B_2, Li_2, O_2^+, O_2^-

Answer: 5.00

Solution: He_2^+, C_2^-, B_2, O_2^+ and O_2^-

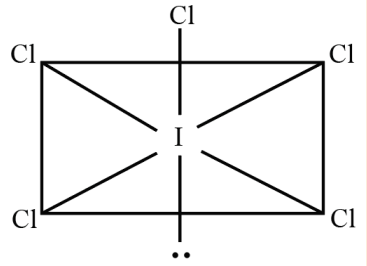
These are paramagnetic species due to presence to unpaired electron

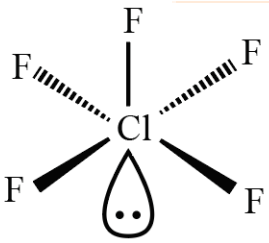
Question: Number of structure having square pyramidal shape is/are

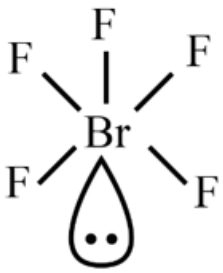
ICl_2, ICl_5, BrF_5, ClF_5

Answer: 3.00

Solution:







Question: MnO_4^{2-} disproportionates in acidic medium to form two compounds of manganese A and B. Oxidation state of Mn is less in B than in A. Spin only magnetic moment of B (in B.M.) is: (Round off to nearest integer)

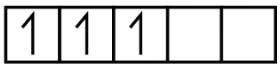
Answer: 4.00

Solution:

$$3\overset{(+6)}{Mn}O_4^{2-} + 4H^+ \rightarrow 3\underset{(A)}{\overset{(+7)}{Mn}}O_4^- + \underset{(B)}{\overset{(+4)}{Mn}}O_2 + 2H_2O$$

MnO_2 – Mn is present in +4 oxidation state

Mn^{+4} – $[Ar]3d^3$



n = 3

$$\mu = \sqrt{n(n+2)} = \sqrt{3(3+2)} = \sqrt{15}\ \text{BM}$$

= 3.89 BM ≈ 4 BM

Question: K_a for C_3H_7COOH is 2×10^{-5}. Find pH of 0.2 M solution

Answer: 9.00

Solution:

$$\underset{(0.2-x)}{C_3H_7COO^-} + H_2O \rightleftharpoons \underset{x}{C_3H_7COOH} + \underset{x}{OH^-}$$

$$K_h = \frac{x^2}{0.2-x} = \frac{x^2}{0.2}$$

$$K_h = \frac{K_w}{K_a}$$

$$\frac{10^{-14}}{2\times10^{-5}} = \frac{x^2}{0.2}$$

$x = 10^{-5}$ mol/L

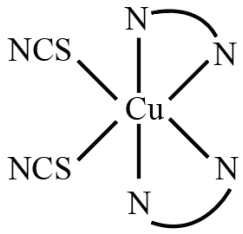
$[OH^-] = 10^{-5}$

$H^+ = 10^{-14}/10^{-5} = 10^{-9} \therefore$ pH = 9

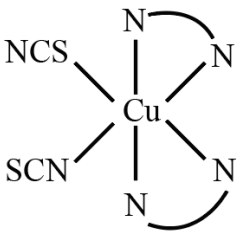
Question: Number of possible isomers of $[Cu(en)_2(SCN)_2]$

Answer: 6.00

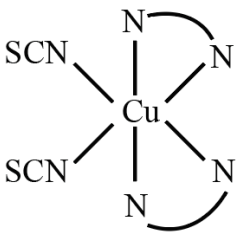
Solution: $[Cu(en)_2(SCN)_2]$



(I)



(II)



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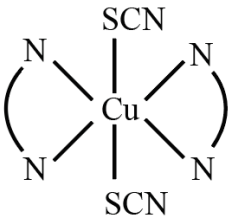

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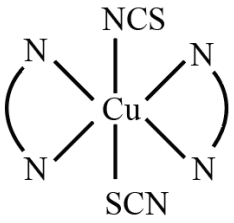

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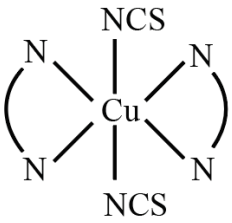

(VI)