CHEMISTRY

Section-1

1. Match List - I with List II :

List1	List2
A. Li	I. photoelectric cell
B. Na	II. absorbent of CO2
C. K	III. coolant in fast breeder nuclear reactor
D. Cs	IV. treatment of cancer
E. .	V. bearings for motor engines

A) A - v, B - i, C - ii, D - iv

B) A - v, B - ii, C - iv, D - i

C) A - iv, B - iii, C - i, D - ii

D) A - v, B - iii, C - ii, D - i

Answer: D,
Explanation:
Li makes alloy with Lead to make white metal bearings for motor engines

Liquid Na metal is used as coolant in fast breeder nuclear reactor

K is a very absorbent of CO_2

Cs is used in making photoelectric cell

2. **Match List - I with List - II :**
List - I - (compound)
List - II - (effect/affected species)

List1	List2
A. Carbon monoxide	I. Carcinogenic
B. Sulphur dioxide	II. Metabolized by pyrus plants
C. Polychlorinated biphenyls	III. Haemoglobin
D. Oxides of Nitrogen	IV. Stiffness of flower buds

A) A - iii, B - iv, C - i, D - ii
B) A - iv, B - i, C - iii, D - ii
C) A - i, B - ii, C - iii, D - iv
D) A - iii, b - iv, C - ii, D - i

Answer: A,
Explanation:
A - iii, B - iv, C - i, D - ii

3. **Which one of the following set of elements can be detected using sodium fusion extract ?**

A) Sulfur, Nitrogen, Phosphorous, Halogens
B) Phosphorous, Oxygen, Nitrogen, Halogens
C) Nitrogen, Phosphorous, Carbon, Sulfur
D) Halogens, Nitrogen, Oxygen, Sulfur

Answer: A,
Explanation:
By sodium fusion extract we can detect sulphur, nitrogen,

Phosphorous and halogens, because they are converted in to their ionic form with sodium metal.

4. **The number of neutrons and electrons, respectively, present in the radioactive isotope of hydrogen is :-**

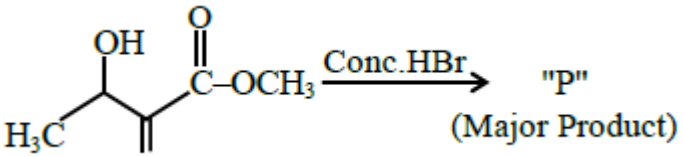
A) 1 & 1
B) 3 & 1
C) 2 & 1
D) 2 & 2

Answer: C,
Explanation:
Radioactive isotope of hydrogen is Tritium $\left({}_{1}^{3}\mathrm{T}\right)$

No. of neutrons $(\mathrm{A}-\mathrm{Z})=3-1=2$

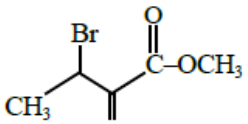
No. of electrons = 1

5.



Consider the above reaction, the major product "P" formed is :-

A)



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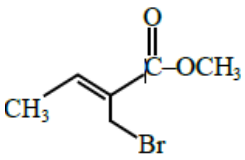
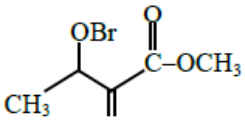
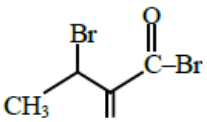


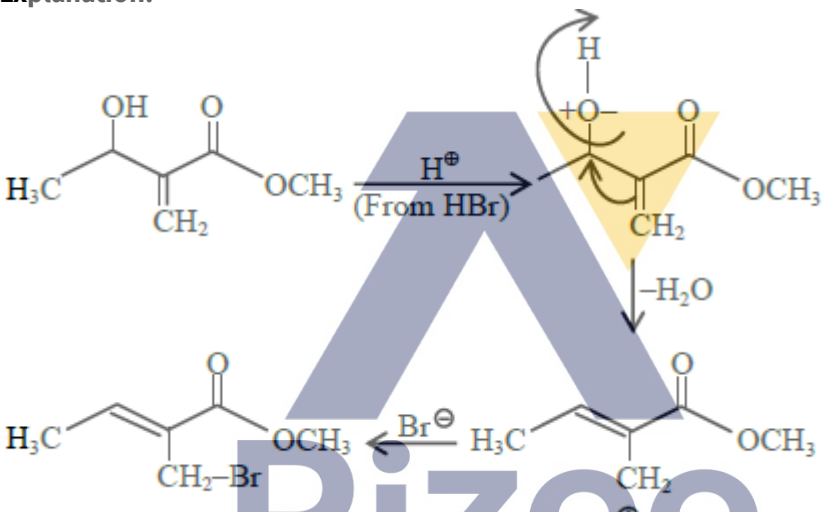
C)



D)



Answer: B,
Explanation:



6.

Given below are two statement : one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : $SO_2\ (g)$ **is adsorbed to a large extent than** $H_2\ (g)$ **on activated charcoal.**

Reason R : $SO_2\ (g)$ **has a higher critical temperature than** $H_2\ (g)$**. In the light of the above statements,**

choose the most appropriate answer from the options given below.

A) Both A and R are correct but R is not the correct explanation fo A

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

C) A is not correct but R is correct.

D) A is correct but R is not correct.

Answer: B,
Explanation:
Gases having higher critical temperature absorb to a greater extent.

7. **The CORRECT order of first ionisation enthalpy is :**

A) $Mg < S < Al < P$

B) $Mg < Al < S < P$

C) $Al < Mg < S < P$

D) $Mg < Al < P < S$

Answer: C,
Explanation:

$Mg\ Al\ P\ S \rightarrow$ **IE.Order** $\Rightarrow A < Mg < S < P$

$[N_e]: 3s^2 \quad 3s^2 3p^1 \quad 3s^2 3p^3 \quad 3s^2 3p^4$

	Full Filled	Half Filled
Valence	Stable	Stable

8. **Given below are two statements :**

Statement I : Hyper conjugation is a permanent effect.

Statement II : Hyper conjugation in ethyl cation $\left(CH_3 - \overset{+}{C}H_2\right)$ **involves the overlapping of** $C_{sp^2} - H_{1s}$ **bond with empty 2p orbital of other carbon.**

Choose the correct option :

A) Both statement I and statement II are false

B) Statement I is incorrect but statement II is true

C) Statement I is correct but statement II is false

D) Both Statement I and statement II are true.

Answer: C,
Explanation:

Statement I : It is correct statement

Statement II : $CH_3 - \overset{+}{C}H_2$ **involve** $C_{sp^3} - H_{1s}$ **bond with empty 2p orbital hence given statement is false.**

9. **Given below are two statements :**

Statement I : $[Mn(CN)_6]^{3-}$, $[Fe(CN)_6]^{3-}$ **and** $[Co(C_2O_4)_3]^{3-}$ **are** d^2sp^3 **hybridised.**

Statement II : $[MnCl_6]^{3-}$ **and** $[FeF_6]^{3-}$ **are paramagnetic and have 4 and 5 unpaired electrons, respectively.**

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

A) Statement I is correct but statement II is false

B) Both statement I and statement II are false

C) Statement I is incorrect but statement II is true

D) Both statement I and statement II are are true

Answer: D,

Explanation:

$[MnCl_6]^{3-}$ $[Fe(CN)_6]^{3-}$ $[Co(C_2O_4)_3]^{3-}$

⇓

Mn^{3+} CN^- Fe^{3+}, CN^- Co^{3+}, $C_2O_4^{2-}$

d^4 **configuration, SFL** d^5 **configuration, SFL** d^6 **configuration, Chelating ligand**

All will have larger splitting hence d^2sp^3 **hybridisation**

$[MnCl_6]^{3-}$ **and** $[FeF_6]^{3-}$

d^4 **configuration,** Cl^- d^5 **configuration,** F^-

10. To an aqueous solution containing ions such as Al^{3+}, Zn^{2+}, Ca^{2+}, Fe^{3+}, Ni^{2+}, Ba^{2+} and Cu^{2+} was added conc. HCl, followed by H_2S. The total number of cations precipitated during this reaction is/are :

A) 1 **B)** 3

C) 4 **D)** 2

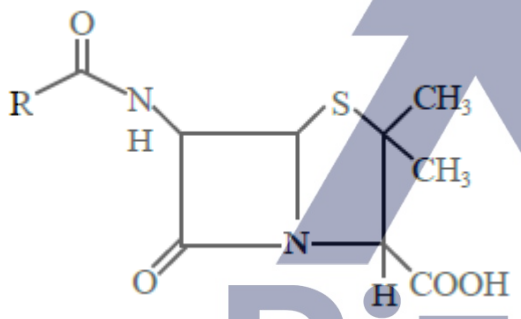
Answer: A,
Explanation:
Al^{3+} **and** Fe^{3+} **sulphides hydrolyse in water.**

Ni^{2+} **and** Zn^{2+} **require basic medium with** H_2S **to form ppt**

Ca^{2+} **and** Ba^{2+} **sulphides are soluble**

hence we will receive only CuS ppt.

11. Given below are two statements :
Statement I : Penicillin is a bacteriostatic type antibiotic.
Statement II : The general structure of Penicillin is:



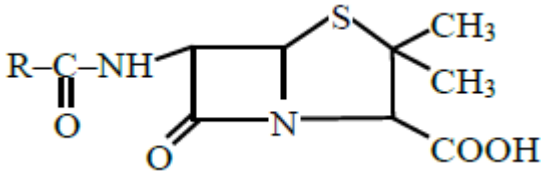
Choose the correct option :

A) Both statement I and statement II are false **B)** Statement I is incorrect but statement II is true

C) Both statement I and statement II are true **D)** Statement I is correct but statement II is false

Answer: B,
Explanation:
Statement I : Pencillin is bactericidal not bacteriostatic hence given statement is false.

Statement II : Structure of pencilline given is correct



12. **Compound A gives D-Galactose and D-Glucose on hydrolysis. The compound A is :**

A) Amylose

B) Sucrose

C) Maltose

D) Lactose

Answer: D,
Explanation:
Lactose : It is a disaccharide of β–D–Galactose and β–D–Glucose with C_1 of galactose and C_4 of glucose link.

Lactose : β–D–Galactose + β–D–Glucose

13. $R-CN \xrightarrow[(ii)\ H_2O]{(i)\ DIBAL\ -\ H} R-Y$ **. Consider the above reaction and identify "Y"**

A) $-CH_2NH_2$

B) $-CONH_2$

C) $-CHO$

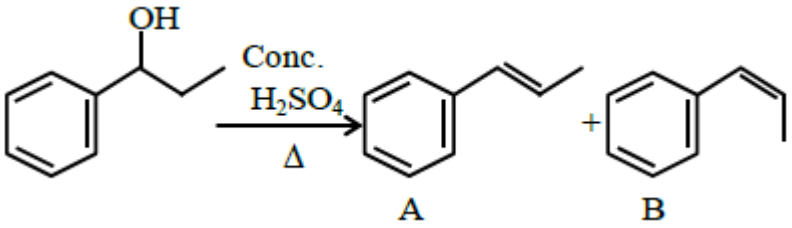
D) $-COOH$

Answer: C,
Explanation:

$$R-C\equiv N \xrightarrow[(2)\ H_2O]{(1)\ DiBAL\ -H} R-\underset{\underset{O}{\|}}{C}-H$$

Here Y is $-\underset{\underset{O}{\|}}{C}-H$ **Aldehyde**

14.



consider the above reaction, and choose the correct statement :

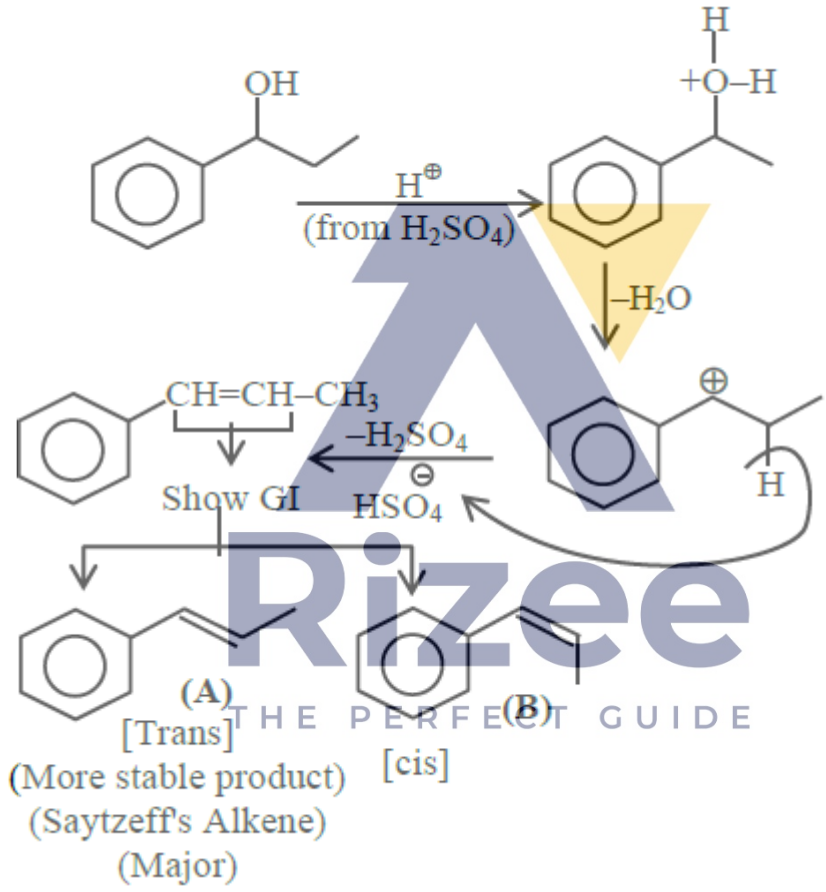
A) The reaction is not possible in acidic medium

B) Both compounds A and B are formed equally

C) Compound A will be the major product

D) Compound B will be the major product

Answer: C,
Explanation:



15. **If the Thomson model of the atom was correct, then the result of Rutherford's gold foil experiment would have been :**

A) All of the α-particles pass through the gold foil without decrease in speed.

B) α-Particles are deflected over a wide range of angles.

C) All α-particles get bounced back by 180°

D) α-Particles pass through the gold foil deflected by small angles and with reduced speed.

Answer: D,
Explanation:
As in Thomson model, protons are diffused (charge is not centred) α- particles deviate by small angles and due to repulsion from protons, their speed decreases.

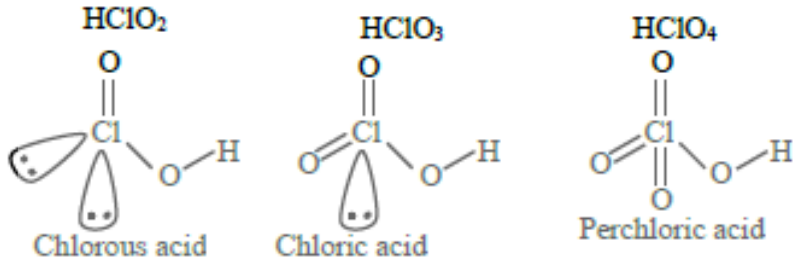
Section-2

16. Number of Cl = O bonds in chlorous acid, chloric acid and perchloric acid respectively are :

A) 3, 1 and 1 **B)** 4, 1 and 0

C) 1, 1 and 3 **D)** 1, 2 and 3

Answer: C,
Explanation:
Number of Cl = O bonds



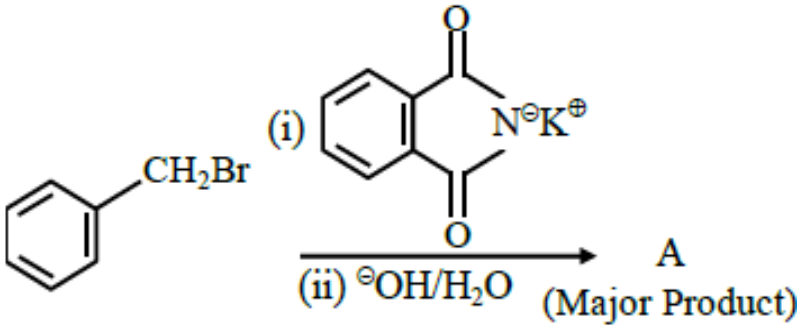
17. Select the correct statements.
(A) Crystalline solids have long range order.
(B) Crystalline solids are isotropic.
(C) Amorphous solid are sometimes called pseudo solids.
(D) Amorphous solids soften over a range of temperatures.
(E) Amorphous solids have a definite heat of fusion.
Choose the most appropriate answer from the options given below.

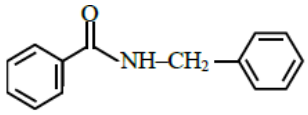
A) (A), (B), (E) only **B)** (B), (D) only

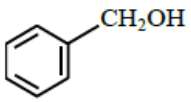
C) (C), (D) only **D)** (A), (C), (D) only

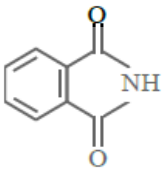
Answer: D,
Explanation:
(A) Crystalline solids have definite arrangement of constituent particles and have long range order. (C), (D) Different constituent particles of an amorphous solid have different bond strengths and soften over a range of temperatures.

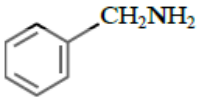
18. What is A in the following reaction ?



A) 

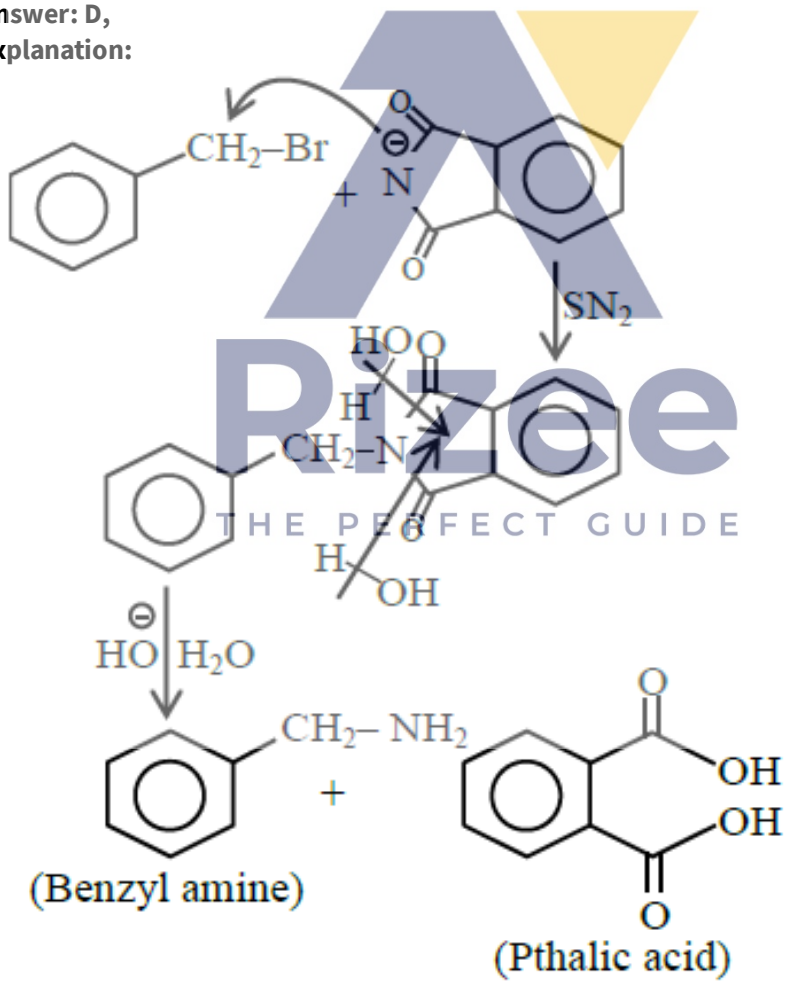
B) 

C) 

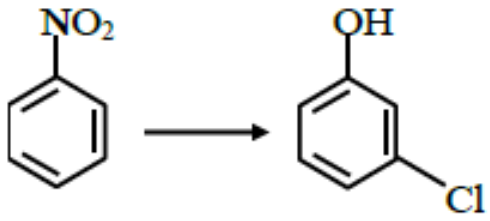
D) 

Answer: D,

Explanation:



19. The correct sequence of correct reagents for the following transformation is :-



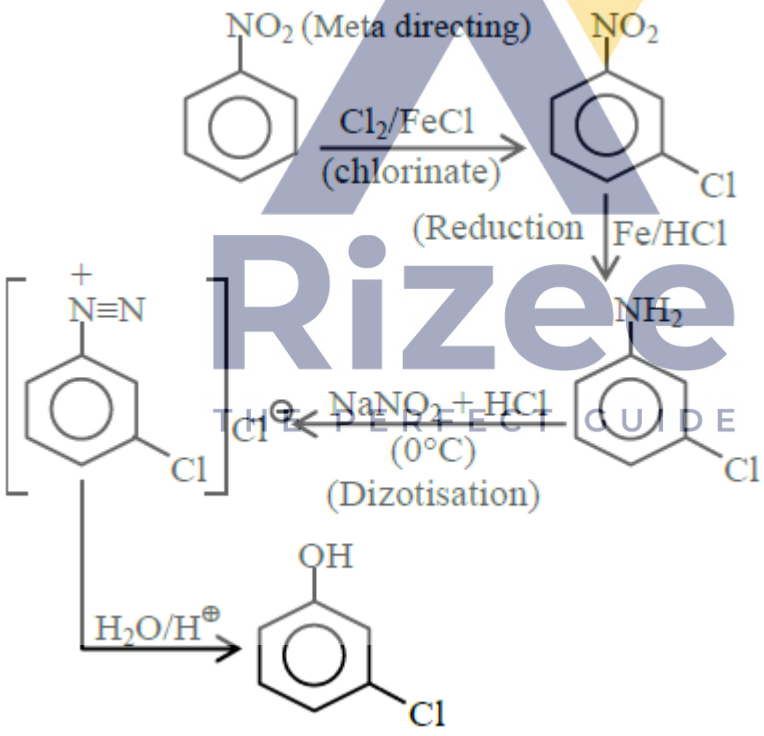
A) (i) Fe, HCl
(ii) Cl_2, HCl
(iii) $NaNO_2$, HCl, 0° C
(iv) H_2O/H^+

B) (i) Fe, HCl
(ii) $NaNO_2$, HCl, 0° C
(iii) H_2O/H^+
(iv) Cl_2, $FeCl_3$

C) (i) Cl_2, $FeCl_3$
(ii) Fe, HCl
(iii) $NaNO_2$, HCl, 0° C
(iv) H_2O/H^+

D) (i) Cl_2, $FeCl_3$
(ii) $NaNO_2$, HCl, 0° C
(iii) Fe, HCl
(iv) H_2O/H^+

Answer: C,
Explanation:



20. **The addition of silica during the extraction of copper from its sulphide ore :-**

A) converts copper sulphide into copper silicate

B) converts iron oxide into iron silicate

C) reduces copper sulphide into metallic copper

D) reduces the melting point of the reaction mixture

Answer: B,
Explanation:
Silica is used to remove FeO impurity from the ore of copper

$FeO + SiO_2 \rightarrow FeSiO_3$ iron silicate (Slag)

21. **The equilibrium constant for the reaction** $A(s) \rightleftharpoons M(s) + \frac{1}{2}O_2(g)$ **is** $K_p = 4$. **At equilibrium, the partial pressure of** O_2 **is _____ atm. (Round off to the nearest integer)**

Answer: _____

Answer: 16

Explanation:

$K_p = Po_2^{1/2} = 4$

$\therefore\ Po_2 = 16\ bar = 16\ atm$

22. **When 400 mL of** $0.2M\ H_2SO_4$ **solution is mixed with 600 mL of 0.1 M NaOH solution, the increase in temperature of the final solution is _____** $\times 10^{-2}$ **K. (Round off to the nearest integer). [Use :** $H^+(aq) + OH^-(aq) \rightarrow H_2O : \Delta_y H = -57.1\ kJ\ mol^{-1}$**]**
Specific heat of $H_2O = 4.18\ JK^{-1}g^{-1}$**, density of** $H_2O = 1.0\ g\ cm^{-3}$
Assume no change in volume of solution on mixing.

Answer: _____

Answer: 82

Explanation:

$n_{H^+} = \frac{400 \times 0.2}{1000} \times 2 = 0.16$

$n_{OH^-} = \frac{600 \times 0.1}{1000} = 0.06\ (L.R)$

Now, heat liberated from reaction = heat gained by solutions

or $0.06 \times 57.1 \times 10^3$

$= (1000 \times 1.0) \times 4.18 \times \Delta T$

$\therefore\ \Delta T = 0.8196\ K$

$= 81.96 \times 10^{-2}\ K \approx 82 \times 10^{-2}\ K$

23. $2SO_2(g)+O_2(g)\rightarrow 2SO_3(g)$. The above reaction is carried out in a vessel starting with partial pressure $P_{SO_2}=250\ m\ bar$, $P_{O_2}=750\ m\ bar$ and $P_{SO_3}=0\ bar$. When the reaction is complete, the total pressure in thereaction vessel is _____ m bar. (Round off of the nearest integer).

Answer: _____

Answer: 875

Explanation:

	$2SO_2(g)$	+ $O_2(g)$	→ $2SO_3(g)$
Initial	250 m bar	750 m bar	O
Final	−250 m bar	−125 m bar	250 m bar
	0	625 m bar	250 m bar

∴ **Final total pressure** = $625+250=875\ m\ bar$

24. 10.0 mL of $0.05\ M\ KMnO_4$ solution was consumed in a titration with 10.0 mL of given oxalic acid dihydrate solution. The strength of given oxalic acid solution is ..... $\times 10^{-2}\ g/L$. (Round off to the nearest integer)

Answer: _____

Answer: 1575

Explanation:

$n_{eq}\ KMnO_4 = n_{eq}\ H_2C_2O_4.2H_2O$

or $\frac{10\times 0.05}{1000}\times 5=\frac{10M}{1000}\times 2$

∴ **Conc. of oxalic acid solution = 0.125 M**

$=0.125\times 126\ g/L=15.75\ g/L$

$=1575\times 10^{-2}\ g/L$

25. The total number of electrons in all bonding molecular orbitals of O_2^{2-} is ..... . (Round off to the nearest integer)

Answer: _____

Answer: 10

Explanation:

M.O. Configuration of $O_2^{2-}\ (18\ e^-)$

$\sigma 1s^2\ \overset{*}{\sigma} 1s^2\ \overset{*}{\sigma} 2s^2\ \sigma 2s^2\ \sigma 2p_z^2\ \pi 2p_x^2=\pi 2p_y^2\ \overset{*}{\pi} 2p_x^2=\overset{*}{\pi} 2p_y^2$

Total B.M.O electrons = 10

26. **3 moles of metal complex with formula $Co(en)_2Cl_3$ gives 3 moles of silver chloride on treatment with excess of silver nitrate. The secondary valency of Co in the complex is _____.(Round off to the nearest integer)**

Answer: _____

Answer: 6

Explanation:

$3\ Co(en)_2Cl_2\left[Cl + AgNO_3(excess)\right] \rightarrow 3AgCl\,(white\ ppt)$

Secondary valency of Co = 6 (C. N.)

27. **In a solvent 50% of an acid HA dimerizes and the rest dissociates. The van't Hoff factor of the acid is _____$\times 10^{-2}$. (Round off to the nearest integer)**

Answer: _____

Answer: 125

Explanation:

$$2HA \rightleftharpoons H_2A_2 \qquad HA \rightleftharpoons H^+ + A$$

Initial Moles	$a\times\frac{50}{100}$	0	$a\times\frac{50}{100}$	0	0
Final Moles	0	$0.25\,a$	0	$0.5\,a$	$0.5\,a$

Now, $i = \frac{\text{Final Moles}}{\text{Initial Moles}} = \frac{0.25a + 0.5a + 0.5a}{0.5a + 0.5a}$

$= 1.25 = 125 \times 10^{-2}$

28. **The dihedral angle in staggered form of Newman projection of 1, 1, 1-Trichloro ethane is ..... degree. (Round off to the nearest integer) (Round off to the nearest integer)**

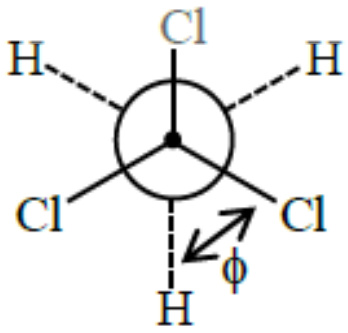
Answer: _____

Answer: 60

Explanation:

1,1,1–Trichloro ethane $[CCl_3 - CH_3]$

(Newmonns stqqared form)



Dihedral angle $(\phi) = 60^\circ$

29. For the first order reaction $A \rightarrow 2B$, 1 mole of reactant A gives 0.2 moles of B after 100 minutes. The half life of the reaction is ..... min. (Round offto the nearest integer).

[Use $\ln 2 = 0.69, \ln 10 = 2.3$]

Properties of logarithms: $\ln x^y = y \ln x; \ln\left(\frac{x}{y}\right) = \ln x - \ln y$

(Round off to the nearest integer)

Answer: _____

Answer: 600-700

Explanation:

	A	→	2B
$t = 0$	1 mole		0
$t = 100$ min	$1 - x$		$2x$
	$= 0.9$ mol		$= 0.2$ mol

Now, $t = \frac{t_{1/2}}{\ln 2} \times \frac{[A_0]}{[A_t]}$

$$100 = \frac{t_{1/2}}{\ln 2} \times \ln \frac{1}{0.9} \Rightarrow t_{1/2} = 690 \text{ min}$$

30. For the cell $Cu(s)|Cu^{2+}(aq)\ (0.1\ M)||Ag^{+}(aq)\ (0.01\ M)|Ag(s)$ the cell potential $E_1 = 0.3095$ V

For the cell $Cu(s)|Cu^{2+}(aq)\ (0.1\ M)||Ag^{+}(aq)\ (0.01\ M)|Ag(s)$ the cell potential = _____ $\times 10^{-2}$ V. (Round off the Nearest Integer). [Use $\frac{2.303\ RT}{F} = 0.059$]

Answer: _____

Answer: 28

Explanation:

Cell reaction is : $Cu(s) + 2Ag^{+}(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$

Now, $E_{cell} = E^{\circ}_{cell} - \frac{0.059}{2} \log \frac{[Cu^{2+}]}{[Ag^{+}]^2}$ ...(1)

$$\therefore E_1 = 0.3095 = E^{\circ}_{cell} - \frac{0.059}{2} \log \frac{0.01}{(0.001)^2} \quad ...(2)$$

From (1) and (2), $E_2 = 0.28\ V = 28 \times 10^{-2}\ V$