1.

(b) 1.2

Explanation:

1.2

2.

(c) i < iv < iii < ii

Explanation:

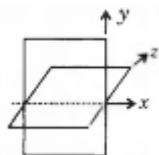| Shell number	Number of possible orientations of orbital in the shell	Orbital designation
3	3	i = 3p
4	3	ii = 4p
3	5	iii = 3d
4	1	iv = 4s

3.

(d) Na

Explanation:

Na

4. **(a)** Both xy plane and xz plane

Explanation:

There are 2π-bonds, one in xz plane (whose nodal plane will be in xy plane) and other in xy plane (whose nodal plane will be in xz plane).
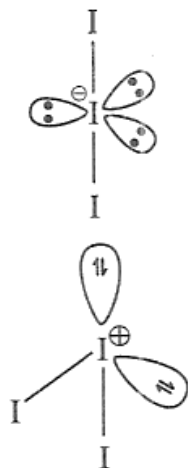

5. **(a)** OF_4, OF_6

Explanation:

OF_4, OF_6 are non-existing because oxygen does not have vacant orbitals in its valency shell.

6.

(b) none of these

Explanation:

7.

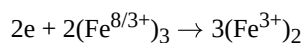**(b)** Free expansion

Explanation:

Free expansion

8.

(b) 1

Explanation:

$$2HI \rightleftharpoons H_2 + I_2$$

1	0	0
$1 - 2\alpha$	α	α

Total mole at equilibrium $= 1 - 2\alpha + \alpha + \alpha = 1$

9.

(b) 2

Explanation:

$2e + 2(Fe^{8/3+})_3 \rightarrow 3(Fe^{3+})_2$

10.

(d) 3

Explanation:

3

11.

(c) decreases

Explanation:

Boiling points of group 13 elements show a regular decrease from B to Tl, which indicates that the strength of the bonds holding the atoms in liquid state decreases from B to Tl.
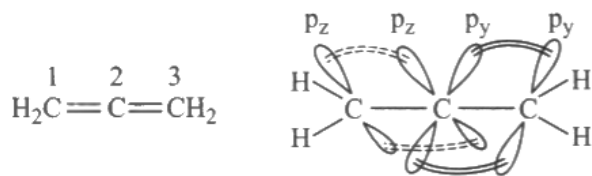
12.

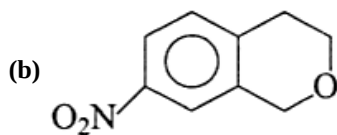**(c)** a linear silicone

Explanation:
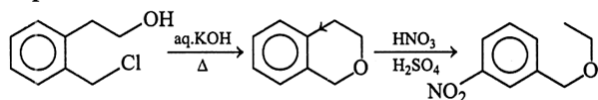
a linear silicone

13.

(b) $H_2C = C = CH_2$

Explanation:
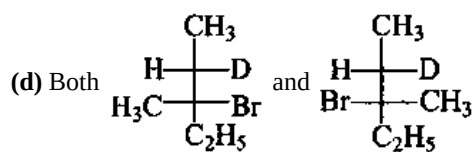
p_z and p_y orbital of C-1 and C-3 are perpendicular.

14.

(b)

Explanation:

15.

(d) Both

Explanation:

$$Br_2 \xrightarrow{hv} 2Br^\bullet$$
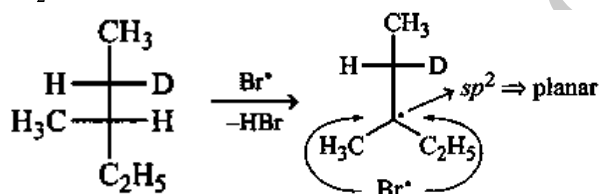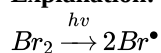

16. **(a)** 1 g

Explanation:

Equivalent weight of dibasic acid,

$E = \frac{\text{Molecular weight}}{2}$

$E = \frac{200}{2} = 100$

Strength = 0.1 N

m = ?, V = 100 mL

Normality, $N = \frac{\text{Mass}}{E} \times \frac{100}{V(\text{L})}$

$m = \frac{ENV}{1000} = \frac{100 \times 100 \times 0.1}{1000} = 1$ g

17.

(c) $CH_3OH > CH_4 > H_2$

Explanation:

Alcohol involves H-bonding, thus have the highest boiling point; also a molar mass of $CH_4 >$ molar mass of H_2. Greater is the molar mass of covalent compound higher is its boiling point. SO the boiling point of methane is higher than hydrogen.
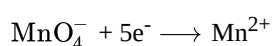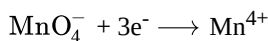
18.

(d) $MnO_4^- \mid Mn^{2+}$
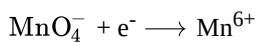
Explanation:

Reduction of MnO_4^- is pH dependent.

In acidic medium

$MnO_4^- + 5e^- \longrightarrow Mn^{2+}$

In neutral medium

$$MnO_4^- + 3e^- \longrightarrow Mn^{4+}$$

In basic medium

$$MnO_4^- + e^- \longrightarrow Mn^{6+}$$

So, according to pH, the reaction and potential of cell changes.

19.

(b) 63%

Explanation:

$2.303 \log \frac{K_2}{K_1} = \frac{E_a}{R} \frac{[T_2 - T_1]}{T_1 T_2}$

$\therefore 2.303 \log \frac{K_2}{K_1} = \frac{9}{2 \times 10^{-3}} \left[\frac{10}{298 \times 308} \right]$

$\therefore \frac{K_2}{K_1} = 1.63$, i.e., 63% increase

20.

(c) nothing can be said

Explanation:

$K_1 = A_1 e^{-E_1/RT}$ and $K_2 = A_2 e^{-E_2/RT}$

$\frac{K_1}{K_2} = \frac{A_1}{A_2} e^{(-E_1 + E_2)/RT}$; A_1 and A_2 are not given.

21. **(a)** charge transfer from L to M

Explanation:

Intense colours are observed because of charge transfer spectra.

22.

(b) Aqueous solution of chlorine on cooling gives green crystals of $Cl_2 \cdot 6H_2O$.

Explanation:

An aqueous solution of chlorine on cooling gives green crystals of $Cl_2 \cdot 6H_2O$.

23.

(d) Group-12

Explanation:

Group-12 contains Zn, Cd, Hg which are not considered as transition metals.

24.

(b) Red complex has a tetrahedral geometry

Explanation:

$[Ni(dmg)_2]$ is square planar in structure not tetrahedral.

25.

(d) i > iv > iii > ii
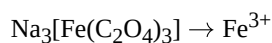
Explanation:

As, $\mu_s = \sqrt{n(n+2)}$

$Na_4[Fe(CN)_6] \rightarrow Fe^{2+}$

$\Rightarrow$ S.F.L. $\Rightarrow t_{2g}^6 e_g^0 \Rightarrow \mu_s = 0$

$[Cr(H_2O)_6]Br_2 \rightarrow Cr^{2+}$

$\Rightarrow$ W.F.L. $\Rightarrow t_{2g}^3 e_g^1 \Rightarrow \mu_s = \sqrt{24}$ B.M.

$(Et_4N)_2[CoCl_4] \rightarrow Co^{2+}$

$\Rightarrow$ W.F.L. $\Rightarrow e^4 t_2^3 \Rightarrow \mu_s = \sqrt{15}$ B.M.

$Na_3[Fe(C_2O_4)_3] \rightarrow Fe^{3+}$

$\Rightarrow$ S.F.L. $\Rightarrow t_{2g}^5 e_g^0 \Rightarrow \mu_s = \sqrt{3}$ B.M.

26. **(a)** 65

Explanation:
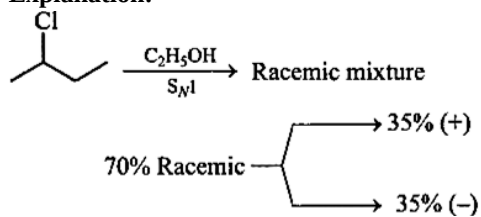
Total inverted product = 35 + 30 = 65%
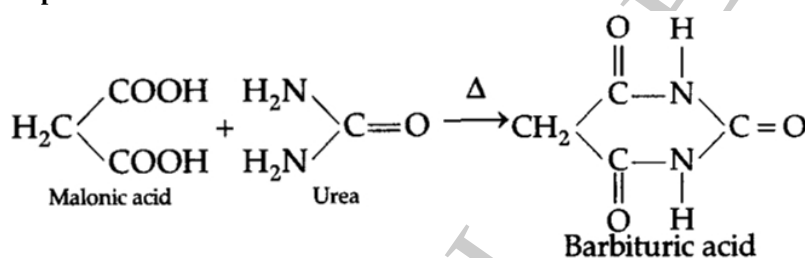
27.

(d) III > I > II > IV

Explanation:

Electron withdrawing group increase acidic strength and electron releasing group decrease acidic strength.

28.

(b) barbituric acid

Explanation:

29.

(d) chloroform and a primary amine
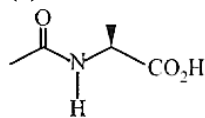
Explanation:

chloroform and a primary amine

30. **(a)** Replication
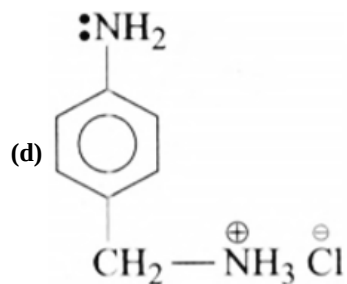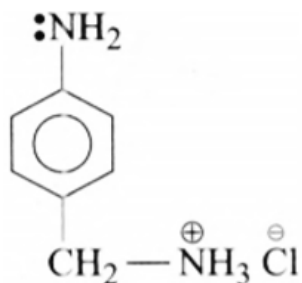
Explanation:

Multiplication of DNA is called replication.

31. **(a)**

Explanation:

The N atom of amide is not basic so it will not exist in zwitterionic form at pH 7.0.

32.

(d)

Explanation:

33.

(d) C, B, D, A

Explanation:

As the value of reduction potential decreases the reducing power increases i.e.

C < B < D < A

(0.85) < (0.6) < (-0.76) < (-1.2)

34.

(c) Solubilities

Explanation:

Solubilities
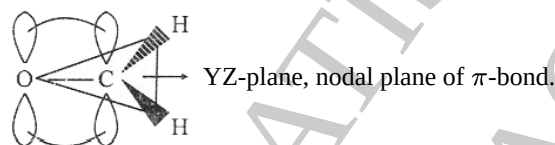
35.

(c) NO_2

Explanation:

NO_2 When nitrate salts are treated with concentrated H_2SO_4, it gives brown fumes of NO_2.

CHEMISTRY (Section-B)

36.

(b) YZ

Explanation:

 YZ-plane, nodal plane of π-bond.

37. **(a)** 66 %

Explanation:

meq. of oxalate = meq. of KMnO4

$\frac{w}{\frac{88}{2}} \times 1000 = 90 \times \frac{1}{20}$

$\therefore$ w$_{oxalate}$ = 0.198 g

$\therefore$ % oxalate = $\frac{0.198}{0.3} \times 100$ = 66 %

38.

(c) Statement d is false.

Explanation:

Zeolites are alumino silicates having three dimensional open structure in which four or six membered ring predominates. Thus, due to open chain structure, they have cavities and can take up water and other small molecules.

39.

(c) Ionisation energy increases

Explanation:

Ionisation energy increases

40. **(a)** $\frac{kv_1 - v_2}{k-1}$

Explanation:

When frequency is ν_1,

$h\nu_1 = hv_0 + \frac{1}{2}mu_1^2$ ...(i)

When frequency is v_2,

$h\nu_2 = hv_0 + \frac{1}{2}mu_2^2$ ...(ii)

$\because \frac{1}{2}mu_1^2 - \frac{1}{k}\left(\frac{1}{2}mu_2^2\right)$

$\therefore$ from Eq. (i)

$h\nu_1 = hv_0 + \frac{1}{2k}mu_2^2$ ...(iii)

or $\frac{1}{2}mu_2^2 = kh\nu_1 - khv_0$ ...(iv)

From Eqs. (ii) and (iv)

$h\nu_2 = hv_0 + kh\nu_1 - khv_0$

or $v_0(1-k) = \nu_2 - k\nu_1$

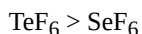or $v_0 = \frac{kv_1 - v_2}{k-1}$

41.

(d) (i)

Explanation:

Correct order of ease of hydrolysis

$TeF_6 > SeF_6$

due to large size of central atom.

CCl_4, PF_3, NF_3 are not hydrolysed under normal condition.

42.

(b) The order of reaction w.r.t. B is 2

Explanation:

For the reaction, $2A + B \longrightarrow$ products.

Let, the rate expression is $r \propto [A]^a [B]^b$

Expt 1 $\frac{r_2}{r_1} = \left(\frac{2A}{A}\right)^a \left(\frac{2B}{B}\right)^b$

$\Rightarrow \frac{2.4}{0.3} = 2^a \times 2^b \Rightarrow 2^3 = 2^{a+b}$

$\Rightarrow 3 = a + b$ ...(i)

Expt 2 $\frac{r_2}{r_1} = \left(\frac{2A}{A}\right)^a \left(\frac{B}{B}\right)^b$

$\Rightarrow \frac{0.6}{0.3} = 2^a \times 1 \Rightarrow 2^1 = 2^a \Rightarrow a = 1$ ...(ii)

$\therefore$ From Eq. (i), $1 + b = 3 \Rightarrow b = 2$

$\Rightarrow$ Order of the reaction (n) = a + b = 1+ 2 = 3

$\Rightarrow$ Order of the reaction wrt. A = 1

$\Rightarrow$ Order of the reaction wrt. B = 2

43.

(c) Kohlrausch

Explanation:

At infinite dilution, each ion of an electrolyte contributes a characteristic ionic conductance towards equivalent conductance of electrolyte which is independent of the nature of another ion present in solution. This statement was given by Kohlrausch and is known as Kohlrausch law of independent migration of ions.

44. **(a)** 19.3

Explanation:

$W = \frac{E \times i \times t}{96500}$

$\therefore 1.8 = \frac{E \times 3 \times 50 \times 60}{96500}$

$\therefore E = 19.3$

45.

(c) 4.92 K

Explanation:

$\log \frac{k_2}{k_1} = \frac{E_a}{2.303R} \left[\frac{T_2 - T_1}{T_1 T_2} \right]$

For reaction A-

Given, $\frac{k_2}{k_1} = 2$, T_1 = 300 k, T_2 = 310 k

$\log 2 = \frac{E_a^A}{2.303R} \left[\frac{1}{300} - \frac{1}{310} \right]$ ...(i)

For reaction B-

Given, $\frac{k_2}{k_1} = 2$, $E_a^B = 2E_a^A$, T_1 = 300 K, T_2 = ?

$\log 2 = \frac{E_a^B}{2.303R} \left[\frac{1}{300} - \frac{1}{T_2} \right]$ ...(ii)

From equation (i) and (ii),

$\frac{2E_a^A}{2.303R} \left[\frac{1}{300} - \frac{1}{T_2} \right] = \frac{E_a^A}{2.303R} \left[\frac{1}{300} - \frac{1}{310} \right]$

$\Rightarrow 2 \left[\frac{1}{300} - \frac{1}{T_2} \right] = \frac{310 - 300}{300 \times 310} \Rightarrow T_2 = 304.92$ K

T_1 = 300 K, T_2 = 304.92 K

$\Delta T = T_2 - T_1$ = 4.92K

46.

(c) Option (i)

Explanation:

The atomic and ionic radii of group 15 elements are smaller than the atomic and ionic radii of the corresponding group 14 elements.

47.

(c) Mg_2C_3

Explanation:

Propyne can be prepared by the hydrolysis of magnesium carbide. $Mg_2C_3 + 4H_2O \rightarrow CH_3C \equiv CH + 2Mg(OH)_2$

48.

(d) Eu^{2+} and Tb^{4+}

Explanation:

Species	Sm^{2+}	Er^{3+}	Yb^{2+}	Lu^{3+}	Eu^{2+}	Tb^{4+}	Tb^{2+}	Tm^{4+}
No. of electrons	60	65	68	68	61	61	63	65

49.

(d)

$[Ni(CN)_4]^{2-}$	$[Ni(Cl)_4]^{2-}$	$[Ni(CO)_4]$
$\mu = 0$	tetrahedral	diamagnetic

Explanation:

$[Ni(CN)_4]^{2-}$	$[Ni(Cl)_4]^{2-}$	$[Ni(CO)_4]$
$\mu = 0$	tetrahedral	diamagnetic

50.

(c)

 + NH$_2$-CH$_2$-CH$_2$-F

Explanation: