Marking Scheme
Chemistry Sample Paper (2023-24) CHE-856 Class: 11th

1. (a) 2 (1)
2. (b) 6 unpaired e^- (1)
3. (c) F<Cl>Br>I (1)
4. (d) O_2^{2-} (1)
5. (b) 18 gm/mol (1)
6. (c) q=0 (1)
7. (a) +2 (1)
8. (a) electron deficient species (1)
9. (c) < ΔU° (1)
10. (c) (1)
11. (a) 0 (1)
12. (a) planar (1)
13. (b) 6.022 x10^{21} molecules (1)
14. (a) 1 (1)
15. (d) Assertion(A) is false but Reason(R) is true. (1)
16. (a) Assertion(A) and Reason(R) are correct and (R) is correct explanation of Assertion(A) (1)
17. (a) Assertion(A) and Reason(R) are correct and (R) is the correct explanation of Assertion(A) (1)
18. (d) Assertion(A) is wrong statement Reason(R) is correct statement. (1)

SECTION-B

19. (a) n=5 (1)

    (b) $16e^-$ (1)

20. (a) as the volume increases, pressure decreases so equilibrium move in forward direction where number of moles increases. (1)

    (b) K_C(Reverse) = $\frac{1}{8.3x15^{-3}}$ = 120.48 (1)

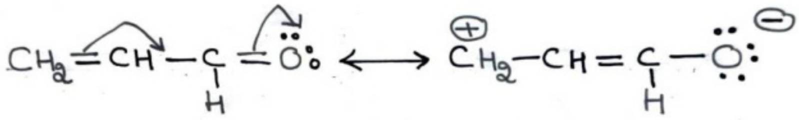
21. $16H^+ + Cr_2O_7^{2-} + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$

$[C_2H_4O + H_2O \longrightarrow C_2H_4O_2 + 2e^- + 2H^+]3$

$Cr_2O_7^{2-} + 16H^+ + 3C_2H_4O + 3H_2O \longrightarrow 2Cr^{3+} + 7H_2O + 3\,C_2H_4O_2 + 6H^+$

$Cr_2O_7^{2-} + 3\,C_2H_4O_2 + 10H^+ \longrightarrow 2Cr^{3+} + 3\,C_2H_4O_2 + 4H_2O$ (2)

22.



(2)

23. Buffer solution is the solution which resist change in the pH value of solution when small amount of acid or base is added to it.

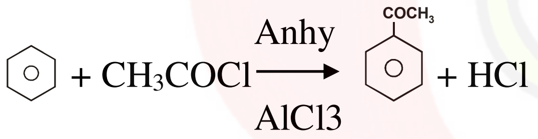
Buffer solutions are of two types

(a) Acidic buffer:- It contains equimolar quantities of weak acid and its salt with strong base.

Example acetic acid and sodium acetate

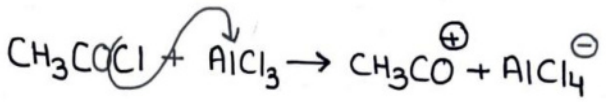
(b) Basic Buffer:- It contains equimolar quantities of weak base and its salt with strong acid

Example ammonium hydroxide and ammonium chloride (2)

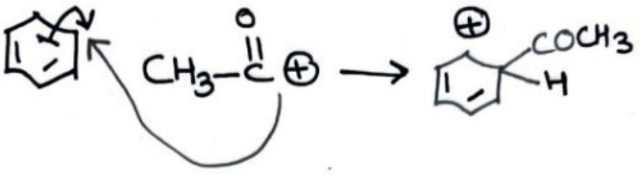
24. 

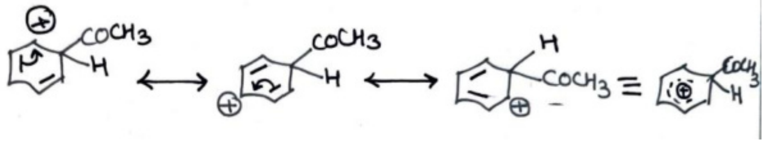
Mechanism

(i) Generation of Electrophile

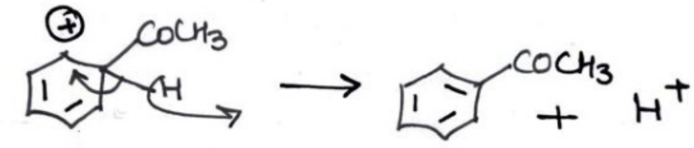


(ii) Attack of electrophile to form intermediate carbocation.





(iii) Loss of proton from carbocation

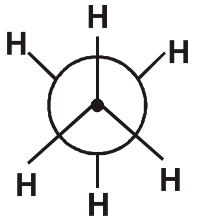


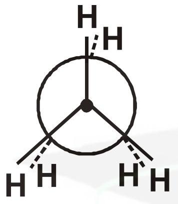
(2)

$AlCl_4^- + H^+ \longrightarrow AlCl_3 + HCl$

OR

Newman's Representation





(1)

Staggerred Eclipsed

Staggerred Conformation is more stable due to less repulsions. (1)

25.(a) S<P<O<N (1)

(b) P<S<N<O (1)

OR

(a) $3s^2 3p^4$

Group ⟶ 16th group

Block ⟶ p-block

Period ⟶ 3rd period (1)

(b) $4s^2$ $3d^2$

Group ⟶ 4th group

Block ⟶ d-block

Period ⟶ 4th period (1)

SECTION-C

26.(a) 1 mole C_2H_6 contains 2 moles of carbon, 3 mole C_2H_6 contains 3x2=6 moles carbon. (1)

(b) 1 mole C_2H_6 contains 6 mole hydrogen, 3 mole C_2H_6 contains 6x3=18 mole hydrogen. (1)

(c) 1 mole $C_2H_6 = 6.022 \times 10^{23}$ molecules

3 mole $C_2H_6 = 3 \times 6.022 \times 10^{23}$ molecules

$= 18.066 \times 10^{23}$ molecules (1)

27. (a) C non metal (1)

(a) A alkali metal (1)

(b) B alkaline earth metal (1)

28. $\Delta G = \Delta H - T\Delta S$ (1)

$= 40.63 \times 1000 - 300 \times 108.8$

$= 7990$ J/mol (1)

$\Delta G = +ve \therefore$ reaction is not feasible (1)

OR

$SO_2(g) + \frac{1}{2} O_2 \rightarrow SO_3(g)$

$\Delta H = \Sigma \Delta_f H^\circ$ products - $\Sigma \Delta_f H^\circ$ reactants (1)

$= \Delta_f H^\circ SO_3 - \Delta_f H^\circ SO_2$

$= -395.6 - (-296.6)$ (1)

$= -395.6 + 296.6$

$= -99$ KJ (1)

29.(a) $AgCl \equiv Cl$

108+35.5 35.5

143.5 35.5

$\% \text{ of Cl} = \frac{35.5}{143.5} \times \frac{\text{Amt.of AgCl formed}}{\text{Wt.of Organic Compound}} \times 100$

$\% \text{ of Cl} = \frac{35.5}{143.5} \times \frac{0.5740}{0.3780} \times 100$ (2)

$= 37.57\%$

(b) Paper chromatography is a type of partition chromatography which is based upon the differences in the tendencies of substance to distribute between two phases. (1)

OR

(c) The process of displacement of σ electrons along the saturated carbon chain due to the presence of a polar covalent bond at one end of the chain is called inductive effect (I effect). It is of two types.

(i) + I effect → substituent has less e^- attracting power than H.

(ii) - I effect → substituent has more e^- attracting power than H.

+ I effect example $-CH_3$, $-C_2H_5$

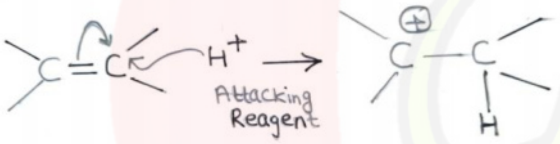
- I effect example – NO_2, - CN, -X (1½)

Electromeric effect is the complete transfer of shared pair of π e^- to one of the atom joined by multiple bond. It is of two types

(i) + E effect

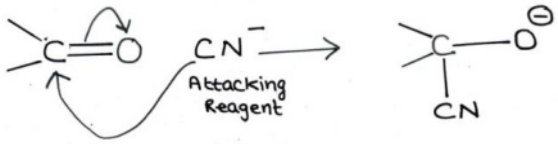
(ii) - E effect

(i) + E effect is when π e^-s are transferred to atom to which attacking reagent get attached example



(ii) - E effect is when π bond e^- all transferred to atom other than the one to which reagent get attached.

Example



(1½)

30.(a) NaOH → $Na^+ + OH^-$

0.01 M 0.01M

$K_W = [H^+][OH^-] = 10^{-14}$

$$[H^+] = \frac{10^{-14}}{0,01} \text{ x } 100 = 10^{-12}$$ (1)

pH = - log $[H^+]$

$= -\log 10^{-12}$

$= 12$ (1)

(b) SO_4^{2-} (1)

31.(a) $N_2 + 3H_2 \rightarrow 2NH_3$

$\Delta ng = 2 - 4 = -2$

$\Delta H = \Delta U + \Delta ng\, RT$

$= -87.425 \times 1000 + (-2) \times 8.314 \times 298$ (2)

$= -87425 - 4955.14$

$= -77514.7J$

OR

(a) $\Delta H = \Delta U$ when $\Delta ng = 0$

eg. $H_2 + I_2 \rightarrow 2HI$

$\Delta ng = 2-2=0$

$\therefore\ \Delta H = \Delta U + 0RT$

$\therefore\ \Delta H = \Delta U$

$\Delta H = \Delta U + P\Delta V$

when $\Delta V = 0$ then $\Delta H = \Delta U$ (2)

OR

any other relevant example.

(b) (i) $\Delta ng = 1-3 = -2$ $\Delta H = \Delta U - 2RT$ $\Delta H < \Delta U$

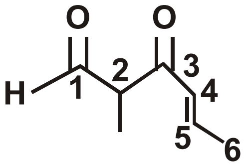
(ii) $\Delta ng = 1 - 1 = 0$ $\Delta H = \Delta U + O$

(iii) $\Delta ng = 1 - 0 = 1$ $\Delta H = \Delta U + RT$ $\Delta H > \Delta U$

$\Delta H < \Delta U$ in (i) (1)

$\Delta H > \Delta U$ in (iii) (1)

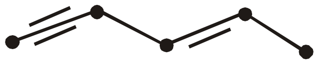
32.(a)



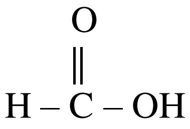
3-keto-2-methylhex – 4 – en – 1 – al (1)

(b) pent - 3 – en -1 - yne

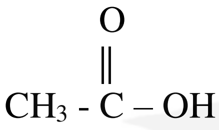
$HC\cong C-CH=CH-CH_3$



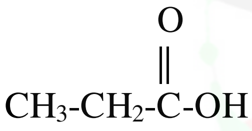
(1)

(c) (i) 

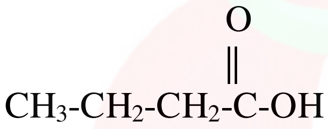
$H-\overset{\overset{O}{\|}}{C}-OH$ Methonic acid

(ii) 

$CH_3-\overset{\overset{O}{\|}}{C}-OH$ Ethanoic acid

(iii) 

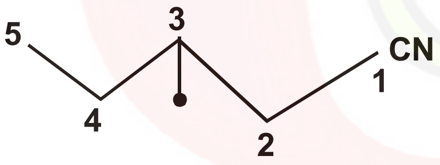
$CH_3-CH_2-\overset{\overset{O}{\|}}{C}-OH$ Propanoic acid

(iv) 

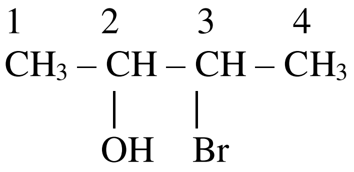
$CH_3-CH_2-CH_2-\overset{\overset{O}{\|}}{C}-OH$ Butanoic acid (2)

OR

(i)



3-methyl pentane nitrile (1)

(ii) 

$\overset{1}{CH_3}-\underset{\underset{OH}{|}}{\overset{2}{CH}}-\underset{\underset{Br}{|}}{\overset{3}{CH}}-\overset{4}{CH_3}$

3-Bromobutan-2-o1 (1)

SECTION-E

33.(a) $\Delta V = 45 \times \frac{2}{100} = 0.9$ (1)

$m = \frac{40}{1000}$

$\Delta x = \frac{h}{4\pi m \Delta v}$ (1)

$= \frac{6.626x10^{-34}}{4x3.14x40x10^{-3}x0.9}$

$= 1.46x10^{-33}m$ (1)

(b)

	Orbit	Orbital
(a)	It I well defined circular path around which e^- revolve	It is region in space around nucleus where the probability to find e^- is maximum
(b)	Represent planar motion	three dimensional motion of electron

OR / any other relevant difference. (2)

OR

(a) $\frac{\lambda A}{\lambda B} = \frac{h}{P_A}\frac{P_B}{h} = \frac{P_B}{P_A}$ (1)

$P_B = \frac{P_A}{2}$

$\frac{\lambda A}{\lambda B} = \frac{P_A}{2.P_A} = \frac{1}{2}$ (1)

$\frac{5x10^{-8}}{\lambda B} = \frac{1}{2} \therefore \lambda B = 10x10^{-8}m$

$= 10^{-7}m$ (1)

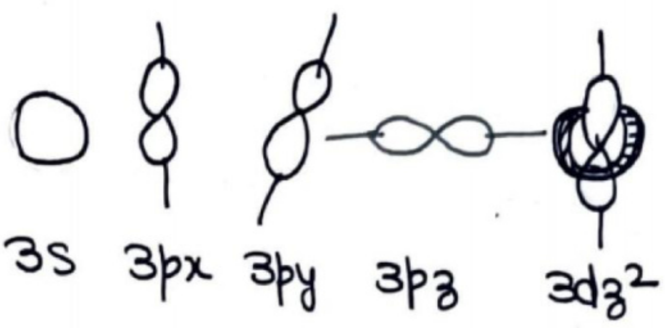
(b)

	Emission Spectrum	Absorption Spectrum
(i)	It is obtained when radiation emitted by the excited substance are analysed with spectroscope	It is obtained when white white light is passed through solution and transmitted light is analysed through spectroscope
(ii)	Emission spectrum consist of bright coloured lines separated by dark spaces.	Consist of dark lines lines in otherwise continuous spectrum

(2)

34.(a) P(Ground State) $ls^2\ 2s^2\ 2p^6\ 3s^2\ 3px^1\ 3py^1\ 3pz^1$

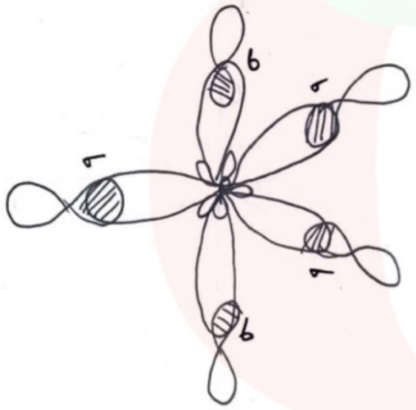
P(Excited State) $ls^2\ 2s^2\ 2p^6\ 3px^1\ 3py^1\ 3pz^1\ 3dz^{2^1}$

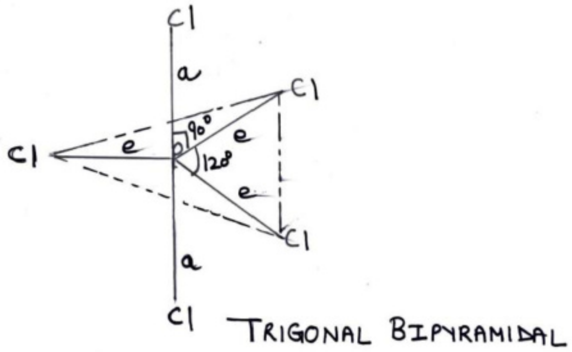


(1)

5 orbital hybridise and form 5 new orbitals of same energy and same shape.

5 sp3d hybrid orbitals adopt trigonal bipyramidal arrangement which overlap with 3pz orbital to form 5 σ bonds





(1)

Axial bonds are longer than equatorial bonds due to greater repulsions from other bonds in axial position. (1)

(b) BeH_2 is linear molecule. Therefore the resultant dipole moment of two Be-H bonds get cancelled giving zero dipole moment.

$$\longleftarrow\!\!\!+ \quad +\!\!\!\longrightarrow$$

H – Be – H $\mu=0$ (2)

OR

(a) $O_2 = \sigma ls^2\ \sigma^*ls^2\ \sigma 2s^2\ \sigma^*2s^2\ \sigma 2pz^2\ \pi 2px^2 = \pi 2py^2\ \pi^*2px^1 = \pi^*2py^1$

$O^+{}_2 = \sigma ls^2\ \sigma^*ls^2\ \sigma 2s^2\ \sigma^*2s^2\ \sigma 2pz^2\ \pi 2px^2 = \pi 2py^2\ \pi^*2px^1 = \pi^*2py^0$

$O^-{}_2 = \sigma ls^2\ \sigma^*ls^2\ \sigma 2s^2\ \sigma^*2s^2\ \sigma 2pz^2\ \pi 2px^2 = \pi 2py^2\ \pi^*2px^2 = \pi^*2py^1$ (1)

Bond order $O_2 = \frac{8-4}{2} = \frac{4}{2} = 2$

$O^+{}_2 = \frac{8-3}{2} = \frac{5}{2} = 2.5$

$O^-{}_2 = \frac{8-5}{2} = \frac{3}{2} = 1.5$ (1)

Higher is the bond order, more is the stability.

$O_2^+ > O_2 > O_2^-$ (1)

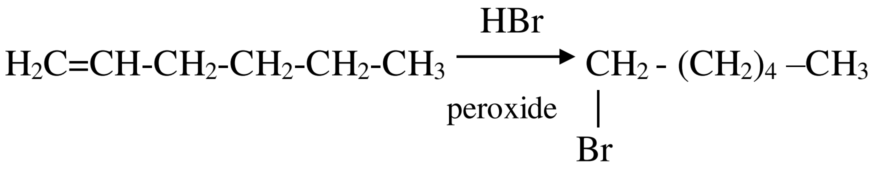
(b) CO_2 has zero dipole moment so CO_2 is linear as two C=O bond moments get cancelled where as H_2O molecule has resultant dipole moment. Two O-H bonds are arranged in angular shape and the bond moment of two O-H bonds give resultant dipole moment. (2)

35.(a)

(i) $CH_2{=}CH_2{+}H_2 \xrightarrow[523\text{- }573K]{Ni} CH_3\text{-}CH3$ (1)

(ii) $2CH_3CH_2Cl + Hg_2F_2 \longrightarrow 2CH_3CH_2F + Hg_2Cl_2$ (1)

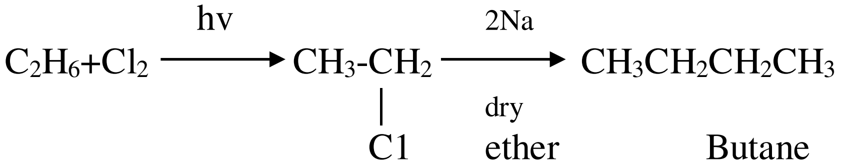
(iii) $CH_3Br + 2Na + CH_3Br \xrightarrow[ether]{Dry} CH_3\text{-}CH_3$ (1)

(b) 

$$H_2C{=}CH\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_3 \xrightarrow[\text{peroxide}]{HBr} \underset{\substack{|\\ Br}}{CH_2}\text{ - }(CH_2)_4\text{ –}CH_3$$

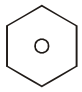
1 – bromohexane (2)

OR

(a) 

$$C_2H_6+Cl_2 \xrightarrow{hv} CH_3\text{-}\underset{\substack{|\\ Cl}}{CH_2} \xrightarrow[\text{dry ether}]{2Na} CH_3CH_2CH_2CH_3$$

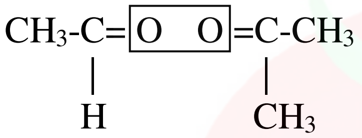
Butane (1)

(b) $3CH\cong CH \xrightarrow[\text{Fe tube}]{\text{Red Hot}}$  (1)

(c) Two isomers of C_3H_6O are

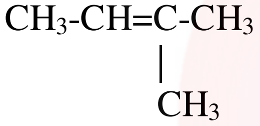
$$CH_3\text{-}CH_2\text{-}CHO \text{ and } CH_3\text{-}\underset{\substack{||\\ O}}{C}\text{-}CH_3$$

(1)



$$CH_3\text{-}\underset{\substack{|\\ H}}{C}{=}\boxed{O\quad O}{=}\underset{\substack{|\\ CH_3}}{C}\text{-}CH_3$$

(1)



$$CH_3\text{-}CH{=}\underset{\substack{|\\ CH_3}}{C}\text{-}CH_3$$

(1)

2-methyl but-2-ene