- What will be the mass of one atom of ${}^{12}C$: 1.
 - a. 1 amu b. $1.6603 \times 10^{-22} \text{ g}$ C. d.
- Bond order of He₂, He $_2^+$ and He $_2^{2+}$ are respectively. 2.
 - a. 1, $\frac{1}{2}$, 0 b. 0, $\frac{1}{2}$, 1 d. 1, 0, $\frac{1}{2}$ c. $\frac{1}{2}$, 1, 0
- To a solution of a colourless efflorescent sodium salt, when dilute acid is added, a 3. colourless gas is evolved along with formation of a white precipitate. Acidified dichromate solution turns green when the colourless gas is passed through it. The sodium salt is
 - b. Na₂S a. Na₂SO₃ c. Na₂S₂O₃ $Na_2S_4O_6$ d.
- The reaction for obtaining the metal (m) from its oxide M₂O₃ ore is given by 4. $M_2O_3(s) + 2Al(l) \xrightarrow{Heat} Al_2O_3(l) + 2M(s), (s = solid, l = liquid)$ in the case, M is a. Copper b. Calcium d. Zinc c. Iron
- 5. In the extraction of Ca by electro reduction of molten $CaCl_2$ some CaF_2 is added to the electrolyte for the following reason :
 - a. To keep the electrolyte in liquid state at temperature lower than the melting point of CaCl₂
 - b. To effect precipitation of Ca
 - c. To effect the electrolysis at lower voltage
 - d. To increase the current efficiency

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1.9923×10-23g

6 amu





9. The correct order of acidity for the following compound is :



10. For the following carbocations the correct order of stability is

- I: ${}^{\oplus}CH_2 COCH_3$ II: ${}^{\oplus}CH_2 OCH_3$ III: ${}^{\oplus}CH_2 CH_3$ a. III < II < I b. II < I < III c. I < II < III d. I < III < II
- 11. The reduction product of ethyl-3-oxobutanoate by NaBH₄ in methanol is







13. The maximum number of electrons in an atom in which the last electron filled has the quantum number n = 3, I = 2 and m = -1 is

a.	17	b.	27
c.	28	d.	30

14. In the face-centred cubic lattice structure of gold the closest distance between gold atoms is : ('a' being the edge length of the cubic unit cell)

a.
$$a\sqrt{2}$$

b. $\frac{a}{\sqrt{2}}$
c. $\frac{a}{2\sqrt{2}}$
d. $2\sqrt{2}$



15.	The equilibrium constant for the following reaction are given at 25°C							
	$2A \square \square \square B + C, K_1 = 1.0$							
	$2B \square C + D, K_2 = 16$							
	$2C + D \square \square 2P, K_3 = 25$	$2C + D \square \square 2P, K_3 = 25$						
	The equilibrium constant for the reactions P $\exists \Box \Phi$ A + $\frac{1}{2}$ B at 25° C is							
	a. <u>1</u>	b.	20					
	20	d.	21					
	c. $\frac{1}{42}$	u.						
4.6		66						
16.	Among the following, the ion which will be more \circ	effect: b	ive for flocculation of $Fe(OH)_3$ sol is :					
	$c SO^{2-}$	d.	NO ²⁻					
		u.	1103					
17.	The mole fraction of ethanol in water is 0.08. Its m	nolalit	ty is :					
	a. 6.32 molkg^{-1} c. 3.82 molkg^{-1}	b. d.	4.83 molkg ⁻¹ 2.84 molkg ⁻¹					
18.	5 ml of $0.1 \text{ M Pb}(\text{NO}_3)_2$ is mixed with 10 ml of 0.	02 M	K I. The amount of PbI ₂ precipitated					
	a. 10^{-2} mol	b.	10 ⁻⁴ mol					
	c. 2×10^{-4} mol	d.	10 ⁻³ mol					
19.	At 273 K temperature and 76 cm Hg pressure, the	e dens	sity of a gas is 1.964 gL^{-1} . The gas is					
	a. CH4	b. CC						
	c. He	d. CC)2					
20.	Equal masses of ethane and hydrogen are mix fraction of total pressure exerted by hydrogen is	ed in	an empty container at 298K. The					
	a. 15:16	b.	1:1					
	c. 1:4	d.	1:6					
21.	An ideal gas expands adiabatically against vacuum. Which of the following is correc							
	a. $\Delta S = 0$	b.	$\Delta T = -ve$					
	c. $\Delta U = 0$	d.	$\Delta \mathbf{P} = 0$					
22.	K_f (water) = 1.86 K kg mol ⁻¹ . The temperature	e at which ice begins to separate from a						
	a. – 1.86 °C	b.	– 3.72 °C					
	c. – 3.3 °C	d.	– 3 °C					

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23.	3. The radius of the first Bohr orbit of a hydrogen atom is 0.53×10^{-8} cm. The velocity of the electron in the first Bohr orbit is:						
	a. $2.188 \times 10^8 \mathrm{cm s^{-1}}$	b.	$4.376 \times 10^8 \mathrm{cm s^{-1}}$				
	c. $1.094 \times 10^8 \mathrm{cm s^{-1}}$	d.	$2.188 \times 10^9 \mathrm{cms^{-1}}$				
24.	4. Which of the following statement is not true for the reaction : $2F_2 + 2H_2\Omega \rightarrow 4HF + \Omega_2^2$						
	 a. F₂ is more strongly oxidising than O₂ b. F – F bond is weaker than O = O bond c. H – F bond is stronger than H – O bond 						
	d. F is less electronegative than O						
~							
25.	The number of unpaired electrons in the uranium (92U)	atom is :				
	a. 4	D. d	0				
	c. 5	u.	1				
26.	The difference between orbital angular momentum electron in a 4s orbitals is :	of a	n electron in a 4f orbital and another				
	a. $2\sqrt{3}$	b.	$3\sqrt{2}$				
	c. $\sqrt{3}$	d.	2				
27.	Which of the following has the largest number of a	toms	5?				
	a. 1 g of Ag	b.	1g of Fe				
	c. 1g of Cl ₂	d.	1g of Mg				
20	Indicate the connect HIDAC name of the conordination		and the sum in the firmure				
28.	Indicate the correct IUPAC name of the co-ordinati	on co	ompound snown in the figure.				
	NH ₃ NH						
	CI NH ₃						
	a. Cis-dichlorotetraminochromium (III) chloride						
		_					

- b. Trans-dichlorotetraminochromium (III) chloride
- c. Trans-tetraminedichlorochromium (III) chloride
- d. Cis-tetraamminedichlorochromium (III) chloride



- 29. A homonuclear diatomic gas molecule shows 2 electrons magnetic moment. The-electron and two-electron reduced species obtained from above gas molecule can act as both oxidizing and reducing agent. When the gas molecule is one-electron oxidized the bond length decreases compared to the neutral molecule. The gas molecule is :
 - a. N₂
 - c. 0₂

a.

b.

c.

d.

CL

Brillinn

b. Cl₂

d. B₂

- 30. CH₃ O CH₂ Cl $\xrightarrow{\text{aq.}^{-}\text{OH}}_{\Delta}$ CH₃ O CH₂ OH which information below regarding this reaction is applicable?
 - a. It follows S_N^2 pathway, because it is a primary alkyl chloride
 - b. It follows S_N1 pathway, because the intermediate carbocation is resonance stabilized
 - c. S_N 1pathway is not followed, because the intermediate carbocation is destabilised by -I effect of oxygen.
 - d. A mixed S_N 1 and S_N 2 pathway is followed

Br

Br

C

ID ////

31. Which of the following compound is asymmetric? Br



36. Which of the following give(s) a meso-compound as the main product?





37. For spontaneous polymerization, which of the following is (are) correct?

- a. ΔG is negative b. ΔH is negative
- c. ΔS positive

- d. ΔS is negative
- 38. Which of the following statement(s) is/are incorrect:
 - a. A sink of SO₂ pollutant is O_3 in the atmosphere.
 - b. FGD is a process of removing NO_2 from atmosphere.
 - c. NO₂ in fuel gases can be removed by alkaline scrubbing.
 - d. The catalyst used to convert CCl_4 to CF_4 by HF is SbF₆.

39. The total number of alkyl bromides (including stereoisomers) formed in the reaction Me₃ –

- $C CH = CH_2 + HBr \rightarrow will be$
- a. 1
- c. 3

2

b.

- d. No bromide forms
- 40. How and why does the density of liquid water change on prolonged electrolysis?
 - a. Decreases, as the proportion of $H_2 O \mbox{ increases}$
 - b. Remains unchanged
 - c. Increases as the proportion of D_2O increases
 - d. Increases, as the volume decreases



ANSWER KEYS

1. (b)	2. (b)	3. (c)	4. (c)	5. (a)	6. (c)	7.(c)	8. (c)	9.(b)	10. (d)
11. (c)	12. (a)	13. (b)	14. (b)	15. (a)	16. (a)	17. (b)	18. (b)	19. (d)	20. (a)
21. (c)	22. (c)	23. (a)	24. (d)	25. (a)	26. (a)	27. (d)	28. (d)	29. (c)	30. (b)
31. (d)	32. (b)	33. (d)	34. (a,c)	35. (a,c)	36. (a,b)	37. (a,b,d)	38. (b,c)	39. (c)	40. (a)

<u>Solution</u>

1. (b)

Mole concept 1 mole of element = atomic mass of atom 1 mole of element = 6.022×10^{23} atoms So, mass of one mole ${}^{12}C = 12g$ One mole of ${}^{12}C$ contains = 6.022×10^{23} atoms Mass of 1 atom of ${}^{12}C = \frac{12g \times 1 {}^{12}C \text{ atom}}{6.022 \times 10^{23} {}^{12}C \text{ atom}}$ = $1.9923 \times 10^{-23}g$

2. (b)

Bond order = $\frac{N_{BMO} - N_{ABMO}}{2}$ Where N_{BMO} = number of Bonding molecular orbital's electrons

 N_{ABMO} = number of antibonding molecular orbital's electrons. Electronic configuration of He₂ = $(\sigma 1s)^2 (\sigma^* 1s)^2$

From the above electronic configuration,

Bond order = $\frac{N_b - N_a}{2} = \frac{2 - 2}{2} = \frac{0}{2} = 0$ Same as for other molecules

Electronic configuration of $\operatorname{He}_{2}^{+}:(\sigma 1s)^{2}(\sigma * 1s)^{1}$

Bond order =
$$\frac{2-1}{2} = \frac{1}{2}$$

Electronic configuration of $\operatorname{He}_{2}^{2+}:(\sigma 1s)^{2}(\sigma * 1s)^{0}$

Bond order =
$$\frac{2-0}{2} = 1$$

So, Bond order of He₂, He₂⁺, He₂²⁺ are respectively 0, $\frac{1}{2}$, 1

3. (c)

When the salt reacts dilute acid, sulphur dioxide gas is liberated.

$$Na_{2}S_{2}O_{3(aq)} + 2HCl_{(aq.)} \rightarrow S_{(s)} \downarrow + SO_{2(g)} \uparrow + H_{2}O_{(\ell)} + 2NaCl_{(aq.)}$$
White ppt

 Na_2SO_3 and $Na_2S_4O_6$ both produce SO_2 on treatment with HCl but does not give white precipitate of sulphur.

Acidified dichromate solution turns green on passing SO₂ gas.

 $3SO_{2(g)} + Na_{2}Cr_{2}O_{7(g)} + H_{2}SO_{4(aq.)} \longrightarrow Cr_{2}(SO_{4})_{3(aq.)} + K_{2}SO_{4}(aq.) + H_{2}O_{(\ell)}$



4. (c)

Thermite reaction: A thermite reaction is demonstrated by igniting a mixture of aluminium and iron oxide generating molten iron and aluminium oxide.

This reaction is an oxidation-reduction reaction, a single replacement reaction.

5. (a)

In the extraction of calcium by electro-reduction of molten Calcium chloride (CaCl₂), some amount of CaF₂ is added to keep the electrolyte in liquid state at temperature lower than the melting point of CaCl₂. As it is known, the electrolyte can be decomposed if the potential applied is high enough.

6. (c)



Under alkaline condition, hydroxide attacks on carbonyl carbon of esters to furnish respective acids.

So, when the partial positive charge on carbonyl carbon increases, attack of -OH becomes more favorable and rate of hydrolysis increases.

– I effect ∝ ——

1

- I effect ∞ positive charge +M effect ∞ positive charge +I effect ∞ positive charge +M effect is dominant than +I effect.

Hence, order of rate of alkaline hydrolysis I > III > II.

8. (c)

Cannizaro reaction is a redox reaction in which two molecules of aldehyde react to give oxidation product which is a salt of a carboxylic acid and the reduction product which is an alcohol, under basic condition.

$$2Ph-C-D \xrightarrow{50\% \text{ aq. NaOH}} Ph - CD_2OH + Ph - C - ONa$$

9. (b)

Acidity \propto resonance

Acidity ∝–I effect

Anything which stabilizes the conjugate base will increase the acidity. Resonance increases the stability of conjugate base because the negative charge can be delocalized i.e. COO⁻ group.

Electron withdrawing substituent's (-NO2 group) can increase acidity of a nearby atom.

-NO₂ groupis ortho/para directing group that shows maximum acidity at para position.

CH₃ group shows +I effect which destabilize conjugate base.

So, compound I is more acidic than compound II.

Hence, the acidity order is II < III < I < IV.

10. (d)

Stability of carbocations depends on following factors: Stability of carbocation ∞ + M or +I effect Stability of carbocation ∞ Hyper conjugation



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NaBH₄ is most selective reducing agent which only reacts with aldehydes or ketones due to its milder nature. So, keto group of Ethyl-3-oxobutanoate reduce only not ester group.





12. (a)

Perkin reaction is used to convert an aromatic aldehyde and an anhydride to an α , β -unsaturated carboxylic acid using sodium acetate, and an acid work up.





In FCC lattice, the closest distance is 2r. Edge length of the cubic unit cell = a In \triangle ABC According to Pythagoras theorem: $AC^2 = AB^2 + BC^2$ $= a^2 + a^2$ $AC^2 = 2a^2$ $AC = \sqrt{2}.a$ $d = \frac{AC}{2} = \frac{\sqrt{2}.a}{2} \{d = \text{distance}$ $d = \frac{a}{\sqrt{2}}$ r (radius) = $\frac{d}{2} = \frac{a}{2\sqrt{2}}$ $2r = \frac{a}{\sqrt{2}}$

In FCC closest distance between gold atoms is $\frac{a}{\sqrt{2}}$

15. (a)

According to the question:

According to the question:

$$2A \longrightarrow B + C; K_1 = 1.0$$

$$K_1 = \frac{[B][C]}{[A]^2}$$

$$2B \longrightarrow C + D; K_2 = 16$$

$$K_2 = \frac{[C][D]}{[B]}$$

$$2C + D \longrightarrow 2P; K_3 = 25$$

$$K_3 = \frac{[P]^2}{[C]^2[D]}$$
Final reaction: $P \longrightarrow A + \frac{1}{2}B$

$$K = \frac{[A][B]^{1/2}}{[P]}$$
To get final equilibrium constant (K)
$$K = \sqrt{\frac{1}{K_3} \times \frac{1}{K_2} \times \frac{1}{K_1}}$$

$$K = \sqrt{\frac{1}{25} \times \frac{1}{16} \times \frac{1}{1.0}}$$

$$K = \frac{1}{20}$$



16. (a)

"According to Hardy Schulze rule, greater the valency of the active ion or flocculating ion, greater will be its coagulating power." thus effective flocculation of Fe(OH)₃ sol is: $PO_4^{3-} > SO_4^{2-} \approx SO_3^{2-} > NO_3^{-}$

17.(b)

```
As we know,
    Mole fraction of ethanol + mole fraction of water = 1
             (\mathbf{x}_{C_{2}H_{r}OH})
                             (\mathbf{x}_{H_{2}0})
    x_{C_2H_5OH} = 0.08
    x_{H_20} = 1 - x_{C_2H_5OH}
    x_{H_{2}0} = 0.92
    Mass of water = moles × molar mass
         = 0.92 \times 18
         = 16.56 \text{ g} = 0.01656 \text{ kg}
    Molality = \frac{\text{moles of solute}}{\text{mass of solvent(kg)}}
    m = ---0.08
          0.01656
    m = 4.83 \text{ mol/kg}
    molality of the solution is 4.83 mol/kg.
18. (b)
    Given,
    Volume of Pb(NO_3)_2 = 5 ml
    Concentration [Pb(NO_3)_2] = 0.1 M
    Moles of Pb (NO<sub>3</sub>)<sub>2</sub> = C(Concentration) × V(Volume) = \frac{5 \times 0.1}{1000} = 5×10<sup>-4</sup> mol
    Volume of KI = 10 ml
    Concentration of KI = 0.02 M
    Moles of KI = Concentration × volume
    =\frac{0.02\times10}{}
         1000
    = 2 \times 10^{-4} mol
                       Pb(NO_3)_2 + 2KI \longrightarrow PbI_2 + 2KNO_3
    Initial moles 5 \times 10^{-4} mol 2 \times 10^{-4} mol
              5 \times 10^{-4} 2 \times 10^{-4}
                                2
                                            10<sup>-4</sup> Limiting reagent
    L.R. \Rightarrow Moles of reactant is divided by its stoichiometry coefficient. Lesser moles of reactant
    is limiting reagent.
    Because of KI bing a limiting reagent, the amount of PbI<sub>2</sub> precipitated will be 10<sup>-4</sup> mol.
```

19. (d)

Given, Density (d) = 1.964 g/L Pressure (P) = 76 cm Hg= 760 mm Hg or 1 atm Temperature (T) = 273 K R = 0.0821 atm/k mol According to ideal gas equation: PV = nRT PV = $\frac{m \times R}{Mwt \times T}$ \therefore n = $\frac{mass(m)}{Moleculer weight(Mwt)}$ Molecular weight = $\frac{m \times R}{P \times V \times T}$ \therefore density = $\frac{mass(m)}{Volume(v)}$ Mwt = $\frac{d \times R}{P \times T}$ = $\frac{1.964 \times 0.0821}{1 \times 273}$ = 44g

$$44g$$
 is the molecular weight of CO_2 gas.

20. (a)

According to Raoult's law partial vapor pressure of each volatile component in the solution is directly proportional to its mole fraction.

 $P_{H_2} \propto x_{H_2}$

Suppose x_g of both are mixed.
Moles of H₂ =
$$\frac{\text{weight}}{\text{molecular weight}} = \frac{x}{2}$$

Moles of C₂H₅ = $\frac{x}{30}$
Mole fraction of H₂ = $\frac{\frac{x}{2}}{\frac{x}{2} + \frac{x}{30}} = \frac{\frac{x}{2}}{\frac{16x}{30}} = \frac{15}{16}$
So, fraction of total pressure exerted by hydrogen is $\frac{15}{16}$.

21. (c)

For an ideal gas expanding adiabatically, $\Delta U = w$ $\therefore q = 0$ So, $W = -P_{ext}\Delta V = 0$ Expansion against $P_{ext} = 0$ For Adiabatic Process: $\Delta U = q + W$ $\Delta U = 0$

22. (c) As we know $\Delta T_{\rm f} = \frac{K_{\rm f} \times W_{\rm B} \times 1000}{M_{\rm B} \times W_{\rm A}}$ Given that $K_f = 1.86 k kg / mol$ 10 mass% \Rightarrow 10g ethylene glycol mixed with 90g ice \Rightarrow 100 g solution $w_{A} = ice_{CH_{2}0} = 90g$ $w_{\rm B}$ = ethylene glycol = 10g Molecular weight of ethylene glycol $(m_{\rm B}) = 62$ So, $\Delta T_{\rm f} = \frac{1.86 \times 10 \times 1000}{62 \times 90}$ $\Delta T_{f} = 3.33^{\circ}C$ $\Delta T_{f} = T_{f}^{\circ} - T_{f}$ $T_f = \Delta T_f - T_f^{\circ}$ $T_f = -3.3^{\circ}C$ 23. (a) Velocity of electron in first Bohr orbit of hydrogen atom $mvr = \frac{nh}{mvr}$ $\frac{1}{2\pi}$ $r = 0.53 \times 10^{-8} m$ n = 1 $h = 6.626 \times 10^{-26} m$ $m = 9.1 \times 10^{-31} \text{ kg}$ $v = -\frac{nh}{n}$ 2πmr On substituting the values velocity (v) = $\frac{1 \times 6.626 \times 10^{-26}}{2 \times 3.14 \times 9.1 \times 10^{-31} \times 0.53 \times 10^{-8}}$ $= 2.18 \times 10^{6} \text{ m/s}$ $= 2.18 \times 10^{8} \text{ cm/s}$ 24. (d) Oxygen is less electronegative element than the fluorine having electro negativity values 3.44 and 3.98 respectively. Hence, the option D is incorrect. 25. (a) General electronic configuration of Uranium ($_{92}$ U) = [Rn]5f³ 6d¹ 7s² Orbital diagram of filling electrons: Filling of electrons - According to Hund's rule -1 1 1 7s 5f 6d So, the number of total unpaired electrons in uranium atom = 3 + 1 = 4WBJEE-2020 (Chemistry)

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26. (a)

Expression for the orbital angular momentum

$$(\mu_{\ell}) = \sqrt{\ell(\ell+1)} \frac{h}{2\pi}$$

For 4f electron, ℓ = 3 and

For 4s electron, $\ell = 0$

So,
$$\mu_{\ell_{(4f)}} - \mu_{\ell_{(4s)}} = \sqrt{3 + (3+1)} \frac{h}{2\pi} - \sqrt{0(0+1)} \frac{h}{2\pi}$$

= $\sqrt{12}$
= $2\sqrt{3}$

(A) 1g of Ag =
$$\frac{1}{\text{atomic weight}}$$
 mole atom of Au
= $\frac{1}{107} \times N_A$ atoms of Au
= $\frac{1}{107} \times 6.022 \times 10^{23}$ atoms of Au

Similarly,

(B) 1g of Fe =
$$\frac{1}{56}$$
 mole atom of Fe
1g of Fe = $\frac{1}{56} \times 6.022 \times 10^{23}$ atoms of Fe
(C) 1g of Cl₂ = $\frac{1}{71}$ mole molecules of Cl₂
= $\frac{1}{71} \times 6.022 \times 10^{23}$ atoms of Cl₂
(D) 1g of Mg = $\frac{1}{24}$ mole atom of Mg
= $\frac{1}{24} \times 6.022 \times 10^{23}$ atoms of Mg
So, 1g magnesium has the largest number of atoms.

28. (d)



IUPAC name of Co-ordination compound is:Cis-tetraminedichlorochromium (III) chloride.

To write the correct IUPAC name of the compound first we write cationic part and then anionic part. The prefix 'tetra' indicates presence of four NH₃ ligands prefix 'di' indicates two chlorine ligand.

The name of ligands is written in alphabetical order because both the ammonia and the chlorine atoms are on same sides hence we use cis before the name of the compound.

29. (c)

The gas molecule must be O₂ because having two unpaired electrons in its outer most electronic configuration i.e.



After removal of one electron (oxidized), bond length decreases as compared to neutral molecule.

O₂ behaves as oxidizing as well as reducing agent by either losingor gaining of an electron.

30. (b)

 $CH_{3}\text{-}O\text{-}CH_{2}\text{-}Cl \xrightarrow{aq. \overline{O}H}{\Delta} CH_{2}\text{-}O\text{-}CH_{2}\text{-}OH$

Mechanism:

$$CH_{3}-O-CH_{2} \xrightarrow{+\delta} CH_{3}-O-CH_{2} \xrightarrow{\oplus} CH_{3}-O=CH_{2}$$

$$1^{\circ} \text{ carbocation}$$

$$stabilized by +M \text{ effect of OCH}_{3} \text{ group}$$

$$\downarrow \overline{O}H$$

$$CH_{3}-O-CH_{2}-OH$$

It is the Nucleophilic substitution reaction and follows $S_N 1$ mechanism due to 1° stable carbocation.

31. (d)



Plane of symmetry is present; hence it is a symmetric molecule.



Plane of symmetry is present; hence it is a symmetric molecule.



superimposable mirror images



Plane of symmetry absent, has non superimposable mirror image (Diastereomer). Hence it is an Asymmetric compound.

32. (b)

For the reaction: $2A + B \longrightarrow P$ Rate of reaction (r) = k[A]²[B]

According to first order reaction, half-life $t_{1/2} = \frac{0.693}{K}$ is not affected by change in

concentration.

So, order of the reaction with respect to b is one, similarly for A is also one. Overall order of the reaction = 1 + 1 = 2Hence, unit of rate constant is L/mol.

33. (d)

Given that solubility product of $SrCO_3 = 7.0 \times 10^{-10}$ Solubility product of $SrF_2 = 7.9 \times 10^{-9}$ Concentration of $[CO_3^{2-}] = 1.2 \times 10^{-3}$ M Solution is saturated with $SrCO_3$ and SrF_2 . $SrF^2 \rightarrow Sr^{2+} + 2F^ K_{sp}SrF_2 = [Sr^{2+}][F^-]^2$ $SrCO_3 \rightarrow Sr^{+2} + Co_3^{2-}$ $K_{sp}(SrCO_3) \rightarrow (Sr^{+2})[CO_3]^{2-}$

S0,

$$\frac{K_{sp}(SrF_{2})}{K_{sp}(SrCO_{3})} = \frac{\left[Sr^{+2}\right]\left[F^{-}\right]^{2}}{\left[Sr^{+2}\right]\left[CO_{3}^{2^{-}}\right]} = \frac{\left[F^{-}\right]^{2}}{\left[CO_{3}^{2^{-}}\right]}$$
$$\left[F^{-}\right]^{2} = \frac{\left[CO_{3}^{2^{-}}\right] \times 7.9 \times 10^{-10}}{7 \times 10^{-10}}$$
$$\left[F^{-}\right]^{2} = \frac{1.2 \times 10^{-3} \times 7.9}{7}$$
$$\left[F^{-}\right]^{2} = 13.5 \times 10^{-4}$$
$$\left[F^{-}\right] = \sqrt{13.5 \times 10^{-4}}$$
$$\left[F^{-}\right] = 3.7 \times 10^{-2} M$$
So, concentration of F⁻ in the solution would be 3.7 \times 10^{-2} M

```
Reactions of SiO<sub>2</sub>:

SiO<sub>2</sub> + HF \longrightarrow H<sub>2</sub>[SiF<sub>6</sub>] + H<sub>2</sub>O

SiO<sub>2</sub> + NaOH \longrightarrow Na<sub>2</sub>SiO<sub>3</sub> + H<sub>2</sub>O

SiO<sub>2</sub> is an acid oxide. Therefore, it dissolves in alkaline solutions.
```

35. (a,c)





In the above reaction, presences of Na in liquid NH3 alkynes reduce to give trans alkene. Alkaline KMnO₄ gives vicinal diol as oxidation product. These diols are enantiomers of each other.

36. (a,b)



37. (a,b,d)

The free energy change for any polymerization will be,

 $\Delta G = G_{polymer} - G_{monomer}$

So, $\Delta G = \Delta H - T \Delta S$

 $\Delta T = (H_{polymer} - H_{monomer}) - T(S_{polymer} - S_{monomer})$

When the polymer has a lower free energy than the initial monomer, a polymerisation can occur spontaneously and the sign of ΔG is negative. ΔH is negative due to it's an exothermic process. Entropy change for polymerisation is also negative because, polymers are orderly arranged.

38. (b,c)



Fuel gas desulphurisation (FGD) process is used to remove sulphur from exhaust flue gases. In this system, the sulphur removed from the flue gas is converted into its elemental form or

into sulphuric acid.

Alkaline scrubbing is used to remove SO₂ from combustion exhaust gas.

39. (c)

For chemical reaction:



Total number of stereo isomers possible for 4,4-dimethylpentene are three. As the molecule contain one chiral carbon atom.

Number of R and S isomers = $2^{n-1} = 2^{1-1} = 2$

So, total number of stereo isomers possible are = 2 + 1 = 3.

40. (a)

In electrolysis, water is decomposed in the presence of electricity, to produce hydrogen gas and oxygen gas. The half reaction,

Reduction at cathode: $2H^+(aq.) + 2e^- \longrightarrow H_2(g)$ Oxidation at anode: $2H_2O(\ell) \longrightarrow O_2(g) + 4H^+(aq.) + 4e^-$

Over all reaction: $2H_2O(\ell) \longrightarrow 2H_2(g) + O_2(g)$

On electrolysis volume of gases produced increases.

Relation between density and volume

Density = $\frac{Mass}{Volume}$

As the volume increases density decreases, so as the proportion of water molecules increases density decreases.

