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ANNUAL EXAMINATION

Class - XI
Section - A
Subject - Chemistry
Subject Code - 043
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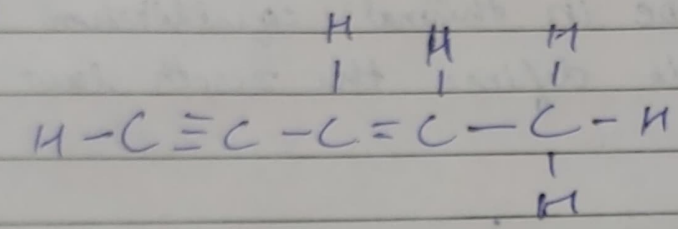
Roll No. - 07
Father's Name - Ravindra Mishra

Section - A

A1. (i)

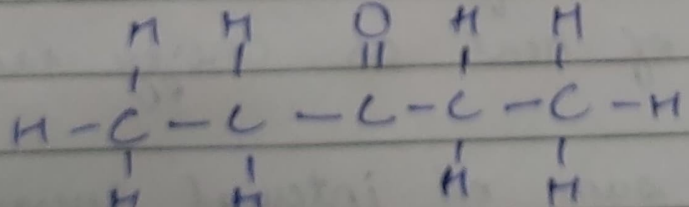


According to the diagram;

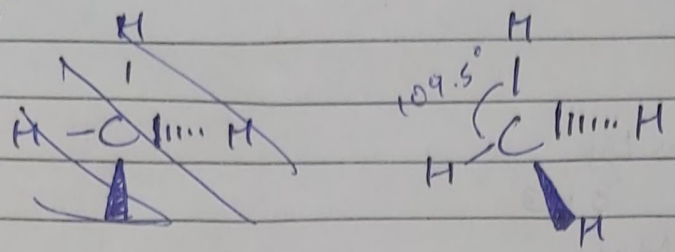
No. of sigma bonds = 10
No. of pi bonds = 3

A2. (ii) sp^3

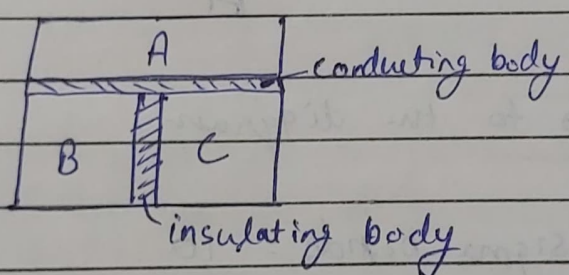
A3. (iii)



A1. (iv)



A2. (i) When a body 'A' is in thermal equilibrium with another body 'b', and also separately in thermal equilibrium with a body "C", then body 'B' and 'C' will also be in thermal equilibrium with each other. This defines the zeroth law of thermodynamics.



(ii) ~~Second~~ Second Law of thermodynamics.

(iii) System is defined as any part of the ~~observable~~ universe with definite boundaries through which exchange of heat or energy takes.

(iv) Enthalpy is the sum of internal energy and the product of pressure and volume of a thermodynamic system.

A3. (a) 6.022×10^{23} molecules of oxygen.

A4. (a) 1

A5. (b) Fe^{3+}, Mn^{2+}

A6. (d) 1

A7. (c) $\Delta S_{(system)}$ decreases but $\Delta S_{(surroundings)}$ increase.

A8. (d) $i^- > i > i^+$

A9. (a) enthalpy of fusion + enthalpy of vapourisation.

A10. (a)

A11. (b) $LiH < NaH < KH < RbH < CsH$

A12. ~~(c) It has~~ (a) Exceptionally small size of its atom and high polarising power.

A13. (b) Fullerenes are cage-like ~~molecule~~ molecules and Graphite is ~~the most~~ thermodynamically most stable allotrope of carbon.

A14. (b) 1- Chloro - 4 - methyl - 2 - nitrobenzene

A15. (c) 2° Carbocation

A16. (a) ~~I~~ $I_2 < Br_2 < Cl_2 < F_2$

Section - B

A17. The molar mass of Na_2SO_4 = $2\times(23)+32+4\times(16)$
= 142

Now,
The mass percent of Na = $\frac{46}{142}\times 100$ = 32.4 %

The mass percent of O = $\frac{64}{142}\times 100$ = 45.0%

A16. ~~Given,~~
~~Percentage of iron oxide = 69.9~~

A18. Given,
Percentage of iron = 69.9 %
Percentage of dioxygen = 30.1 %
Now,
Let us take 100g of iron oxide
Therefore,
Mass of iron = 69.9 g
Mass of dioxygen = 30.1 g
Now,
No. of moles of iron present in iron oxide = $\frac{69.9}{55.8}$ = 1.25

No. of moles of dioxygen present in iron oxide = $\frac{30.1}{16}$ = 1.88

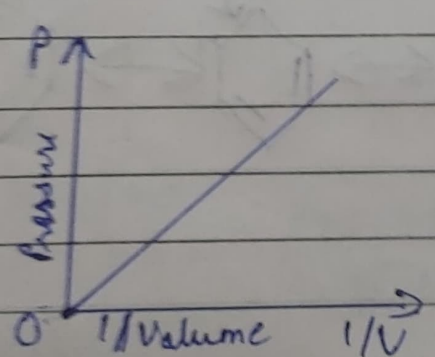
Now, the ratio of the number of oxygen atoms to the number of carbon atoms present in one formula unit of iron oxide = $\frac{1.88}{1.25}$ = 1.5 : 1 or 3 : 2

Hence, the formula of iron oxide is Fe_2O_3

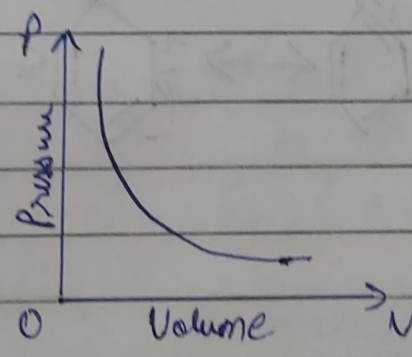
A19. Given,
Mass of oxygen = 8g
Mass of hydrogen = 4g
∴ No. of mole of $O_2 = \frac{8}{32} = 0.25$ mol
~~No. of moles of H_2~~
No of moles of $H_2 = \frac{4}{2} = 2$ mol
Now,
We know,
$PV = nRT$
$P \times 1 = (0.25 + 2) \times 0.083 \times 300$ { $R = 0.083$ (Given), $T = 27°C = 300°K$ }
$P = 56.02$ bar

A20. Boyle's law states that, the pressure of a fixed mass of a gas is inversely proportional to its volume if temperature is kept constant.
$P \propto \frac{1}{V}$
$PV =$ constant (n and T are constant)
$\Rightarrow P_1V_1 = P_2V_2$

Graphs.



Graph of P against 1/V



Graph of P against V

A21. In the given reaction,

Pb is oxidized
PbO_2 is reduced
PbO_2 is the oxidizing agent
Pb is the reducing agent.

A22.

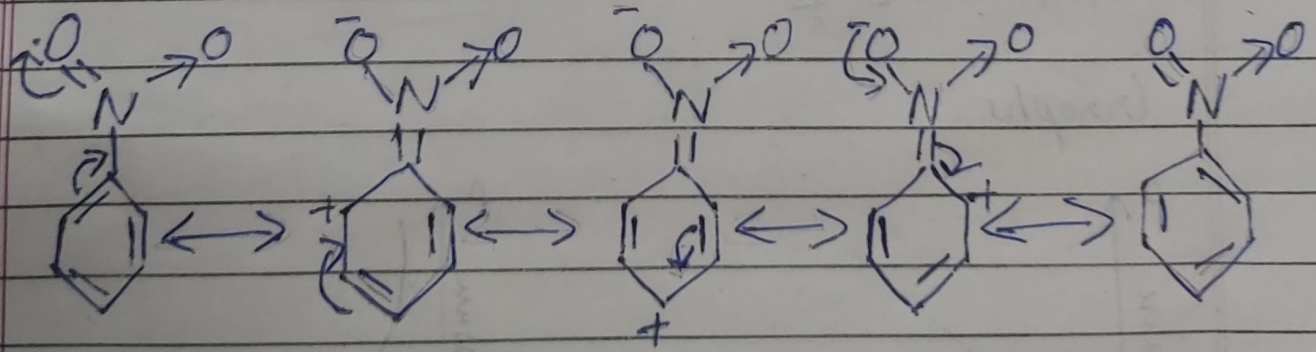
(a) Let the oxidation number of P in HPO_3^{2-} be x,

$+1 + x + (-6) = -2$
$\Rightarrow x = +3$

(b) Let the oxidation number of P in PO_4^{3-} be x,

$\Rightarrow x + (-8) = -3$
$\Rightarrow x = +5$

A23.



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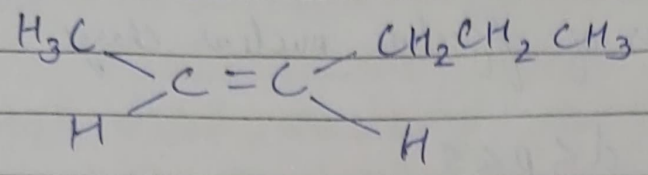
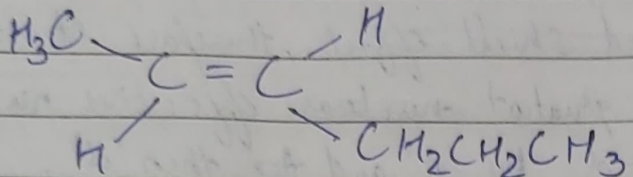
A24.



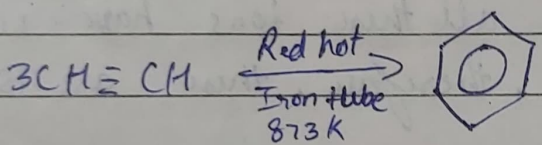
Cis-form



Trans-form.

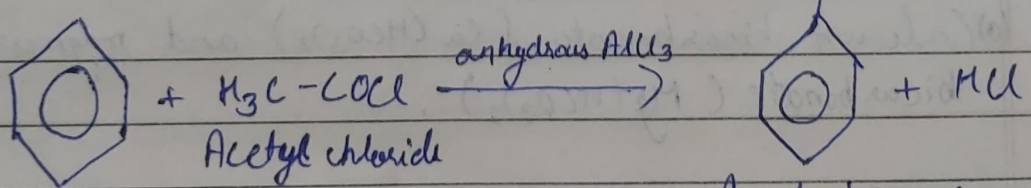
The cis form will have higher boiling point due to more polar nature leading to stronger intermolecular dipole-dipole interaction, thus requiring more heat to seperate them.

A25. (a)



Benzene

(b)



Benzene

Acetyl chloride

Acetophenone

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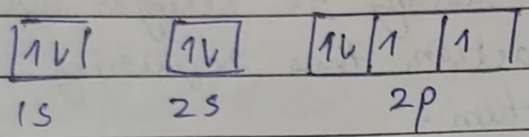
Section-C

A26. Increasing order of effective nuclear charge.

~~s > p > d~~ $d < p < s$

This is so because s subshell is the nearest to the nucleus ~~and shield effect~~, therefore it will have the greatest ~~nucleus~~ effective nuclear charged, followed by 'p' and ~~the~~ then 'd'.

Orbital diagram of oxygen. (atomic number 8).



A27. (a) In the given, all these ions have 10 electrons in their shell, therefore, these are iso-electronic species.

(b) $Al^{3+} < Mg^{2+} < Na^{+} < F^{-} < O^{2-} < N^{3-}$

A28. (a) Calcium bicarbonate ($Ca(HCO_3)_2$) and magnesium bicarbonate ($Mg(HCO_3)_2$).

(b) ~~Det~~ Deuterium ($^{2}_{1}H$) and Tritium ($^{3}_{1}H$) and Protium ($^{1}_{1}H$)

(c) Protium ($^{1}_{1}H$)

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A29. (a) Alkali metals are highly reactive in nature. That's why they always exist in combined state in nature.

(b)

(i) When sodium metal is dropped in water, hydrogen gas is evolved as sodium is extremely reactive with water, also H_2 gas catches fire as it creates intense heat from the reaction.

$$2Na + 2H_2O \rightarrow 2NaOH + H_2$$

(b) When sodium metal is heated in the presence of free supply of air sodium peroxide is formed along with the small quantity of sodium oxide.

$$2Na + O_2 \rightarrow Na_2O_2$$

A30. (a) Carbon (C)

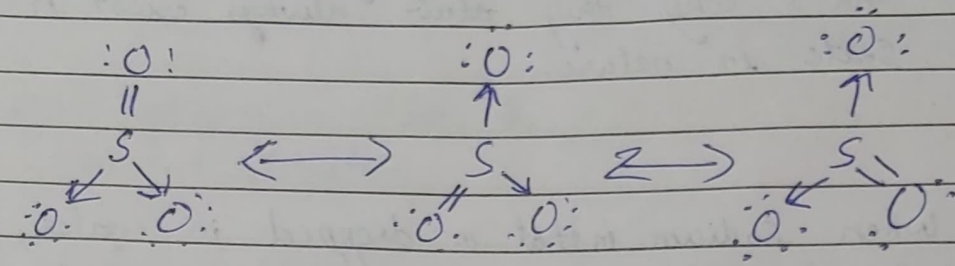
(b) Boron is used in a neutron reactors because of its neutron absorbing properties.

(c) Due to smaller size of F as compared to Cl, six small F atoms can be easily accommodated around Si atom while Cl cannot since F are present in smaller 2p orbital and Cl are present in larger 3p orbital therefore interaction of F lone pair electron with d-orbitals of silicon are stronger in F as compared to Cl.

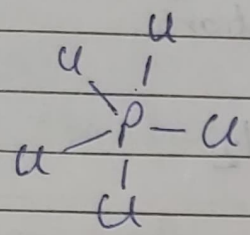
Section - D

A30.

A31. (i)



(ii)



According to the structure,
No. of of Sigma (σ) bonds in PCl_5 is 5
$\therefore$ ~~Hybriba~~ Type of Hybridisation is sp^3d
And shape will be Trigonal bipyramidal.

(iii)

Sigma (σ)	Pi (π)
• It is formed by head on overlap of s-s, s-p and p-p orbitals.	• It is formed by lateral overlap of p-p orbitals. formed after the formation of σ
• Single bond are sigma bonds.	• Multiple bonds are pi bonds.
• It is a strong bond.	• It is weak bond.
• Free rotation is allowed	• No free rotation is allowed.
• ∞ , ∞∞ , ∞∞∞	• ∞

A32. (a) Equilibrium constant, $K_c = \frac{[NO]^2[Cl_2]}{[NOCl]^2}$

(b) (i) When ~~hygro~~ hydrogen is added, the equilibrium shifts in the forward direction.

(ii) When methanol (CH_3OH) is added, the equilibrium will shift in backward direction.

(iii) When CO is removed, the equilibrium will shift in the backward direction.

(iv) When methanol (CH_3OH) is removed, the equilibrium will shift is the forward direction.

(c) Equilibrium constant, $K_c = \frac{[O_3]^2}{[O_2]^3}$

Now,
Concentration of O_3

$$\Rightarrow 2 \times 10^{-50} = \frac{[O_3]^2}{(1.6)^3 \times 10^{-6}}$$

$$\Rightarrow [O_3]^2 = 2 \times 10^{-50} \times (1.6)^3 \times 10^{-6}$$

$$\Rightarrow [O_3] = \sqrt{18.192 \times 10^{-28}}$$

$$[O_3] = 2.86 \times 10^{-28} \text{ mol } L^{-1}$$

A33. (a) A Lindlar's catalyst is a heterogenous catalyst that consists of palladium deposited on calcium carbonate which is then poisoned with various forms of lead as sulphur.
It used for the hydrogenation of alkynes to alkenes.
~~and is named after~~

(b) According to Huckel's rule, all planar aromatic compounds must have $(4n+2]$ pi-electrons where n is an integer (i.e. $n = 0, 1, 2, 3, 4$, ... etc).
This rule estimates whether a planar ring compound will posses aromatic properties or not.

(c) The reaction in which alkyne halides on treatment with sodium metal in ~~dry~~ dry either to give substituted aromatic compound.
Example - $CH_2Br + 2Na + BrCH_3 \xrightarrow{\text{dry ether}} CH_3-CH_3 + 2Na$.

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(d) (i) $C_6H_6 + Br_2 \xrightarrow{\text{anhydrous } AlCl_3} C_6H_5Br + HBr$

(ii) $C_6H_6 + H_2SO_4 \longrightarrow C_6H_5SO_3H + H_2O$
(benzene sulphonic acid)