

# CHEMISTRY STUDY MATERIALS FOR CLASS 12 (NCERT Based Reasoning of Chapter -07)

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## P – block elements

1

Nitrogen does not form pentahalide although it exhibit +5 oxidation state.

Due to absence d-orbitals N cannot extend its valency beyond four

2

PH<sub>3</sub> has lower B.pt than NH<sub>3</sub>

N is more electronegative than P so in NH<sub>3</sub> there is intermolecular H-bonding hence it has high b.pt

3

NH<sub>3</sub> acts as Lewis base

Because N has a lone pair electron so NH<sub>3</sub> acts as a Lewis base

4

NO<sub>2</sub> dimerises

NO<sub>2</sub> has an odd electron so it dimerises to pair up electron and to achieve octet configuration

5

NH<sub>3</sub> is stronger base than PH<sub>3</sub>

Due to smaller size of nitrogen there is high electron density on nitrogen so electron pair is easily available.

6

PCl<sub>3</sub> fumes in moisture

PCl<sub>3</sub> undergoes hydrolysis and gives fumes of HCl.



7

All the five P-Cl bonds are not equal in PCl<sub>5</sub>

The two axial bonds suffer more repulsion from equatorial bonds and hence are elongated.

8	H <sub>3</sub> PO <sub>2</sub> has reducing character
	Since it has two P-H bonds
9	H <sub>3</sub> PO <sub>3</sub> is dibasic (diprotic) but H <sub>3</sub> PO <sub>4</sub> is tribasic
	In H <sub>3</sub> PO <sub>3</sub> only two H atoms are linked to O which are ionisable the third H is attached to P and not ionisable because P is less electronegative. In H <sub>3</sub> PO <sub>4</sub> all the three H atoms are with O and ionisable
10	PCl <sub>5</sub> is ionic in solid state
	It is due to the following conversion : $2\text{PCl}_5 \rightarrow [\text{PCl}_4]^+[\text{PCl}_6]^-$
11	NO is paramagnetic in gaseous state but diamagnetic in liquid and solid state
	NO(g) has odd number of electrons so it is paramagnetic but in liquid and solid state it exists as dimer so there is no unpaired electron and it will be diamagnetic
12	NCl <sub>3</sub> hydrolysed but NF <sub>3</sub> does not
	In NCl <sub>3</sub> Cl has vacant d-orbitals to accept the lone pair from H <sub>2</sub> O but in NF <sub>3</sub> F has no d-orbitals $\text{NCl}_3 + 3\text{H}_2\text{O} \rightarrow \text{NH}_3 + 3\text{HOCl}$
13	Nitrogen shows little catenation but phosphorous distinctly shows catenation property
	Due to smaller size of N there is repulsion between the lone pairs and N-N single bond is weaker than P-P
14	+5 oxidation state of Bi is less stable than +3
	Because inert pair effect is very prominent in Bi , so +5 oxidation state is not stable
15	Bi in +5 oxidation state is strong oxidizing agent
	Because inert pair effect is very prominent in Bi so Bi <sup>5+</sup> can be easily converted into Bi <sup>3+</sup>

16	NO(nitric oxide) becomes brown when released to air
	It oxidizes to NO <sub>2</sub>
17	NH <sub>3</sub> is a good complexing agent/ NH <sub>3</sub> acts as a ligand
	It has lone pair of electron on N-atom and can be donated for the coordination bond.
18	Bi <sub>2</sub> O <sub>3</sub> is not acidic
	The size of Bi <sup>3+</sup> is very large and so there is very weak +ve electric field around it so it does not interact with water to release H <sup>+</sup>
19	BiH <sub>3</sub> is the strongest reducing agent among the group-15 hydrides
	Since Bi-H bond is the weakest among pr-15 hydrides so H <sub>2</sub> gas is evolved which is reducing
20	N <sub>2</sub> is less reactive at room temperature
	Due to having triple bond and hence high bond dissociation energy(946 kJ/mol)
21	Bond angle in PH <sub>4</sub> <sup>+</sup> higher than in PH <sub>3</sub>
	In PH <sub>3</sub> there is lp-bp repulsion so bond angle is less where as in PH <sub>4</sub> <sup>+</sup> there is no lp-bp repulsion
22	NH <sub>3</sub> has greater bond angle than PH <sub>3</sub>
	N is more electronegative so it attracts the bond pair electron and hence there is greater bp-bp repulsion in NH <sub>3</sub> and hence greater bond angle
23	R <sub>3</sub> P=O exists but R <sub>3</sub> N=O does not
	N due to absence of d-orbitals cannot form pπ-dπ multiple bond
24	N exists as N <sub>2</sub> but P exists as P <sub>4</sub>
	Due to smaller size N can form pπ-dπ multiple bonding and exists as discrete N <sub>2</sub> molecule but P cannot form pπ-pπ multiple bonding.
25	PCl <sub>5</sub> can not act as reducing agent

	In $\text{PCl}_5$ P has +5 oxidation state. P has five valence electron in its valence shell so it can not increase its oxidation state beyond +5, so it can not act as reducing agent.
26	Phosphorous is kept under kerosene
	It is highly reactive and easily catches fire due to air oxidation
27	$\text{H}_3\text{PO}_3$ is syrupy liquid
	Due to intermolecular H-bonding
28	$\text{PH}_3$ bubbles but $\text{NH}_3$ dissolves in water
	$\text{NH}_3$ forms H-bonding with water but $\text{PH}_3$ can not form so $\text{NH}_3$ dissolves but $\text{PH}_3$ bubbles out
29	Only a small increase in radius is observed from As to Bi
	Due to poor shielding effect of d and f orbitals.
30	Nitrogen is gas where as phosphorous is solid at room temp.
	Nitrogen is diatomic molecule having weak van der Waals attraction where as phosphorous is tetra atomic so it has strong van der Waals attraction.
31	N-N bond is weaker than P-P bond
	Due to shorter bond length there is greater repulsion between lone pairs in $\text{N}_2$
32	Maximum number of covalent bond formed by N is four
	Because it has three unpaired electrons and one lone pair.
33	$\text{P}_2\text{O}_5$ can not be used for drying ammonia gas.
	$\text{P}_2\text{O}_5$ is acidic it reacts with ammonia in presence of moisture and form $(\text{NH}_4)_3\text{PO}_4$
34	$\text{NO}_2$ is coloured but its dimer $\text{N}_2\text{O}_4$ is colourless
	Because $\text{NO}_2$ has unpaired electron so it can absorb light from VR
35	Acidity of oxyacids of nitrogen increases with increase in oxidation number of N

	Because non metallic character increases with oxidation number
36	White phosphorous is more reactive than red phosphorous
	White phosphorous consists of discrete $P_4$ molecules which is tetrahedral so reactive but in red phosphorous the $P_4$ molecules are linked in extended chain structure so it is less reactive.
37	Phosphinic acid ( $H_3PO_4$ ) is mono basic / mono protic
	Only one H atom is linked with O which is ionisable
38	$N_2$ has higher bond dissociation energy than NO
	Because $N_2$ has higher bond order
39	$N_2$ and CO have same bond order but CO is more reactive
	CO is polar molecule
40	$(CH_3)_3N$ is pyramidal but $(SiH_3)_3N$ is planar
	$(CH_3)_3N$ is pyramidal due to $sp^3$ hybridisation and one lone pair on N but $(SiH_3)_3N$ is planar due to $sp^2$ hybridisation and its lone pair is donated to vacant d orbital of Si for $p\pi-d\pi$ overlap
41	The first IE of N is greater than that of O
	It is due to half filled and hence stable electronic configuration of N
42	$HNO_2$ disproportionates
	In $HNO_2$ the N is in +3 oxidation state which may increase as well as decrease
43	$PCl_5$ can not act as reducing agent
	In $PCl_5$ phosphorous is in +5 oxidation state that is the highest oxidation state of P.

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