BYJU'S Study Planner for Board Term I
(CBSE Grade 12)

Date: 21/11/2021

Subject: Chemistry

Topic : P-block elements

Class: Standard XII

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1. The noble gases have closed-shell electronic configuration and are monoatomic gases under normal conditions. The low boiling points of the lighter noble gases are due to weak dispersion forces between the atoms and the absence of other interatomic interactions.
The direct reaction of xenon with fluorine leads to a series of compounds with oxidation numbers $+2, +4$ and $+6$. XeF_4 reacts violently with water to given XeO_3. The compounds of xenon exhibit rich stereochemistry and their geometries can be deducted considering the total number of electron pairs in the valence shell.

   Argon is used in arc welding because of its

   ✔ **A.** Low reactivity with metal

   ✘ **B.** Ability to lower the melting point of metal

   ✘ **C.** Flammability

   ✘ **D.** High caloric value

   Argon, being a noble gas, will not react with the metals, thus, can be used in arc welding.

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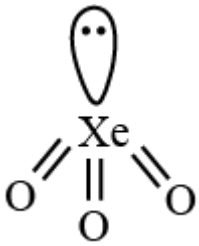
The structure of XeO_3 is

- **A.** Linear
- **B.** Planar
- **C.** Pyramidal
- **D.** T-shaped

In XeO_3 there are total of 4 electron pairs around central atom. Out of which 3 are bonding electron pair and one is non-bonding electron pair. This combination provides sp^3 -hybridization and pyramidal shape.



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3. The noble gases have closed-shell electronic configuration and are monoatomic gases under normal conditions. The low boiling points of the lighter noble gases are due to weak dispersion forces between the atoms and the absence of other interatomic interactions.
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XeF_4 and XeF_6 are expected to be

- ✔ **A.** Oxidizing
- ✘ **B.** Reducing
- ✘ **C.** Unreactive
- ✘ **D.** Strongly basic

All xenon floorides are strongly oxidizing, XeF_4 can act as reducing agent (with F_2) as well as oxidizing agent but XeF_6 can only function as an oxidizing agent.
$6XeF_4 + 12H_2O \rightarrow 4Xe + 2XeO_3 + 24HF + 3O_2$
$XeF_6 + 3H_2O \rightarrow XeO_3 + 6HF$

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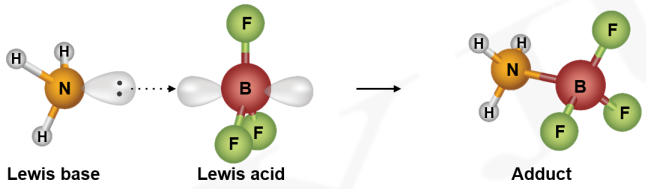
4. Which of the following analogies is correct regarding NH_3

BF_3 : Lewis acid :: NH_3 _____?

- **A.** Lewis acid
- **B.** Lewis base
- **C.** Bronsted acid
- **D.** Bronsted base

BF_3 acts as lewis acid and NH_3 acts as lewis base together they form adduct.



5. Match the correct combination :

Column I	Column II
A) B_2H_6	P) Lewis acid
B) BF_3	Q) Tetrahedral
C) $AlCl_3$	R) sp^3 hybridisation
D) BH_4^-	S) Planar molecule

- **A.** $A \rightarrow P, Q, R;\ B \rightarrow P, S;\ C \rightarrow P, S;\ D \rightarrow Q, R$
- **B.** $A \rightarrow P, S;\ B \rightarrow P, S;\ C \rightarrow Q, R;\ D \rightarrow P, S$
- **C.** $A \rightarrow Q, R;\ B \rightarrow P, S;\ C \rightarrow R, S;\ D \rightarrow P, S$
- **D.** $A \rightarrow P, S;\ B \rightarrow P, S;\ C \rightarrow Q, R;\ D \rightarrow R, S$

$B_2H_6 : B - sp^3$ Hybridisation, Tetrahedral, Lewis acid
$BF_3 : B - sp^2$ Hybridisation, planar - Lewis acid
$AlCl_3 : Al - sp^2$ Hybridisation - Planar and Lewis acid
$BH_4^- : B - sp^3$ Hybridisation, Tetrahedral

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6. Directions : In the following questions, A statement of Assertion (A) is followed by a statement of
Reason (R). Mark the correct choice as.

Assertion (A) : N_2 is less reactive than P_4.
Reason (R) : Nitrogen has more electron gain enthalpy than phosphorus.

- ✗ **A.** Both A and R are true and R is the correct explanation of A
- ✗ **B.** Both A and R are true but R is NOT the correct explanation of A
- ✓ **C.** A is true but R is false
- ✗ **D.** A is false and R is True

Due to high bond dissociation energy of tripe bond between the two N atoms, nitrogen (N) is less reactive than P_4 and its electron gain enthalpy is less than phosphorus.

7. Assertion (A) : Group 18 gases exhibit very high ionisation enthalpy.
Reason (R) : They have a stable electronic configuration.

- ✓ **A.** Both A and R are true and R is the correct explanation of A
- ✗ **B.** Both A and R are true but R is NOT the correct explanation of A
- ✗ **C.** A is true bur R is false
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Group 18 gases exhibit very high ionisation enthalpy because they have a stable electronic configuration.

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8. The product obtained on passing excess carbon dioxide through lime water is ___

- ✗ **A.** $CaCO_3$
- ✓ **B.** $Ca(HCO_3)_2$
- ✗ **C.** $CaHCO_3$
- ✗ **D.** Ca_2CO_3

Lime water is aqueous solution of $Ca(OH)_2$.
When CO_2 is passed through lime water, it turns milky due to formation of $CaCO_3$.
If excess of CO_2 is added, precipitate of $CaCO_3$ dissolve to form $Ca(HCO_3)_2$
$Ca(OH)_2(aq) + H_2O(l) + 2CO_2(g) \rightarrow Ca(HCO_3)_2(aq)$

9. Group 13 elements react with dinitrogen at high temperature to form :

- ✓ **A.** Nitrides
- ✗ **B.** Nitrates
- ✗ **C.** Nitrites
- ✗ **D.** None of the above

Group 13 elements react with dinitrogen at high temperature to form nitrides.
$2B(s) + N_2(g) \rightarrow 2BN(s)$

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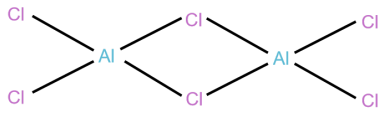
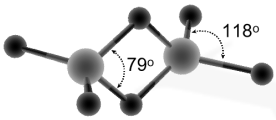
10. Aluminium (III) chloride forms a dimer through

- **A.** Chlorine bridging
- **B.** hydrogen bond
- **C.** Aluminium bridging
- **D.** (a) and (c) above.

$AlCl_3$ can form dimer through halogen bridging and exists as Al_2Cl_6 because it has vacant d-orbitals which can accommodate electron from chlorine atom.





11. Boric acid on heating gives:

- **A.** B_2O_3
- **B.** $H_2B_4O_7$
- **C.** H_2BO_3
- **D.** None of the above

Orthoboric acid, H_3BO_3 is a white crystalline solid, with soapy touch. It is sparingly soluble in water but highly soluble in hot water.
On heating, orthoboric acid above 370 K forms metaboric acid, HBO_2 which on further heating yields boric oxide, B_2O_3.

$$H_3BO_3 \xrightarrow{100^\circ C} HBO_2 \xrightarrow{\Delta} B_2O_3$$

Hence correct option is a.

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12. Name the ore of tin and lead.

- ✔ **A.** Cassiterite, galena
- ✘ **B.** Galena, bauxite
- ✘ **C.** Magnetite , cassiterite
- ✘ **D.** Galena, Hematite

Tin occurs mainly as cassiterite, SnO_2 and lead as galena, PbS.

13. The most commonly used reducing agent among the following is

- ✘ **A.** $AlCl_3$
- ✘ **B.** $PbCl_2$
- ✘ **C.** $SnCl_4$
- ✔ **D.** $SnCl_2$

+4 oxidation state of Sn is more stable than +2 oxidation state.
Therefore, Sn^{2+} and hence $SnCl_2$ acts a reducing agent.
$SnCl_2 + Cl_2 \rightarrow SnCl_4 + 2e^-$

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14. In a Buckminsterfullerene (C_{60}) :

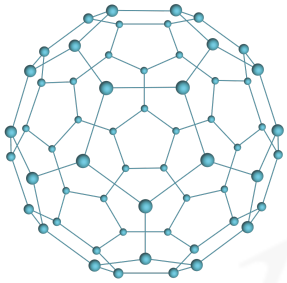
A. Carbons in five membered rings have sp^3 hybridization

B. Carbons of six membered rings have sp hybridization

C. All carbons are identical and have sp^2 hybridization.

D. (a) and (b) above.

In a Buckminsterfullerene (C_{60}) :



All the carbon atoms are identical and undergo sp^2 hybridization. Each carbon atom forms three sigma bonds with other three carbon atoms. The remaining electron at each carbon atom is delocalized.

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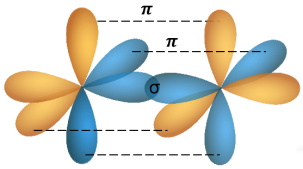
15. Carbon dioxide molecule contains

- ✗ **A.** single covalent bond
- ✓ **B.** double covalent bond
- ✗ **C.** triple covalent bond
- ✗ **D.** ionic bond

CO_2 is a linear molecule $O = C = O$. It consists of double covalent bonds. It has linear shape [with both C-O bonds of equal length (115 pm)] with no dipole moment.



16. Which one of the following is most stable ?

- ✗ **A.** Al^+
- ✗ **B.** Ga^+
- ✗ **C.** In^+
- ✓ **D.** Tl^+

For boron family, Relative stability of +1 oxidation state progressively increases for heavier elements. Hence $Tl^+$is most stable.

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17. Boron has an extremely high melting point because of:

✗ **A.** The strong van der waals forecs between its atoms

✓ **B.** Due to very strong crystalline lattice.

✗ **C.** Its ionic crystal structure

✗ **D.** Allotropy

Boron has very high melting point because of its small atomic size and very strong crystalline lattice.
It forms strong covalent bonds with the neighbouring atoms. Thus boron atom are closely packed in its solid state, so a large amount of heat is needed to break the bonds between atoms.
Thus boron has an extremly high melting point. Hence, the correct answer is option (b).

18. The correct order of atomic radii in group 13 elements is

✓ **A.** $B < Ga < Al < In < Tl$

✗ **B.** $B < Al < Ga < Tl < In$

✗ **C.** $Ga < Al < Tl < In < B$

✗ **D.** $B < In < Al < Tl < Ga$

Down the group, for each successive member one extra shell of electrons is added. Atomic radius increases down the group. But, there is an exception. Presence of additional 10 d-electrons in Ga offer poor screening effect for the outer electrons which increases the force of attraction between the outermost electrons and nuclear charge, due to which the atomic radius of gallium decreases.
Hence, Ga has a lower atomic radius as compared to Al.
Hence, the correct order of atomic radii is

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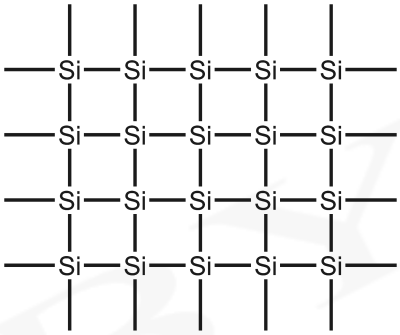
19. Which one of the following allotropc forms of carbon is isomorphous with crystalline silicon?

- ✗ **A.** Graphite
- ✗ **B.** Coal
- ✗ **C.** Coke
- ✓ **D.** Diamond

In crystallography, crystals are described as isomorphous if they are closely similar in shape.
Crystalline silicon



Diamond and crystalline silicon are isomorphous because they both have three dimensional tetrahedral structure.
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20. Assertion (A) : F_2 has lower reactivity.
Reason (R) : F - F bond has low $\Delta_{bond}H^{\circ}$.

- ✗ **A.** Both A and R are true and R is the correct explanation of A
- ✗ **B.** Both A and R are true but R is NOT the correct explanation of A
- ✗ **C.** A is true but R is false
- ✓ **D.** A is false and R is True

Fluorine is the maximum reactive because of low bond dissociation enthalpy.

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