Term-I

p-BLOCK ELEMENTS

Syllabus

- ***Group -15 Elements: General introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties; Nitrogen preparation properties and uses; compounds of Nitrogen: preparation and properties of Ammonia and Nitric Acid.***
- ***Group 16 Elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties, dioxygen: preparation, properties and uses, classification of Oxides, Ozone, Sulphur -allotropic forms; compounds of Sulphur: preparation properties and uses of Sulphur-dioxide, Sulphuric Acid: properties and uses; Oxoacids of Sulphur (Structures only).***
- ***Group 17 Elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; compounds of halogens, Preparation, properties and uses of Chlorine and Hydrochloric acid, interhalogen compounds, Oxoacids of halogens (structures only).***
- ***Group 18 Elements: General introduction, electronic configuration, occurrence, trends in physical and chemical properties, uses.***

STAND ALONE MCQs

[1 Mark each]

Q. 1. Which of the following statements is wrong?

(A) Single N–N bond is stronger than the single P–P bond.

(B) PH_3 can act as a ligand in the formation of coordination compound with transition elements.

(C) NO_2 is paramagnetic in nature.

(D) Covalency of nitrogen in N_2O_5 is four. U

Ans. Option (A) is correct.

Explanation: N−N single bond is weaker than P−P bond due to smaller size of N as compared to P. Smaller size of N leads to smaller N−N bond length. Because of larger size of P atom, P−P bond length is more and lone pair-lone pair repulsion between P atoms is less which makes the P−P bond stronger than N−N bond.

Q. 2 Which of the following elements can be involved in pπ–dπ bonding?

(A) Carbon **(B)** Nitrogen

(C) Phosphorus **(D)** Boron

Ans. Option (C) is correct.

Explanation: pπ-dπ bonding is present in phosphorus due to the presence of vacant *d*-orbitals and in carbon (C), nitrogen (N) and boron (B) do not have *d* orbitals.

Q. 3. Bond dissociation enthalpy of E-H (E = element) bond is given below. Which of the compounds will act as strongest reducing agent?

Compound	NH_3	PH_3	AsH_3	SbH_3
$\Delta_{diss}(E-H)/kJ\ mol.^{-1}$	389	322	297	255

(A) NH_3 (B) PH_3

(C) AsH_3 (D) SbH_3

Ans. Option (D) is correct.

Explanation: The strongest reducing agent is SbH_3 due to the presence of minimum bond enthalpy.

Q. 4. On heating with concentrated NaOH solution in an inert atmosphere of CO, white phosphorus gives a gas. Which of the following statement is incorrect about the gas?

(A) It is highly poisonous and has smell like rotten fish.

(B) It's solution in water decomposes in the presence of light.

(C) It is more basic than NH_3.

(D) It is less basic than NH_3.

Ans. Option (C) is correct.

Explanation: PH_3 is less basic than NH_3.

$$P_4 + 3NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2PO_2$$

(Phosphine)

Q. 5. A brown ring is formed in the ring test for NO_3^- ion. It is due to the formation of:

(A) $[Fe(H_2O)_5(NO)]^{2+}$ (B) $FeSO_4.NO_2$.

(C) $[Fe(H_2O)_4(NO)_2]^{2+}$ (D) $FeSO_4.HNO_3$.

Ans. Option (A) is correct.

Explanation: When freshly prepared solution of ferrous sulphate ($FeSO_4$) is added in a solution containing NO_3^- ion, formation of a brown-coloured complex will take place. This is called as brown ring test of nitrate. Hence, two moles of ammonia will produce two moles of NO.

$$NO_3^- + 3Fe^{2+} + 4H^+ \rightarrow NO + 3Fe^{3+} + 2H_2O$$

$$[Fe(H_2O)_6]^{2+} + NO \rightarrow [Fe(H_2O)_5(NO)]^{2+} + H_2O$$

Brown ring

Q. 6. Hot conc. H_2SO_4 acts as moderately strong oxidising agent. It oxidises both metals and non-metals. Which of the following element is oxidised by conc. H_2SO_4 into two gaseous products? R

(A) Cu (B) S

(C) C (D) Zn

Ans. Option (C) is correct.

Explanation: $C + 2H_2SO_4 \rightarrow CO_2 + 2SO_2 + 2H_2O$

Hot concentrated sulphuric acid should be used to oxidise carbon to carbon dioxide.

Q. 7. Which of the following are peroxoacids of sulphur?

(A) H_2SO_5 and $H_2S_2O_8$

(B) H_2SO_5 and $H_2S_2O_7$

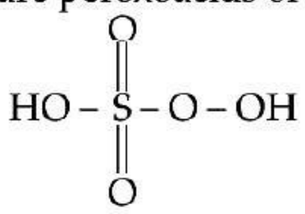
(C) $H_2S_2O_7$ and $H_2S_2O_8$

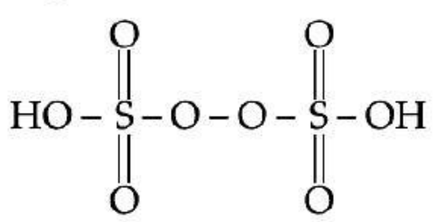
(D) $H_2S_2O_6$ and $H_2S_2O_7$ R

Ans. Option (A) is correct.

Explanation: H_2SO_5 and $H_2S_2O_8$

Peroxymonosulphuric acid and Peroxydis sulphuric acid are peroxoacids of sulphur.





AI **Q. 8.** Which of the following statements are correct for SO_2 gas?

(A) It acts as bleaching agent in moist conditions.

(B) Its molecule has linear geometry.

(C) It can be prepared by the reaction of dilute H_2SO_4 with metal sulphide.

(D) All of the above

Ans. Option (A) is correct.

Explanation: SO_2 acts as a bleaching agent under moist conditions.

$$SO_2(g) + 2H_2O \rightarrow H_2SO_4 + 2[H]$$

SO_2 is oxidized to sulphuric acid and releases nascent hydrogen which bleaches the material. But this is a temporary as atmospheric oxygen re-oxides the bleached matter after some time.

Q. 9. Which of the following orders are correct as per the properties mentioned against each?

(A)	$As_2O_3 < SiO_2 < P2O_3 < SO_2$	Acid strength
(B)	$AsH_3 < PH_3 < NH_3$	Enthalpy of vaporisation
(C)	$S < O < Cl < F$	More negative electron gain enthalpy
(D)	$H_2O > H_2S > H_2Se > H_2Te$	Thermal stability

Ans. Option (A, D) is correct.

Explanation: Acidic strength of oxides in group : Decreases down the group and increases along a period from left to right.

Thermal stability of hydrides of group 16 decreases down the group.

Q. 10. Which of the following statements are correct?

(A) S–S bond is present in $H_2S_2O_6$.

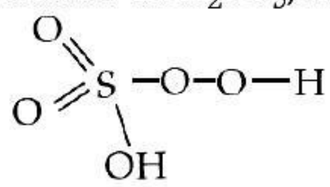
(B) In peroxosulphuric acid (H_2SO_5) sulphur is in +6 oxidation state.

(C) Iron powder along with Al_2O_3 and K_2O is used as a catalyst in the preparation of NH_3 by Haber's process.

(D) Change in enthalpy is positive for the preparation of SO_3 by catalytic oxidation of SO_2.

Ans. Option (B) is correct.

Explanation: In H_2SO_5, there is a peroxo-linkage:



(O in peroxide linkage has oxidation state – 1)

Q. 11. In which of the following reactions conc. H_2SO_4 is used as an oxidising reagent?

(A) $CaF_2 + H_2SO_4 \rightarrow CaSO_4 + 2HF$

(B) $2HI + H_2SO_4 \rightarrow I_2 + SO_2 + 2H_2O$

(C) $Cu + 2H_2SO_4 \rightarrow CuSO_4 + SO_2 + 2H_2O$

(D) $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$

Ans. Option (B, C) is correct.

Explanation: In given four reactions, option (B) and (C) represent oxidising behaviour of H_2SO_4 that oxidising agent reduces itself as oxidation state of central atom decreases. The reaction is given below :

$$2\overset{-1}{H}I + H_2S\overset{-6}{O_4} \rightarrow \overset{0}{I_2} + S\overset{-4}{O_2} + 2H_2O$$

$$\overset{0}{Cu} + 2H_2S\overset{-6}{O_4} \rightarrow C\overset{+2}{u}SO_4 + S\overset{+4}{O_2} + 2H_2O$$

Q. 12. Which of the following is not tetrahedral in shape?

(A) NH_4^+ **(B)** $SiCl_4$

(C) SF_4 **(D)** SO_4^{2-}

Ans. Option (C) is correct.

Explanation: SF_4 has trigonal bi-pyramidal structure.

Q. 13. Which of the following does not react with oxygen directly?

(A) Zn **(B)** Ti

(C) Pt **(D)** Fe

Ans. Option (C) is correct.

Explanation: Platinum (Pt) is an inert metal and does not react very easily. All other elements, Zn, Ti and Fe, are quite reactive. Hence, Pt does not react with oxygen directly.

Q. 14. Affinity for hydrogen decreases in the group from fluorine to iodine. Which of the halogen acids should have highest bond dissociation enthalpy?

(A) H-F **(B)** HCl

(C) HBr **(D)** HI U

Ans. Option (A) is correct.

Explanation: F being smallest has the shortest H-F bond and therefore HF has the highest bond dissociation energy.

Q. 15. Reduction potentials of some ions are given below. Arrange them in decreasing order of oxidising power.

Ion	ClO_4^-	IO_4^-	BrO_4^-
Reduction potential E^Θ/V	E^Θ=1.19V	E^Θ=1.65V	E^Θ=1.74V

(A) $ClO_4^- > IO_4^- > BrO_4^-$ **(B)** $IO_4^- > BrO_4^- > ClO_4^-$

(C) $BrO_4^- > IO_4^- > ClO_4^-$ **(D)** $BrO_4^- > ClO_4^- > IO_4^-$ A

Ans. Option (C) is correct.

Explanation: The higher the reduction potential, the higher is its tendency to get reduced. Hence, the order of their oxidising power is :

$BrO_4^- > IO_4^- > ClO_4^-$

Q. 16. Which of the following is iso-electronic pair?

(A) ICl_2, ClO_2 **(B)** BrO_2^-, BrF_2^+

(C) ClO_2, BrF **(D)** CN^-, O_3 A

Ans. Option (B) is correct.

Explanation:

(A) $ICl_2 = 53 + 2 \times 17 = 87$

$ClO_2 = 17 + 16 = 33$

(B) $BrO_2^- = 35 + 2 \times 8 + 1 = 52$

$BrF_2^+ = 35 + 9 \times 2 - 1 = 52$

(C) $ClO_2 = 17 + 16 = 33$

$BrF = 35 + 9 = 44$

(D) $CN^- = 6 + 7 + 1 = 14$

$O_3 = 8 \times 3 = 24$

Q. 17. A black compound of manganese reacts with a halogen acid to give greenish yellow gas. When excess of this gas reacts with NH_3 an unstable tri-halide is formed. In this process the oxidation state of nitrogen changes from:

(A) – 3 to +3. **(B)** – 3 to 0.

(C) – 3 to +5. **(D)** 0 to – 3. A&E

Ans. Option (A) is correct.

Explanation:

$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

(Greenish yellow gas)

$NH_3 + 3Cl_2 \rightarrow NCl_3 + 3HCl$

When excess of chlorine reacts with ammonia then NCl_3 and HCl will form. In this reaction on left-hand side chlorine has (−3) oxidation state and on the right-hand chlorine has (+3) oxidation state.

Q. 18. Which of the following statements are true?

(A) Only types of interactions between particles of noble gases are due to weak dispersion forces.

(B) Ionisation enthalpy of molecular oxygen is very close to that of xenon.

(C) Hydrolysis of XeF_6 is a redox reaction.

(D) Xenon fluorides are not reactive.

Ans. Option (A) is correct.

Explanation: Weak dispersion forces are present between particles of noble gases. Ionisation enthalpy of molecular oxygen is very close to that of xenon.

Q. 19. Which of the following statements are correct?

(A) Among halogens, radius ratio between iodine and fluorine is maximum.

(B) Leaving F – F bond, all halogens have weaker X – X bond than X – X′ bond in inter-halogens.

(C) Among inter-halogen compounds maximum number of atoms ate present in iodine fluoride.

(D) Inter-halogen compounds are more reactive than halogen compounds.

Ans. Option (B) is correct.

Explanation: In case of halogens radius ratio between iodine and fluorine is maximum radius because iodine has maximum radius while fluorine has minimum radius. Also, due to highest ratio maximum numbers of atoms are present in iodine fluoride. Inter-halogen compounds are more reactive than halogen compounds because A–B bond of dissimilar halogen is weaker than A–A or B–B bond of halogens.

Q. 20. Which one of the following does not exist?

(A) $XeOF_4$ **(B)** NeF_2

(C) XeF_2 **(D)** XeF_6 R

Ans. Option (B) is correct.

Explanation: Xe has least ionisation energy among the noble gases and hence it forms chemical compounds with oxygen and fluorine, however, Ne cannot form compounds with oxygen and fluorine so NeF_2 does not exist.

Q. 21. In the preparation of compounds of Xe, Bartlett had taken $O_2^+PtF_6^-$ as a base compound. This is because
(A) both O_2 and Xe have same size.
(B) both O_2 and Xe have same electron gain enthalpy.
(C) both O_2 and Xe have same ionisation enthalpy.
(D) both Xe and O_2 are gases.

Ans. Option (C) is correct.

Explanation: In the preparation of compounds of Xe, Bartlett had taken $O_2^+PtF_6^-$ as a base compound. This is because both O_2 and Xe have almost same ionisation enthalpy.

Q. 22. Which of the following statements are true?
(A) Only types of interactions between particles of noble gases are due to weak dispersion forces.
(B) Hydrolysis of XeF_6 is a redox reaction.
(C) Xenon fluorides are not reactive.
(D) None of the above.

Ans. Option (A) is correct.

Explanation: Only types of interactions between particles of noble gases are due to weak dispersion forces.

Q. 23. When XeF_4 is partially hydrolysed, it yields
(A) $XeSO_3$ (B) $XeOF_2$
(C) $XeOF_4$ (D) XeF_2

Ans. Option (B) is correct.

Explanation: Partial hydrolysis of XeF_4 gives oxyfluorides, $XeOF_4$ and XeO_2F_2.

$XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$

Xenon oxytetrafluoride

$XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$

Xenon dioxydifluoride

Q. 24. Which of the following reactions is an example of redox reaction?
(A) $XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2$
(B) $XeF_2 + PF5 \rightarrow [XeF]+[PF_6]^-$
(C) $XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$
(D) $XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 2HF$

Ans. Option (A) is correct.

Explanation: $XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2$

Q. 25. Complete the following reaction: $Xe + PtF_6 \rightarrow$
(A) $Xe + PtF_6 \rightarrow XeF_4 + PtF_2$
(B) $Xe + PtF_6 \rightarrow XeF_6 + Pt$
(C) $Xe + PtF_6 \rightarrow Xe^+[PtF_6]^-$
(D) $Xe + PtF_6 \rightarrow XeO_2F_4 + Pt$

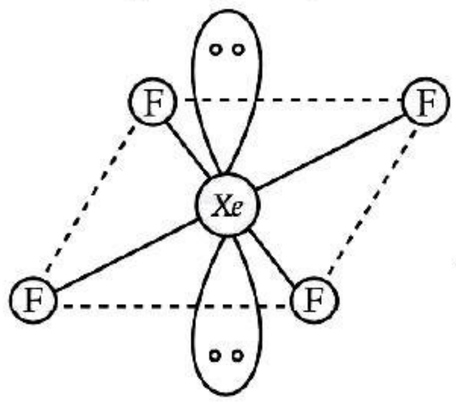
Ans. Option (C) is correct.

Explanation: $Xe + PtF_6 \rightarrow Xe^+[PtF_6]^-$

Q. 26. The shape of XeF_4 is
(A) tetrahedral (B) square planar
(C) pyramidal (D) linear

Ans. Option (B) is correct.

Explanation: XeF_4 is square planar in structure.



Q. 27. Main source of helium is
(A) Air **(B)** Radium
(C) Monazite **(D)** Water

Ans. Option (C) is correct.

Explanation: Monazite is the main source of Helium.

ASSERTION AND REASON BASED MCQs [1 Mark each]

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

Q. 1. Assertion (A): N_2 is less reactive than P_4.
Reason (R): Nitrogen has more electron gain enthalpy than phosphorus. U

Ans. Option (C) is correct.

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

Q. 2. Assertion (A): HNO_3 makes iron passive.
Reason (R): HNO_3 forms a protective layer of ferric nitrate on the surface of iron. R

Ans. Option (C) is correct.

Explanation: HNO_3 makes iron passive and its passivity is attained by formation of a thin film of oxide on iron.

AI **Q. 3. Assertion (A):** Bismuth forms only one well characterised compound in +5 oxidation state.
Reason (R): Elements of group-15 form compounds in +5 oxidation state.

Ans. Option (B) is correct.

Explanation: Elements of group-15 form compounds in +5 oxidation state. Bismuth forms only one well characterised compound in +5 oxidation state which is BiF_5. Due to inert pair

effect bismuth exhibit +3 oxidation state and only forms trihalides. But due to small size and high electronegativity of fluorine, Bismuth forms BiF_5.

Q. 4. Assertion (A): NaCl reacts with concentrated H_2SO_4 to give colourless fumes with pungent smell. But on adding MnO_2 the fumes become greenish yellow.
Reason (R): MnO_2 oxidises HCl to chlorine gas which is greenish yellow.

Ans. Option (A) is correct.

Explanation: Colourless fumes of hydrochloric acid (HCl) become greenish yellow because MnO_2 oxidises HCl to chlorine gas.

Q. 5. Assertion (A): Both rhombic and monoclinic sulphur exist as S_8 but oxygen exists as O_2.
Reason (R): Oxygen forms pπ–pπ multiple bond due to small size and small bond length but pπ–pπ bonding is not possible in sulphur. R

Ans. Option (A) is correct.

Explanation: Sulphur (S) exists as S_8 but oxygen forms pπ–pπ multiple bonds which is not present in S.

Q. 6. Assertion (A): NaCl reacts with concentrated H_2SO_4 to give colourless fumes with pungent smell. But on adding MnO_2 the fumes become greenish yellow.
Reason (R): MnO_2 oxidises HCl to chlorine gas which is greenish yellow R

Ans. Option (A) is correct.

Explanation: Colourless fumes of hydrochloric acid(HCl) because greenish yellow because MnO_2 oxidises HCl to chlorine gas.

Q. 7. Assertion (A): SF_6 cannot be hydrolysed but SF_4 can be.
Reason (R): Six atoms in SF_6 prevent the attack of H_2O on sulphur atom of SF_6. U

Ans. Option (A) is correct.

Explanation: SF_6 is sterically protected due to presence of six F atoms around S atom which prevents the attack of H_2O on SF_6.

Q. 8. Assertion (A): H_2O a liquid and H_2S a gas.
Reason (R): Water molecules are held by H-bonds while in H_2S molecules no such interactions are present between molecules.

Ans. Option (C) is correct.

Explanation: Due to small size and high electronegativity of oxygen, water is highly associated with intermolecular hydrogen bonding but molecules of H_2S are held together by van der Waal's forces of attraction. Hence, H_2O is a liquid and H_2S is a gas.

Q. 9. Assertion (A): HI cannot be prepared by the reaction of KI with concentrated H_2SO_4.
Reason (R): HI has lowest H–X bond strength among halogen acids. R

Ans. Option (B) is correct.

Explanation: Both statements are correct but are independent of each other.
HI cannot be prepared by the reaction of KI with concentrated H_2SO_4 as it results in the formation of HI which further oxidizes to I_2 as H_2SO_4 is a strong oxidizing agent.

Q. 10. Assertion (A): F_2 is a strong oxidizing agent.
Reason (R): Electron gain enthalpy of fluorine is less negative. **[CBSE O.D. Set-I 2020]**

Ans. Option (B) is correct.

Explanation: Fluorine is the best oxidising agent because it has more reduction potential (more ability to lose the electrons) which is attributed to its high electronegativity.

Q. 11. Assertion (A): F_2 has lower bond dissociation energy than Cl_2.
Reason (R): Flourine is more electronegative than chlorine. **[CBSE O.D. Set-II 2020]**

Ans. Option (D) is correct.

Explanation: F_2 has higher bond dissociation enthalpy than Cl_2.

Q. 12. Assertion (A): F_2 has lower reactivity.
Reason (R): F-F bond has low $\Delta_{bond} H^o$.

Ans. Option (D) is correct.

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

AI **Q. 13. Assertion(A):** Group 18 gases exhibit very high ionisation enthalpy.
Reason (R): They have a stable electronic configuration. U

Ans. Option (A) is correct.

Explanation: Group 18 gases exhibit very high ionisation enthalpy because they have a stable electronic configuration.

AI **Q. 14. Assertion(A):** The noble gases are inactive.
Reason(R): These gases have a closed shell structure. U

Ans. Option (A) is correct.

Explanation: The noble gases are inactive as they have a closed shell structure.

AI **Q. 15. Assertion(A):** Helium diffuses through most commonly used laboratory materials.
Reason(R): This gas has a very low melting point. U

Ans. Option (C) is correct.

Explanation: Helium diffuses through most commonly used laboratory materials which is an unusual property of this gas.

Q. 16. Assertion (A): Helium used in diving apparatus.
Reason (R): Helium is very less soluble in blood.

Ans. Option (A) is correct.

Explanation: Helium used in diving apparatus because of its low solubility in blood.

CASE-BASED MCQs

I. Read the passage given below and answer the following questions:

In spite of the predictions of stable noble gas compounds since at least 1902, unsuccessful attempts at their synthesis gave rise to the widely held opinion that noble gases are not only noble but also inert. It was not until 1962 that this dogma was shattered when Bartlett in Canada published the first stable noble gas compound $XePtF_6$. This discovery triggered a worldwide frenzy in this area, and within a short time span many new xenon, radon, and krypton compounds were prepared and characterized. The recent discoveries show the ability of xenon to act as a ligand . The discovery by Seppelt's group that more than one xenon atom can attach itself to a metal center which in the case of gold leads to surprisingly stable Au- Xe bonds. The bonding in $[AuXe4]^{2+}$ involves 4 Xe ligands attached by relatively strong bonds to a single Au(II) center in a square planar arrangement with a Xe-Au bond length of about 274 pm This discovery provides not only the first example of multiple xenon ligands but also represents the first strong metal - xenon bond.

[CBSE QB 2021]

Q. 1. In the complex ion $[AuXe4]^{2+}$, Xe acts as:

(A) central atom **(B)** ligand

(C) chelating agent **(D)** electrophile

Ans. Option (A) is correct.

Q. 2. Hybridisation shown by Au in $[AuXe4]^{2+}$ is:

(A) sp3 **(B)** sp^3d

(C) sp^3d^2 **(D)** sp^2

Ans. Option (B) is correct.

Q. 3. Compounds of noble gases except _____ are known.

(A) Krypton **(B)** Radon

(C) Helium **(D)** Xenon

Ans. Option (C) is correct.

Q. 4. Xe is a _____ ligand

(A) ambidentate **(B)** bidentate

(C) unidentate **(D)** hexadentate

Ans. Option (C) is correct.

II. Read the passage given below and answer the following questions:

In the last 10 years much has been learned about the molecular structure of elemental sulfur. It is now known that many different types of rings are sufficiently metastable to exist at room temperature for several days. It is known that at high temperature, the equilibrium composition allows for a variety of rings and chains to exist in comparable concentration, and it is known that at the boiling point and above, the vapour as well as the liquid contains small species with three, four, and five atoms.

The sulfur atom has the same number of valence electrons as oxygen. Thus, sulfur atoms S_2 and S_3 have physical and chemical properties analogous to those of oxygen and ozone. S2 has a ground state of 38 $\sigma 3s^2\sigma^*3s^2\sigma 3pz^2\pi 3px\ 2 = \pi 3py^2\pi^*3px^1 = \pi^*3py^1$. S3 , thiozone has a well known uv spectrum, and has a bent structure, analogous to its isovalent molecules 03, SO2, and S20. The chemistry of the two elements, sulphur and oxygen, differs because sulfur has a pronounced tendency for catenation. The most frequently quoted explanation is based on the electron structure of the atom. Sulfur has low-lying unoccupied 3d orbitals, and it is widely believed that the 4s and 3d orbitals of sulfur participate in bonding in a manner similar to the participation of 2s and 2p orbitals in carbon.

[CBSE QB 2021]

In the following questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices on the basis of the above passage.

(A) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(B) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(C) Assertion is correct statement but reason is wrong statement.

(D) Assertion is wrong statement but reason is correct statement.

Q. 1. Assertion (A): Sulphur belongs to same group in the periodic table as oxygen.
Reason (R): S_2 has properties analogous to O_2.

Ans. Option (B) is correct.

Q. 2. Assertion (A): Thiozone has bent structure like ozone.
Reason (R): Ozone has a lone pair which makes the molecule bent.

Ans. Option (B) is correct.

Q. 3. Assertion (A): S_2 is paramagnetic in nature
Reason (R): The electrons in π^*3px and π^*3py orbitals in S_2 are unpaired.

Ans. Option (A) is correct.

Q. 4. Assertion (A): Sulphur has a greater tendency for catenation than oxygen.
Reason (R): 3*d* and 4*s* orbitals of Sulphur have same energy.

Ans. Option (C) is correct.

III. Read the given passage and answer the questions (i) to (iv) that follow:

The halogens have the smallest atomic radii in their respective periods. The atomic radius of fluorine is extremely small. All halogens exhibit –1 oxidation state. They are strong oxidising agents and have maximum negative electron gain enthalpy. Among halogens, fluorine shows anomalous behaviour in many properties. For example electronegativity and ionisation enthalpy are higher for fluorine than expected whereas bond dissociation enthalpy, m.p. and b.p. and electron gain enthalpy are quite lower than expected. Halogens react with hydrogen to give hydrogen halides (HX) and combine amongst themselves to form a number of compounds of the type XX', XX'_3, XX'_5 and XX'_7 called inter-halogens.

Q. 1. Why halogens have maximum negative electron gain enthalpy?

Ans. Halogens have only seven electrons in their valence shell. So they require only one electron to attain a noble gas configuration. Hence they have maximum electron gain enthalpy.

Q. 2. Why fluorine shows anomalous behaviour as compared to other halogens?

Ans. **(i)** It has smallest in size.
(ii) Very high electronegativity.
(iii) Absence of d-orbitals.
(iv) dissociation enthalpy in molecular form is least. **(Any one)**

Q. 3. Arrange the hydrogen halides (HF to HI) in the decreasing order of their reducing character.

Ans. HI > HBr > HCl > HF

Q. 4. Why fluorine is a stronger oxidizing agent than chlorine?

Ans. Because fluorine has greater E° value (2.87V) than chlorine (1.36V).

Q. 5. What are the sizes of X and X′ in the interhalogen compounds?

Ans. Size of X is greater than X′.