

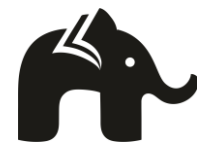


PRACTICE MCQs

CLASS 12 CHEMISTRY (TERM - I)
P-BLOCK ELEMENTS

BY
learn-o-hub
learning simplified



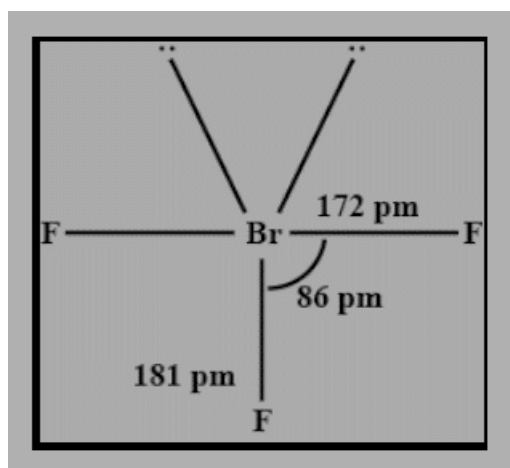
**Question 1:**

In BrF_3 , molecule, the lone pairs occupy equatorial positions to minimise.

- (a) lone pair-bond pair repulsions only
- (b) bond pair-bond pair repulsions only
- (c) lone pair-lone pair and lone pair-bond pair repulsions
- (d) lone pair-lone pair repulsions only.

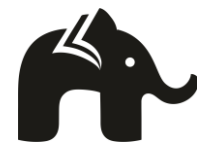
Answer: (c) lone pair-lone pair and lone pair-bond pair repulsions

In BrF_3 there are three bonding Br-F pairs and two lone pairs on Br. Therefore, in order to avoid repulsion, the lone pairs occupy the two equatorial positions and the bond pairs will occupy the other three positions, it reduces the repulsion between lone pair-lone pair as well as lone pair and bond pair repulsion. It gives the following structure.

**Question 2:**

Which of the following oxides of nitrogen is solid?

- (a) NO_2
- (b) N_2O
- (c) N_2O_3



(d) N_2O_5

Answer: (d) N_2O_5

N_2O_5 exists as colourless solid below 273 K. Above this temperature it starts decomposing.



Question 3:

All elements of Group 15 show allotropy except:

- (a) Nitrogen
- (b) Arsenic
- (c) Antimony
- (d) Bismuth

Answer: (a) Nitrogen

Nitrogen has a small size and highly electronegativity of N-N bond is weak.

Question 4:

Covalency of nitrogen is restricted to:

- (a) 2
- (b) 3
- (c) 4
- (d) 5

Answer: (c) 4

Covalency of nitrogen is restricted to 4 due to non-availability of d orbitals.



Question 5:

Which of the following statements is true:

- (a) Melting point of Phosphorous is less than that of Nitrogen
- (b) N_2 is highly reactive while P_4 is inert
- (c) Nitrogen shows higher tendency of catenation than P
- (d) N-N is weaker than P-P

Answer: (d) N-N is weaker than P-P

All other statements are incorrect except (d) statement; as Phosphorus has a higher melting point due to bigger size than Nitrogen. Nitrogen is inert due to formation of triple bonds and has a lower covalence due to non-availability of d-orbitals.

Question 6:

Which of the following has highest ionisation enthalpy?

- (a) Nitrogen
- (b) Phosphorus
- (c) Oxygen
- (d) Sulphur

Answer: (a) Nitrogen

(High Ionization Enthalpy of N is because of smallest size in the group and completely half-filled p subshell).

Question 7:

The oxidation state of central atom in the anion of compound NaH_2PO_2 will be _____.



- (a) +3
- (b) +5
- (c) +1
- (d) -3

Answer. (c) +1

Let oxidation state of NaH_2PO_2 be x

$$=+1+(2x+1)+x+2(-2)=0$$

$$x-1=0$$

$$\text{or } x=1$$

The oxidation state of central atom in the anion of compound NaH_2PO_2 will be +1.

Question 8:

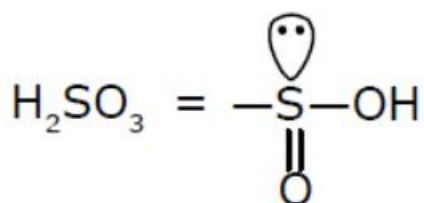
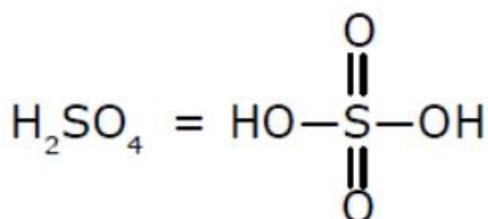
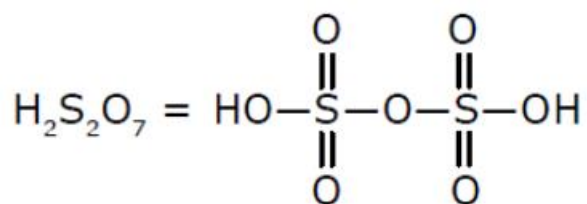
The correct sequence of decreasing number of π -bonds in the structures of H_2SO_3 , H_2SO_4 and $\text{H}_2\text{S}_2\text{O}_7$ is:

- (a) $\text{H}_2\text{SO}_3 > \text{H}_2\text{SO}_4 > \text{H}_2\text{S}_2\text{O}_7$
- (b) $\text{H}_2\text{SO}_4 > \text{H}_2\text{S}_2\text{O}_7 > \text{H}_2\text{SO}_3$
- (c) $\text{H}_2\text{S}_2\text{O}_7 > \text{H}_2\text{SO}_4 > \text{H}_2\text{SO}_3$
- (d) $\text{H}_2\text{S}_2\text{O}_7 > \text{H}_2\text{SO}_3 > \text{H}_2\text{SO}_4$

Answer. (c) $\text{H}_2\text{S}_2\text{O}_7 > \text{H}_2\text{SO}_4 > \text{H}_2\text{SO}_3$

In $\text{H}_2\text{S}_2\text{O}_7$ the number of π bond is 4

In H_2SO_4 the number of π is 2 and in H_2SO_3 number π bond is 1.

**Question 9:**

Of the interhalogen AX_3 compounds, ClF_3 is more reactive than BrF_3 , but BrF_3 has higher conductance in the liquid state. The reason is that

- (a) BrF_3 has higher molecular weight
- (b) ClF_3 is volatile
- (c) BrF_3 dissociates into BrF_2^+ and BrF_4^- more easily
- (d) ClF_3 is most reactive

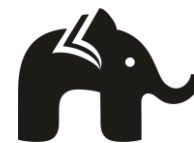
Answer: (c) BrF_3 dissociates into BrF_2^+ and BrF_4^- more easily

In liquid state BrF_3 dissociates into BrF_2^+ and BrF_4^- ions most easily.

Question 10:

What causes nitrogen to be chemically inert?

- (a) Multiple bond formation in the molecule
- (b) Absence of bond polarity



- (c) Short internuclear distance
- (d) High bond energy

Answer: (a) Multiple bond formation in the molecule

Due to high bond energy of N=N molecule, N₂ is chemically inert.

Question 11:

What are the products formed in the reaction of xenon hexafluoride with silicon dioxide?

- (a) XeSiO₄ + HF
- (b) XeF₂ + SiF₄
- (c) XeOF₄ + SiF₄
- (d) XeO₃ + SiF₂

Answer: (c) XeOF₄ + SiF₄



Xenon oxytetrafluoride and silicon tetrafluoride are formed.

Question 12:

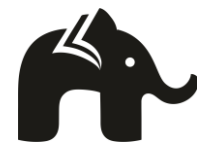
Match the columns

Column 1

Column 2

- | | |
|--|-----------------|
| (A) Used in manufacture Of calcium cyanamide | (p) Ammonia |
| (B) Used in the manufacture Of nitric acid | (q) Nitric Acid |
| (C) Used in picking of stainless steel | (r) Dinitrogen |

- (a) A-(r), B-(p), C-(q)
- (b) A-(p), B-(r), C-(q)
- (c) A-(r), B-(q), C-(p)



(d) A-(q), B- (p), C-(r)

Answer: (a) A-(r), B-(p), C-(q)

(A) $\text{CaC}_2 + \text{N}_2 \rightarrow \text{CaCN}_2 + \text{C}$ (temperature should be 1100°C)

(B) NH_3 is oxidised to NO , which is used to prepare nitric acid.

(C) Steel metal is dipped in a bath of nitric acid/hydrofluoric acid. It strips the surface layer of steel removing the impurities and free iron molecules, leaving an even, stain like finish.

Question 13:

Elements of the group-15 form compounds in +5 oxidation state. However, bismuth forms only one well-characterized compound in +5 oxidation state.

The compound is:

(a) Bi_2O_5

(b) BiF_5

(c) BiCl_5

(d) Bi_2S_5

Answer: (b) BiF_5

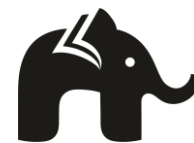
The only well characterised compound having +5 oxidation state of Bi is BiF_5 .

Due to inert pair effect bismuth only exhibit +3 oxidation state and forms trihalides only. But due to small size and high electronegativity of Fluorine Bismuth forms BiF_5 only.

Question 14:

Which of the following statement is incorrect for group 15 elements?

(a) Order of ionization enthalpies is $\Delta_i H_1 < \Delta_i H_2 < \Delta_i H_3$



- (b) The boiling point and melting point increases from top to bottom in the group
- (c) Dinitrogen is a gas while all others are solids
- (d) All statements are correct

Answer. (b) The boiling point and melting point increases from top to bottom in the group.

Assertion Reason Based Questions

In the following questions from 15 to 18 a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- (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 but R is true.

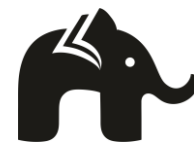
Question 15:

Assertion (A): Electron gain enthalpy of oxygen is less than that of Fluorine but greater than Nitrogen.

Reason (R): Ionisation enthalpies of the elements follow the order Nitrogen > Oxygen > Fluorine

Answer: (c) A is true but R is false.

Assertion (A): Electron gain enthalpy of oxygen is less than that of Fluorine but greater than Nitrogen. (correct)



Reason: Ionisation enthalpies of the elements follow the order Nitrogen > Oxygen > Fluorine (incorrect)

Ionisation enthalpies of the elements follow the order Fluorine > Nitrogen > Oxygen

Question 16:

Assertion (A): Ozone is thermodynamically stable with respect to oxygen.

Reason (R): Decomposition of ozone into oxygen results in the liberation of heat.

Answer: (d) A is false but R is true.

Ozone is thermodynamically less stable than oxygen due to large negative Gibb's free energy and decomposes easily to form oxygen.

Question 17:

Assertion (A): Bond angle of H_2S is smaller than H_2O .

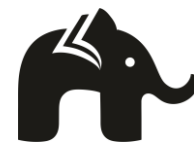
Reason (R): Electronegativity of the central atom increases, bond angle decreases.

Answer: (c) A is true but R is false.

Bond angle of H_2S (92°) < H_2O ($104^\circ 31'$). As the electronegativity of the central atom decreases, bond angle decreases. In the present case, S is less electronegative than oxygen. Thus, bond pairs in H_2S are more away from the central atom than in H_2O and thus repulsive forces between bond pairs are smaller producing smaller bond angle.

Question 18:

Assertion (A): Iodine is more soluble in water than in carbon tetrachloride.



Reason (R): Iodine is a polar compound.

Answer: (d) A is false but R is true.

Iodine, being a non-polar compound is more soluble in CCl_4 (non-polar compound) than in water as "like dissolves like".

Question 19:

The three important oxidation states of phosphorus are

- (a) -3 , $+3$ and $+5$
- (b) -3 , $+3$ and -5
- (c) -3 , $+3$ and $+2$
- (d) -3 , $+3$ and $+4$

Answer. (a) -3 , $+3$ and $+5$

The most important oxidation states of P are -3 , $+3$ and $+5$.

$+3$ is due to the participation of only $3p^3$ (due to inert pair effect). Only three electrons involve in bond formation.

$+5$ is due to the participation of $3s^2 3p^3$ (due to absence of inert pair effect). All the five electrons involve in bond formation.

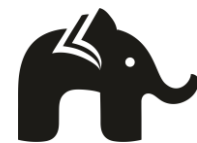
-3 is due to gain of three electrons as it has five electrons in valence shell so as to attain octet configuration.

Question 20:

Ammonia on reaction with excess of chlorine gives:

- (a) NCl_3 and HCl
- (b) N_4 and NH_4Cl
- (c) NCl_3 and NH_4Cl
- (d) N_2 and HCl

Answer: (c) NCl_3 and NH_4Cl



Pure chlorine gas may react vigorously with ammonia gas. An excessive mix of the two gases in air can produce hazardous compounds such as nitrogen trichloride.

The following reaction takes place:



NCl_3 is an explosive material

Ammonia reacts with excess of chlorine to form NCl_3 and HCl .

Question 21:

Bleaching action of SO_2 is due to its:

- (a) oxidising property
- (b) acidic property
- (c) reducing property
- (d) basic property

Answer: (c) reducing property

Bleaching by sulphur dioxide is due to the process of reduction in the presence of moisture.



The nascent hydrogen liberated in the reaction is responsible for bleaching powder but when this powder comes in contact with air. It gets oxidized and becomes coloured.



Question 22:

Hydrolysis of one mole of peroxodi-sulphuric acid produces

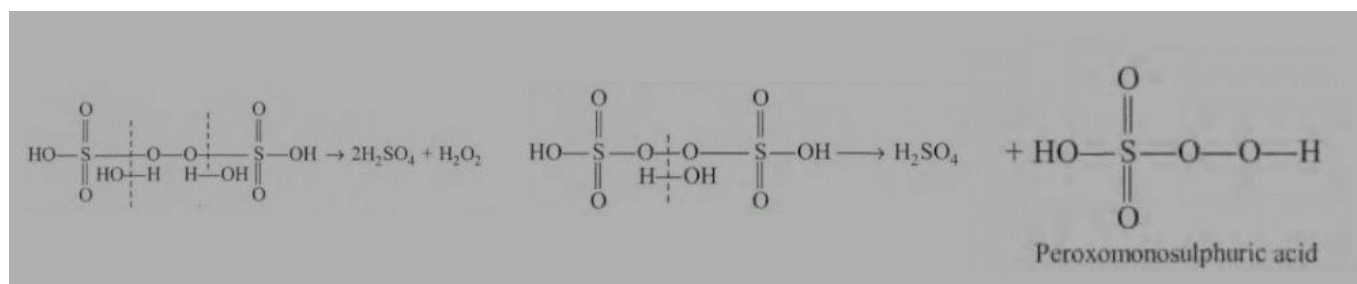
- (a) two moles of sulphuric acid



- (b) two moles of peroxomono sulphuric acid
- (c) one mole of sulphuric acid and one mole of peroxomono- sulphuric acid
- (d) one mole of sulphuric acid, one mole of peroxomono -sulphuric acid and one mole of hydrogen peroxide

Answer: (c) one mole of sulphuric acid and one mole of peroxomono-sulphuric acid

Peroxodisulphuric acid ($\text{H}_2\text{S}_2\text{O}_8$) on complete hydrolysis gives two moles of H_2SO_4 and one mole of H_2O_2 .



While on partial hydrolysis, it gives one mole of H_2SO_4 and one mole of peroxomono sulphuric acid as

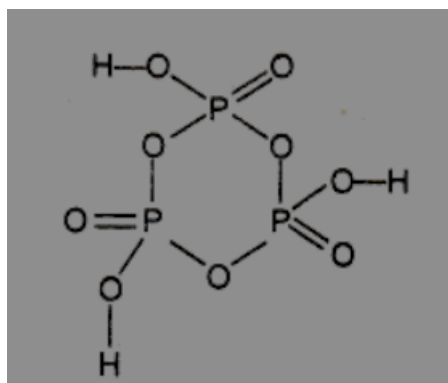
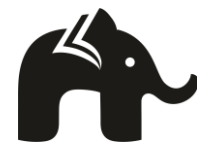
Question 23:

The number of P-O-P bond in cyclic metaphosphoric acid is:

- (a) Zero
- (b) Two
- (c) Three
- (d) Four

Answer: (c) Three

The number of P-O-P bond in cyclic metaphosphoric acid is three.



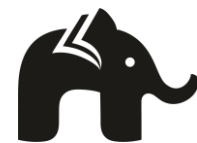
Hence, number of P-O-P bonds in cyclic meta-phosphoric acid is three.

Case-Study Based Questions

Question 24:

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 vapor 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. S_2 has a ground state of $3\sigma 3s^2 \sigma^* 3s^2 \sigma 3p_z^2 \pi 3p_x^2 = \pi 3p_y^2 \pi^* 3p_x^1 = \pi^* 3p_y^1$. S_3 , thiozone has a well-known uv spectrum, and has a bent structure, analogous to its isovalent molecules O_3 , SO_2 , and S_2O . 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.

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.

1. Assertion: Sulphur belongs to same group in the periodic table as oxygen.

Reason: S_2 has properties analogous to O_2 .

2. Assertion: Thiozone has bent structure like ozone.

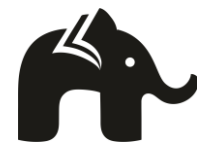
Reason: Ozone has a lone pair which makes the molecule bent.

3. Assertion: S_2 is paramagnetic in nature

Reason: The electrons in π^*3p_x and π^*3p_y orbitals in S_2 are unpaired.

4. Assertion: Sulphur has a greater tendency for catenation than oxygen.

Reason: 3d and 4s orbitals of Sulphur have same energy

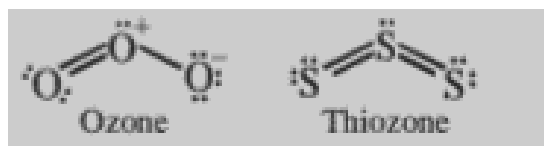


Answer:

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

Sulphur and Oxygen both belong to group 16 of the periodic table.

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



Ozone molecules is found to have a bent shape because lone pairs present on central atom repels the electrons of the two bonds.

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

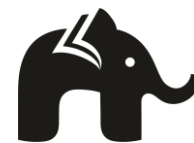
S₃ also found to adopt bent shape.

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

Sulphur has a greater tendency for catenation than oxygen because lone pair of oxygen repel the bond O-O bond to a greater extent than the lone pairs of S-S bond. According to Aufbau principle, the 4s orbital is lower in energy than 3d orbitals.

Question 25:

Ozone is an unstable, dark blue diamagnetic gas. It absorbs the UV radiation strongly, thus protecting the people on earth from the harmful UV-radiation from the sun. The use of chlorofluorocarbon (CFC) in aerosol and refrigerator and their subsequent escape into the atmosphere, is blamed for making holes



in the ozone layer over the Antarctica. Ozone acts as a strong oxidising agent in acidic and alkaline medium. For this property, ozone is used as a germicide and disinfectant for sterilizing water. It is also used in laboratory for the ozonolysis of organic compounds and in industry for the manufacture of potassium permanganate, artificial silk, etc.

The following questions are multiple choice question. Choose the most appropriate answer:

1. Which of the following statements is not correct for ozone?

- (a) It oxidises lead sulphide
- (b) It oxidises potassium iodide
- (c) It oxidises mercury
- (d) It cannot act as bleaching agent in dry state.

2. Ozone reacts with moist iodine gives

- (a) HI
- (b) HIO_3
- (c) I_2O_5
- (d) I_2O_4

3. Ozone acts as an oxidising agent due to

- (a) liberation of nascent oxygen
- (b) liberation of oxygen gas
- (c) both (a) and (b)
- (d) none of these

4. The colour of ozone molecule is



- (a) white
- (b) blue
- (c) pale green
- (d) pale yellow

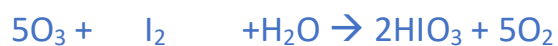
Answer:

1. (d) It cannot act as bleaching agent in dry state.

Ozone can react in dry state as it is present in air in the form of suspended ions.

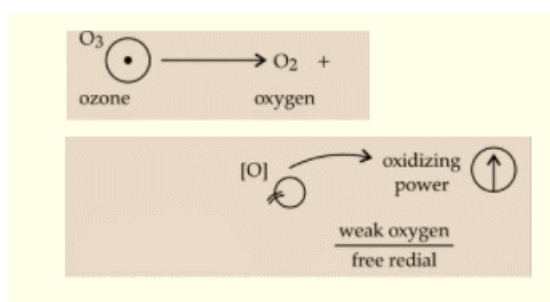
2. (b) HIO₃

Moist iodine will react with ozone to form iodic acid. The reaction is: -



Ozone Iodine Iodic Acid

3. (a) liberation of nascent oxygen



4. (b) Blue

It is observed blue in colour.
