

Quiz (Shape of Molecules)

Section A: Multiple-choice

- Which of the following molecules obeys octet rule?
 - SCl_6
 - PCl_5
 - CCl_4
 - BCl_3
- Which of the following molecules has the greatest number of lone pairs of electrons?
 - HCl
 - OF_2
 - CS_2
 - Br_2
- Which of the following statements about arsenic trifluoride (AsF_3) is INCORRECT?
 - It has ten lone pairs of electrons.
 - It has three bond pairs of electrons.
 - The electron pairs take up the tetrahedral arrangement.
 - It is tetrahedral in shape.
- Which of the following pairs of molecules have a similar shape?

(1) SO_2 and CO_2	(2) PH_3 and NCl_3	(3) SO_3 and BF_3
A. (1) and (2) only	B. (1) and (3) only	
C. (2) and (3) only	D. (1), (2) and (3)	
- Which of the following molecules is trigonal bipyramidal in shape?
 - PCl_3F_2
 - SCl_2
 - CCl_2F_2
 - NF_3

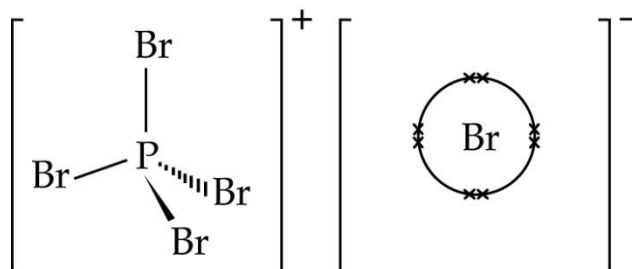
Questions 6 and 7 are about phosgene (COCl_2) molecules.

- Which of the following combinations about phosgene is correct?

	<u>Number of bond pair(s)</u>	<u>Number of lone pair(s)</u>
A.	3	6
B.	3	8
C.	4	6
D.	4	8
- What is the shape of a phosgene molecule?
 - Linear
 - Tetrahedral
 - Trigonal planar
 - V-shaped
- Which of the following statements about nitrogen trichloride are correct?
 - It has a simple molecular structure.
 - It obeys octet rule.
 - It is trigonal pyramidal in shape.
 - (1) and (2) only
 - (1) and (3) only
 - (2) and (3) only
 - (1), (2) and (3)

Section B: Structured questions

Phosphorus pentabromide (PBr_5) is a common reagent for bromination in organic syntheses. Unlike phosphorus pentachloride (PCl_5), it is a compound consisting of PBr_4^+ and Br^- ions. The structure of PBr_5 is shown below:



- (a) State whether the phosphorus atom in PBr_4^+ obeys octet rule.
- (b) When phosphorus pentabromide is heated, it decomposes to phosphorus tribromide and bromine.
- Write an equation for the decomposition of phosphorus pentabromide.
 - Draw the three-dimensional structure of phosphorus tribromide.
- (c) In terms of bonding and structure, state the difference between phosphorus pentabromide and phosphorus pentachloride.

Suggested Answer

Section A

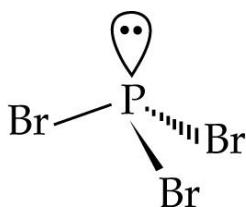
1.	C	5.	A
2.	B	6.	B
3.	D	7.	C
4.	C	8.	D

Section B

(a) The phosphorus atom in PBr_4^+ obeys octet rule.

(b) (i) $\text{PBr}_5 \longrightarrow \text{PBr}_3 + \text{Br}_2$

(ii)



(c) Phosphorus pentabromide has a giant ionic structure.
The ions are held together by strong ionic bonds.

Phosphorus pentachloride has a simple molecular structure.
The molecules are held together by weak intermolecular forces.