Smart Edu Hub [.in/.com]

CAIE A LEVEL Chemistry Topic Questions / 9701

1.3.4-Shapes-of-s-and-p-Orbitals-set-1-qp

Total Questions: 10

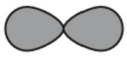
Note:

- For questions with answer choices as statements 1, 2 and 3, follow these instructions for selecting options A/B/C/D:
- A= 1, 2 and 3 are correct
- B=1 and 2 only are correct
- C=2 and 3 only are correct
- D=1 only is correct

Questions

Question 1:

Which atom has its outermost electron in an orbital of the shape shown, with principal quantum number 3?



A sodium

B chlorine

C calcium

D bromine

Question 2:

The table refers to the electron distribution in the second shell of an atom with eight protons.

Which row is correct for this atom?

	orbital shape 		orbital shape 	
	orbital type	number of electrons	orbital type	number of electrons
A	p	2	s	4
B	p	4	s	2
C	s	2	p	4
D	s	4	p	2

Question 3:

Phosphorus forms two chlorides. Phosphorus(III) chloride, PCl_3, is a covalent liquid.

Phosphorus(V) chloride is an ionic solid. One of the ions present is $[PCl_4]^+$.

What is the shape of the PCl_3 molecule and the $[PCl_4]^+$ ion?

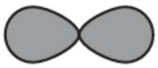
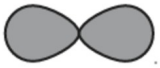
	PCl_3	$[PCl_4]^+$
A	pyramidal	square planar
B	pyramidal	tetrahedral
C	tetrahedral	square planar
D	trigonal planar	tetrahedral

Questions (Continued)

Question 4:

The outermost electron in an atom of neon occupies a particular orbital.

Which row shows the relative energy and shape of this orbital?

	energy of orbital relative to other occupied orbitals	shape of orbital
A	higher or equal	
B	higher or equal	
C	lower or equal	
D	lower or equal	

Question 5:

Atom X is the central atom in a molecule.

In this molecule, atom X has four pairs of valence electrons in its outer shell.

The four pairs of valence electrons include at least one bond pair and at least one lone pair.

What could be a possible shape for the molecule?

A linear

B non-linear

C trigonal bipyramidal

D trigonal planar

Questions (Continued)

Question 6:

Ammonia reacts with acids to form the ammonium ion.

$$NH_3 + H^+ \rightleftharpoons NH_4^+$$

Which row is correct?

	shape of NH_4^+	bond angle in NH_4^+ / °
A	pyramidal	107
B	pyramidal	109.5
C	tetrahedral	107
D	tetrahedral	109.5

Question 7:

Which row is correct?

	molecule	shape	total number of pairs of electrons in the valence shell of the central atom
A	CO_2	linear	two
B	BF_3	trigonal planar	three
C	NH_3	regular tetrahedral	four
D	PF_5	octahedral	six

Questions (Continued)

Question 8:

Which row is correct?

	shape		bonds present	
	ammonia molecule	ammonium ion	ammonia molecule	ammonium ion
A	pyramidal	regular tetrahedral	σ	σ
B	pyramidal	regular tetrahedral	σ	π
C	regular tetrahedral	pyramidal	σ	σ
D	regular tetrahedral	pyramidal	π	σ

Question 9:

Cyclohexene, C_6H_{10}, is a hydrocarbon with a six-membered ring of carbon atoms.

It has several structural isomers that are straight-chain alkenes. The number of double bonds in each of these molecules is P.

What is the shape of the cyclohexene molecule and what is the value of P?

	shape	P
A	planar	1
B	planar	2
C	non-planar	1
D	non-planar	2

Question 10:

Which of the following molecules and ions have a regular trigonal planar shape?

1 $AlCl_3$

2 CH_3^+

3 PH_3