Past-paper walk-through

Shapes of molecules ▪ 3.5

eXercise

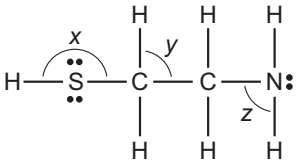
Questions in this set

- 9701/12 N25 Q6 ▪ 1 mark
- 9701/14 N25 Q5 ▪ 1 mark

Question 6

9701/12 N25 ▪ Q6 ▪ 1 mark

6 Three bond angles are labelled on the molecule shown.



: represents a lone pair of electrons

What is the order of **decreasing** size of the bond angles *x*, *y* and *z*?

	largest ⟶		smallest
A	*x*	*y*	*z*

Question 6

A	*x*	*y*	*z*
B	*x*	*z*	*y*
C	*y*	*z*	*x*
D	*z*	*y*	*x*

Solution 6

Answer: **C**

Why

- Lone pairs repel more strongly than bonding pairs, so each lone pair squeezes the angles around its atom.
- A carbon with four single bonds is about 109.5°; one lone pair drops it to roughly 107° and two to about 104.5°.
- So rank the three atoms by how many lone pairs they carry – fewest lone pairs gives the largest angle.

Question 5

9701/14 N25 ▪ Q5 ▪ 1 mark

5 In which set do all the molecules have all their atoms arranged in one plane?

A $AlCl_3$, BF_3, PH_3

B $AlCl_3$, CO_2, NH_3

C BF_3, C_2H_4, C_3H_6

D C_2H_4, CO_2, H_2O

Solution 5

Answer: **D**

Why

- Any molecule of three atoms or fewer is automatically planar, so CO_2 and H_2O both qualify.
- Ethene is planar because each carbon is trigonal planar around the C=C.
- PH_3 and NH_3 are pyramidal, and C_3H_6 has a carbon with hydrogens out of the plane.