Electron Pairs and Molecular Shape

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

In this model, one single bond, one multiple bond, or one lone pair each counts as one electron domain around the central atom.

1 How many electron domains are around C in O=C=O?

(1) 1

(2) 2

(3) 3

(4) 4

2 NH_3 has three N–H bonds and one lone pair on nitrogen. Explain why it has four electron domains but only three H positions in its molecular shape. [1]

Answer and work

3 Which shape describes three atoms arranged on one straight line with the central atom between the other two?

(1) Bent

(2) Linear

(3) Trigonal pyramidal

(4) Tetrahedral

4 Water has four electron domains around O, including two lone pairs. Explain why H_2O is described as bent in the domain model. [1]

Answer and work

Choosing a Model for a Display

Use the information below to answer the questions.

A display compares three molecules. Use the central atom and the domain information to select or check labels.

Molecule	Bonded atoms around center	Lone pairs on center	Molecular shape
CH_4	4	0	Tetrahedral
NH_3	3	1	Trigonal pyramidal
H_2O	2	2	Bent

5 Which of these molecules have four electron domains around the central atom?

(1) CH_4 only

(2) NH_3 and H_2O only

(3) CH_4 and NH_3 only

(4) All three

6 An unlabeled model has four atoms surrounding one central atom, with no lone pairs on the center. Match it to one molecule in the display and justify the match. [1]

Answer and work

7 Which pair has the same number of central domains but differs by two in its number of bonded atoms?

(1) CH_4 and NH_3

(2) CH_4 and H_2O

(3) NH_3 and H_2O

(4) All three pairs

8 The display labels NH_3 as tetrahedral because it has four domains. Explain how the label should distinguish domain arrangement from molecular shape. [1]

Answer and work