

## Exercise 0.22 – VSEPR Theory – 2, 3 and 4 charge centres

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**Q022-01** The geometry and bond angle of the sulphite ion ( $\text{SO}_3^{2-}$ ) are best described as:

- A. Pyramidal,  $107^\circ$
  - B. Tetrahedral,  $109^\circ$
  - C. Bent,  $104^\circ$
  - D. Trigonal planar,  $120^\circ$
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**Q022-02** Which shape correctly describes the stated molecule?

- A.  $\text{PCl}_3$ ; trigonal pyramidal
  - B.  $\text{P}_2\text{H}_4$ ; planar
  - C.  $\text{N}_2\text{O}$ ; bent
  - D.  $\text{NO}_2$ ; linear
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**Q022-03** Which molecule has the smallest bond angle?

- A.  $\text{CO}_2$
  - B.  $\text{NH}_3$
  - C.  $\text{CH}_4$
  - D.  $\text{C}_2\text{H}_4$
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**Q022-04** The geometries of the molecules  $\text{BF}_3$  and  $\text{NF}_3$  are trigonal planar and trigonal pyramidal respectively. Which statement best accounts for the difference?

- A. N is more electronegative than B.
  - B.  $\text{BF}_3$  is ionic, which  $\text{NF}_3$  is covalent.
  - C. B is a metalloid, whereas N is a non-metal.
  - D. N has a non-bonding pair of valence electrons, while B does not.
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**Q022-05** In which compound would the molecules be expected to be linear?

- A.  $\text{O}_3$
  - B.  $\text{SO}_2$
  - C.  $\text{H}_2\text{O}$
  - D.  $\text{CO}_2$
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**Q022-06** Which one of the following is not the expected geometry of the indicated molecule or ion?

- A.  $\text{CCl}_4$  - regular tetrahedron
  - B.  $\text{BeCl}_2$  - linear
  - C.  $\text{SO}_3$  - triangular pyramid
  - D.  $\text{CH}_2\text{O}$  - trigonal planar
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**Q022-07** According to VSEPR theory, repulsion between electron pairs in a valence shell decreases in the order:

- A. lone pair - lone pair > lone pair - bond pair > bond pair - bond pair
  - B. bond pair - bond pair > lone pair - bond pair > lone pair - lone pair
  - C. lone pair - lone pair > bond pair - bond pair > lone pair - bond pair
  - D. bond pair - bond pair > lone pair - lone pair > lone pair - bond pair
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**Q022-08** The arrangement of the atoms in the ammonia molecule at its lowest energy is described as

- A. trigonal pyramid
  - B. trigonal planar
  - C. trigonal bipyramid
  - D. square planar
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**Q022-09** Which of the following describes the shape of the ethene molecule,  $C_2H_4$ :

- A. linear.
  - B. planar.
  - C. pyramidal.
  - D. shaped like two tetrahedra joined at the points.
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**Q022-10** Which species has a trigonal planar shape?

- A.  $CO_3^{2-}$
  - B.  $SO_3^{2-}$
  - C.  $NF_3$
  - D.  $PCl_3$
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