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# VCE Chemistry ½
## Covalent Molecules [1.6]
## Test

20 Marks. 1 Minute Reading. 16 Minutes Writing

**Results:**

| | |
|---|---|
| Test Questions | _____ /15 |
| Extension | _____ /5 |

## Section A: Test Questions (15 Marks)

**Question 1** (3 marks)

Tick whether the following statements are true or false:

| | True | False |
|---|---|---|
| **a.** A Lewis structure for nitrogen molecule ($N_2$) consists of a triple bond between the nitrogen atoms. | | |
| **b.** In a Lewis structure, the dots represent the nucleus of the atoms. | | |
| **c.** Carbon dioxide ($CO_2$) has a linear molecular shape according to VSEPR theory. | | |
| **d.** Water ($H_2O$) has a tetrahedral molecular shape due to the arrangement of electron pairs around the oxygen atom. | | |
| **e.** In methane ($CH_4$), the central carbon atom forms single bonds with four hydrogen atoms resulting in a tetrahedral molecular and parent geometry. | | |
| **f.** In hydrogen chloride (HCl), the chlorine atom shares one pair of electrons with hydrogen, resulting in a linear molecular shape. | | |

Space for Personal Notes

**Question 2** (6 marks)

Khadija is investigating a simple yet intricate molecule - oxygen gas.

**a.** State what is meant by the term 'diatomic molecule'. (1 mark)

_____

**b.** Draw the Lewis dot structure of oxygen gas. (2 marks)

**c.** Hence or otherwise, explain why oxygen exists diatomically in nature. (1 mark)

_____

_____

**d.** Complete the table below regarding the 3-dimensional shape of oxygen. (2 marks)

| **Molecular geometry of $O_2$** | **Electron geometry for each O atom** |
|---|---|
| | |

Space for Personal Notes

**Question 3** (6 marks)

Ana is researching the Haber process, wherein ammonia, $NH_3$, is evolved.

**a.** Justify why nitrogen can form 3 covalent bonds. (1 mark)

**b.** Hence or otherwise, draw the Lewis structure of ammonia. You may use lines to depict covalent bonds. (2 marks)

**c.** State the molecular geometry of ammonia, and justify why it is as such, with reference to an appropriate theory. (3 marks)

Space for Personal Notes

## Section B: Extension (5 Marks)

**Question 4** (5 marks)

Jake is investigating some compounds and their 3-dimensional shapes.

For **parts a.** and **b.**:

**i.** State the molecular geometry. (1 mark)

**ii.** State the parent geometry of the central atom. (1 mark)

**a.** Hydrogen cyanide (HCN). (2 marks)

_____

_____

_____

_____

**b.** Nitrosyl chloride (NOCl). (2 marks)

_____

_____

_____

_____

_____

**c.** Draw the structure of boron trifluoride ($BF_3$). (1 mark)

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