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Level 2 Chemistry, 2015

91164 Demonstrate understanding of bonding, structure, properties and energy changes

9.30 a.m. Monday 23 November 2015
Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of bonding, structure, properties and energy changes.	Demonstrate in-depth understanding of bonding, structure, properties and energy changes.	Demonstrate comprehensive understanding of bonding, structure, properties and energy changes.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

A periodic table is provided on the Resource Sheet L2-CHEMR.

If you need more room for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Not Achieved


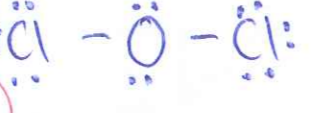
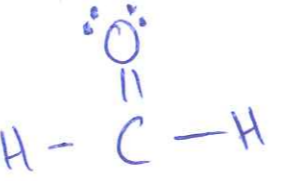
TOTAL

5

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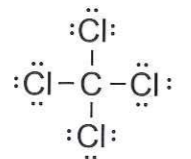
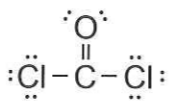
QUESTION ONE

- (a) Draw the Lewis structure (electron dot diagram) for each of the following molecules.

Molecule	O ₂	OC ₂	CH ₂ O
Lewis structure			

- (b) Carbon atoms can bond with different atoms to form many different compounds.

The following table shows the Lewis structure for two molecules containing carbon as the central atom, CCl₄ and COCl₂. These molecules have different bond angles and shapes.

Molecule	CCl ₄	COCl ₂
Lewis structure		

Evaluate the Lewis structure of each molecule to determine why they have different bond angles and shapes.

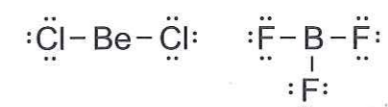
In your answer, you should include:

- the approximate bond angle in each molecule
- the shape of each molecule
- factors that determine the shape and bond angle for each molecule.

COCl₂ - Trigonal planar
Bond angle: 120°

CCl₄ - Tetrahedral Planar
Bond angle: 109°

- (c) BeCl
- ₂
- and BF
- ₃
- are unusual molecules because there are not enough electrons for the central atoms, Be and B, to have a full valence shell. Their Lewis structures are shown below.



Both molecules have the same polarity.

Circle the word that describes the polarity of these molecules.

polar

non-polar

Justify your choice.

Both of these molecules are symmetrical, meaning that the dipoles cancel out. As the molecules are symmetrical, there is no polarity, making these molecules non-polar. //

- (c) Consider each of the solids copper, Cu, silicon dioxide, SiO_2 , and potassium chloride, KCl.

Complete the table below by identifying which of these solids have the listed physical properties:

Physical properties	Solid
The solid is insoluble in water and is malleable.	<u>Cu</u>
The solid is soluble in water and is not malleable.	<u>KCl</u>
The solid is insoluble in water and is not malleable.	<u>SiO_2</u>

Justify TWO of your choices in terms of the particles, structure, and bonding of these solids. You may use diagrams in your justification.

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Extra paper if required.
Write the question number(s) if applicable.

QUESTION
NUMBER

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