Covalent structure and bonding

1 Covalent bonding involves the sharing of electrons.

(a) Which of the following usually have covalent bonding?

Circle the **two** correct answers.

(2 marks)

A compounds of metals and non-metals

B compounds of non-metals only

C molecules of non-metals

D mixtures of two metals

E pure metals

(b) How many electrons are shared in:

i. a single covalent bond

_____ **(1 mark)**

ii. a double covalent bond

_____ **(1 mark)**

iii. a triple covalent bond?

_____ **(1 mark)**

(c) What does each dot represent in a dot and cross diagram? Circle the correct answer.

(1 mark)

A a neutron

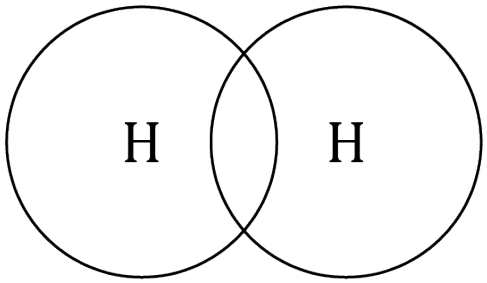
B a nucleus

C a proton

D an electron

(d) Hydrogen atoms have one electron in their outer shell.

i. Use dots and crosses to complete the diagram to show the covalent bond in a hydrogen molecule.



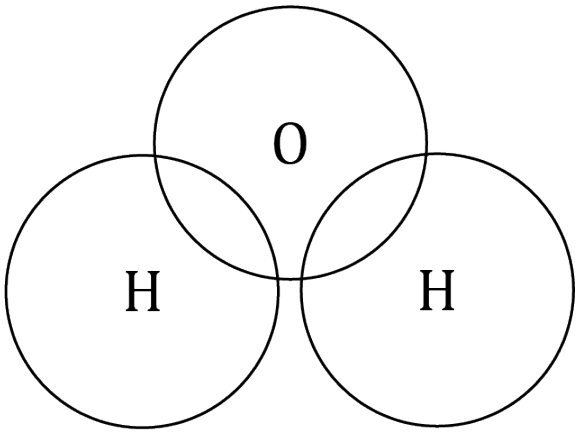
(2 marks)

ii. What is the chemical formula for this molecule?

_____

(1 mark)

(e) A water molecule contains two hydrogen atoms and one oxygen atom. Draw a dot and cross diagram to show the electron arrangement in a water molecule. Show the outer electrons only.

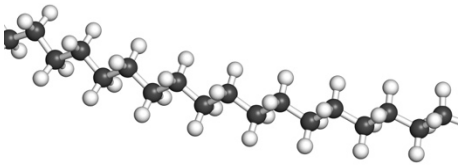
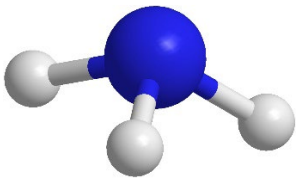
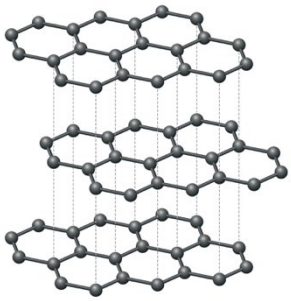


(2 marks)

2 Substances with covalent bonding may be any of the following types of structure:

simple molecule **giant covalent structure** **polymer**

(a) Choose from the list above to complete the table and identify the types of structure for each substance.

Substance	Diagram of structure	Type of structure
poly(ethene)		
ammonia		
graphite		

(3 marks)

(b) The melting point of ammonia is –78°C.

Use some of the words provided to complete the sentences. You do not have to use all the words.

covalent bonds **weak** **ionic bonds**

metallic bonds **strong** **intermolecular forces**

In an ammonia molecule, one nitrogen atom forms _____ covalent bonds with three hydrogen atoms. Ammonia molecules are attracted to each other by _____ intermolecular forces. When ammonia melts, enough energy is needed to overcome the _____ _____ to separate the molecules.

(3 marks)

(c) The melting point of poly(ethene) is approximately 110°C.

Use some of the words provided to complete the sentences. You do not have to use all the words.

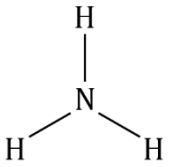
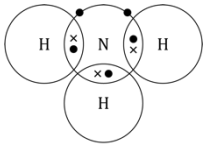
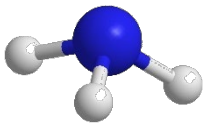
less **more** **weaker**

stronger **lower** **higher**

In poly(ethene) molecules, carbon atoms have covalent bonds between each other and with hydrogen atoms. Poly(ethene) molecules have _____ intermolecular forces than ammonia molecules. Therefore, poly(ethene) has a _____ melting point than ammonia because _____ energy is needed to overcome the intermolecular forces.

(3 marks)

3 The table includes different ways of representing an ammonia molecule. Add ticks (✓) and crosses (✖) in each box to identify the details shown by each representation. Some boxes have been completed for you.

Does the representation show:	NH_3			
the types of atoms in the molecule?				✓
the number of each type of atom?	✓			
how the electrons are shared?		✖		
the 3-D structure?			✖	

(4 marks)

[Total: 24 marks]

Which question(s) did you get wrong? Why?

What will you do next time you're asked a similar question?