C3 Structure & Bonding Homework task 1

Q1.

This question is about hydrocarbons.

Methane is a hydrocarbon.

The formula of methane is CH_4

(a) Name the **two** elements in methane.

1 _____

2 _____

(2)

(b) Complete the diagram below to show the structure of a methane (CH_4) molecule.

H – C

(1)

(c) What is the type of bonding in methane?

Tick (✓) **one** box.

Covalent	☐
Ionic	☐
Metallic	☐

(1)

(d) Calculate the percentage by mass of element C in a CH_4 molecule.

Relative atomic mass (A_r): C = 12

Relative formula mass (M_r): CH_4 = 16

_____

_____

_____

Percentage of C = _____ %

(2)

Cracking breaks down hydrocarbons into smaller molecules.

(e) Name **one** method of cracking.

_____

(1)

$C_{13}H_{28}$ is a hydrocarbon.

(f) $C_{13}H_{28}$ is cracked to produce C_8H_{18} and another product.

Complete the equation for the reaction.

$$C_{13}H_{28} \longrightarrow C_8H_{18} + C\_\_\_\ H\_\_\_$$

(1)

(g) C_8H_{18} and $C_{13}H_{28}$ are both alkanes.

C_8H_{18} is a smaller molecule than $C_{13}H_{28}$

Give **one** use of alkanes that have small molecules.

_____

_____

(1)

(h) Cracking also produces alkenes.

Ethene is an alkene.

What is the formula of ethene?

Tick (✓) **one** box.

C_2H_4 ☐ C_2H_6 ☐ C_3H_6 ☐ C_3H_8 ☐

(1)

(i) Complete the sentence.

Ethene molecules join together to form a long-chain molecule called

_____ .

(1)

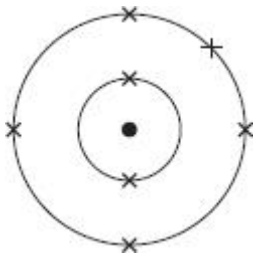
(Total 11 marks)

Q2.

This question is about structure and bonding.

(a) **Figure 1** represents the electronic structure of an atom of an element.

Figure 1



Name the element in **Figure 1**.

Give **one** reason for your answer.

Use the periodic table.

Element _____

Reason _____

_____

(2)

Sodium reacts with fluorine to produce sodium fluoride.

Sodium fluoride is an ionic compound.

(b) An atom of sodium and an atom of fluorine react to form a sodium ion and a fluoride ion.

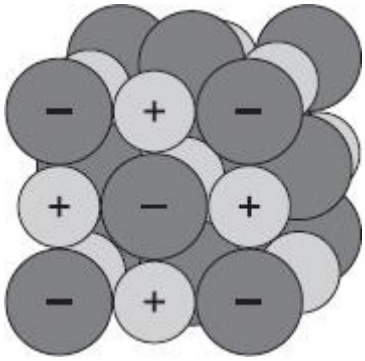
Complete the dot and cross diagram for the sodium ion and the fluoride ion.

Show the charges on the ions.

(2)

(c) **Figure 2** represents the structure of sodium fluoride.

Figure 2



Describe how sodium ions and fluoride ions are held together in sodium fluoride.

_____

_____

_____

(3)

(d) What is a property of sodium fluoride?

Tick (✓) **one** box.

Conducts electricity when solid ☐

High melting point ☐

Low boiling point ☐

(1)

(Total 8 marks)

HIGHER TIER QUESTIONS

Q3.

Carbon can exist in a number of different structures.

(a) The first fullerene to be discovered was Buckminsterfullerene.

What is the formula of Buckminsterfullerene?

Tick (✓) **one** box.

C40 ☐

C50 ☐

C60 ☐

C70 ☐

(1)

(b) Graphite is a form of carbon.

Explain why graphite conducts electricity.

_____

_____

_____

_____

(2)

Steel is an alloy of iron and carbon.

(c) Explain why steel is harder than iron.

_____

_____

_____

_____

_____

_____

(3)

(d) Iron is alloyed with carbon and other metals to make stainless steel.

A stainless steel fork contains 71.92% iron.

The table below shows the mass of each element in the fork.

Element	Iron	Carbon	Chromium	Nickel
Mass of element in g	**X**	0.05	10.44	5.80

Calculate the mass of iron (**X**) in the fork.

X = _____ g

(4)

(Total 10 marks)

Q4.

This question is about halogens.

Bromine reacts with sodium to produce sodium bromide.

(a) Describe the structure of and bonding in sodium bromide.

(2)

(b) The equation for the reaction is:

$$2\ Na + Br_2 \rightarrow 2\ NaBr$$

1 g of bromine reacts with sodium.

Calculate the number of bromine molecules in 1 g of bromine.

1 mole of bromine contains 6.02×10^{23} bromine molecules.

Relative formula mass (M_r) of bromine = 160

Number of bromine molecules = _____

(3)

(c) The table below shows the boiling points of some halogens.

Halogen	**Boiling point in °C**
Bromine	60
Chlorine	−34
Fluorine	−188

Explain the trend in the boiling points of the halogens.

(4)

(Total 9 marks)