C3b QUESTIONS

1. Water in Britain is taken from reservoirs to use as drinking water.

(a) What are the **two** main steps used to treat water from reservoirs?

Give **one** reason for each step.

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(4)

(b) Some people use water filters to treat water before drinking it.

(i) Water filters remove hardness from hard water.

What is in water filters that removes hardness from water?

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(1)

(ii) Suggest why water filters used in the home contain particles of silver.

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(1)

(c) Pure water can be produced by distillation.

Why is distillation **not** usually an economic method of treating water for drinking?

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(1)

(d) Drinking hard water has health benefits.

State **one** health benefit of drinking hard water.

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(1)
(Total 8 marks)

2. In 1869, Dmitri Mendeleev produced his periodic table of the elements.

Mendeleev placed the alkali metals in the same group.

(a) What evidence did Mendeleev use to decide that the alkali metals should be in the same group?

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(1)

(b) Describe how the elements in the modern periodic table are arranged:

(i) in terms of protons

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(1)

(ii) in terms of electrons.

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(1)

(c) State **two** properties of transition elements that make them more useful than alkali metals for making water pipes.

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(2)

(d) Describe and explain the trend in reactivity of the alkali metals (Group 1).

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(4)
(Total 9 marks)

3. Sodium is a Group 1 element.

(a) (i) A small piece of sodium is added to some water containing Universal Indicator solution.

Describe what you would **see** happening.

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(3)

(ii) Complete **and** balance the equation for the reaction of sodium with water.

.....Na + ...H_2O → ..... + H_2

(2)

(b) Francium is the most reactive element in Group 1.

Explain why in terms of electronic structure.

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(3)

(c) The transition elements have different properties from the elements in Group 1.

Give **two** of these different properties of transition elements.

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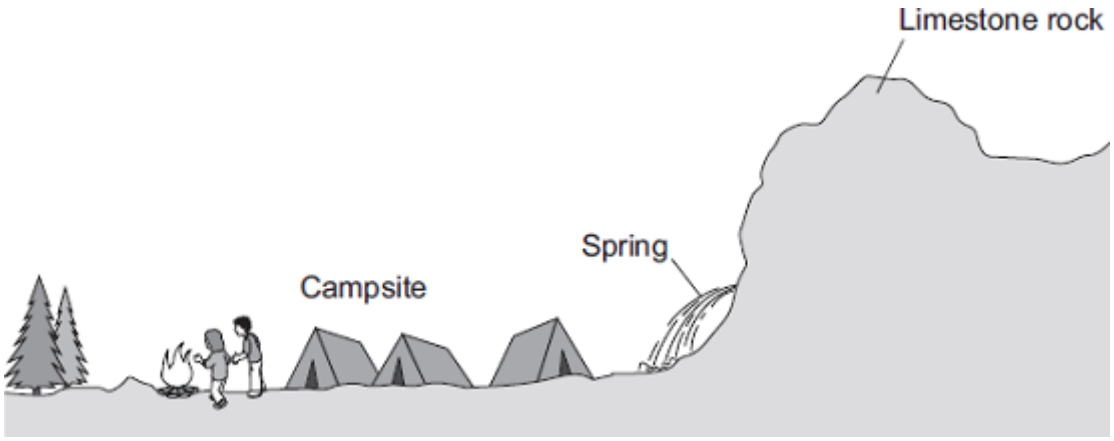
(2)
(Total 10 marks)

4. (a) A campsite has a spring, where hard water flows out of limestone rock.



A student compared the hardness of the spring water with two other samples of water.

The student measured 20 cm^3 of water into a boiling tube.

The student then:

- added a drop of soap solution
- shook the boiling tube for 10 seconds
- looked to see if a permanent lather had formed.

The student repeated the procedure until a permanent lather formed.

The results are shown in the table.

Water sample	Number of drops of soap solution needed to form a permanent lather			
	Test 1	**Test 2**	**Test 3**	**Mean**
Spring water (from the campsite)	13	11	6	
Tap water	7	5	6	6
Distilled water	1	1	1	1

(i) Calculate the correct mean for spring water.

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Mean = ... drops

(2)

(ii) What conclusion could the student make from her results?

Use the results in the table to give a reason for your answer.

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(2)

(iii) Another student at the campsite boils some of the hard spring water in a pan. The inside of the pan becomes coated with a white solid.

Explain how the white solid is produced.

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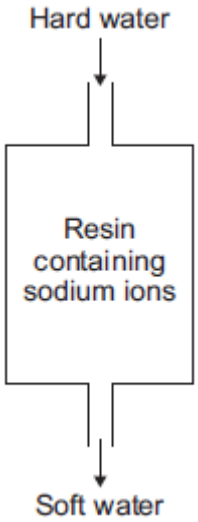
(3)

(b) Ion exchange columns can be used to soften hard water.



(i) Describe how an ion exchange column softens water.

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(3)

(ii) An ion exchange column is used for a few weeks.

Sodium chloride solution now needs to be passed through the ion exchange column.

Suggest why.

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(1)

(c) Tap water in the UK is safe to drink because water companies add chlorine to sterilise the water.

Suggest **one** argument for and **one** argument against water companies adding chlorine to sterilise water.

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(2)

(Total 13 marks)

5. Fluorine is the most reactive element in group 7 of the Periodic Table.
Fluorine reacts with all the other elements in the Periodic Table except some of the noble gases. It does not react with helium, neon and argon, but it does react with xenon. Many substances burst into flames when exposed to fluorine.

(a) (i) The electronic structure of chlorine is 2.8.7. What is the electronic structure of fluorine?

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(1)

(ii) What is the electronic structure of the chloride ion Cl^-?

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(1)

(iii) Explain why fluorine is more reactive than chlorine.

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(4)

(b) (i) What does the information at the start of this question suggest about the reactivity of the elements in group 0?

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(1)

(ii) A chemist did an experiment to find out if fluorine reacts with xenon. The two gases were mixed in a glass container. The only product detected was silicon fluoride. Explain what happened.

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(2)

(iii) The experiment was repeated many years later but the gases were mixed in a different type of container. A white solid was obtained which was xenon fluoride.

Predict whether you think (1) krypton and (2) radon will react with fluorine. Explain the reasons for your predictions.

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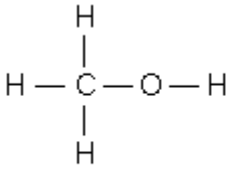
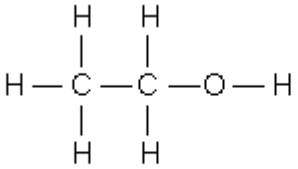
(5)

(Total 14 marks)

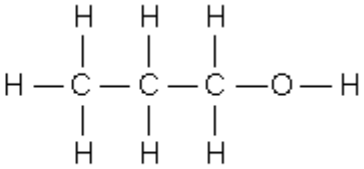
6. The structures shown are of the first three members of a homologous series of alcohols.



Methanol



Ethanol



Propanol

(a) (i) Draw a ring around the correct general formula for alcohols.

$C_nH_{2n+1}OH$ $C_{2n}H_{2n+1}OH$ $C_nH_{2n+2}OH$

(1)

(ii) What is the formula of the functional group for alcohols?

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(1)

(b) Ethanol is the alcohol used in alcoholic drinks.

(i) When ethanol dissolves in water the solution formed is **not** alkaline.

Tick (✓) the reason why the solution formed is **not** alkaline.

Reason	Tick (✓)
Ethanol can be used as a solvent.	
Ethanol dissolves in water to form hydroxide ions.	
Ethanol has only covalent bonds in its molecule.	

(1)

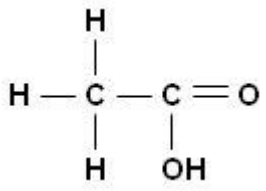
(ii) Ethanol is used as a fuel because ethanol burns in oxygen.

Complete and balance the chemical equation for this reaction.

C_2H_5OH + ...O_2 → $2CO_2$ + ...

(2)

(c) Ethanol can be oxidised to produce the compound shown.



(i) Draw a ring around the correct answer to complete the sentence.

When this compound dissolves in water, the solution formed is

acidic.
alkaline.
neutral.

(1)

(ii) Ethanol reacts with this compound to produce the organic compound shown.

C_2H_5OH + CH_3COOH → $CH_3COOC_2H_5$ + H_2O

Complete the sentence.

The type of organic compound produced is ..... .

(1)

(Total 7 marks)