

Name:

School Year:

School:

Answer all questions in the spaces provided.

Please write your answers clearly.

The total marks allocated to the paper are 40 marks (Section A 10 marks, Section B 30 marks)

The time allocated to the paper is 30 minutes.

Scoring: Section A / 10

Section B / 30

Total / 40

SECTION A General chemistry knowledge

1. Name **two** elements that are liquid at room temperature (2 marks)

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2. Four new elements were added to the Periodic Table at the start of 2016.

Name any **one** of the elements. (1 mark)

.....

3. Name the element that can exist in one of three allotropes; diamond, graphite or fullerene. (1 mark)

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4. Name the radioactive element, an isotope of which was believed to be used to poison the Russian security agent, Alexander Litvinenko in 2006. (1 mark)

.....

5. The phrase 'as mad as a hatter' is believed to be a result of hat makers being exposed to the vapours of which element during the hat making process. (1 mark)

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6. Name the process you would use to separate a liquid from an **insoluble** solid. (1 mark)

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7. Name the process you would use to separate a liquid from a **soluble** solid. (1 mark)

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8. Name the compound found in dry ice. (1 mark)

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9. State the chemical name for vinegar. (1 mark)

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Total: 10 marks

SECTION B Questions linked to this year's theme of Energy

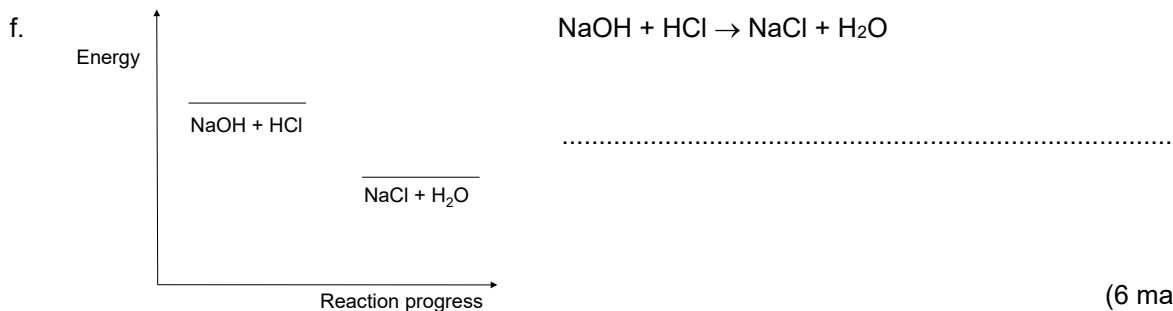
10. An **endothermic process** is a process that *takes in energy from the surroundings*.

An **exothermic process** is a process that *gives out energy to the surroundings*.

For example respiration is an example of an exothermic process as energy is given out during the process.

State if the following processes are **endothermic** or **exothermic**;

- a. evaporation.....
- b. melting an ice cube
- c. burning wood.....
- d. photosynthesis.....
- e. thermal decomposition of copper carbonate.....



11. A student is investigating the reaction of magnesium metal with hydrochloric acid. She reacts 25 cm³ of hydrochloric acid with a concentration of 1 mol/dm³ with a 3 cm strip of magnesium ribbon.

a. i. Complete the word equation for the reaction. (1 mark)

magnesium + hydrochloric acid →

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ii. Write a balanced symbol equation for the reaction. (2 marks)

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b. The hydrochloric acid is **in excess**. Explain what this means. (1 mark)

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The student measures the temperature change during the experiment. Her results are shown in the table below;

Temperature of hydrochloric acid at start / °C	18.5
Temperature of hydrochloric acid at end / °C	21.5
Temperature change / °C	

- c. i. Complete the table by calculating the temperature change for the experiment. (1 mark)
- ii. State if the reaction is **endothermic** or **exothermic**. (1 mark)

.....

- d. The student wishes to investigate what effect increasing the volume of the hydrochloric acid will have on the temperature change recorded.
- i. Describe the experiment the student could carry out to investigate how increasing the volume of the hydrochloric acid affects the temperature change.

Include details about how to make the experiment a fair test. (4 marks)

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- ii. A **hypothesis** is an idea about what will happen in an experiment.
- Write a hypothesis to predict what effect increasing the volume of the hydrochloric acid will have on the temperature change observed.
- Explain the reasons behind your hypothesis. (3 marks)

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12. Humans obtain the energy they need to survive from the food they eat.

The energy content of foods is given along with other nutritional information on the side of a food packet.

Josh looks at this label on a packet of biscuits. It shows the nutritional information for **100 g** of biscuits.

Nutrient	Value
Energy / kJ	2179
Energy / kcal	521
Fat / g	27.3
of which saturates / g	15.8
Carbohydrates / g	61.3
of which sugars / g	40.1
Fibre / g	2.5 g
Protein / g	6.3 g

- a. If one biscuit has a mass of 10 g, calculate the energy content in kJ in a single biscuit. (1 mark)

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- b. The Guideline Daily Amount (GDA) for energy is 2000 kcal. Calculate the percentage of the GDA for energy in 100 g of biscuits. (2 marks)

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- c. Using the information in the table, calculate the amount of energy in kJ that is equivalent to 1 kcal. (1 mark)

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1 kcal = kJ

13. Combustion is an **exothermic** process. Heat energy is given out from the combustion of a fuel.

- a. Complete the diagram of the fire triangle by writing the three elements a fire needs to ignite around the edges of the triangle. (3 marks)



(Image © Shutterstock)

- b. Complete combustion of any fuel requires a plentiful supply of oxygen and produces carbon dioxide and water only.

Write a balanced symbol equation for the complete combustion of ethanol, C₂H₅OH. (2 marks)

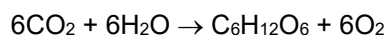
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Many conventional petrol engines will run on ethanol, or mixtures of petrol and ethanol. Much of the petrol sold in the UK at present has 5-10% ethanol added.

One method for producing ethanol is *via* the fermentation of glucose. A balanced symbol equation for fermentation is shown below;



The glucose needed for fermentation is made from plants during photosynthesis. A balanced symbol equation for photosynthesis is shown below;



- c. Ethanol made by fermentation is sometimes termed **carbon neutral**. This means that the *carbon dioxide released when it is produced and burnt is balanced by the carbon dioxide absorbed by the plant from which it is originally obtained, during photosynthesis.*

Use the equations above and your answer part (b) to prove that ethanol is a carbon neutral fuel.

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.....(2 marks)

Total: 30 marks