

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)

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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)

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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.....

f.

$\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$

.....

(6 marks)

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 →

.....

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)

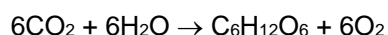
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Many conventional petrol engines will run on ethanol, or mixtures of petrol and ethanol. Much of the petrol sold in the UK at present has 5-10% ethanol added.

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