OCR
Oxford Cambridge and RSA

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Monday 15 November 2021 – Morning

GCSE (9–1) Combined Science (Biology) A (Gateway Science)

J250/07 Paper 7 (Higher Tier)

Time allowed: 1 hour 10 minutes

8343218845

You must have:
- a ruler (cm/mm)

You can use:
- a scientific or graphical calculator
- an HB pencil

J250078

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has **24** pages.

ADVICE
- Read each question carefully before you start your answer.

SECTION A

Answer **all** the questions.

You should spend a maximum of 20 minutes on this section.

Write your answer to each question in the box provided.

1 A student uses a light microscope to observe onion cells.

It magnifies the cells 400×. The magnification of the eyepiece is 20×.

What is the magnification of the objective lens?

A 20×

B 200×

C 420×

D 8000×

Your answer ☐ **[1]**

2 Which row describes the correct direction of blood flow through the **left** side of the heart?

A pulmonary artery → atrium → ventricle → vena cava

B pulmonary artery → ventricle → atrium → aorta

C pulmonary vein → ventricle → atrium → vena cava

D pulmonary vein → atrium → ventricle → aorta

Your answer ☐ **[1]**

3 What advantage does a light microscope have compared to an electron microscope?

A Complex preparation of sample

B Greater magnification

C Greater resolution

D Live specimens can be observed

Your answer ☐ **[1]**

4 The model represents a molecule found inside human cells.

Which term describes this molecule?

A Double helix-shaped monomer

B Double helix-shaped polymer

C Triple helix-shaped monomer

D Triple helix-shaped polymer

Your answer ☐ **[1]**

5 Which statement is a correct description of a prokaryotic cell?

A The cell contains chloroplasts and plasmids.

B The cell has mitochondria in the cytoplasm but no cell wall.

C The cell has a nucleus and a cell wall.

D The genetic material is a single circular molecule of DNA.

Your answer ☐ **[1]**

6 Look at the table.

	Substrate(s)	Product(s)	Relative yield of ATP	Endothermic or exothermic
A	glucose + oxygen	lactic acid + carbon dioxide	less than aerobic respiration	exothermic
B	glucose	lactic acid	less than aerobic respiration	exothermic
C	glucose	lactic acid	greater than aerobic respiration	endothermic
D	glucose + oxygen	lactic acid + carbon dioxide	greater than aerobic respiration	endothermic

Which row describes **anaerobic** respiration in humans?

Your answer ☐ **[1]**

7 Which process allows oxygen to enter blood cells from the alveoli down a concentration gradient?

A Active transport

B Diffusion

C Evaporation

D Osmosis

Your answer ☐ **[1]**

8 A student investigates movement of water into cells using potato chips.

They place a potato chip with a mass of 5 g in pure water. After 20 minutes the potato chip has increased in mass to 5.3 g.

Calculate the percentage change in mass.

A 5.7%

B 6.0%

C 94.3%

D 106%

Your answer ☐ **[1]**

9 Which statement about the hormone glucagon is correct?

A Produced by the pancreas and decreases glucose levels in the blood.

B Produced by the liver and increases glucose levels in the blood.

C Produced by the pancreas and increases glucose levels in the blood.

D Produced by the liver and decreases glucose levels in the blood.

Your answer ☐ **[1]**

10 A patient has the following symptoms:

- tiredness
- lack of energy
- weight gain
- sensitive to cold
- pain in their muscle.

Their doctor suggests the symptoms are caused by a gland in their neck not producing enough of one hormone.

Which hormone is the patient deficient in?

A Adrenaline

B Insulin

C Thyroxine

D Testosterone

Your answer ☐ **[1]**

SECTION B

Answer **all** the questions.

11 Catalase is an enzyme found in potato. Catalase breaks down hydrogen peroxide to form water and oxygen.

A student investigates the activity of catalase.

This is the method they follow:
– Cut equal sized pieces of potato.
– Put one piece of potato into a conical flask.
– Add 50 cm^3 of dilute hydrogen peroxide.
– Collect the oxygen produced in 15 minutes using a measuring cylinder full of water.

Fig. 11.1 shows the set-up of their investigation.

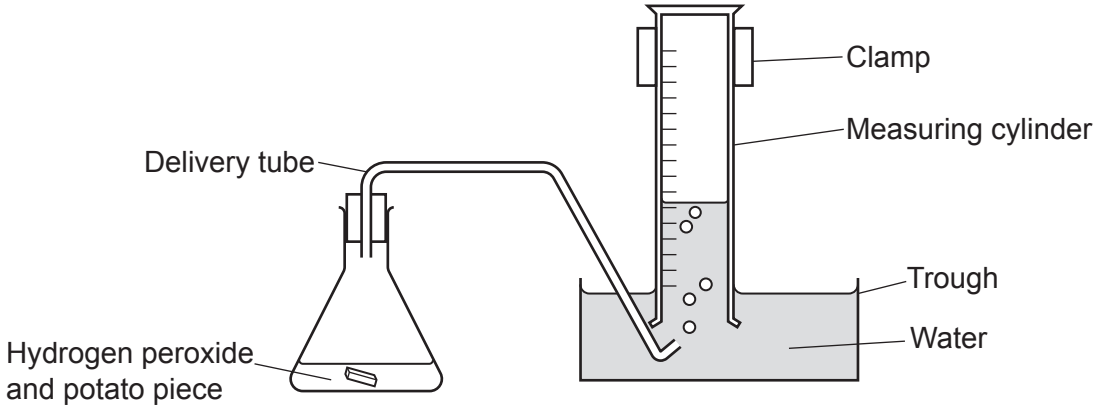

Fig. 11.1

The student then repeats the investigation, increasing the number of potato pieces each time.

(a) (i) Each time the student repeats the investigation they use 50 cm^3 of new dilute hydrogen peroxide.

Explain why they need to replace the dilute hydrogen peroxide.

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..... **[2]**

(ii) Explain why the student does **not** need to replace the potato pieces already in the flask when repeating the investigation.

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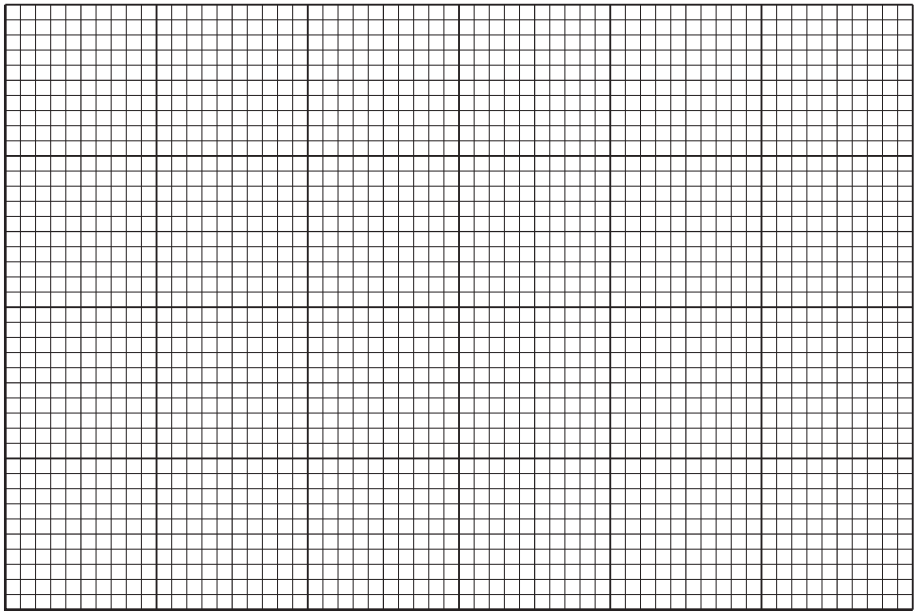
..... **[1]**

(b) The table shows their results.

Number of pieces of potato	Volume of oxygen collected in 15 minutes (cm^3)
1	0.7
2	1.2
3	1.9
4	
5	3.2
6	3.8

(i) Plot a graph of the results and draw a line of best fit.



[4]

(ii) Use the graph to find the expected volume of oxygen produced when **4 pieces** of potato are used.

Volume of oxygen = ... cm^3 **[1]**

(iii) Use the data in the **table** to calculate the rate of reaction when the student used **6 pieces** of potato.

Give your answer to **2** significant figures.

Rate of reaction = ... cm^3 / min **[3]**

(c) The reaction is exothermic.

Suggest how the student could improve their investigation to control the temperature.

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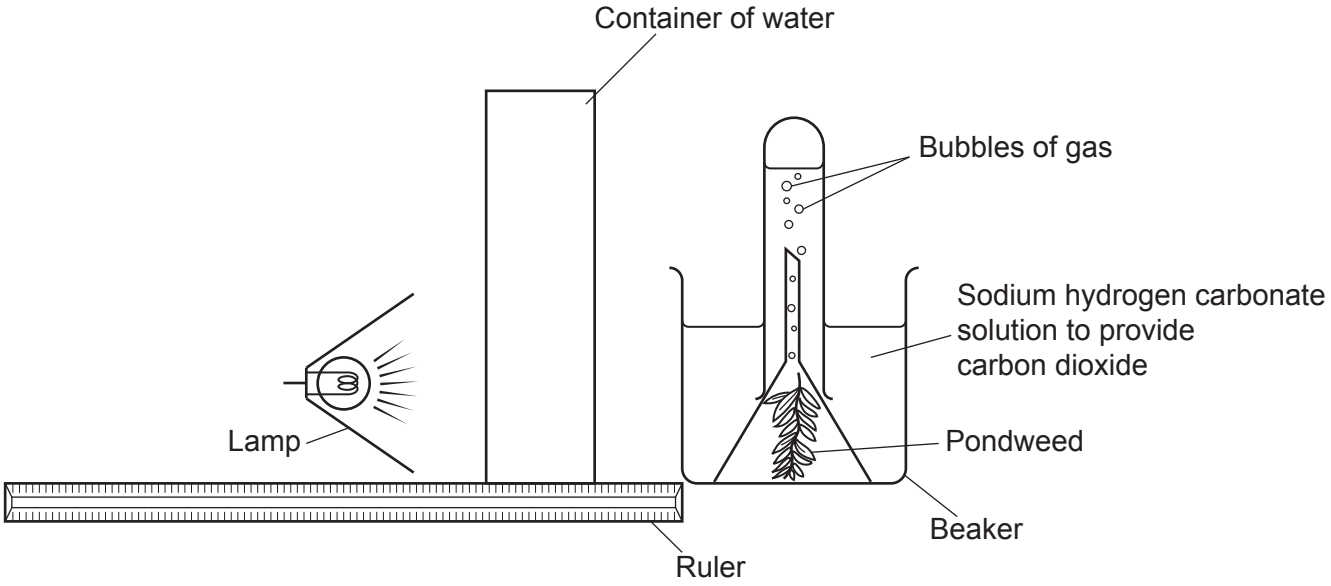
..... **[1]**

12 A student investigates the rate of photosynthesis.

The diagram shows the apparatus they use.



(a) Suggest why the student places a container of water between the lamp and the beaker.

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..... **[1]**

(b) The student counts the number of bubbles made by the pondweed for 5 minutes.

They repeat this, setting the lamp at different distances from the beaker each time.

The table shows their results.

Lamp distance from beaker (m)	Number of bubbles
0.1	41
0.2	41
0.3	34
0.4	24
0.5	10

(i) The relative light intensity when the lamp distance is 0.1 m is 100.

Use the inverse square law to calculate the relative light intensity for 0.4 m.

Give your answer to **1** decimal place.

Relative light intensity = ... **[2]**

(ii) Explain the patterns shown in the data.

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***(c)** Evaluate the student's investigation and describe improvements to the equipment and method to increase the accuracy and precision.

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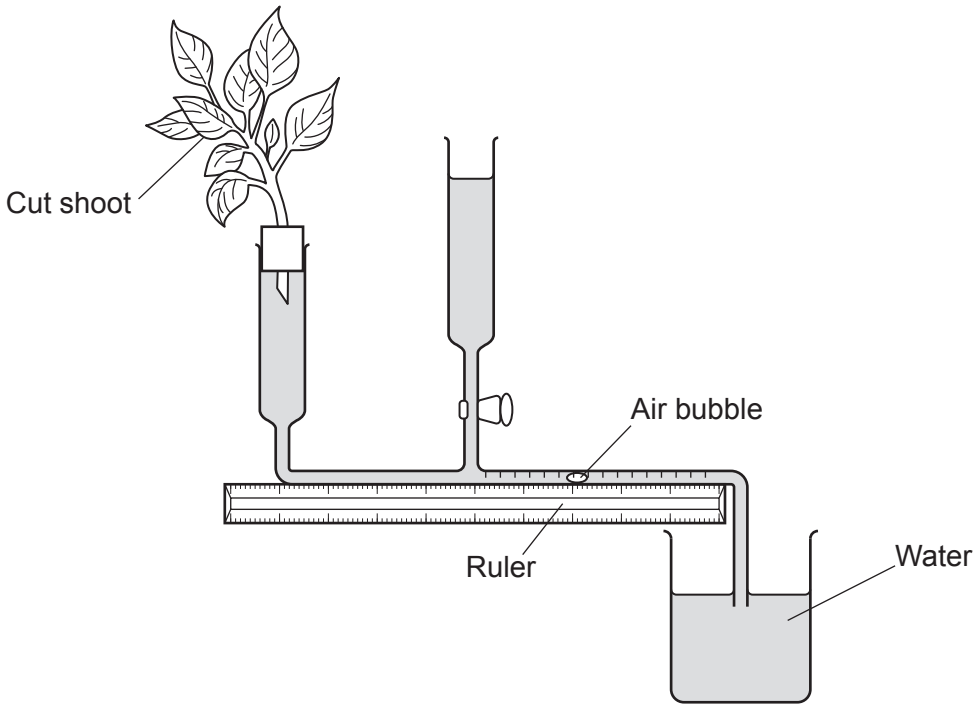
..... **[6]**

13 A student investigates the environmental factors that affect water uptake by plants.

The diagram shows the apparatus they use.



(a) The student measures the distance the air bubble moves in 5 minutes. They then cover the cut shoot with a **black** plastic bag. The student then measures the distance the air bubble moves in 5 minutes again.

The air bubble moves less distance in 5 minutes when the cut shoot is covered.

Explain why.

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(b) Most of the water taken in by the plant is lost through transpiration.

Describe the process of water uptake **and** transpiration.

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(c) Translocation occurs in phloem vessels.

Explain **two** ways phloem vessels are adapted to their function.

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2 .....

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[2]

14 **(a)** The diagrams show a healthy heart valve and a damaged heart valve.

	Open	**Closed**
Healthy heart valve		
Damaged heart valve		

A patient with a damaged heart valve may have these symptoms:

- shortness of breath
- feeling lightheaded, dizzy or faint.

Use the diagrams to explain why the damaged heart valve may cause these symptoms.

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..... **[2]**

(b) Adult stem cells can be used to grow new heart valves for the patient.

(i) The adult stem cells used are taken from the patient's own body.

Describe the function of stem cells inside the human body.

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..... **[1]**

(ii) Stem cells could also be taken from a human embryo.

Suggest **two** advantages of using the patient's own adult stem cells rather than embryonic stem cells.

1 .....

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2 .....

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[2]

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PLEASE DO NOT WRITE ON THIS BLANK PAGE

15 (a) The body maintains a constant internal environment in different ways.

One example is maintaining body temperature.

Explain why it is important to maintain body temperature.

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..... **[2]**

(b) The nervous system helps the body maintain a constant internal environment. It also allows a person to respond to external stimuli.

A person touches a hot pan. **Fig. 15.1** shows the reflex arc involved with a response when a person touches a hot pan.

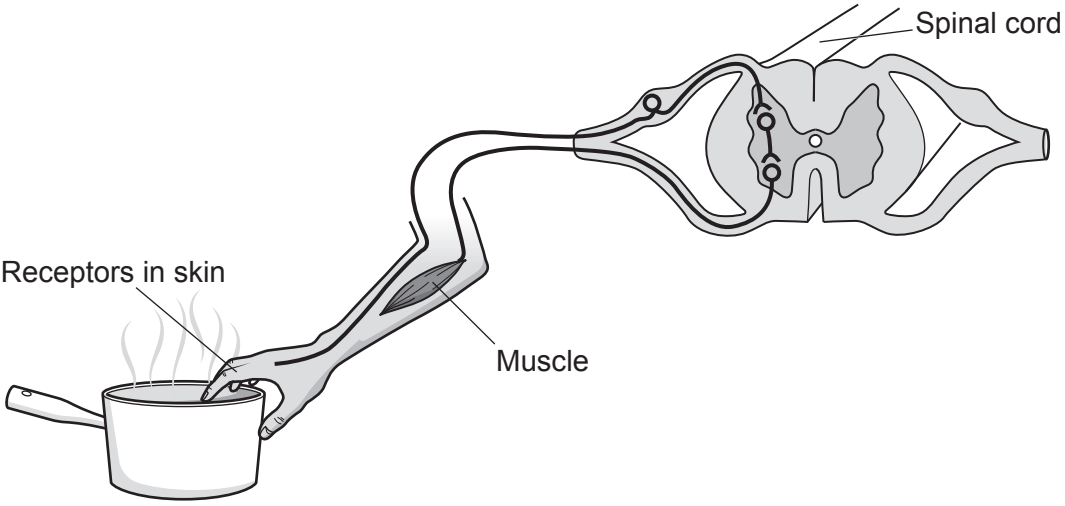

Fig. 15.1

Use **Fig. 15.1** to explain how the nervous system coordinates a response to touching the hot pan.

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..... **[4]**

(c) Caffeine is a chemical found in coffee and cola drinks.

A scientist investigates the effect of caffeine on reaction times.

They test two groups:

- Group **A** contains 2 boys aged 15 years; they are given 150 cm^3 of a caffeine-free drink.
- Group **B** contains 2 boys aged 15 years; they are given 150 cm^3 of a caffeine drink.

Both groups are tested before and after taking the drink.

(i) Suggest **one** reason why their method produces results that may **not** be reproducible.

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..... **[1]**

(ii) **Fig. 15.2** shows the results.

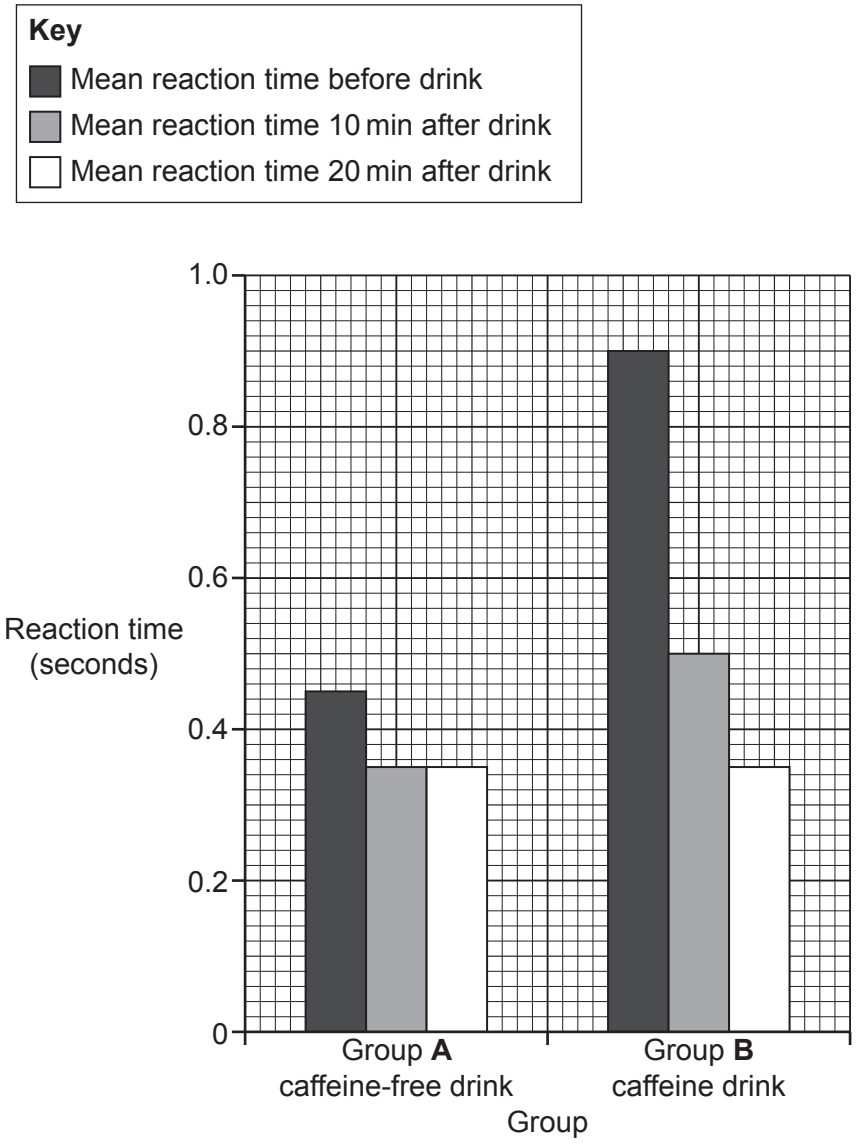

Fig. 15.2

Compare the data for group **A** with the data for group **B**.

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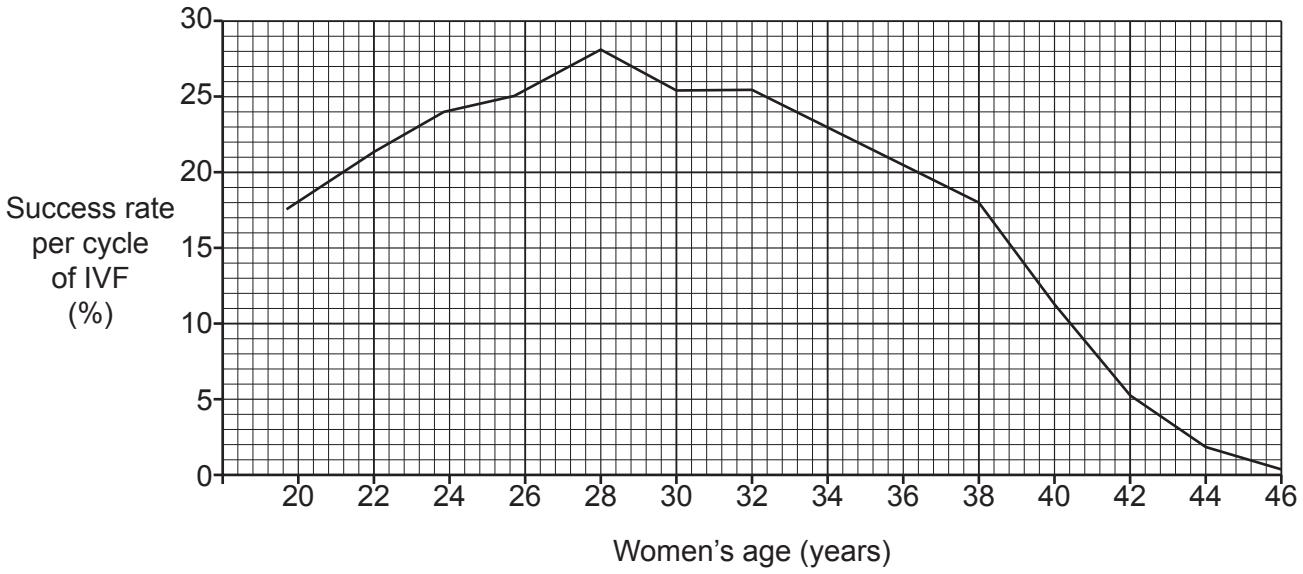
..... **[2]**

16 Infertility can be treated using *in vitro* fertilisation (IVF).

Eggs are collected from the ovary of the woman and fertilised by sperm in a Petri dish.

The fertilised eggs are then placed into the uterus of the woman.

(a) The graph shows the success rate per cycle of IVF compared to the age of the woman.



Use data in the graph to describe the effect of age on success rate.

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..... **[2]**

(b) Infertility can also be treated using the hormones LH and FSH.

(i) Explain why these two hormones are used to treat infertility.

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..... **[2]**

(ii) Use of these hormones can result in more than one embryo developing inside the uterus. This may have personal, social or economic implications for the mother.

One reason would be the increased stress on the mother's heart.

Suggest **one** other reason.

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..... **[1]**

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).