Communication and homeostasis – 2021/20 GCE Biology A Component 01

1. Nov/2021/Paper_H420/1/No.1

Which of the options is **not** a function of the liver?

A production of urea in the ornithine cycle

B removal of amino groups from amino acids

C storage of excess amino acids as protein

D storage of glucose as glycogen

Your answer ☐ **[1]**

2. Nov/2021/Paper_H420/1/No.2

Which of the statements about the control of blood glucose is correct?

A Pancreas cells increase their release of glucagon when blood glucose concentration rises above a set level.

B Glucagon stimulates the conversion of glycogen to glucose by liver cells.

C Insulin increases blood glucose concentration by stimulating glycogenesis and gluconeogenesis.

D The interaction of insulin and glucagon keeps the blood glucose concentration constant.

Your answer ☐ **[1]**

3. Nov/2021/Paper_H420/1/No.16(b)

(b) **Fig. 16.2** is a diagram of a section through the human brain.

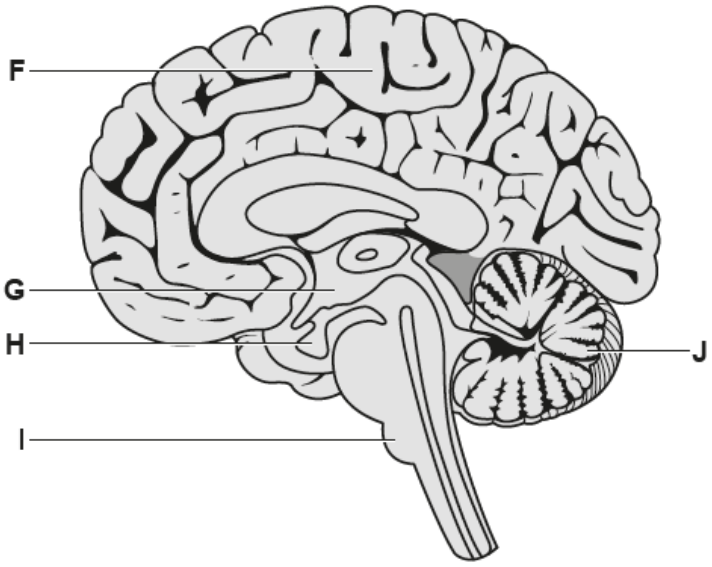

Fig. 16.2

(i) Identify the letter and name of the structure in **Fig. 16.2** that is connected by nerves to structure **A** in **Fig. 16.1**.

Letter .....

Name .....

[2]

(ii) Normal human resting heart rate is approximately 70 beats per minute (bpm). Cutting the parasympathetic nerve to the heart increases this to approximately 100 bpm.

Suggest **two** conclusions that could be made from this observation about the control of resting heart rate in normal humans.

1 .....

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2 .....

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[2]

(iii) Injury to the parts of the brain labelled **G** and **H** in **Fig. 16.2** can lead to a range of symptoms including:

- fatigue
- weight gain
- menstrual irregularities
- low blood pressure or dizziness
- increased sensitivity to cold.

Outline how injury to **G** and **H** is able to cause such a wide range of symptoms.

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

(iv) Suggest why it can be difficult for a doctor to conclude that the symptoms described in part **(iii)** are definitely caused by damage to parts of the brain.

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

4. Nov/2021/Paper_H420/1/No.17

The pancreas produces digestive enzymes and is also involved in the regulation of blood glucose concentration.

(a) **Fig. 17**, **in the insert**, shows a light micrograph of a section of mouse pancreas.

Identify the structures labelled **K** and **L** in **Fig. 17**.

K .....

L .....

[2]

(b) Scientists investigated the effect of the drug nifedipine on the secretion of insulin from pancreas cells in culture.

Pancreas cells were first incubated with glucose at a concentration of $3\,mmol\,dm^{-3}$. The concentration of glucose was then increased to $20\,mmol\,dm^{-3}$ in the presence or absence of nifedipine.

The scientists then measured the amount of insulin secreted by the cells. They recorded their results as a percentage of the total insulin content of the cells. Each experiment was repeated seven times.

The results are shown in the table.

Condition	Mean insulin secreted (%)
Without nifedipine	7.8 ± 0.78
With nifedipine	0.8 ± 0.15

(i) Name the cells that secrete insulin.

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

(ii) Explain why it was necessary to increase the concentration of glucose surrounding the cells before they measured insulin secretion.

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

(iii) Suggest and explain which statistical test the researchers would have used to analyse their data.

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

(iv) The statistical test gave a value of $p < 0.001$. Use the words 'chance' and 'probability' to draw a conclusion from the result of the statistical test.

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

(v) Nifedipine blocks Ca^{2+}-channels.

Explain how blocking calcium channels could inhibit insulin secretion.

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(c)* Type 1 diabetes has been treatable for many years, but treatments are always improving.

Evaluate the treatments for type 1 diabetes that have been used in the past as well as current and potential future treatments.

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