

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Pearson Edexcel

International GCSE (9-1)

Centre Number

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Sample Assessment Material for first teaching September 2017

(Time: 1 hour 45 minutes)

Paper Reference **4HB1/02**

Human Biology

Unit 4HB1

Paper 02

You must have:

Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Calculators may be used.
- Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Pearson

Answer ALL questions.

- 1** (a) A student uses a computer program to investigate his reaction time.

This is the student's method.

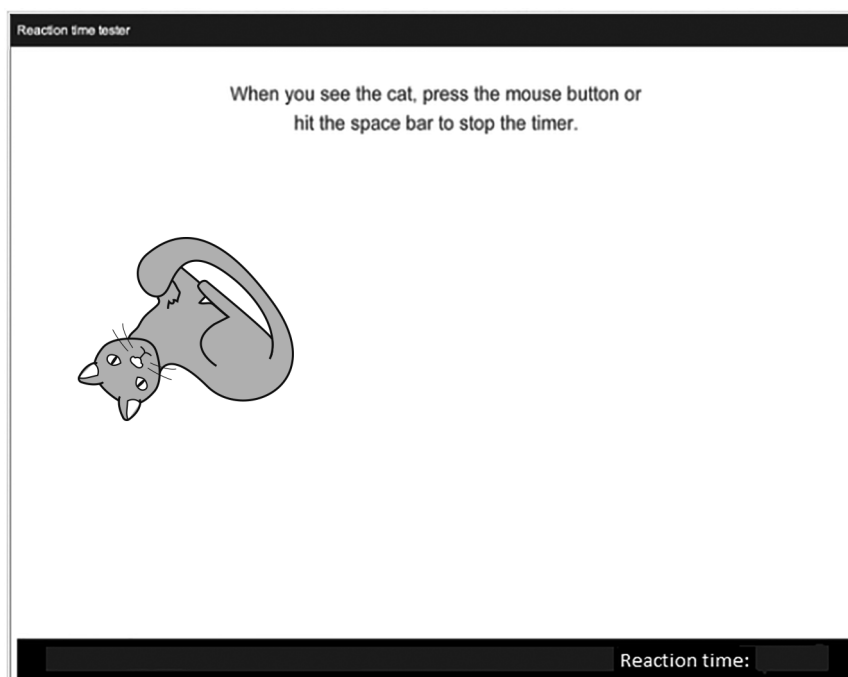
Step 1 drink a cup of coffee containing no caffeine

Step 2 press the spacebar on the keyboard when a cat appears on the computer screen to measure the reaction time

Step 3 repeat Step 2 twice

The student then repeats the method, but in Step 1 he drinks coffee containing caffeine.

The diagram shows the computer screen where the cat appears.

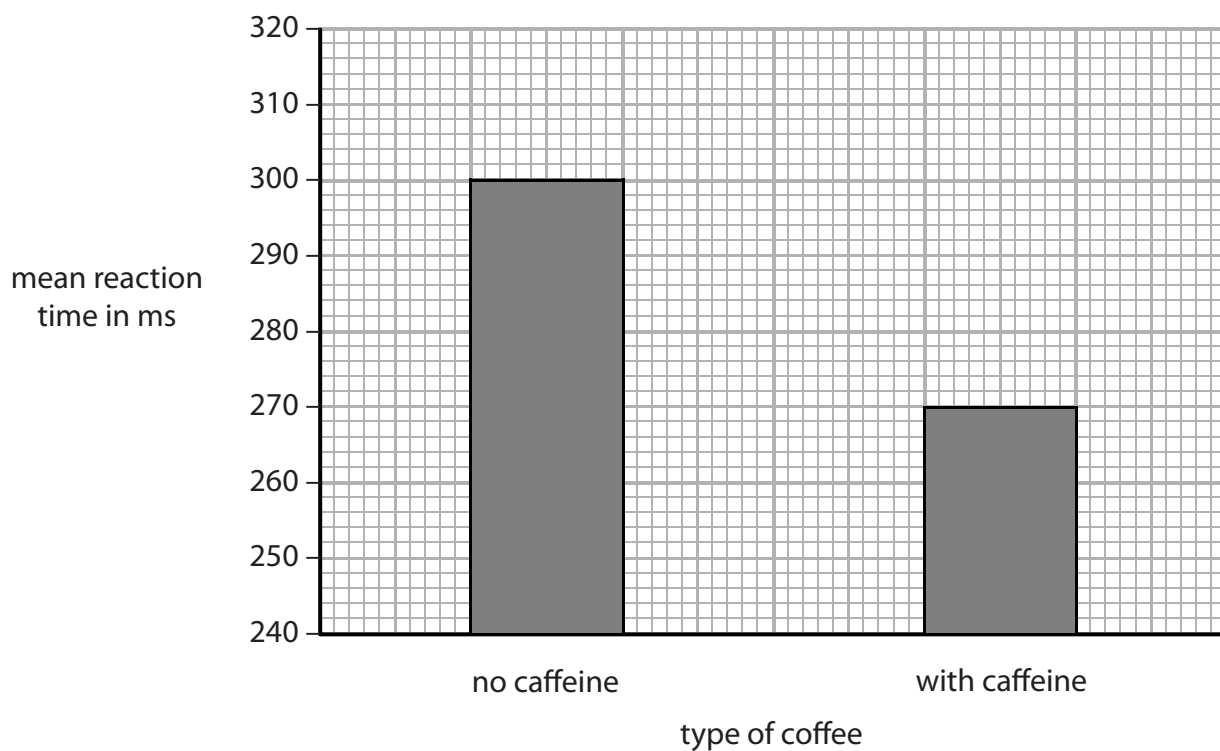


- (i) State why the student repeats Step 2.

(1)



(ii) The bar chart shows the results of the student's investigation.



Describe the effect of caffeine on the student's reaction time.

(2)

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(b) Caffeine is a type of drug.

Statements X and Y give information about drugs.

Statement X Drugs alter the way in which chemical reactions take place in the body.

Statement Y All drugs are illegal because they are addictive.

Which of these statements is correct?

(1)

- ☐ **A** statement X only
- ☐ **B** statement Y only
- ☐ **C** statements X and Y
- ☐ **D** neither statement X or Y

(c) State the name of a drug used as a painkiller.

(1)

(Total for Question 1 = 5 marks)

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2 The diagram shows a short length of DNA from a cell.



(a) State the name given to the shape of a DNA molecule.

(1)

(b) The two strands of the DNA molecule are held together by base pairs.

(i) How are the bases paired in DNA?

(1)

- ☐ **A** A-A and T-T
- ☐ **B** C-C and G-G
- ☐ **C** A-T and C-G
- ☐ **D** C-T and A-G

(ii) Name the type of bond that holds the base pairs together.

(1)



(c) Diagram 1 shows the normal order of bases along one strand of a DNA molecule.

Diagram 2 shows the same DNA strand but with a change in the order of bases.



(i) Use the diagrams to describe the change in the order of bases on the DNA strand. (2)

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(ii) State the name given to a change in the normal order of bases along a DNA strand. (1)

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(iii) The passage describes what happens when the order of bases on a DNA strand changes.

Use information from the box to complete the passage.

(3)

| | | | |
|--------------|----|------------|---------|
| 46 | 23 | amino acid | protein |
| carbohydrate | 3 | sugar | 4 |

Each set of bases along a strand of DNA is a code for one If the order of bases changes, then the final made may not function correctly.

(Total for Question 2 = 9 marks)

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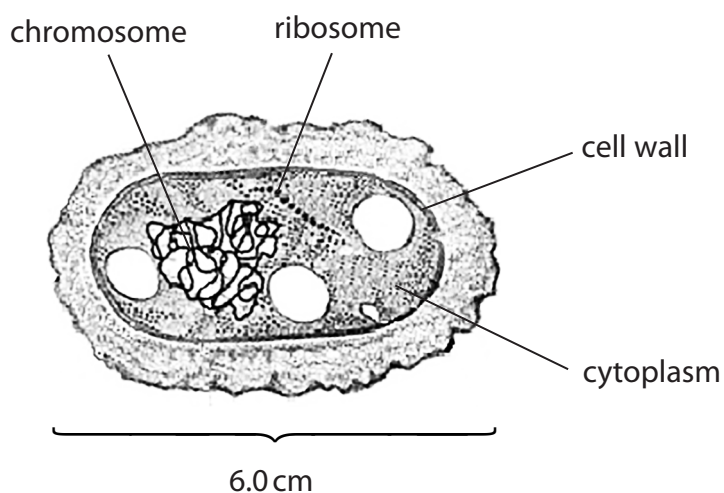
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3 The diagram shows a bacterial cell viewed with an electron microscope.



© Kenneth Todar, PhD

(a) (i) Different structures in the bacterial cell are shown in the diagram.

What is the function of the ribosomes?

(1)

- ☐ **A** make proteins
- ☐ **B** help the cell to move
- ☐ **C** cause resistance to antibiotics
- ☐ **D** help the cell to attach to surfaces

(ii) What is the function of the cell wall?

(1)

- ☐ **A** controls the movement of substances in and out of the cell
- ☐ **B** holds genetic information
- ☐ **C** prevents the cell from bursting
- ☐ **D** where all chemical reactions take place



- (iii) The width of the bacterial cell in the diagram is 12 000 times greater than its actual width.

Use information from the diagram to calculate the actual width of the bacterial cell.

Give your answer in micrometres (μm).

(3)

actual width = μm

- (iv) Describe why working with bacteria can be a safety risk.

(1)

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- (v) State one precaution that reduces the safety risk of working with bacteria.

(1)

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- (b) Describe how to use a light microscope to obtain a clear image of cells.

(2)

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(Total for Question 3 = 9 marks)



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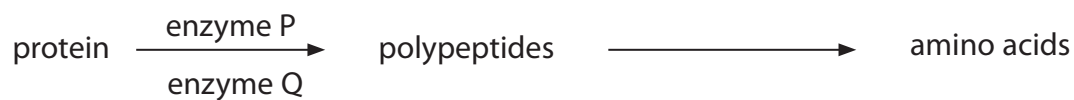
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- 4 (a) The diagram shows how a protein is broken down into amino acids in the digestive system.



- (i) Enzyme P is most active in acidic conditions.

Enzyme Q is most active in alkaline conditions.

What are the names of enzyme P and enzyme Q?

(1)

- ☐ A enzyme P is pepsin and enzyme Q is maltase
- ☐ B enzyme P is trypsin and enzyme Q is pepsin
- ☐ C enzyme P is maltase and enzyme Q is trypsin
- ☐ D enzyme P is pepsin and enzyme Q is trypsin

- (ii) State the location in the digestive system where enzyme P breaks down protein into polypeptides.

(1)



S 6 0 1 2 8 A 0 1 3 3 2

(b) A student investigates the optimum temperature for amylase activity.

This is the student's method.

- add indicator solution to 10 cm³ of starch solution
- add 3 cm³ of amylase solution to the indicator and starch solution
- heat to 35 °C for 15 minutes
- time how long it takes for the mixture to lose its colour
- repeat the test at 40 °C and again at 55 °C

(i) Draw a table suitable for recording the results of the student's investigation.

(3)

(ii) Name the indicator that the student should use in this investigation.

(1)

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(iii) What is the independent variable in this investigation?

(1)

- ☐ A change in colour
- ☐ B temperature
- ☐ C time
- ☐ D volume of amylase solution

(iv) Describe what the student should do to find out if the results obtained are reliable.

(2)

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(v) Explain one step in the method that could introduce errors into the student's results.

(2)

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(Total for Question 4 = 11 marks)





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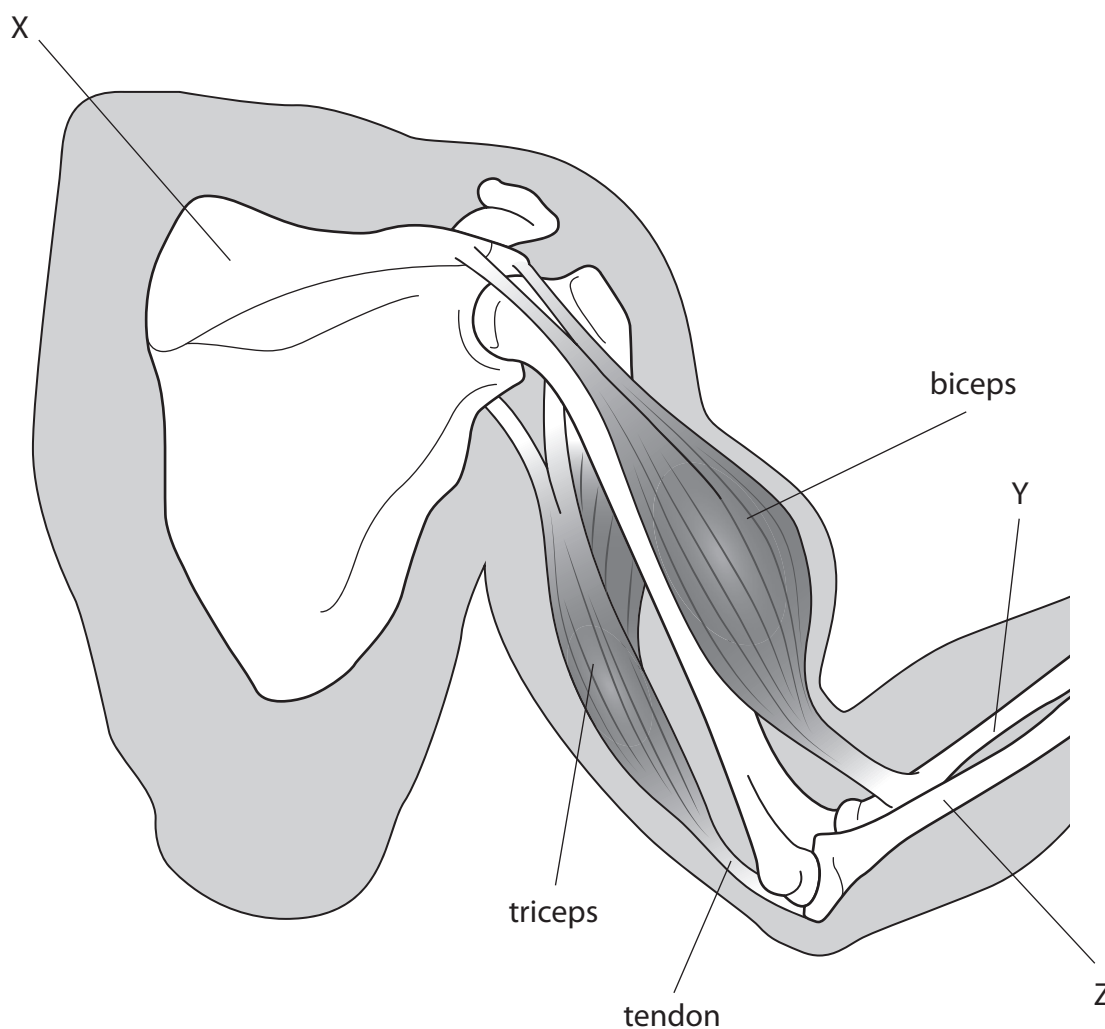
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5 The diagram shows some structures in a human arm.



(a) (i) Name structures X, Y and Z.

(3)

X

Y

Z

(ii) Describe how the function of a tendon is different from the function of a ligament.

(2)

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(iii) Describe how the triceps and biceps muscles work to straighten the arm.

(2)

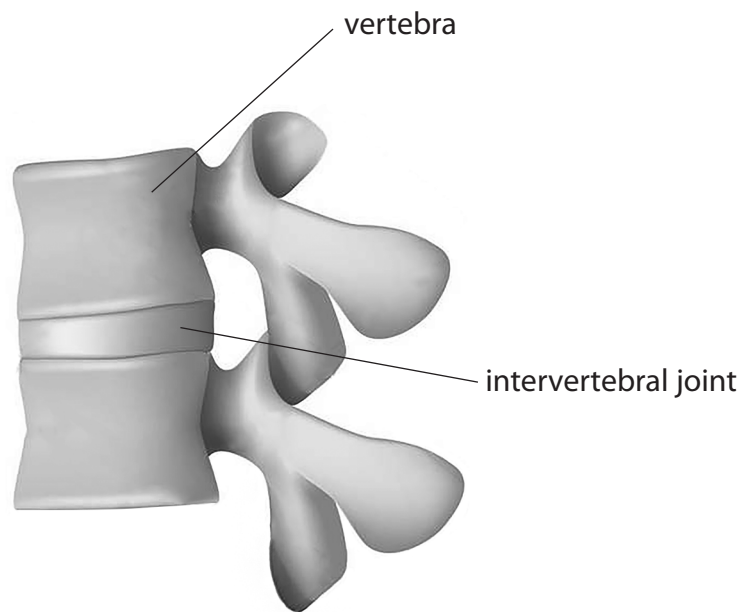
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(b) The diagram shows an intervertebral joint found between two vertebrae in the spinal column.



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Compare the difference in the movement that occurs at an intervertebral joint and at a ball and socket joint.

(2)

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(Total for Question 5 = 9 marks)



6 Read the passage below.

Use the information in the passage and your own knowledge to answer the questions that follow.

Methicillin-resistant *Staphylococcus aureus* (MRSA) are harmless bacteria found on the surface of the skin. However, if these bacteria enter the body of a human it can be fatal. Most bacterial infections can be treated with antibiotics that destroy bacteria. MRSA are resistant to many antibiotics, even methicillin which is a powerful antibiotic. Once inside the body, the number of MRSA bacteria increase rapidly, particularly in people who have weakened immune systems. The bacteria spread quickly throughout the body causing life-threatening infections in bones, joints, surgical wounds, the bloodstream, heart valves and lungs.

MRSA are transmitted from person to person by skin-to-skin contact, or a person may become infected by touching contaminated objects. Infections caused by MRSA bacteria are particularly common in hospital patients who have recently had surgery. In 2003, 7700 cases of MRSA were reported by UK hospitals although in 2011, the number of reported cases dropped significantly to 1481. This was as a result of the 'Clean Your Hands' campaign, which was introduced in hospitals and other medical centres in 2004. This campaign encouraged all hospital staff and visitors to clean their hands using alcohol gel.

Scientists are researching new ways to treat MRSA infections. Tests have found that a liquid from cockroach brains can kill more than 90% of MRSA without the need for antibiotics, some of which can cause serious and unwanted side effects. These tests involve growing MRSA on agar plates using aseptic techniques and adding the liquid from cockroach brains.

One type of honey has also been shown to be highly effective in treating MRSA infections. Tests have been carried out on rats and clinical trials have been carried out on patients with an MRSA infection. The honey, combined with an antibiotic, cleared the MRSA infection far more quickly and effectively than the antibiotic alone.

(a) State what is meant by the term antibiotic resistance (line 4).

(1)

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(b) Explain why MRSA bacteria increase more rapidly in people with weakened immune systems (lines 5 and 6).

(2)

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(c) An MRSA infection can damage heart valves.

Explain what effect this might have on a person (line 8).

(2)

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(d) Calculate the percentage change in the number of reported cases of MRSA between 2003 and 2011 (lines 12 and 13).

(3)

percentage change = %

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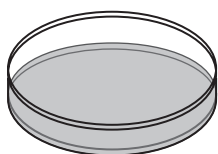


- (e) In tests using the liquid from cockroach brains, MRSA were grown on agar plates using an aseptic technique (lines 20 and 21).

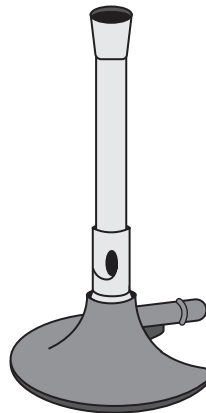
The diagram shows some of the equipment used to carry out an aseptic technique.



inoculating loop



sterile Petri dish
containing agar gel



Bunsen burner



flask containing
bacterial culture

Describe an aseptic technique for growing bacteria that includes the use of the equipment shown in the diagram.

(3)

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(Total for Question 6 = 11 marks)





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- 7 (a) *In vitro* fertilisation (IVF) is a treatment that helps to increase the chance of pregnancy.

The percentage success rate of IVF treatment can be measured by comparing the number of embryos transferred to female patients with the number of pregnancies produced from these transfers.

The table gives information on the success rate of IVF treatment, in women of different age groups, in one hospital.

| Age | Number of eggs retrieved from female patients | Number of embryos transferred to female patients | Number of pregnancies from the embryo transfers | Percentage success rate (%) |
|-------|---|--|---|-----------------------------|
| <35 | 273 | 259 | 136 | |
| 35–37 | 188 | 178 | 79 | 44 |
| 38–39 | 131 | 117 | 44 | 38 |
| 40–42 | 106 | 92 | 25 | 27 |
| 43–44 | 35 | 29 | 5 | 17 |
| >44 | 6 | 6 | 0 | 0 |

- (i) Calculate the percentage success rate in women aged less than 35.

Give your answer to two significant figures.

(3)

success rate = %



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- (ii) Use information from the table and your own knowledge to suggest why IVF is less successful as women become older.

(3)

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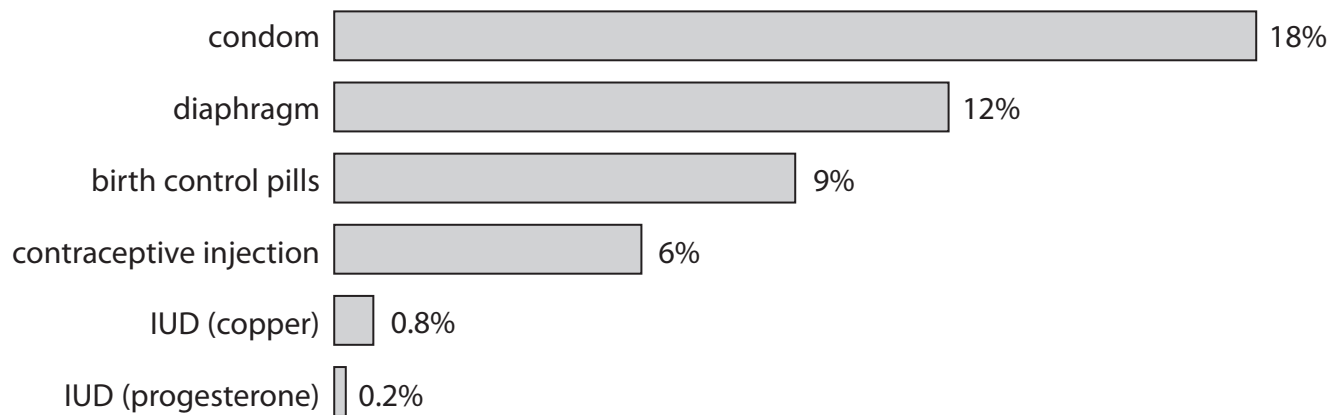
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- (b) Contraception is used to reduce the chance of pregnancy.

The bar chart shows different contraceptive methods and the percentage of women who became pregnant while using each contraceptive method.



- (i) Identify the least effective contraceptive method and suggest a reason why it is the least effective.

(2)

method

reason

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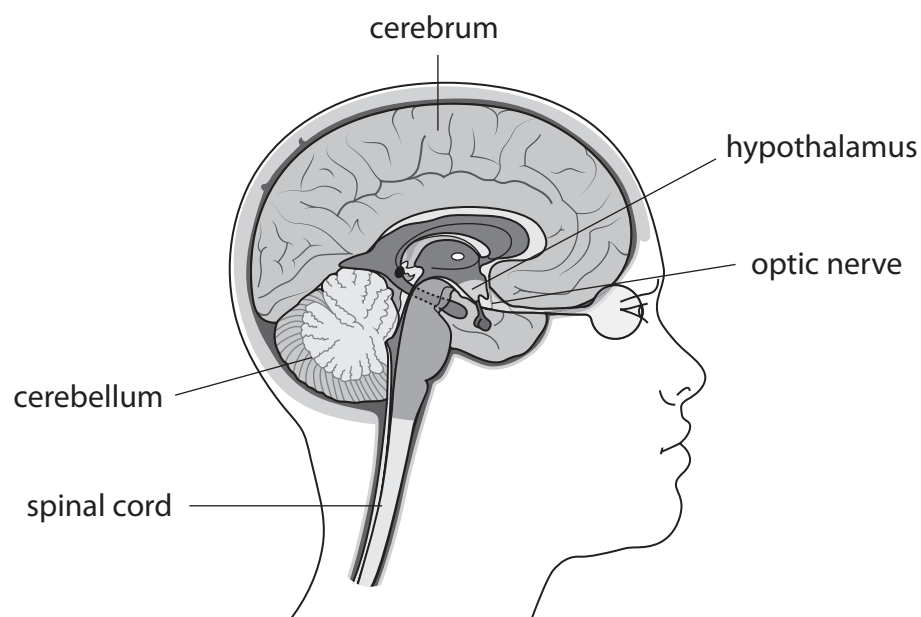
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(Total for Question 7 = 14 marks)



8 The diagram shows a human brain.



(a) Draw a label line to the pituitary gland on the diagram and label this line X.

(1)

(b) A prolactinoma is a non-cancerous tumour of the pituitary gland.

A prolactinoma can interfere with the normal production of hormones by the pituitary gland.

Explain why one symptom of this tumour in females can be reduced fertility.

(6)

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(c) Use information from the diagram to suggest why larger prolactinomas can affect vision.

(3)

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(d) The hypothalamus is involved in maintaining a constant body temperature.

Name two effector organs that respond to electrical signals from the hypothalamus to adjust body temperature.

(2)

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(Total for Question 8 = 12 marks)



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- 9 (a) Gluten is a protein found in wheat, rye and barley.

People with coeliac disease become ill if they eat food containing gluten. Their immune system recognises gluten as a foreign substance. This results in the immune system attacking and destroying cells in the small intestine.

Explain how the immune system reacts to foreign substances, such as gluten, in the body.

(3)

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(b) Diagram 1 shows part of the small intestine from a healthy person

Diagram 2 shows part of the small intestine from a person with coeliac disease.

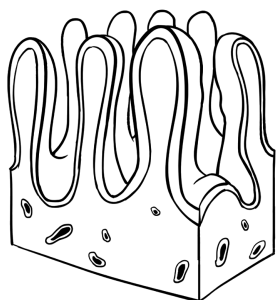


Diagram 1

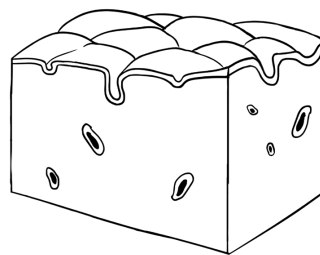


Diagram 2

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Explain the effect of coeliac disease on the digestion and absorption of food molecules in the small intestine.

(4)

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(c) Explain why people with coeliac disease often show symptoms of anaemia.

(3)

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(Total for Question 9 = 10 marks)

TOTAL FOR PAPER = 90 MARKS





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