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CANDIDATE NAME

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BIOLOGY **0610/42**

Paper 4 Theory (Extended) **October/November 2020**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Blank pages are indicated.

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1 **(a)** Sensitivity is one of the characteristics of life. The eye is one of the major sense organs of vertebrates.

(i) Define the term *sensitivity*.

.....

.....

.....

..... [2]

(ii) Define the term *sense organ*.

.....

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.....

..... [2]

(b) Accommodation (focusing) is one of the functions of the eye.

Fig. 1.1 is a diagram of an eye that is focusing on a distant object.

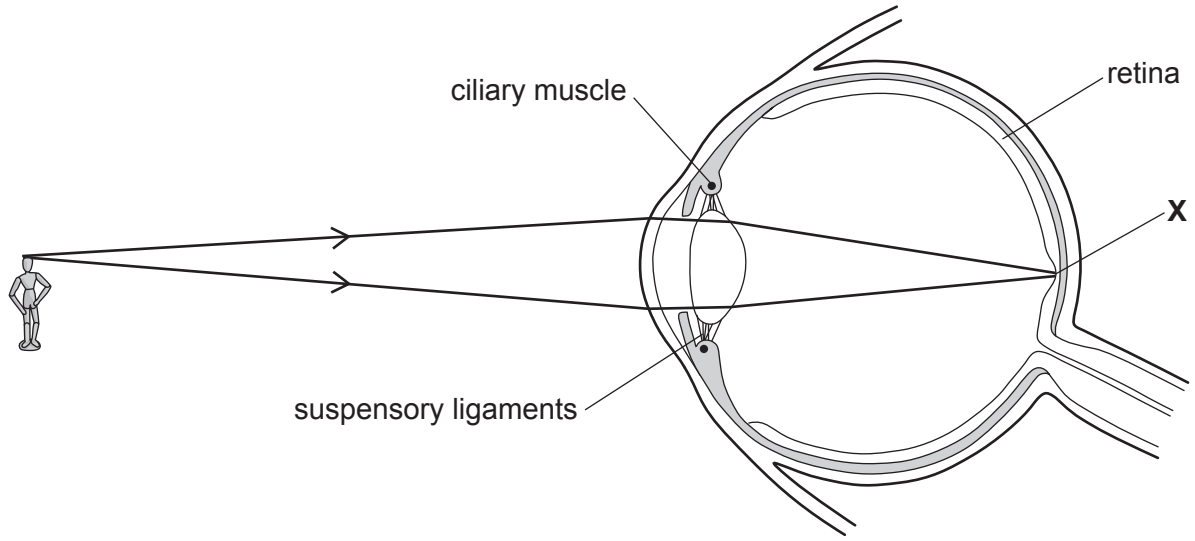


Fig. 1.1

(i) State the name of the part of the retina labelled **X**.

..... [1]

Fig. 1.2 is an incomplete diagram of an eye that is focusing on a near object.

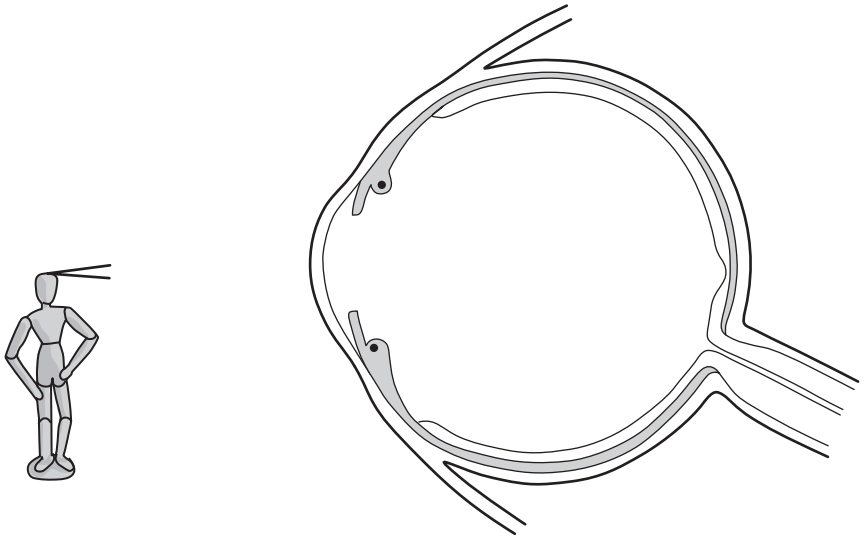


Fig. 1.2

(ii) Complete Fig. 1.2 by **drawing** the shape of the lens and the light rays from the object to the retina. [3]

(iii) Describe the roles of the ciliary muscles and suspensory ligaments in focusing on a **distant object**, as shown in Fig. 1.1.

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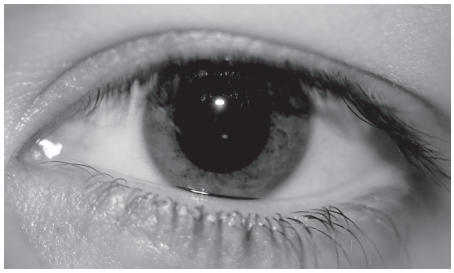
.....

.....

..... [3]

(c) The eye also controls the amount of light that enters the pupil.

Fig. 1.3 shows an eye in low light and in bright light.



eye in low light



eye in bright light

Fig. 1.3

Describe the changes that occur in the eye when the light becomes bright, as shown in Fig. 1.3.

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.....

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.....

.....

.....

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..... [3]

(d) The change shown in Fig. 1.3 occurs automatically without thought.

State the name given to this type of action.

..... [1]

[Total: 15]

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2 Fig. 2.1 is a vertical section of a human molar tooth and surrounding structures.

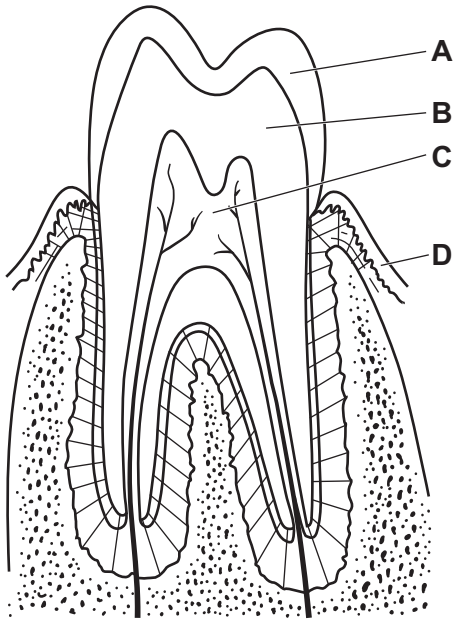


Fig. 2.1

(a) State the names of the parts labelled **A** to **D** on Fig. 2.1.

A .....

B .....

C .....

D .....

[4]

(b) Describe **and** explain the function of molar teeth.

.....

.....

.....

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.....

.....

..... [3]

(c) Fig. 2.2 is an X-ray of decay in a molar tooth.

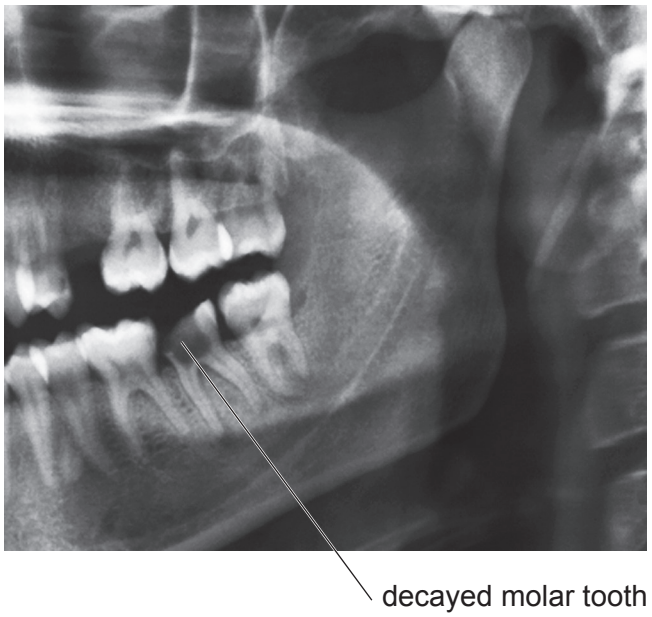


Fig. 2.2

Explain how tooth decay occurs.

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.....

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..... [4]

[Total: 11]

3 Fig. 3.1 is a food web for a forested area in Central America.

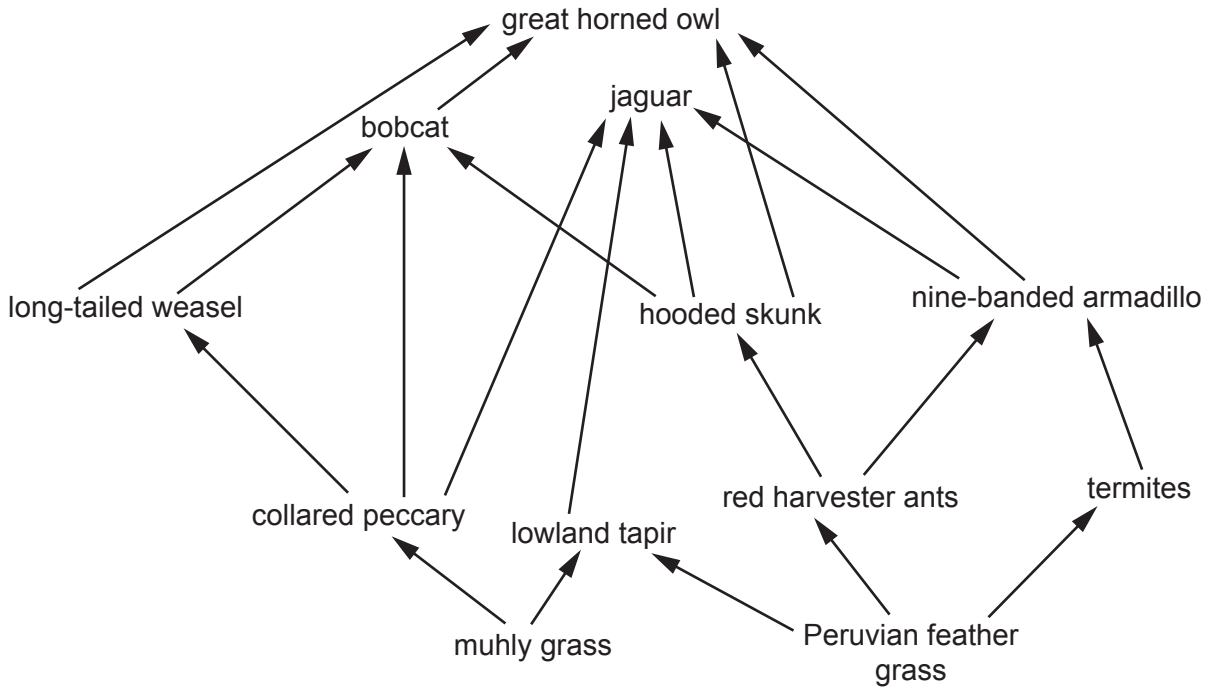


Fig. 3.1

(a) Complete Table 3.1 using information from Fig. 3.1.

Table 3.1

trophic level	description	example from Fig. 3.1
herbivore		
producer		
	feeds on tertiary consumers	
secondary consumer		

[4]

(b) Fig. 3.2 shows the flow of energy through a food chain. The size of each box represents the energy available in each trophic level, numbered 1, 2, 3 and 4.

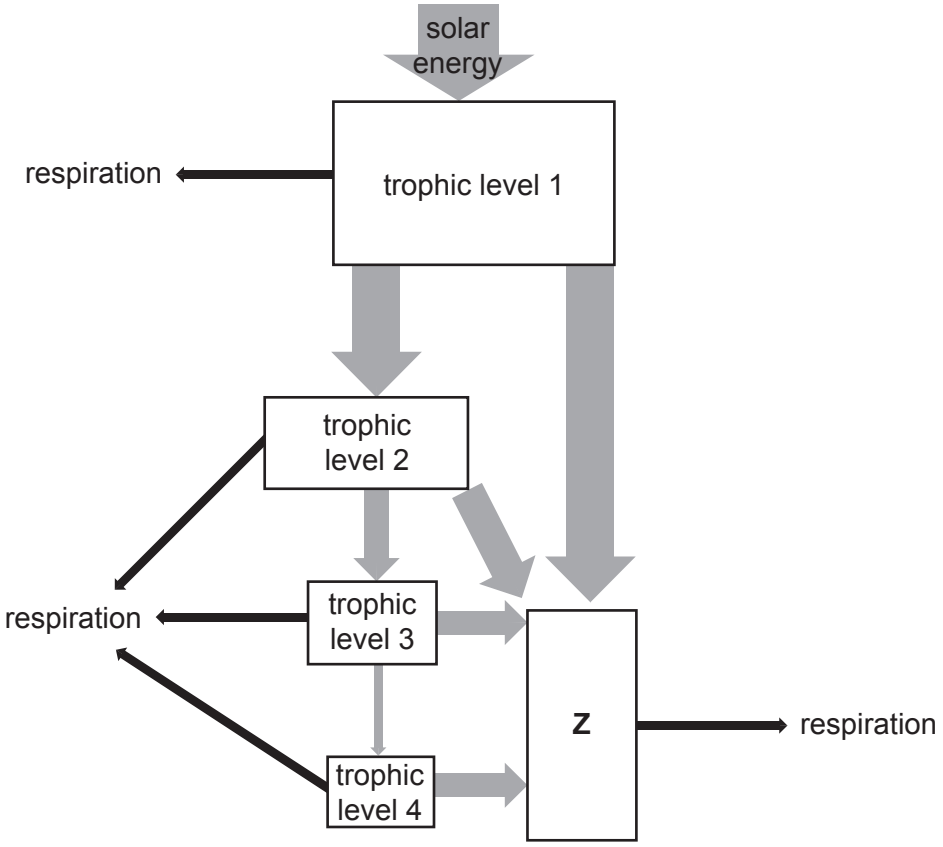


Fig. 3.2

(i) State the term given to the group of organisms represented by **Z** in Fig. 3.2.

..... [1]

(ii) Explain, with reference to Fig. 3.2, why food chains usually have fewer than five trophic levels.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

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(c) Intensive livestock production can be damaging to natural ecosystems.

Fig. 3.3 shows intensive farming of chickens.



Fig. 3.3

(i) Describe the negative impact on an ecosystem of the intensive production of livestock, such as chickens.

.....

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.....

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.....

.....

..... [3]

(ii) Forests are cleared for farmland. Deforestation can lead to a loss of soil (soil erosion).

Explain the effects of soil erosion on ecosystems.

.....

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.....

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..... [3]

[Total: 15]

4 **(a)** Yeast cells have many structures in common with a plant cell.

Fig. 4.1 is a drawing of a yeast cell.

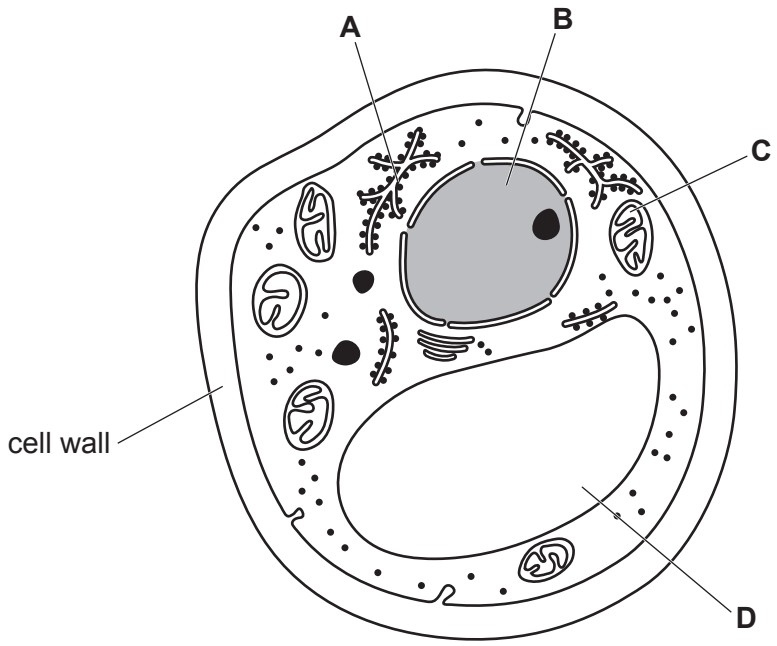


Fig. 4.1

(i) State the names of the cell structures labelled **A** and **D** on Fig. 4.1.

A .....

D .....
[2]

(ii) State the functions of the cell structures labelled **B** and **C** on Fig. 4.1.

B .....

C .....
[2]

(iii) State the name of **one** structure that is found in plant cells but is absent in yeast cells.

..... [1]

(b) Yeast is used in the production of ethanol to manufacture a type of biofuel.

Fig. 4.2 is a flow chart of the process.

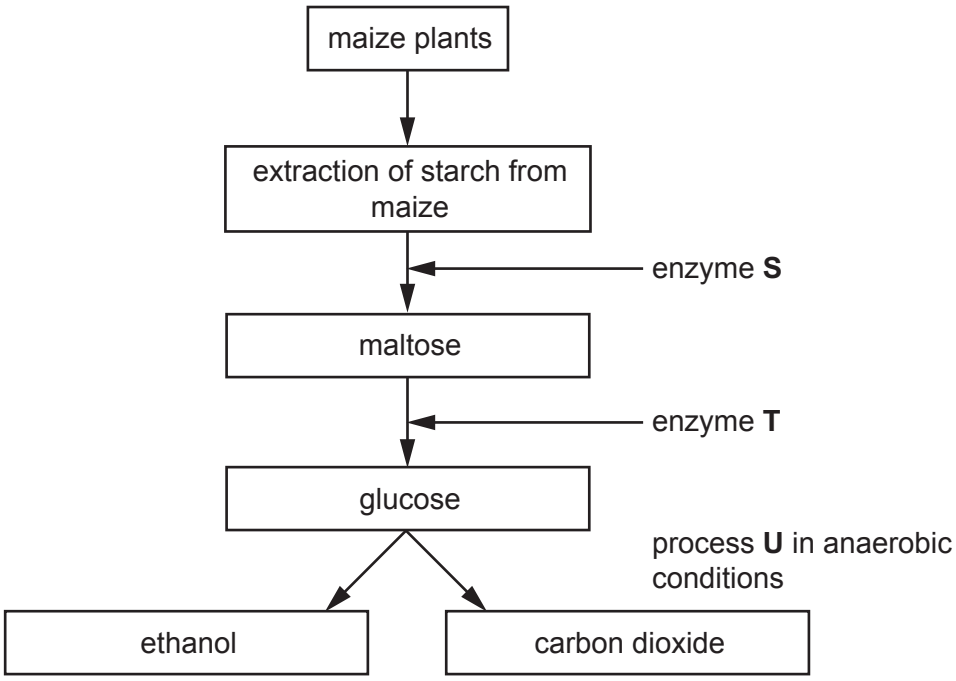


Fig. 4.2

(i) State the names of enzymes **S** and **T**.

S .....

T .....
[2]

(ii) Yeast is used in process **U**. Complete the balanced chemical equation for anaerobic respiration in yeast.

..... ⟶ .....C_2H_5OH + ...
[2]

(iii) Suggest the advantages of using biofuels instead of fossil fuels.

.....

.....

.....

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.....

..... [3]

(iv) Carbon dioxide may be collected from process **U** and sold for use in glasshouses.

Explain why carbon dioxide is used in glasshouses.

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..... [4]

[Total: 16]

5 **(a)** The activities of the ovaries and the uterus are regulated by the hormones FSH, LH, oestrogen and progesterone during the menstrual cycle.

Complete Table 5.1 to show the sites of production and the roles of these four hormones.

Table 5.1

hormone	site of production	target organ	role
FSH	pituitary gland	ovary	
LH	pituitary gland	ovary	
oestrogen		uterus	stimulates growth of the lining of the uterus
progesterone		uterus	

[5]

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(b) Fig. 5.1 shows the changes in the lining of the uterus of a human female.

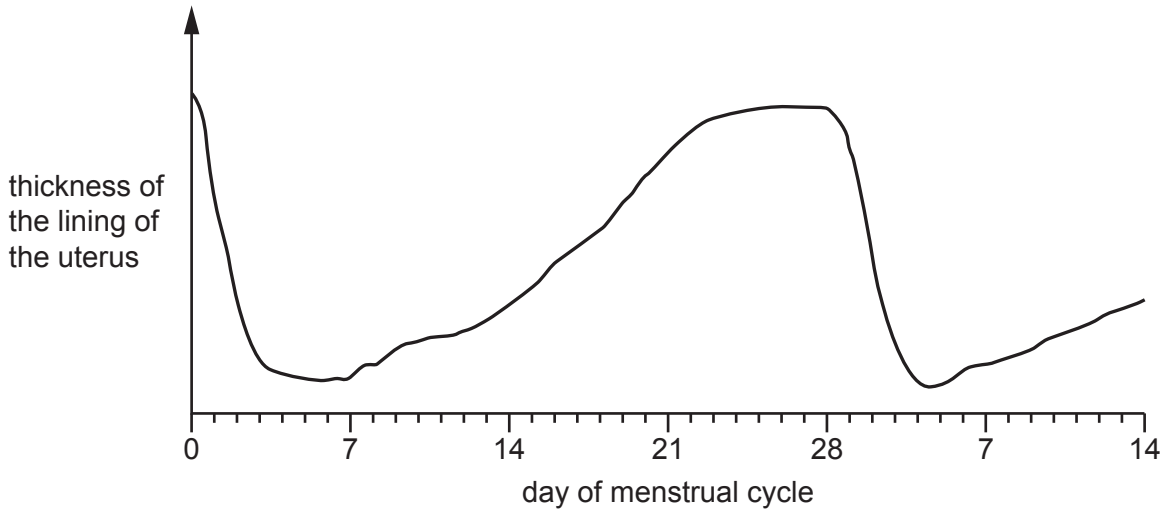


Fig. 5.1

Describe the changes in the lining of the uterus between days 0 and 28 of the menstrual cycle.

between days 0 and 7 .....

.....

.....

.....

between days 7 and 28 .....

.....

.....

.....

.....

[3]

(c) Some people are infertile.

Artificial insemination (AI) and *in vitro* fertilisation (IVF) are two methods of fertility treatment.

These two methods are outlined in Fig. 5.2.

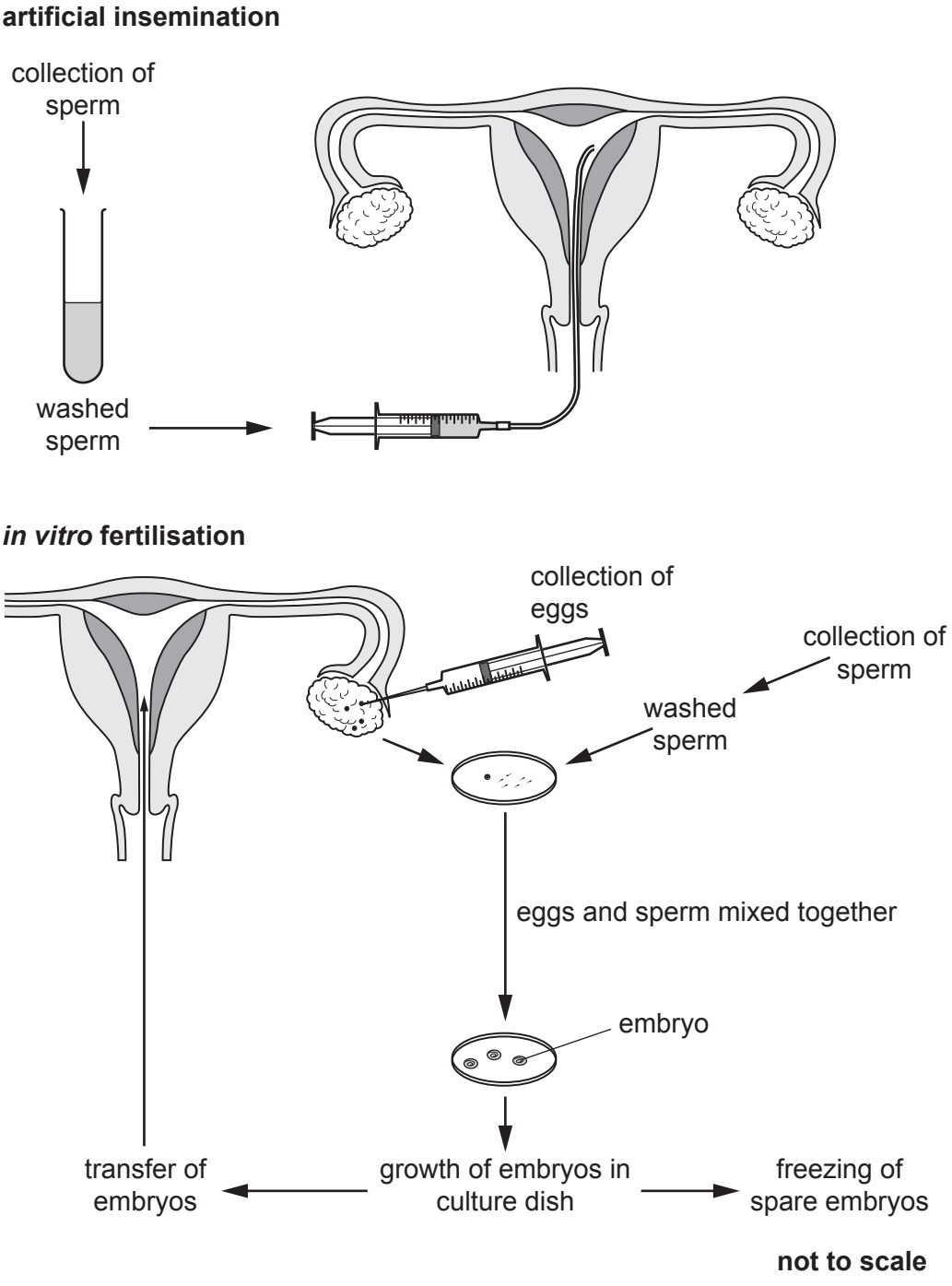


Fig. 5.2

Describe the similarities **and** differences between the two processes of fertility treatment shown in Fig. 5.2.

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..... [6]

[Total: 14]

6 Fig. 6.1 is a diagram of DNA.

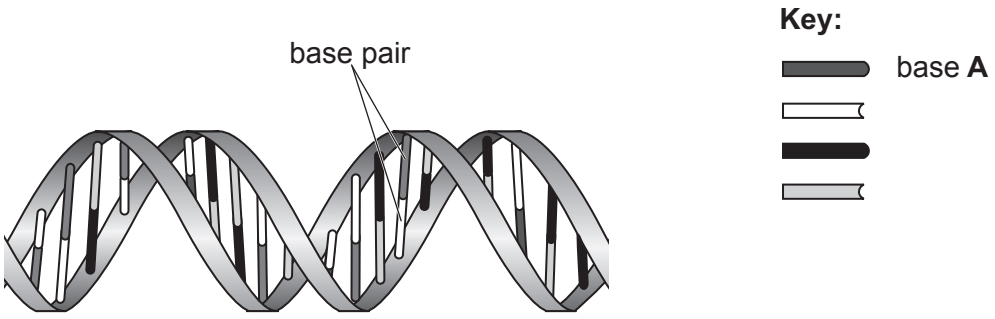


Fig. 6.1

(a) (i) State the letter of the base that pairs with **A**.

..... [1]

(ii) State the letters of the other bases in DNA.

..... [1]

(b) Outline the roles of DNA in a cell.

.....

.....

.....

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..... [2]

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(c) Fig. 6.2 shows a plant tissue in which cells are dividing by mitosis.

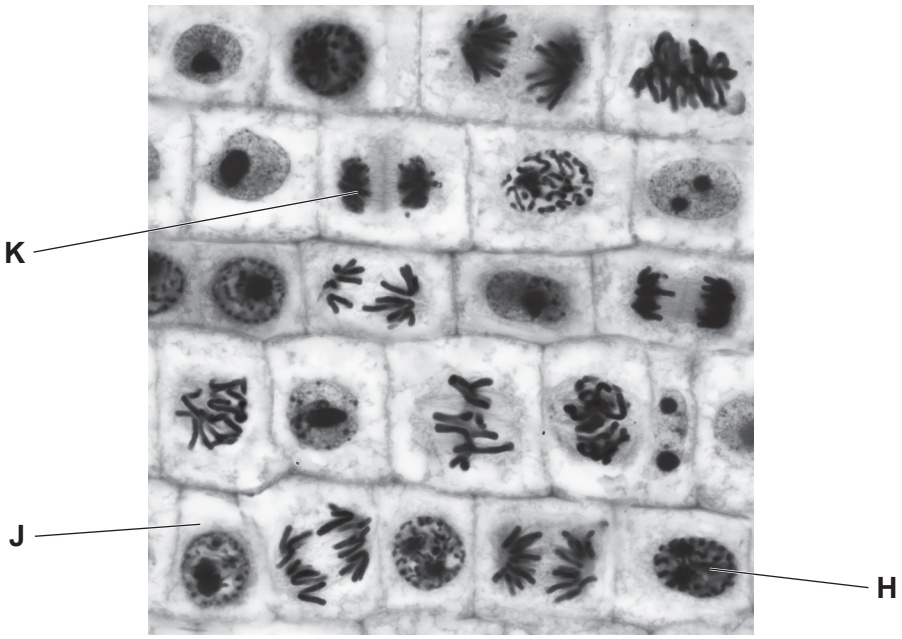


Fig. 6.2

(i) Cell **H** in Fig. 6.2 is about to divide by mitosis.

State what happens to the chromosomes in cell **H** before mitosis takes place **and** state why it is necessary.

.....

.....

.....

.....

..... [2]

(ii) Cell **K** is about to divide into two cells.

State the structures that will form between the nuclei so that the cell divides into two cells.

.....

..... [2]

(iii) Cell **J** in Fig. 6.2 is an example of a diploid cell.

State what is meant by the term diploid.

.....

.....

..... [1]

[Total: 9]

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