Control and co-ordination in mammals

Question Paper 4

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Control and co-ordination
Sub Topic	Control and co-ordination in mammals
Booklet	Theory
Paper Type	Question Paper 4

Time Allowed : **66 minutes**

Score : **/ 55**

Percentage : **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 **(a)** The steroid hormones oestrogen and progesterone are secreted by the ovary.

State precisely the sites of secretion of each.

oestrogen .....

progesterone ..... [2]

(b) The most effective oral contraceptives for general use are the so-called combined oral contraceptives (COCs), which contain both oestrogen and progesterone.

Explain how COCs produce their effects.

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..... [4]

(c) Describe two **social** implications of the use of contraceptives.

1 .....

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2 .....

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[Total: 8]

2 **(a)** Outline the role of calcium ions in the transmission of nerve impulses.

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(b) It has been suggested that during maturation of a sperm, the uptake of calcium ions is necessary to produce the vigorous movements of the sperm's flagellum that allow it to penetrate the zona pellucida of an oocyte.

Uptake of calcium ions can be measured by staining the sperm with a non-toxic fluorescent stain. Fluorescence increases as the concentration of calcium ions inside the sperm increases.

Sperm from two types of mice were investigated:

- wild-type mice, whose sperm have a particular protein, **P**. **P** is an ion channel found in the plasma (cell surface) membrane.
- mutant mice whose sperm did not have protein **P**.

The results of the investigation are shown in Fig. 4.1.

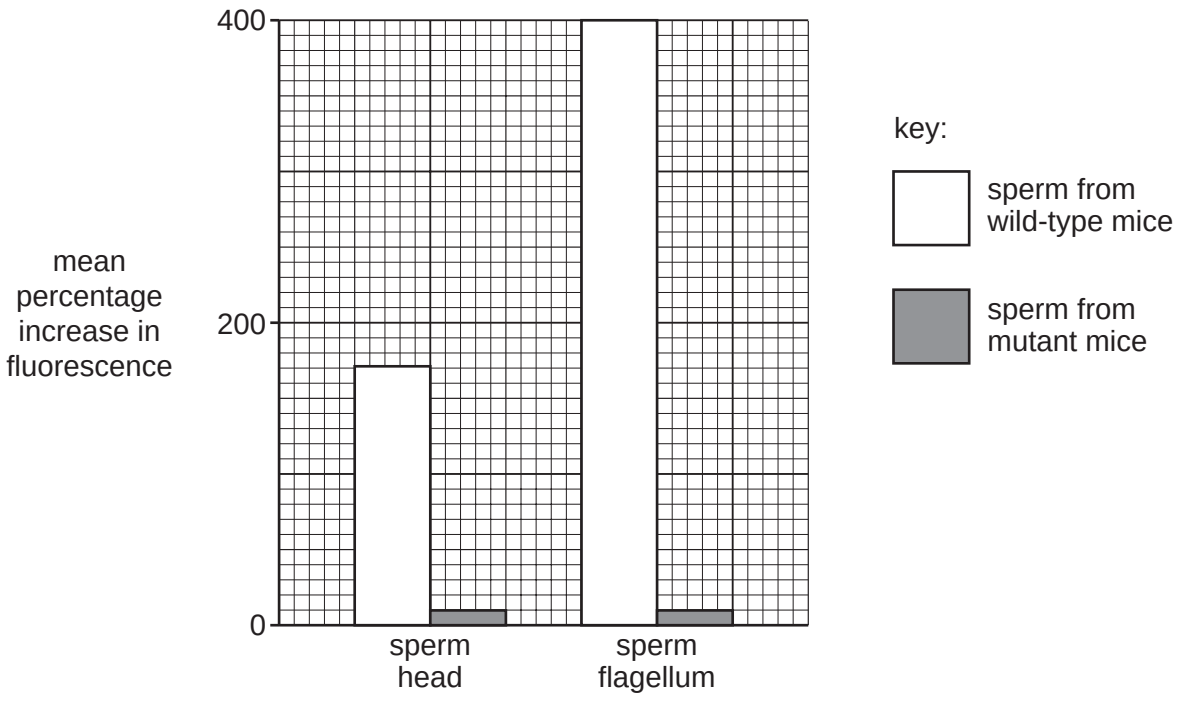

Fig. 4.1

With reference to Fig. 4.1, describe and explain the different mean percentage increases in fluorescence of

(i) sperm from wild-type and mutant mice,

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(ii) sperm heads and flagella.

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(c) The ability of sperm from wild-type and mutant mice to penetrate oocytes was tested using in-vitro fertilisation (IVF) of oocytes with and without a zona pellucida. The results are shown in Fig. 4.2.

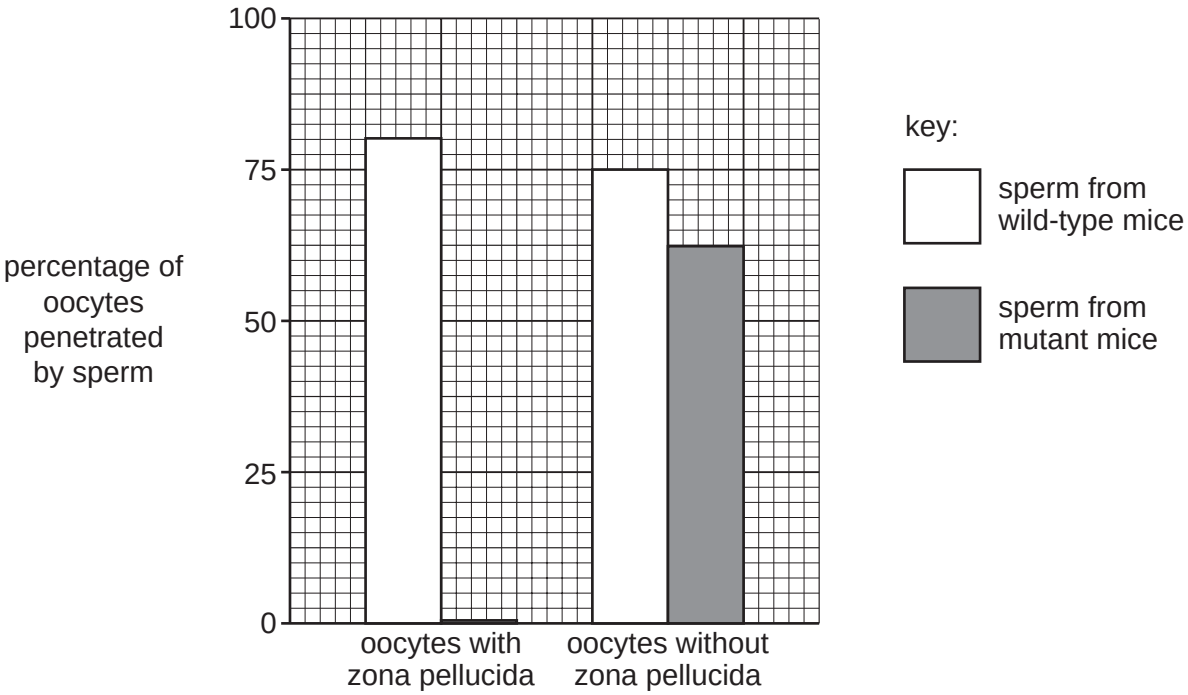

Fig. 4.2

(i) Explain what is meant by *in-vitro fertilisation*.

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.....[2]

(ii) With reference to Fig. 4.2, explain the differences in the ability of sperm from wild-type and mutant mice to penetrate oocytes in IVF.

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[Total: 15]

3 Fig. 6.1 is a photomicrograph of a section through the ovary of a mammal.

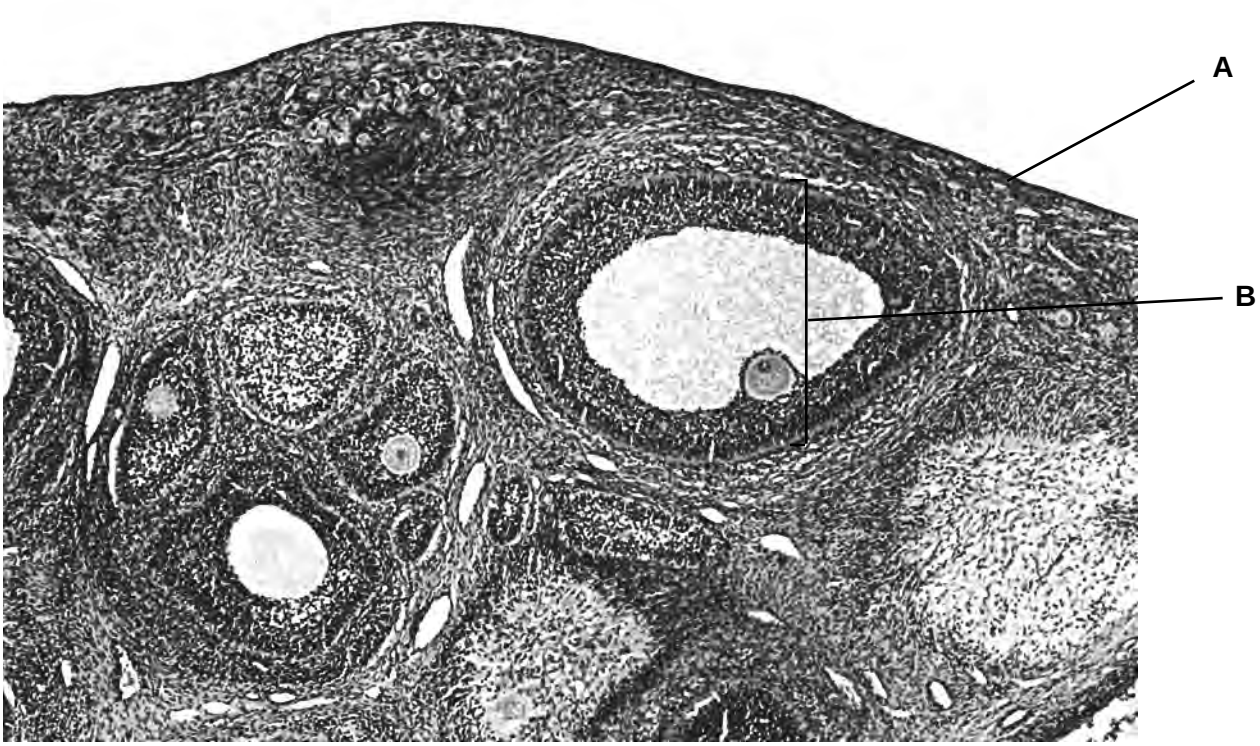

Fig. 6.1

(a) Name **A** and **B**.

A .....

B .....[2]

Fig. 6.2 shows part of the sequence of processes by which female gametes are produced.

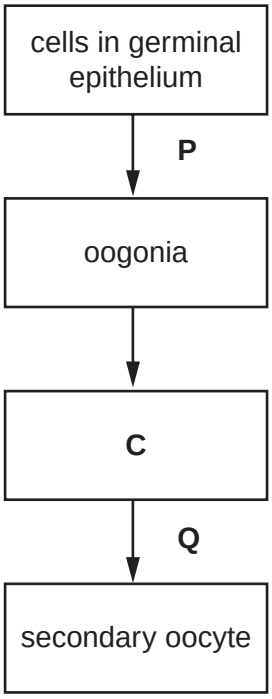

Fig. 6.2

(b) With reference to Fig. 6.2,

(i) name the cell at stage **C**;

..... [1]

(ii) draw a label line **on Fig. 6.1** to a cell at stage **C**; [1]

(iii) name the types of cell division that take place at **P** and **Q**.

P .....

Q ..... [1]

(c) Describe **one** way in which genetic variation between secondary oocytes is achieved during meiosis.

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.....[3]

[Total: 8]

4 **(a)** Name the transmitter which is responsible for the transmission of nerve impulses across a cholinergic synapse.

.....[1]

(b) Outline the role of calcium ions in synaptic transmission.

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(c) Explain how a synapse ensures one-way transmission of nerve impulses.

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[Total: 7]

5 Fig. 3.1 is a diagram of a reflex arc.

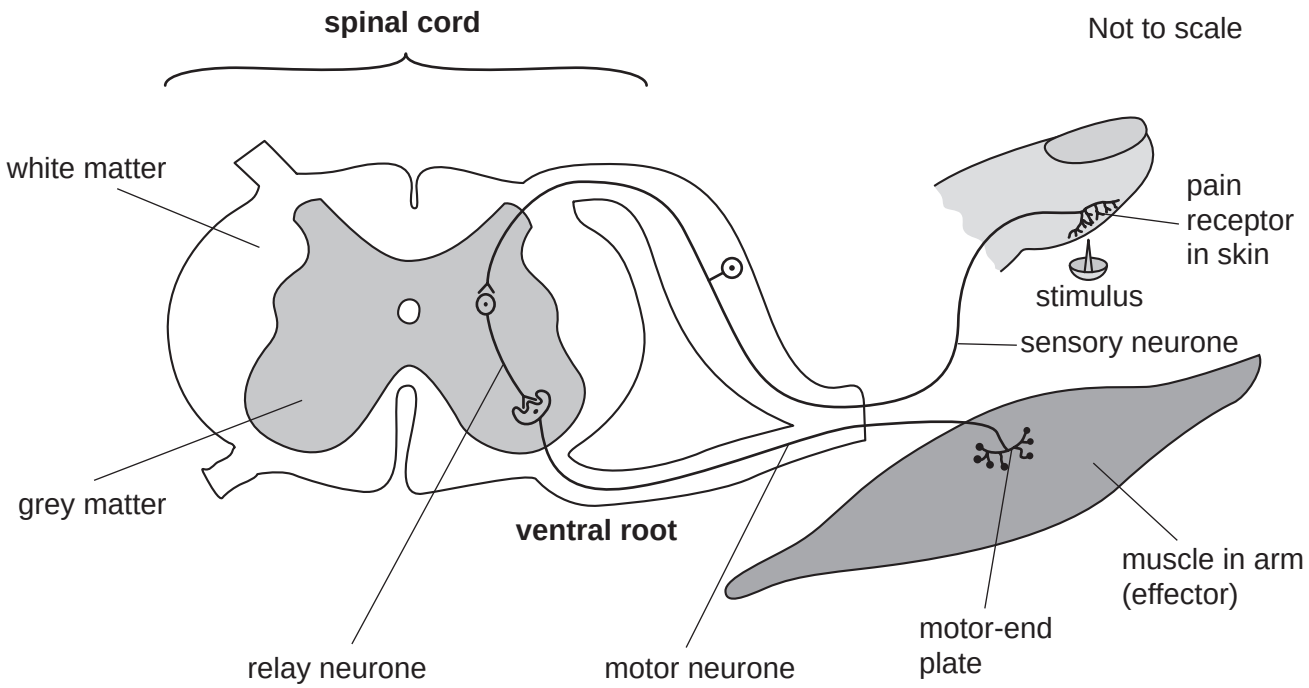

Fig. 3.1

(a) Explain **briefly** how the stimulus at the finger produces an impulse in the sensory neurone.

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(b) Describe the role of the motor neurone in the reflex arc.

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(c) Suggest why nerve impulses can only travel in one direction through the reflex arc.

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[Total: 8]

6 Fig. 3.1 is a diagram that shows the events that occur between two neurones at a synapse.

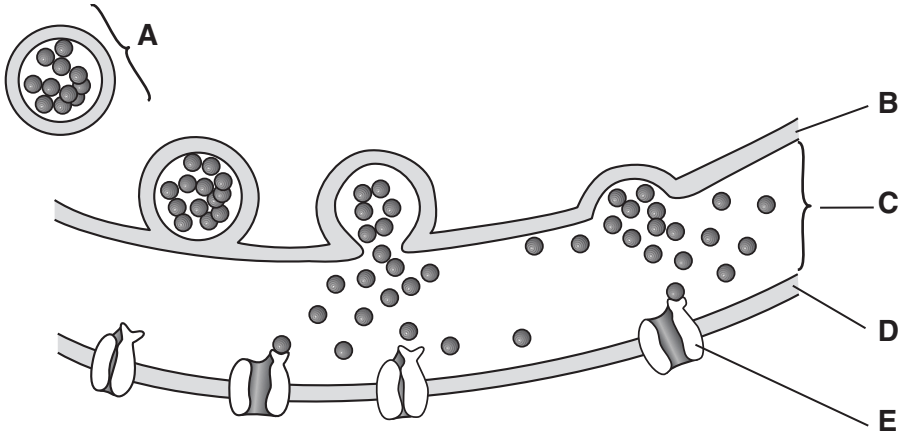

Fig. 3.1

(a) Name **A** to **E**.

A .....

B .....

C .....

D .....

E .....

[5]

(b) Draw a large arrow on the diagram to indicate the direction of the impulse across the synapse. [1]

(c) Describe the role of calcium ions in synaptic transmission.

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[Total : 9]