

Control and co-ordination in mammals

Question Paper 6

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 6

Time Allowed : 72 minutes

Score : / 60

Percentage : /100

Grade Boundaries:

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

1 Many couples who are not able to have children naturally are treated using in-vitro fertilisation (IVF).

(a) Describe how and where fertilisation occurs during IVF.

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

(b) The embryos resulting from IVF are transferred into the mother's uterus. This is sometimes done after 3 days, and sometimes after 5 days.

Suggest **one** advantage and **one** disadvantage of transferring the embryos after 5 days rather than 3 days.

advantage.....
.....
disadvantage
..... [2]

(c) Many IVF clinics usually transfer two or more embryos to the mother's uterus, to increase the chances of a successful pregnancy occurring. However, this increases the risk of more than one embryo developing in the uterus, which in turn increases the risk of problems with the pregnancy or birth.

A study was carried out to compare the success rates of transferring:

- a single embryo that had been carefully chosen as being of 'top quality'
- a non-selected single embryo
- two or more embryos.

Fig. 5.1 shows the results of this study.

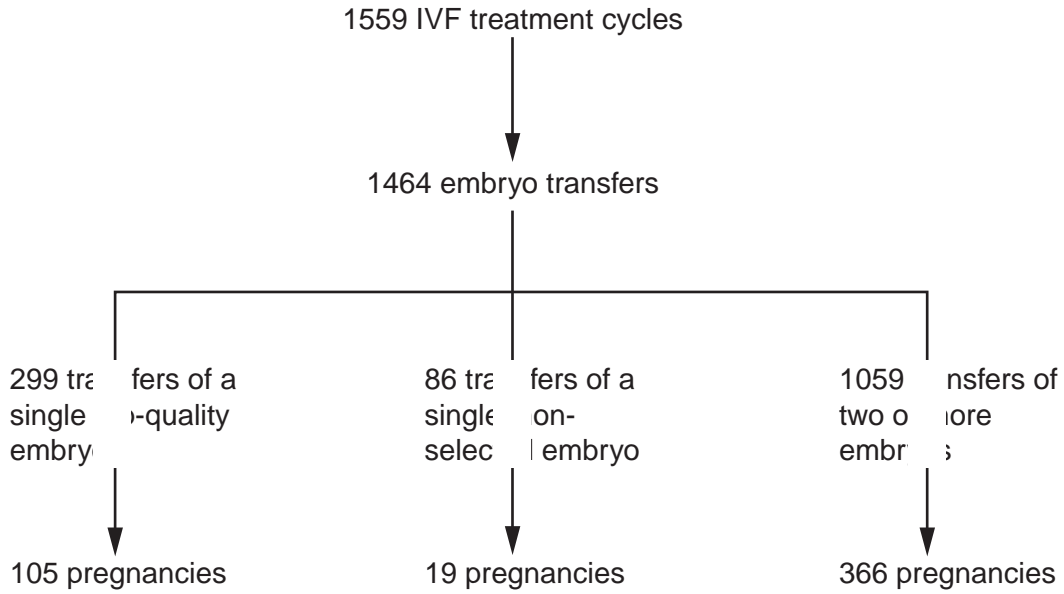


Fig. 5.1

- (i) With reference to Fig. 5.1, explain why transferring a single top-quality embryo is now considered to be the best method to maximise the chance of a successful pregnancy.

.....

 [3]

- (ii) State **one** ethical implication of transferring single top-quality embryos in IVF.

.....

 [1]

[Total: 8]

- 2 (a) Outline the differences in the process of gametogenesis in a man compared with that in a woman.

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..... [3]

- (b) The hormone testosterone is secreted by Leydig cells in the testis. These cells form an endocrine gland.

Explain what is meant by an *endocrine gland*.

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

- (c) In 2009, a research laboratory for family planning in Beijing announced that it had injected 1000 healthy, fertile men with testosterone over a two-year period and found that only 10 of the men were then able to father a child. The men’s normal fertility was restored six months after their last injections.

The injections, each of 500 mg of testosterone, resulted in a reduced production of follicle stimulating hormone (FSH) and of luteinising hormone (LH) in the injected men.

Describe the **similarities** between the effect of these testosterone injections on a fertile man with the effect of the oestrogen/progesterone contraceptive pill on production of FSH and LH by a fertile woman.

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..... [3]

- 3 (a) Spermatogenesis, the production of male gametes, occurs in the testes of a human male from the age of puberty.

Fig. 3.1 outlines the sequence of events that occur during oogenesis.

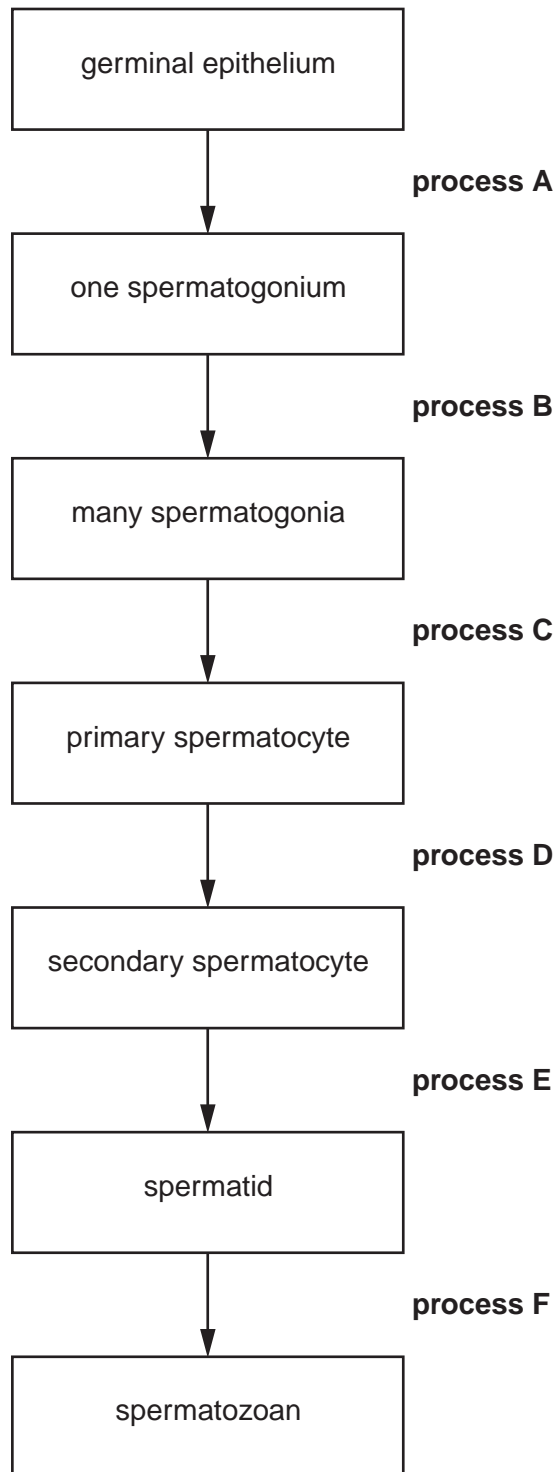


Fig. 3.1

With reference to Fig. 3.1, state what is happening to cells during:

(i) process B

..... [1]

(ii) process D

..... [1]

(iii) process F.

..... [1]

(b) Female gametes develop inside follicles.

Fig. 3.2 shows a section through a mature (Graafian) follicle in a human ovary.

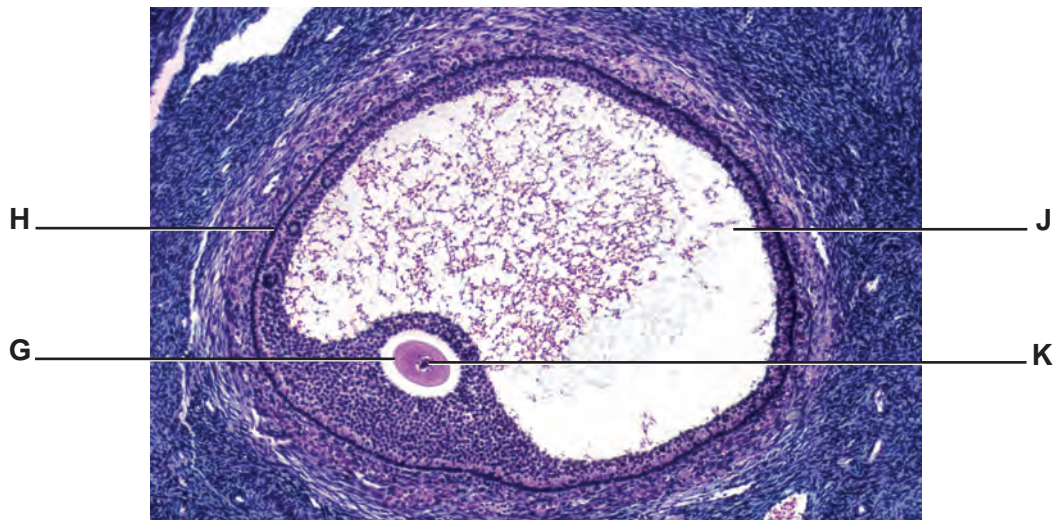


Fig. 3.2

Table 3.1 below lists a number of statements about the mature follicle. Each statement refers to one of the letters **G**, **H**, **J** and **K** shown in Fig. 3.2.

Complete the table using the letters **G**, **H**, **J** and **K**.

Table 3.1

statement	letter
contains protective fluid	
produces oestrogen	
has glycoprotein receptors	
contains 23 chromosomes	

- 4 A recent development in fertility treatment is called in-vitro maturation (IVM). This is both cheaper and safer than the standard procedure used in in-vitro fertilisation (IVF), especially for women with polycystic ovaries. Hormone treatment can be dangerous for women with this condition, in which a number of ovarian follicles mature at the same time.

IVF and IVM are compared in Fig. 3.1.

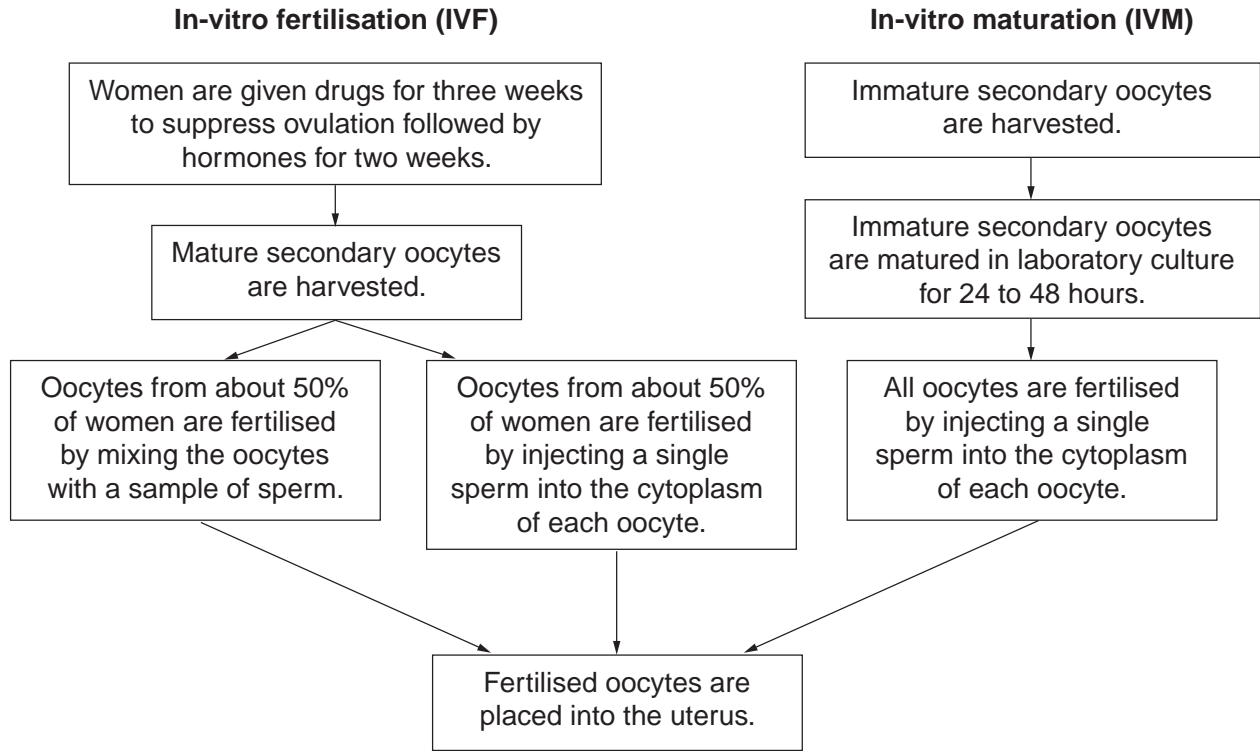


Fig. 3.1

- (a) With reference to Fig. 3.1, explain why women are treated with hormones for two weeks after being given drugs to suppress ovulation at the beginning of IVF treatment.

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..... [2]

(b) State the roles of mitosis and meiosis in producing an immature secondary oocyte.

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.....
.....
..... [3]

(c) Suggest one advantage and one possible disadvantage of fertilising an oocyte by injecting a sperm into its cytoplasm instead of mixing the oocyte with a sample of sperm.

advantage

.....

disadvantage

..... [2]

[Total: 7]

- 5 (a) Describe the maturation of a spermatid into a spermatozoon (sperm).

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.....

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..... [4]

- (b) A method of sorting damaged from undamaged sperm has undergone trials at an *in vitro* fertilisation (IVF) clinic in Australia. It is hoped to use the procedure when attempting IVF with sperm from men with fertility problems.

The sorting process is shown in Fig. 2.1.

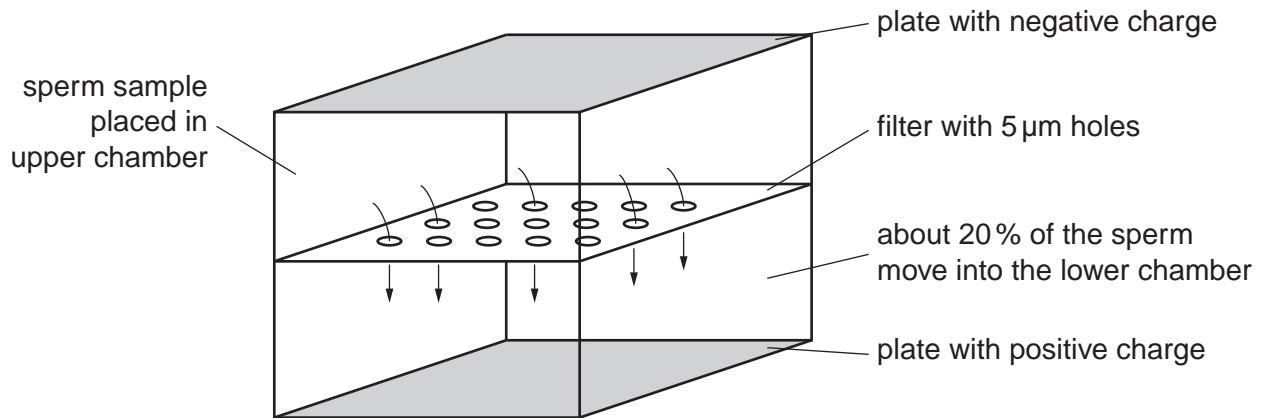


Fig. 2.1

Sperm left in the upper chamber have, on average, twice as much damage to their DNA as those that move into the lower chamber.

In the body, sperm which mature normally move slowly through the epididymis, gradually accumulating molecules of a negatively charged protein in their cell surface membranes. Other sperm move more quickly through the epididymis.

With reference to the information given, including that in Fig. 2.1, explain why only some of the sperm move into the lower chamber.

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..... [3]

[Total: 7]

6 (a) Fig. 5.1 shows a section through part of a human testis.

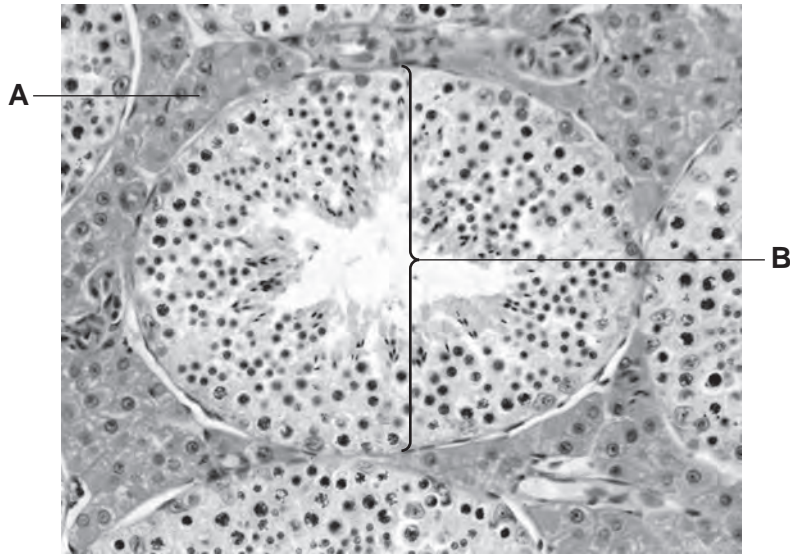


Fig. 5.1

Name structures **A** and **B**.

A

B

[2]

(b) Spermatogenesis, the production of sperm, begins in the testes of a boy around the age of 11 and can continue for the rest of his life.

Fig. 5.2 outlines the sequence of events that occur during spermatogenesis.

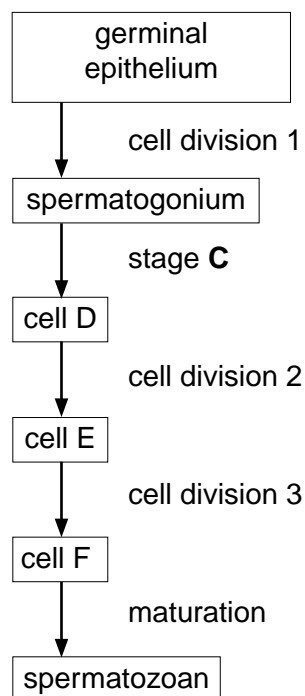


Fig. 5.2

With reference to Fig. 5.2,

(i) state which cell division is mitotic,
..... [1]

(ii) state which cells are haploid,
.....
..... [2]

(iii) state what is happening to the cell during stage C.
..... [1]

(c) The middle piece of a spermatozoan contains many mitochondria.

Suggest why a spermatozoan needs so many mitochondria.

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

(d) Some couples have difficulty in conceiving. This could be due to a problem with either the male or female reproductive systems.

(i) Suggest reasons why a man may be infertile.
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.....
..... [3]

(ii) *In vitro fertilisation* (IVF) is a widely used treatment for infertility.

Explain what is meant by the term *in vitro fertilisation*.

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..... [2]

(iii) At one IVF clinic, over 1000 treatment cycles were monitored. The number of live births was recorded as a percentage of the number of treatment cycles for each age group. The results are shown in Table 5.1.

Table 5.1

age of women/years	percentage of live births per treatment cycle
under 34	27.6
34 to 36	22.3
37 to 39	18.3
40 to 42	10.0
above 42	less than 5.0

The data in Table 5.1 show that there is a decrease in the percentage of live births per treatment cycle with increasing age.

Explain this trend.

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..... [3]

[Total: 16]