# Control and co-ordination in mammals

## Mark Scheme 6

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|---|---|
| **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** | Mark Scheme 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 **(a** 1 ref. to suitable container e.g. dish
**or**
ref. suitable medium ;
2 ref. to addition of, sperm / semen, to <u>oocytes</u> ; [2]
**A** ICSI

**(b)** *advantage*
better chance of survival / more certain of getting a good-quality embryo / better chance of implantation ;
*disadvantage*
may be difficult to keep embryos alive for this time / embryos may become less viable / less chance of implantation ; [2]
*only allow one mark for ref. to implantation*

**(c)** **(i)** 1 higher % of pregnancies than the other methods ;
2 2. 35 % versus 22 .1 % **or** 35.1 % versus 34.6 % ;
3 little difference in the success rate of single top quality embryo transfer compared to multiple embryo transfer ;
4 multiple embryos increases risk of problems during pregnancy / birth ; [3 max]

**(ii)** 1 could lead to selection of features desired by parents / society
***or*** less chance of a child being born with features seen as undesirable ;
2 ref. to discarding other embryos ; [1 max]

**[Total: 8]**

2 **(a)**

| | male | | female | |
|---|---|---|---|---|
| 1 | produces sperm | **or** | produces, oocyte | ; |
| 2 | division of cytoplasm is equal | **or** | division of cytoplasm is unequal | ; |
| 3 | four gametes produced | **or** | one gamete produced | ; |
| 4 | no polar bodies | **or** | polar bodies | ; |
| 5 | ref. maturation | **or** | no equivalent maturation stage | ; |
| 6 | ref. meiosis completed | **or** | ref. incomplete meiosis | ; |

[3 max]

**(b)** 1. a ductless gland **;**
2. hormones in the blood **;**
3. ref. target, organ / tissues **;** [2 max]

**(c)** 1. (both), reduce / stop, secretion (of FSH and LH) **;**
2. (both) involve negative feedback **;**
3. to, anterior pituitary / hypothalamus **;**
4. both are, contraceptives / description **;** [3 max]

**[Total: 8]**

**3** **(a)** **(i)** mitosis / multiplication / increase in number of cells **;** **R** meiosis / growth / maturity / replicating [1]

**(ii)** meiosis I / reduction division / description **;** [1]

**(iii)** maturation / differentiation / description **;** [1]

**(b)**

| statement | letter |
|---|---|
| contains protective fluid | **J ;** |
| produces oestrogen | **H ;** |
| has glycoprotein receptors | **G or H ;** |
| contains 23 chromosomes | **G or K ;** |

[4]

**(c)** 1. hormone treatment **;** **R** LH / HCG
2. to stimulate follicle development **;**
3. superovulation / several follicles develop at same time **;**
4. oocytes harvested **;** *penalise eggs once*
5. detail of harvesting **;**
6. semen / sperm, collected from man **;**
7. *idea of* sperm activated **;**
8. sperm added to oocyte(s) in dish **;**
9. (potential embryos) inspected, two – three days later / 6–8 cell stage **;**
10. embryo(s) inserted into uterus (through cervix) **;**
11. AVP **;** any two from e.g. donor oocytes / donor sperm / hormones to prepare uterine lining / ICSI *ignore ref. to oestrogen* [5 max]

**(d)** 1. percentage of live births decreases / miscarriage rate increases, with age **;**
2. (as) fewer hormones / unbalanced hormones (in older woman) **;**
3. (as) genetic defects / mutations, increase in oocyte (with age) **;**
4. placental function less efficient **;** [2 max]

**[Total: 14]**

4 **(a** 1 to give superovulation **;**

2 follicles or oocytes, mature or develop, at the same time **;** *ignore grow*

3 to prepare uterus for implantation **;** [2 max]

**(b)** 1 germinal epithelial cell divides by mitosis **;**

2 giving oogonia **;**

3 primary oocyte divides by meiosis I (to give a secondary oocyte) **;**

4 idea of diploid to haploid [3 max]

**(c)** *advantage*
ensure sperm enters oocyte / select (visibly) healthy sperm **;**

*disadvantage*
unneeded parts of sperm enter producing unwanted effects
**or**
cannot tell whether a chosen sperm is genetically suitable **;** [2]

**[Total: 7]**

5 **(a)** 1 ref. differentiation / specialisation **;**

2 ref. Sertoli cell **;**

3 forms flagellum **;** **A** tail

4 detail (of flagellum) **;** e.g. microtubules

5 acrosome **;**

6 detail (of acrosome) **;** e.g. contains enzymes / modified lysosome

7 many mitochondria **;** [4 max]

**(b)** *accept normal or healthy for undamaged*
*accept abnormal or unhealthy for damaged*

1 undamaged sperm move into lower chamber **or** damaged sperm stay in upper chamber **;**

2 undamaged sperm have negatively charged (proteins) **or** damaged sperm lack negatively charged (protein) **;**

3 undamaged sperm are, attracted to positive plate / repelled by negative plate **;**
*ora* for damaged sperm

4 idea that undamaged sperm which have, moved / matured, slowly (in epididymis) **;**
*ora* for damaged sperm [3 max]

**[Total: 7]**

| | | | | |
|---|---|---|---|---|
| 6 | **(a)** | | **A** – Leydig cell / interstitial cell ;<br>**B** – (wall of) seminiferous tubule ; | [2] |
| | **(b)** | **(i)** | 1 ; | [1] |
| | | **(ii)** | *mark first two answers*<br>E ; **A** secondary spermatocyte<br>F ; **A** spermatid<br>spermatozoan ; | [2 max] |
| | | **(iii)** | cells grow in size / cells grow larger ; | [1] |
| | **(c)** | 1<br>2<br>3 | ATP production / provides energy ; **R** produces energy<br>(for) movement of flagellum ; **R** tail<br>(for) production of acrosomal enzymes ; | [2 max] |

| | | | | |
|---|---|---|---|---|
| | **(d)** | **(i)** | 1. infectious disease causes damage<br>**A** mumps / Chlamydia / STDs<br><br>2. lower sperm count / absence of sperm<br><br>3. damaged / abnormal / immobile / lazy , sperm<br><br>4. blocked sperm ducts / lack of seminal fluid<br><br>5. named genetic condition ; e.g.<br><br>6. autoimmune reaction to sperm<br><br>7. reduced testosterone<br><br>8. effect of chemical damage ; e.g. chemotherapy / hormones drinking water | [3 max] |
| | | **(ii)** | (fertilisation of) <u>oocyte</u> by sperm ;<br><br>in glass dish ; **A** appropriate glassware **R** test tube<br><br>AVP ; e.g. sperm injected into oocyte | [2 max] |
| | | **(iii)** | 1. ovulation less likely<br><br>2. (older) <u>oocyt</u> less likely to be fertilised / <u>oocytes</u> less viable ;<br><br>3. implantation less likely (in uterus of older woman)<br><br>4. miscarriage rate increases (with age)<br><br>5. (as) lower concentration of hormones / unbalanced hormones ( older woman) / start of menopause ;<br><br>6. (as) genetic defects / mutations, increase (with age) | [3 max] |
| | | | | **[Total: 16]** |