Control and co-ordination in mammals

Mark Scheme 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	Mark Scheme 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)** *oestrogen*
follicle (cells) / granulosa (cells) / theca **;**

progesterone
corpus luteum **;** **A** follicle (cells) [2]

(b) 1 (oestrogen / progesterone affect) hypothalamus / anterior pituitary **;**

2 inhibit secretion of, FSH / LH / GnRH **;**

3 follicles do not develop **;**

4 no ovulation **;** **R** ref to eggs

5 ref. negative feedback **;**

6 alters cervical mucus to stop sperm **;**

7 prevents implantation / effect on endometrium **;** **R** endometrium thickens [4 max]

(c) *any two from*
1 (advantage of smaller population), less poverty / less starvation / less disease **;**

2 greater care for children that are born **;**

3 (benefit to adult women), fitter women / more women working **;**

4 more promiscuity **;**

5 more, STD / breast cancer / cervical cancer **;**

6 population decrease **;** [2 max]

[Total: 8]

2 **(a** 1 depolarisation / impulses / action potential, opens calcium ion channels **;**
A increased permeability to calcium ions

2 in presynaptic <u>membrane</u> **;**

3 calcium ions enter, synaptic knob / through presynaptic membrane **;**

4 vesicles of, acetylcholine / neurotransmitter **;**

5 fuse with presynaptic membrane **;**

6 empty contents into synaptic cleft / exocytosis **;** [3 max]

(b) (i) 1 fluorescence, more / higher, in sperm from wild type mice / ora **;**

2 comparative figures **;** e.g. 170 v 10 **and** 400 v 10

3 mutant sperm do not have **P** / ora **;**

4 so cannot take up calcium ions / ora **;** [3 max]

(ii) 1 fluorescence of flagella (of wild-type sperm) higher than heads **;**

2 more **P** in flagellum than head **;**

3 flagella take up more calcium ions **;**

4 flagellum has larger surface area / ora **;**

5 no difference in heads and flagella of mutant mice sperm since no **P ;** [3 max]

(c) fertilisation, in glass / in a dish **;** **R** "test tube baby" unexplained
outside the reproductive tract / outside the body **;** [2]

(ii) *with ZP*

1 few / no, mutant sperm penetrate zona pellucida / ora **;**

2 lack of calcium ions / ora **;**

3 no / less, vigorous movement (of flagellum) / ora **;**

without ZP

4 mutant sperm can penetrate oocytes (without ZP) **;**

5 differences in penetration less significant between wild type and mutant **;**

6 flagellum movement not needed for penetration (of oocyte membrane) / AW **;**

7 AVP **;** e.g. smaller % success of wild-type sperm with oocytes without ZP compared with wild with ZP because, lack of binding site / damage to oocyte [4 max]

[Total: 15]

3 **(a** A – <u>germinal epithelium</u> ;
B – <u>Graafian follicle</u> ; [2]

(b) (i) <u>primary oocyte</u> ; [1]

(ii) label to primary oocyte on Fig. 6.2 ; [1]

(iii) P - <u>mitosis</u>
Q - <u>meiosis</u> ; *both required for mark* [1]

(c) *either*
<u>independent assortment</u> ;
homologous / maternal and paternal, chromosomes position themselves either way up / AW ;
on equator (of spindle) ;
so segregate randomly / any combination of maternal and paternal chromosomes can end up in daughter cells ;
AVP ; e.g. occurs during metaphase 1
or
crossing over / chiasmata ;
between, <u>chromatids</u> of homologous chromosomes / non-sister <u>chromatids</u> ;
genetic material on maternal and paternal chromosomes swap places / AW ;
leads to new combination of <u>alleles</u> ; **R** genes
AVP ; e.g. breaking established linkage groups / occurs during prophase 1 [3 max]

[Total: 8]

4 **(a)** acetylcholine / Ach ; **[1]**

(b) wave of depolarisation / action potential, in pre-synaptic axon / membrane ;
Ca^{2+} channels open ;
Ca^{2+} enter pre-synaptic neurone / synaptic knob ;
causes synaptic vesicles to move towards presynaptic membrane ;
ref. exocytosis of Ach / neurotransmitter ; **[4 max]**

(c) vesicles found **only** in, pre-synaptic knob / neurone ;
receptors found **only** in post-synaptic membrane ; **[2]**

[Total: 7]

Question			Marks
5	**(a)**	idea of energy conversion (linked to receptor) ;	
		Na^+ in / AW ;	
		depolarization ;	
		receptor / generator potential ;	
		ref. to threshold ;	
		(therefore) action potential / wave of depolarisation ;;	**3 max**
	(b)	(in / from) CNS / brain / spinal cord ;	
		ref. to synapse with intermediate / relay neurone ;	
		ref. to neuromuscular junction / (neuro)transmitter released ;	
		ref. response ;	**3 max**
	(c)	ref. synapses ;	
		vesicles containing transmitter only found on preSM ;	
		receptors for transmitter only found on postSM ;	
		ref. to refractory period / hyperpolarisation ;	**2 max**
			Total: 8

6 **(a)** **A** vesicles containing transmitter/acetylcholine/synaptic vesicle;
B presynaptic membrane;
C synaptic cleft/gap;
D post synaptic membrane;
E receptor/protein/Na^+ gate;

5

(b) arrow pointing down;

1

(c) ref. low Ca^{2+} in synaptic knob/high Ca^{2+} outside knob;
action potential/depolarization causes opening of Ca^{2+} channels;
Ca^{2+} into synaptic knob;
causes vesicles to move towards presynaptic membrane;
causes vesicles to fuse with presynaptic membrane;
vesicle contents/transmitter/exocytosis into synaptic cleft/gap;

3 max

Total: 9