



2805 / 01 Growth, Development and Reproduction

January 2004

Mark Scheme

ADVICE TO EXAMINERS ON THE ANNOTATION OF SCRIPTS

1. Please ensure that you use the **final** version of the Mark Scheme.
You are advised to destroy all draft versions.
2. Please mark all post-standardisation scripts in red ink. A tick (✓) should be used for each answer judged worthy of a mark. Ticks should be placed as close as possible to the point in the answer where the mark has been awarded. The number of ticks should be the same as the number of marks awarded. If two (or more) responses are required for one mark, use only one tick. Half marks ($\frac{1}{2}$) should never be used.
3. The following annotations may be used when marking. No comments should be written on scripts unless they relate directly to the mark scheme. Remember that scripts may be returned to Centres.

x = incorrect response (errors may also be underlined)
^ = omission mark
bod = benefit of the doubt (where professional judgement has been used)
ecf = error carried forward (in consequential marking)
con = contradiction (in cases where candidates contradict themselves in the same response)
sf = error in the number of significant figures
4. The marks awarded for each part question should be indicated in the margin provided on the right hand side of the page. The mark total for each question should be ringed at the end of the question, on the right hand side. These totals should be added up to give the final total on the front of the paper.
5. In cases where candidates are required to give a specific number of answers, (e.g. 'give three reasons'), mark the first answer(s) given up to the total number required. Strike through the remainder. In specific cases where this rule cannot be applied, the exact procedure to be used is given in the mark scheme.
6. Correct answers to calculations should gain full credit even if no working is shown, unless otherwise indicated in the mark scheme. (An instruction on the paper to 'Show your working' is to help candidates, who may then gain partial credit even if their final answer is not correct.)
7. Strike through all blank spaces and/or pages in order to give a clear indication that the whole of the script has been considered.
8. An element of professional judgement is required in the marking of any written paper, and candidates may not use the exact words that appear in the mark scheme. If the science is correct and answers the question, then the mark(s) should normally be credited. If you are in doubt about the validity of any answer, contact your Team Leader/Principal Examiner for guidance.

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Abbreviations, annotations and conventions used in the Mark Scheme	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT = answers which are not worthy of credit () = words which are not essential to gain credit <u> </u> = (underlining) key words which must be used to gain credit ecf = error carried forward R = reject A = accept AW = alternative wording ora = or reverse argument
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Question	Expected Answers	Marks
1 (a)	E; D;	2
(b)	sloughs off body cells into fluid / AW; exchanges ions / solutes / named; through skin / gut / lungs; swallows fluid; excretes / contains more, nitrogenous waste <i>or</i> named / urine; A decreases pH; AVP;	2 max
(c)	mother / fetus, carries oxygen, as oxyhaemoglobin / attached to haemoglobin; by diffusion; fetal haemoglobin has higher affinity for oxygen than maternal haemoglobin; detail on placental adaptation; e.g. large surface area / selectively permeable membrane / microvilli / blood spaces etc; carried in, umbilical / fetal, vein; (returns / carried back) to fetal heart; pumped throughout body;	4 max

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(d) *oxytocin*

during pregnancy progesterone decreases sensitivity of uterus to oxytocin;
causes contraction;
of uterine muscle / myometrium;
ref to stretch receptors;
positive feedback / described;
contractions become stronger / more frequent;
help push baby, down / out; **R** 'give birth'
aids delivery of the placenta;
helps to shrink uterus;
releases milk;
increased by suckling;
AVP; e.g. sensitivity uterus increased by oestrogen
 released from posterior pituitary
 produced by hypothalamus

5 max

prolactin

stimulates the growth / development of the mammary glands / milk ducts /
breasts;
aids / prepares for, milk production / lactation; **R** produces / stimulates milk
ref to, glandular / alveolar cells;
inhibited by, oestrogen / progesterone;
increased by suckling;
increased as, progesterone / oestrogen, level falls;
AVP; e.g. PRF from hypothalamus
 prolactin from anterior pituitary

4 max

[Total: 17]

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Question	Expected Answers	Marks
2 (a)	<p><i>two from</i></p> <p><i>cuttings</i> root / shoot / stem / leaf / branch, cut; placed on, moist medium / compost / soil; PGR's / named e.g. IAA / rooting hormone, applied; mitosis / division of <u>cambium</u> / <u>callus</u> cells;</p> <p><i>layering</i> bend runner horizontally; cut notch through base of stem / remove lower leaves; detach from parent when roots form; roots / new shoots, form at axial bud;</p> <p><i>grafting / budding</i> root with vigorous growth / healthy roots; stock; shoot / bud, chosen with desirable, flowers / fruit; scion; match slanting cuts / AW; bind together; cell division / mitosis; vascular tissue / xylem / phloem, fuses;</p> <p><i>tissue culture / micropropagation</i> dividing tissue / meristematic tissue / explant cut; sterile conditions / aseptic technique used;; placed in, nutrient / Murashige and Skoog, medium; callus forms; vibrated to, separate / sub-divide, cells; form subcultures / AW; add PGR's / named; promote, differentiation / formation, of roots and shoots;</p>	<p>4 max</p> <p>4 max</p> <p>4 max</p> <p>4 max 6 max</p>
	QWC - legible text with accurate spelling, punctuation and grammar;	1

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- (b) replicate the DNA;
genetically identical / cloned / desirable genes kept;
mitosis;
maintains the chromosome number;
increases cell number;
provides, unspecialised cells / callus;

3 max

[Total: 10]

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Question	Expected Answers	Marks
3 (a) (i)	control; to compare with the experiment with the train of sperm; to be sure that any changes in speed of movement are due to the formation of a train;	2 max
(ii)	indicates the range of results; on either side of the mean; indicates the variability / standard deviation / standard error, of the results; indicates if data significantly different by degree of overlap (of error bars);	2 max
(iii)	<i>award two marks if correct answer (166.66 / 167) is given</i> $\frac{(40 - 15)}{15} \times 100 \quad / \quad \frac{25}{15} \times 100;$ 166.66 / 167 (%); <i>ecf graph reading error</i>	2
(b)	occurs in oviduct; triggered by, follicle cells / zona pellucida; acrosome swells; (membrane ruptures) releasing enzymes; hydrolytic / protease / hyaluronidase; digest, follicle cells / zona pellucida; assist penetration of oocyte by single sperm;	R break through, break down 4 max
(c)	1 train of sperm stronger than single sperm / AW; 2 move faster / able to reach oviduct first / more likely to fertilise; 3 concentrates enzymes / enzymes released sooner; 4 digests more cells; 5 easier to reach, gamete / oocyte; ora 6 selective advantage / natural selection; 7 may be a mutation; 8 sperm may carry favourable / advantageous, genes / alleles; 9 pass it to next generation; 10 frequency of alleles for this trait increases; 11 becomes dominant / most common / AW, characteristic; 12 AVP; e.g. competition variation	5 max
		[Total: 15]

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Question	Expected Answers	Marks
4 (a) (i)	<p>line of best fit shown on Fig. 4.1A; as the mass of alcohol increases, the mass of the baby at birth decreases; negative correlation; most damaging, in first eight weeks / above 80 g day⁻¹ ; causes, fetal alcohol syndrome / FAS; reduced growth / IUGR; poor limb development / cleft palate / heart defects; use of comparative figs;</p>	4 max
(ii)	<p>line of best fit shown on Fig. 4.1B; as mass sweets increases, mass of baby at birth increases; levels out at 250 g day⁻¹; sweets are, carbohydrate / named; converted to fat; fat stored; increase, energy / ATP, for growth of fetus; from respiration; use of comparative figs;</p>	4 max
(b) (i)	<p>vitamin A is, an essential vitamin / needed in (mother's) diet / AW; needed for, healthy epithelia / e.g. placental membranes / skin; deficiency causes, night blindness / corneal ulcers / xerophthalmia; needed for growth in fetus; <u>differentiation</u> in fetus; to establish reserves in fetal liver;</p>	3 max
	<p>vitamin D is manufactured in skin of mother; from cholesterol; in presence of UV light; needed for adequate absorption of Ca²⁺;</p>	3 max
(ii)	<p>smaller / AW / ora; only substances with relative molecular mass around 69 000 cross; A range 67 000 to 69 000 must be soluble; there must be a diffusion gradient for substance (from mother's blood to fetus); or specific / AW, active transport carrier mechanism; AVP; e.g. large molecules may cross at birth if damaged / AW</p>	2 max

[Total: 14]

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Question	Expected Answers	Marks
5 (a) (i)	increase in, (actual / overall) size / mass, over a period of time;	1
(ii)	two individuals may grow by same amount but may be different percentage of original mass / does not consider original mass; growth is slow at first because fewer cells to divide but actually fast / AW; AVP; e.g. different rate over time not shown true growth is dry mass	2 max
(b) (i)	<i>award two marks if correct answer (16.8 / 17) is given</i>	
	% increase $\frac{(51.6 - 34.3) / 17.3}{34.3} \times 100;$ $\frac{50 / 50.4}{3} = 16.8 / 17 (\% y^{-1});$	2 max
(ii)	ill; <u>malnutrition</u> / named deficiency; hormone deficiency / named; genetic / AW; AVP;	2 max

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- (c)
- 1 anterior pituitary produces growth hormone;
 - 2 regulates growth throughout body / AW;
 - 3 stimulates protein synthesis;
 - 4 helps develop, limb (bones) / (skeletal) muscle;
 - 5 increases, cell division / mitosis;
 - 6 favours respiration of fat instead of carbohydrate;
 - 7 FSH / LH / ICSH (from anterior pituitary);
 - 8 stimulate oestrogen from follicle / testosterone from interstitial cells;
 - 9 these develop secondary sexual characteristics / at least two named;
 - 10 anterior pituitary secretes TSH;
 - 11 stimulates thyroxine secretion; 5 max

 - 12 thyroid gland secretes thyroxine / T₄; T₃ neutral
 - 13 inhibits TSH;
 - 14 controls BMR;
 - 15 increases / stimulates, transcription / formation mRNA;
 - 16 increases / stimulates, respiration;
 - 17 increases / stimulates, protein synthesis;
 - 18 increases / stimulates, development skeletal system;
 - 19 stimulates / increase, brain development;
 - 20 ref to negative feedback; 9 max
only penalise once for omitting 'increases' / stimulates

 - QWC - clear, well organised using specialist terms;** **1**

[Total: 17]

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Question	Expected Answers	Marks
6 (a) (i)	<i>1 mark for each correct line</i> 2n, 2n; n, n; n, n, 2n;	3
(ii)	in pollen sacs; (pollen mother cell) divides by meiosis into four, nuclei / cells; tetrad; separate and wall thickens; to form pollen grain; (generative) nucleus divides by <u>mitosis</u> (to form two male gametes / cells); R tube nucleus	3 max
(iii)	double fertilisation; one gamete fuses with the ovum (to form the zygote); second with the diploid nucleus in the embryo sac; to form, endosperm / 3n, nucleus; endosperm is food store;	3 max
(iv)	<i>pollination</i> transfer of pollen from anther to stigma; <i>fertilisation</i> fusion of male and female gamete;	2
(b)	wind pollinated; a lot of wastage; increases the chance of pollination;	2 max

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- (c)
- 1 may cause an allergic reaction / named;
 - 2 pollen contains a foreign protein;
 - 3 in exine;
 - 4 provokes an immune response / AW;
 - 5 recognised by APC;
 - 6 β cells produce antibodies;
 - 7 formation of antibody - antigen complex;
 - 8 causes release of histamine;
 - 9 predicts time of year when, symptoms may occur / when most people are affected *or* ill;
 - 10 predicts time of year when demand on medical services may increase;
 - 11 can give warnings about, the pollen count / increase in pollen;
 - 12 can advise people to take precautions / warn doctors to prescribe medication;
 - 13 ref to antihistamine / named drugs;
 - 14 AVP; e.g. type of pollen
those most at risk

4 max

[Total: 17]