RECOGNISING ACHIEVEMENT

2805/01 Growth, Development and Reproduction

June 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 (½) 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. Examiners will be expected to use their professional judgment in marking answers that contain more than the number required. Advice about specific cases will be given at the standardisation meeting.

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.

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
	R	=	reject
	( )	=	words which are not essential to gain credit
	___	=	(underlining) key words which **must** be used to gain credit
	ecf	=	error carried forward
	AW	=	alternative wording
	A	=	accept
	ora	=	or reverse argument

Question	Expected Answers	Marks
1 (a) (i)	*award two marks if correct answer with units is given* *award one mark for calculation if answer incorrect or no units given* *no leeway on measurement (X-Y), but allow ecf for calculation if measurement is wrong* $\frac{59 \text{ (mm)} / 5.9 \text{ (cm)}}{6}$; 0.0098 m / 0.01 m / 9.83 x 10^{-3} m / 0.98 cm / 9.8(3) mm / 9833.3 µm ;	**2**
(ii)	germinal epithelium; produces, follicles / granulosa (cells); produces, oogonia / primary oocytes; divides by meiosis I / divides up to *or* stops at prophase I; to produce a secondary oocyte; and first polar body;	**3 max**
(iii)	R on, theca / outer layer, of the Graafian follicle; *can be on any follicle*	**1**

Question **Expected Answers**

(b) drawing which looks like secondary oocyte; **R** if Graafian follicle

i.e. roughly circular and three concentric rings 1 mark

three labels in correct place from
haploid nucleus; **A** n nucleus
lipid droplets / cortical granules / lysosomes;
microvilli;
cytoplasm;
zona pellucida;
follicle cells / corona radiata;
first polar body; 3 max **4 max**

(c)
1 GnRH;
2 from hypothalamus;
3 triggers / stimulates, anterior pituitary gland;
4 to produce, FSH / LH;
5 carried in blood;
6 stimulates / causes, development of, primary, follicle / oocyte; **R** produces
7 oogenesis;
8 (primary) follicle / theca, secretes oestrogen;
9 oestrogen inhibits, FSH / LH;
10 negative feedback;
11 high levels / surge, of oestrogen;
12 positive feedback / surge / increase in concentration of FSH *or* LH;
13 (FSH / LH), causes ovulation / AW; may be implied
14 AVP; e.g. GnRH carried in special blood vessel
15 AVP; low, FSH / LH, triggers GnRH **7 max**

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

[Total: 18]

Question			Expected Answers	Marks
2	(a)	(i)	avoids self pollination / ora;	1
		(ii)	protandrous / protandry	1
	(b)	(i)	no; random distribution of nectar concentration in whorls / described; *if described at least 3 positions to be identified* **R** fluctuates comparative figures with units in support; *allow leeway of +/- 2*	2 max
		(ii)	**1** mature flowers are more conspicuous / AW; **2** bees visit in sequence to avoid visiting same flower twice /AW; **3** bees cannot obtain nectar from closed buds at top / AW; **4** orientation of flower directs bee upwards as it leaves / AW; **5** bee can only see flowers above when it leaves a flower / AW; **6** AVP; e.g. bees negatively geotactic, more scent, more pollen, less wind	2 max
	(c)	(i)	the more flowers (on the whorl) the lower the secretion rate / AW / ora; figures in support from both axes; linear relationship / inversely proportional / negative correlation; ref to error bars ; AVP; e.g. does not correlate with flower number	2 max
		(ii)	**1** photosynthesis; **2** transported from, leaves / chloroplasts / source; **3** as sucrose; **4** in phloem; **5** sieve tube has a set rate of transport; **6** detail; e.g. ATP, ref to active transport, mass flow **7** volume shared between all flowers in whorl; **8** AVP; e.g. from $CO_2 + H_2O$, from light energy translocated	3 max
		(iii)	large sample / at least 10 / replicates / repeats; mean / average, found; whorls at different positions / whorls in same position; identical condition <u>named</u>; **R** constant (so) transport / photosynthesis, not affected by external factors / AW; AVP; e.g. same measurement technique same time of day exclude insects	3 max
				[Total: 14]

Question			Expected Answers	Marks
3	(a)	(i)	carries hormones; **R** chemical messages named hormone / trophic hormones / described; in plasma / in blood; from the hypothalamus to the anterior pituitary; links two sets of capillaries; direct link / speeds response / AW; AVP; e.g. blood at low pressure	**3 max**
		(ii)	**1** detects stimuli, qualified; e.g. hormones in the blood **2** action potential / impulse, to hypothalamus; **3** stimulates anterior lobe of pituitary; **4** neurosecretory cells; **5** make hormones / named e.g. oxytocin, GnRH; **6** hormones / oxytocin, passes down, nerve fibres / axons; **7** from hypothalamus to posterior lobe; **8** secreted directly into the blood / ref to fast method;	**3 max**
	(b)		*oxytocin* oxytocin produced in hypothalamus / released from posterior pituitary gland; contracts, uterine muscle / myometrium ; **R** wall or uterus alone positive feedback / AW; stimulates, contractile / muscular / glandular, tissue (in the breasts); **A** AW ref to prostaglandin production; ejaculation / ejection / described, of milk; **R** production of milk 3 max **R** lactation *prolactin releasing factor* prolactin releasing factor from hypothalamus; stimulates anterior pituitary gland; to release / produce, prolactin; stimulates glandular, cells / tissue ; synthesises / produces, milk; **R** lactation 3 max	**6 max**

Question **Expected Answers**

(c) **1** general statement on the shape of the progesterone graph, linked with at least 2 figures from horizontal axis; **R** steadily
2 progesterone increases as HCG increases;
3 HCG maintains corpus luteum;
4 corpus luteum produces progesterone;
5 for first, 12 weeks / 13 weeks / three months;
6 progesterone production slows / AW , because HCG concentration falls;
7 as corpus luteum regresses / AW;
8 placenta produces progesterone;
9 as placental mass increases (placental) progesterone increases;
10 takes over from corpus luteum; **A** implied;
11 progesterone, maintains the endometrium *or* lining / essential to maintain pregnancy;
12 AVP; **5 max**

(d) chorionic villi / chorion / trophoblast;
travels in blood; **A** in blood vessels
through the placenta; **R** *in context if wrong target organ* **2 max**

(e) **(i)** antibody complements shape of HCG / AW; **R** matches, specific **1**

(ii) genetically identical;
therefore all, complement / bind to, HCG;
AVP; e.g. rapid production of large numbers **1 max**

[Total: 21]

Question		Expected Answers	Marks
4	(a)	**X** sieve tube (element); **R** sieve plate, phloem cell **Y** companion cell; **Z** testa / integument;	**3**
	(b) **(i)**	symplast / apoplast pathway; mass flow; as sucrose; in solution; diffusion; down, diffusion / concentration, gradient / described; AVP; e.g. refs to active transport in, companion cells / sieve plate;	**2 max**
	(ii)	apoplast pathway (across placenta); active transport (into endosperm transfer cells) / moves actively; as concentration rises / against concentration gradient; AVP; e.g. detail on active transport / ref protein carrier / ref ATP diffusion into the endosperm	**2 max**
	(c) **(i)**	**1** cells divide by mitosis; **2** triploid; **3** expand / increase in size; **R** mass **4** soluble nutrients / named, become insoluble / named; **5** food store; **6** starch / lipid / protein; **7** absorbed / AW, into cotyledons; **8** in non-endospermous seeds; **9** water content reduces; **10** from 90 to 10-15% (by mass); **11** nucellus, disintegrates / provides nutrients;	**3 max**
	(ii)	**1** ovary wall becomes <u>pericarp</u>; **2** may fuse with the testa; **3** may store / contain, sugar; **A** becomes sweet; **4** fleshy / succulent / thickens; **R** swollen **5** brightly coloured; **6** dries / hardens; **R** woody **7** develops structures to aid, dispersal / dispersal described ; **8** AVP; e.g. may secrete toxins ethene increases	**3 max**
			[Total: 13]

Question	Expected Answers	Marks
5 (a)	*4 max for description* - **A** *+/ - 2 on both axes* *penalise once only if units omitted*	
	1 maximum germination rate 78% / number of grains approx 3 000 / root growth rate 40 mm day^{-1};	
	2 germination rate increases from 12 °C to 33 °C / maximum germination 33 °C; **3** then decreased from 33 °C to 48 °C; **4** optimum temperature, reached at 33 °C;	
	5 the number of grains / seeds per flower head, increases from 18 °C to 25 °C / reaches maximum at 25 °C; **6** and decreased from 25 °C to 31 °C;	
	7 the rate of root elongation increased from 10 °C to 32.5 °C / maximum rate at 33 °C; **8** decreased from 32.5 °C to 44 °C; 4 max	
	all marks could be obtained from these points about millet as a food (F) crop **F1** comparative ref to overall temperature, qualified (idea of); **F2** millet thrives best between 10 °C and 43 °C / ora; **A** single temperature *within range* **F3** millet grains are (food) crop; **F4** productivity greatest / AW, at 25°C / ora; **R** number of grains greatest **F5** will not grow outside temperature range / best temperature, for enzymes; **F6** figs to illustrate related to enzymes; **F7** AVP; e.g. cardinal temperatures (max. min. and optimum) climatic region ref to season therefore tropical / sub-tropical / hot and sunny all graphs asymmetrical qualified	**6 max**
	QWC - legible text with accurate spelling, punctuation and grammar;	**1**

(b) **1** enzymes are protein;
2 have an optimum temperature;
3 as temperature increases, vibration / kinetic energy increases;
4 bonds / named bonds, break / disrupted;
5 tertiary / 3D / globular structure, is altered;
6 enzyme denatured;
7 shape of active site alters;
8 substrate does not fit;
9 cannot form enzyme-substrate complex;
10 cannot digest / hydrolyse, endosperm / food reserves / named; **R** breakdown
11 cannot synthesise, new compounds / macromolecules / named compound;
12 ref to respiration; **4 max**

(c) **1** mobilisation of food reserves / named reserve / AW;
2 respiration;
3 to release energy / form ATP; **R** 'produce energy'
4 for cell division / new cells;
5 detail; e.g. location (apical meristem), glucose is respiratory substrate
6 synthesis / production, of cellulose / AW; **A** named tissue / root hair
7 synthesis / production, of, protein / new enzymes;
8 AVP; e.g. active transport **4 max**

[Total: 15]

Question		Expected Answers	Marks
6	(a)	embryo, has a right to life / is destroyed / is murdered; scientist carries responsibility for decision to use the embryo; parents may not know fate of embryos; well qualified religious objection; **R** 'playing God' AVP; **R** *questions unless answered or well argued*	**1 max**
	(b)	undifferentiated / unspecialised; they can specialise / differentiate, into any cell type / to perform a particular function; **R** develop by a gene switch; a cell that can replicate / divide / multiply, by mitosis; **A** cloned large nucleus:cytoplasm ratio / AW; AVP;	**2 max**
	(c)	determined by genes switched, on / off; erythropoietin secretion (from kidneys); cell loses nucleus; contains / produces / stores haemoglobin; produces carbonic anhydrase; becomes biconcave; specialised to, absorb / carry, oxygen; AVP; e.g. ref to transcription / translation / described ref to factors which trigger red blood cell maturation	**3 max**
	(d)	sterile / aseptic (medium); oxygen; nutrient medium / culture medium / (adequate) nutrients / named nutrients; divide / multiply / number increases, by mitosis / cloning; tested for, genetic abnormalities / cancer; tested for, disease / named disease; tissue should be, typed / AW, for transplant / to check not rejected; ref to MHC / HLA; AVP; e.g. ref to genetic fingerprint hormones / growth factors added agitation while in culture	**3 max**
			[Total: 9]