RECOGNISING ACHIEVEMENT

2805/01 Growth, Development and Reproduction

January 2005

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)	(epithelial cells) secrete / AW, hormones ; no duct / ductless ; (secreted directly) into the blood ; **R** into blood vessels good blood supply / AW ; AVP ; e.g. follicle walls one cell thick	**max 3**
		(ii)	thyroglobulin is a large molecule ; insoluble ; stored until needed / released as required / converted easily to T4 / AW ; does not diffuse away / AW ; *ora* AVP ; e.g. thyroxine may activate secretory cells positive feedback may occur in secretory cells inactive / inert / example of inactivity	**max 2**
	(b)		secretory cells take up (small amount of) thyroglobulin ; by pinocytosis ; hydrolysed / AW (into thyroxine) ; by, enzymes / proteases ; diffuses, into blood / blood vessels / capillaries ; attached to plasma proteins ;	**max 4**
	(c)		*accept release / produce for secrete throughout* (hypothalamus) secretes thyrotrophin releasing, factor / hormone ; **A** TRH stimulates anterior pituitary gland ; to secrete, thyroid stimulating hormone / TSH ; stimulates thyroid gland to release thyroxine ; high level thyroxine inhibits, hypothalamus / anterior pituitary ; reduce production of, TRH / TSH / TRF ; ref to external factors on higher centres ; negative feedback / homeostasis ;	**max 5**

[Total: 14]

Question			Expected Answers	Marks
2	(a)		fruit evolved to be eaten ; fruit attracts, animals / birds / insects ; so seeds are dispersed / ensures dispersal / described ; inhibitors prevent seed germination / AW ;	max 2
	(b)	1	provides, more energy / more ATP ; **R** energy produced	
		2	for, synthesis of enzymes *or* breakdown of, starch / protein / other named e.g. ;	
		3	no photosynthesis / chlorophyll not necessary / AW ;	
		4	breakdown products used for, lycopene / suitable alternative ;	
		5	lycopene / pigment / red colour, attracts birds / animals ; **A** attractive to consumers	
		6	ethene synchronises ripening of all fruits in area / AW ;	
		7	may be involved in lycopene synthesis ;	
		8	sugar / sweetness, attracts, birds / animals ; **A** attractive to consumers / AW	
		9	odour attracts, birds / animals ; **A** attractive to consumers / AW	
		10	polygalacturonase softens cell walls ;	
		11	softening makes it easier to, eat / digest ;	
		12	releases seeds ;	max 4
	(c)	(i)	it would, digest / break down, the walls of the tomato during development / AW ; AVP ; e.g. does not contain gene for enzyme production	max 1
		(ii)	by decomposers / bacteria / fungi ; AVP ;	max 1
	(d)	1	fruit formed from ovary ;	
		2	triggered by seed production ;	
		3	ovary wall becomes pericarp ;	
		4	modified to aid dispersal ;	
		5	e.g. fleshy / sweet / brightly coloured / wings / explosive dehiscence / hard / AW ; *4 max*	
		6	auxin / gibberellin ;	
		7	produce seedless fruit ;	
		8	without fertilisation ;	
		9	parthenocarpy ;	
		10	improve fruit set ;	
		11	increase fruit size ;	
		12	gibberellin / cytokinin / ethene, controls, ripening / maturing / AW ;	
		13	AVP ; e.g. without ethene to delay ripening for transport	
		14	AVP ;	max 8
			QWC – legible text with accurate spelling, punctuation and grammar ;	1
				[Total: 17]

Question			Expected Answers	Marks
3	(a)	1	only one parent needs to be introduced / (asexual) more reliable / AW ;	
		2	no wasted energy, producing gametes / finding a mate ;	
		3	rapid reproduction / large numbers of offspring / outnumbers European species ;	
		4	successful in same environment as parent ;	
		5	quickly colonise new environment ;	
		6	preserves successful combinations of alleles ;	
		7	outcompete native species / competes vigorously / AW ;	
		8	may introduce a, parasite / disease ;	
		9	may mate with the European species ;	
		10	hybrid sterility ;	
		11	may prey on European species ;	
		12	no natural predators ;	
		13	AVP ;	
		14	AVP ; e.g. competitive exclusion / extinction / AW marbling as camouflage	max 4
	(b)	(i)	(vertical) hyphae ; produce spores ; by mitosis ; haploid ; in, conidiophores / sporangiophores ; spores, small / light ; dispersed by air currents ; when, conidiophores / sporangiophores, burst ; germinate / develop, on suitable, medium / substrate ;	
			<u>yeast</u> buds ; new individual buds from parent ; breaks off ; smaller than parent ;	
			all genetically identical ;	max 4

Question	Expected answers	
(ii)	enzymes ; secreted at tip of hypha ; proteases break down protein ; to amino acids ; lipase breaks down fat ; into fatty acids and glycerol ; AVP ; e.g. hydrolysis	**max 4**
(iii)	not autotrophic / cannot make own food ; no chlorophyll ; cannot photosynthesise / make organic compounds from CO_2 and H_2O ; AVP ; e.g. secrete enzymes external digestion	**max 2**
		[Total: 14]

Question			Expected Answers		Marks
4	(a)		**A** primary spermatocyte ; **B** spermatid ;		**2**
	(b)	**1**	hypothalamus ;		
		2	produces GnRH ;		
		3	stimulates anterior pituitary ;		
		4	to produce LH / ICSH ;		
		5	stimulates interstitial / Leydig cells ;		
		6	(lock onto) specific receptors ;		
		7	to produce testosterone ;		
		8	from cholesterol ;		
		9	stimulates, spermatogenesis / sperm production ;		
		10	testosterone inhibits, GnRH / LH, production ;		
		11	FSH stimulates Sertoli cells ;		
		12	to develop sperm ;		
		13	secretes, fluid / inhibin, into seminiferous tubules ;		
		14	inhibin inhibits FSH ;		
		15	AVP ; e.g. ref to androgen binding protein	*max 7*	
			accurate references to position and sequence shown in Fig. 4.1		
		P1	sperm mature from the outside to the centre / AW ;		
		P2	in close association with Sertoli cells / AW ;		
		P3	germinal epithelium surrounds tubules ;		
		P4	form primary spermatocytes ;		
		P5	diploid ;		
		P6	meiosis I ;		
		P7	forms secondary spermatocyte ;		
		P8	meiosis I I ;		
		P9	forms four spermatids ;	*max 5*	**max 8**
			QWC – clear, well-organised using scientific terms ; *award the QWC mark if three of the following are used in correct context* hypothalamus / GnRH / anterior pituitary / LH / ICSH / germinal epithelium / interstitial / Leydig cells / testosterone / cholesterol / inhibin		**1**

(c) **(i)** *award two marks if correct answer to nearest 0.1 μm is given*
award one mark for ecf if incorrectly measured from Fig. 4.2

$\frac{10 \times 45 / 44 / 46}{30 / 31 / 32}$;

15.0 / 14.5 / 14.1 / 14.7 / 14.2 / 13.8 / 15.3 / 14.8 / 14.4 ; **2**

(ii) chromatin ;
chromosomes ;
haploid set / half set / n / 23 ;
DNA / genetic material / genetic information ; **max 2**

(iii) release, ATP / energy ; **R** produce energy
for propulsion of sperm / AW ; **2**

(d) **(i)** *award two marks if correct answer is given (even if not in table)*
award one mark for giving correct calculation if answer incorrect

$\frac{31}{61}$;

= 0.508 ; **2**

(ii) (any) exposure increase proportion of female births ;
exposure of mother has, little / no, effect ;
exposure of father is, more / most, significant ;
causes, decrease in male births / increase in female births ;
comparative figures in support ;
male, fetus harder to carry / prenatal mortality higher ;
perinatal mortality higher in males ;
small sample ;
AVP ; e.g. X sperm stronger **max 4**

[Total: 23]

Question		Expected Answers	Marks
5	(a)	sculptured outer wall will not match stigma surface / AW / ora ; genetically incompatible / ora ; AVP ; e.g. further detail	max 2
	(b)	pollen tube grows from a pore in exine ; grows down the style ; chemotropism ; chemicals secreted by the ovary ; controlled by tube nucleus ; tube enters ovule through micropyle ; tip (bursts) releasing male gametes ; AVP ; e.g. detail of dispersal	max 4
	(c)	one male gamete fuses with the, female gamete / ovum / egg cell (nucleus) ; to form the, zygote / embryo ; diploid ; restores chromosome number ; increases variation ; second male gamete fuses with the diploid nucleus ; to form the triploid (endosperm) nucleus ; (to form) endosperm / food store ; AVP ; e.g. ref to, evolution / natural selection	max 5
			[Total: 11]

Question			Expected Answers	Marks
6	(a)	(i)	a (permanent / irreversible) increase in dry mass ;	1
		(ii)	name of a suitable parameter ; *can be from equation* measure the parameter at the start ; measure the parameter, at the end / after an interval ; *plus one of the following* *EITHER* *subtract the parameter at start from parameter, at end / after an interval ; *divide by parameter at start ; *percentage ; **OR* $\frac{\text{change in parameter}}{\text{parameter at start}}$ x 100 ;;; **OR* $\frac{\text{absolute growth rate / change in parameter unit time}^{-1}}{\text{parameter at start}}$;;;	max 4
	(b)		(**A** shows) higher protein through all three trimesters produces heavier birth weight / (**D** shows) lower protein in all three trimesters produces lower birth weight ; figures stating differences ; (**C** shows) a decrease in protein during second trimester has no significant effect ; (**B** shows) low protein in the third trimester reduces calf weight more than in second ; figures in support ; *3 max* ref to need for statistical test / standard deviation is not given on graph ; during third trimester rapid growth ; more protein needed for growth ; for, structural protein / metabolic protein / enzymes ; second trimester is mainly development ; differences could be due to, another effect / genetics / different fathers / environmental effect ;	max 4

(c) cannot conduct this experiment on humans ;
not ethical ;
ignores the rights of the unborn child ;
difficult to get a large enough sample ;
inadequate controls / difficult to control human diet ;
AVP ; e.g. endanger health of, mother / child **max 2**

[Total: 11]