RECOGNISING ACHIEVEMENT

2805/01 Growth, Development and Reproduction

June 2003

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. 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.

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)	(a gland which) secretes / produces, <u>hormones</u>; (directly) into the, blood / circulatory system; no duct / ductless;	**2 max**
		(ii)	a change, in a body constant / e.g. / AW; initiates a mechanism / detected / monitored, by receptor / sensor / named / AW; (which) corrects / reverses the change / described; level varies, within narrow limits / dynamic equilibrium / AW; homeostasis / ref to set point / constant level / the norm;	**3 max**
	(b)	(i)	regulates / controls / increases, metabolic rate / <u>rate</u> of respiration; *basal metabolic rate = neutral* **R** 'affects' throughout *reject* controls / regulates / helps for all other marking points involved in, glucose / fat, breakdown; stimulates / causes / increases, protein *or* enzyme synthesis / amino acid uptake; increases, body temperature / thermogenesis; **R** maintains ref to mitochondrial activity / ATP production; switches on genes *or* stimulates, transcription / cell division; stimulates / aids / increases, skeletal / bone / muscle, growth; stimulates / aids / increases, brain development / IQ / mental ability; increases, heart rate / cardiac output / pulse rate; **R** maintains heart rate AVP; e.g. increases growth hormone	**3 max**

(b) (ii) **R** refs to T_3 alone **A** refs to T_4 alone or T_3 **and** T_4

answer could be taken from a flow diagram

hypothalamus;
produces, thyrotrophin releasing hormone / TRH / thyroid releasing hormone;
R thyroxine releasing hormone but **A** 'factor' for hormone
stimulates anterior pituitary gland;
to produce, TSH / thyroid stimulating hormone;
which stimulates, thyroxine / T4, production;
thyroxine / T4 inhibits, anterior pituitary / secretion of TSH;
thyroxine / T4 inhibits, hypothalamus / secretion of TRH;
ref to influence of environment / higher centres, on hypothalamus; **6 max**

[Total: 14]

Question			Expected Answers	Marks
2	(a)	(i)	measures tissues *or* cells *or* named e.g. / fresh mass measures water; water content, may vary / is reversible / AW; fresh / wet, mass is not a true indication of growth; dry mass, more accurate / measures irreversible increase *or* change; ora;	**2 max**
		(ii)	*treat the wrong name for the seed as neutral* large sample / sample at least ten; heat in oven at 60 –100 ^{o}C; **A** up to 110 ^{o}C to constant mass / AW; (cool in) desiccator; weigh the seeds; **A** at beginning or when dried each day; separate the embryo from the endosperm; weigh separately; AVP; e.g. same conditions, random sample	**4 max**
	(b)	**1**	endosperm is, food store / named food store / source of nutrients;	
		2	water activates / mobilises, enzymes;	
		3	$\underline{\propto}$ amylase / other named e.g.;	
		4	digest / hydrolyse, carbohydrate / starch / protein / lipid; **R** breakdown, convert etc	
		5	to, maltose / glucose / amino acids / fatty acids / glycerol;	
		6	endosperm, shrinks / mass decreases; **R** used up	
		7	may be absorbed, into cotyledons;	
		8	transported to, growing points of embryo / meristem;	
		9	by diffusion;	
		10	(used for) respiration;	
		11	release / provide, ATP / energy; **R** makes or produces energy	
		12	cell division / mitosis / new tissue / e.g.;	
		13	synthesis of named example;	
		14	ref to PGR's;	
		15	growth / mass, increases;	
		16	mass decreases as CO_2 given off;	
		17	AVP; e.g. detail on gibberellins, comparison to barley,	
		18	AVP; ref to figs with units one mark only	**7 max**
			QWC – legible text with accurate spelling, punctuation and grammar;	**1**
				[Total: 14]

Question			Expected Answers	Marks
3	(a)	(i)	**D**;	**1**
		(ii)	**B**;	**1**
		(iii)	**E**;	**1**
	(b)		erectile tissue / blood space / fills with blood; makes penis erect / rigid / hard; for copulation / AW;	**2 max**
	(c)		delivers / transports / carries, its set of genes / DNA / genetic information / chromosomes (to female gamete); restores diploid number / AW; <u>increases</u> genetic variation; stimulates meiosis 2; AVP; e.g. in human prevents polyspermy / AW, determines the gender of the offspring **R** to reach female gamete	**2 max**
	(d)			**7 max**

	human	*flowering plant*
type of fertilisation	-	-
cell involved in nuclear fusion	-	ovum / egg cell <u>and,</u> endosperm / diploid, nucleus;
	-	two male gametes; **R** generative nucleus
site of fertilisation	fallopian tube / oviduct;	embryo sac / megasporangium;
products of fertilisation	-	embryo / zygote <u>and</u> endosperm;
number of chromosome sets in the products of fertilisation	2 / 2n / diploid;	2 / 2n / diploid (zygote); 3 / 3n / triploid (endosperm); **A** 5n for one mark only

[Total: 14]

Question	Expected Answers	Marks
4 (a) (i)	in xylem / transpiration <u>stream</u>; in phloem / in food strand / translocation; by, diffusion / facilitated diffusion; through plasmodesmata; through cell walls; AVP; e.g. ref to apoplast / symplast, dissolved in water, mass flow **R** pinocytosis	**3 max**
(ii)	**R** refs to seasons **R** grows successfully prevents germination during <u>short</u> period(s) of favourable conditions; ensures germination, when conditions favourable / two or more named conditions; allows seed to survive unfavourable conditions; allows (more time) for dispersal; prevents, pregermination / germination before dispersal; spreads germination time / synchronises germination so that plant flowers when others are in flower *or* when pollinators are abundant;	**4 max**
(iii)	growth promoter / starts germination; **R** breaks dormancy gibberellin production stimulated by water absorption / AW; stimulates / causes synthesis of, (∝) amylase; by activating, (∝) amylase gene / transcription; in aleurone layer; amylase, digests / hydrolyses, starch; **R** breaks down, converts etc produces maltose; glucose, for respiration / energy for growth / ATP produced; **R** making or producing energy AVP; e.g. inhibits ABA, prechilling	**4 max**

(b) **(i)** cells pushed back as meristem divides / AW e.g. description of zones;
by mitosis;
exposed to, PGR's / named example;
gene switch;
on or off;
DNA codes for, enzymes / proteins;
differentiates;
synthesises different specialised structures / e.g.;
AVP; e.g. more detail, ref to environment

R refs to mutation **4 max**

(ii) *If the candidate attempts both answers, mark both and award the highest score.*

either *xylem vessel element*

cells take in water;
by osmosis;
elongate / enlarge;
end walls break down;
lignin, synthesised / formed;
detail on pattern e.g. annular, spiral etc;
impermeable;
living contents / AW, die *or* vessel element becomes hollow;
pits form in wall;
rigid / strong;

or *phloem sieve tube element*

cells take in water;
by osmosis;
elongate / enlarge;
end walls perforated by sieve plates;
ref to companion cell;
connected by numerous plasmodesmata;
nucleus disintegrates;
organelles / named, decrease;
cytoplasm reduced;
phloem protein forms; **4 max**

[Total: 19]

Question		Expected Answers	Marks
5	(a)	oestrogen and progesterone secretion declines; **R** stops parathormone levels rise / removes inhibition of parathormone; increase in / high(er) levels of, FSH / LH; reduced GnRH levels;	**3 max**
	(b) **G1**	incidence of fractures of radius and femur rise with age;	
	G2	fast(er) in radius from 49 - 60 / 45-49 to 60-64 / 45-49 to 55-59;	
	G3	slows / increases slowly, from 60-70 / 55-59 to 65-69;	
	G4	levels from 70-80 / 4%;	
	G5	curve for the femur is exponential / directly proportional (to age);	
	G6	fractures femur increase, slowly / is slower, from 45-49 to 55-59;	
	G7	fractures femur increase from 65-69;	
	G8	from 75-79, dramatic / rapid increase / AW; 4 max	
	9	figures using both axes to illustrate any of the points above;	
	10	(start of) menopause;	
	11	oestrogen inhibits parathormone;	
	12	increase parathormone causes, calcium loss from bone / mobilises bone calcium / AW;	
	13	decrease in bone, mass / density;	
	14	become brittle / more likely to fracture, at / during / after, menopause; **R** in wrong context with data **R** bones become soft	
	15	osteoblasts less active / osteoclasts more active;	
	16	osteoporosis;	
	17	radius not load bearing therefore less dense / femur load bearing therefore denser;	
	18	more likely / less likely, to break;	
	19	until osteoporosis advanced;	
	20	radius takes the impact of the fall / AW;	
	21	HRT replaces oestrogen;	
	22	(HRT) decreases the rate at which calcium, is lost from bones / to the same rate as in men;	
	23	vitamin D converted into active vitamin D;	
	24	vitamin D stimulates gut epithelium to absorb calcium;	
	25	vitamin D regulates deposition of calcium in bones;	
	26	AVP; e.g. older people need adequate exposure to UV / sun light,	
	27	AVP; radius curve sigmoidal, load bearing exercise, ref to calcitonin, ref to a named dietary supplement	**9 max**
		QWC – clear, well organised using specialist terms;	**1**
			[Total: 13]

Question		Expected Answers	Marks
6	(a)	small / inconspicuous; reduced petals / bracts / no petals; no nectaries; large *or* feathery stigma / stigma has a large surface area; stigma / stamens / anthers hang, outside flowers; anther, versatile / swings freely / flexible / attached in centre;	**3 max**
	(b) (i)	*2 marks for the correct answer, one mark for correct working with wrong measurement* $\frac{48 - 50 \times 1000}{3500}$ / $\frac{4.8 - 5.0 \times 10\,000}{3500}$; = 13.7 / 13.71 / 14.00 / 14.2 / 14.3 / 14.29 (μm); correct answer only ;;	**2**
	(ii)	*assume referring to grass if not identified* grass pollen is, smaller / lighter / ora; grass pollen has a smooth surface / ora; may have air sacs / buoyancy aids / large surface area / AW / ora; more pollen in grass / ora;	**2 max**
	(c)	to produce ATP / release of energy / to provide energy; for, nuclear *or* cell, division / meiosis / mitosis; protein synthesis / sporopollenin; to, produce / synthesise, named structure / substance; for active transport;	**2 max**
	(d)	pollen not <u>compatible</u> (with stigma of other species); chemical / structural, incompatibility / detail; isolation / mature at a different time of the year; chromosome number does not match / AW;	**2 max**

(e) (i) ***** protandry / anthers mature first;
* protogyny / stigma matures *or* ripens first;

**allow 1 mark only if refer to 'different times'*

flowers develop mature anthers from the bottom of the spike upwards;
self incompatibility / described;
AVP; e.g. dioecious / monoecious plants / described **2 max**

(ii) *assume self pollination if not specified*

meiosis / not mitosis;
some genetic variation / not genetically identical / ora;
gametes produced / no gametes / e.g. of gamete;
fertilisation / zygote / ora;
involves reproductive cells / not from vegetative cells / AW;
seeds produced / ora; **3 max**

[Total: 16]