RECOGNISING ACHIEVEMENT

2805/05 Mammalian Physiology and Behaviour

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)	**W** tarsal ; **R** lines pointing to metatarsal **X** scapula ; **Y** between 8th and 19th vertebra ; **Z** shoulder / hip, joint ;	**4**
	(b) (i)	ref to, vertebrae / spinal column / axial skeleton / AW ; **R** spinal cord four limbs / tetrapod ; pentadactyl limb / five digits ; one 'upper' limb bone plus two 'lower' limb bones ; ribs attached to thoracic vertebrae ; caudal vertebrae / coccyx / vestigial tail in humans ; AVP ; e.g. teeth correct ref to, pelvic and pectoral girdle / appendicular skeleton	**max 3**
	(ii)	diastema / described ; long jaw ; incisors in upper jaw only / no incisors in lower jaw ; ref to horny pad ; ref to specialised grinding teeth / AW ;	**max 2**
	(c)	link between increased speed and increased oxygen consumption ; link between increasing speed and increasing number of strides ; data quote with correct units ; aerobic respiration ; (respiration linked to) ATP production ; further detail ; e.g. ref to oxidative phosphorylation energy / ATP, needed for muscle contraction ; **R** 'energy for movement of legs' further detail ; e.g. ref to ATP and cross bridge, formation / detachment	**max 5**

[Total: 14]

Question			Expected Answers	Marks
2	(a)	(i)	*automatic* requires no (conscious) thought / AW **;**	
		(ii)	*stereotyped* carried out by all individuals in a species / always carried out in same way / AW **;**	
		(iii)	*conditioned* (response) can be, modified / produced, following exposure to 'new' stimulus / AW **;**	**3**
	(b)		**A** any response, provided correct stimulus is given **;** **R** non-mammalian example **R** examples of conditioned reflexes	**1**
	(c)	**D1**	time spent in box decreases as number of trials increases / AW **;**	
		D2	greatest change in response occurs in first few trials **;**	
		D3	little / less, change in response time **;**	
		D4	between trials 6 and 20 **;**	
		D5	ref to supporting paired data **;**	
		D6	ref to 'fluctuations' **;** *max 4*	
		E1	(at first) cat pulls, loop accidentally / AW **;**	
		E2	ref to trial and error **;**	
		E3	freedom is a, reward / reinforcer **;**	
		E4	associative learning **;**	
		E5	detail (of associative learning) **;**	
		E6	pulls loop sooner / AW **;**	
		E7	correct ref to acclimatisation period (when cat placed in box) / AW **;**	
		E8	AVP **;** e.g. other behaviours / inactivity, not, reinforced / rewarded *max 5*	**max 7**
			QWC – legible text with accurate spelling, punctuation and grammar ;	**1**
	(d)		no reward / punishment (of behaviour), in classical **;** ora one stimulus in operant / two stimuli in classical **;** AVP **;**	**max 2**
				[Total: 14]

Question	Expected Answers	Marks
3 (a)	surface area ; amylase ; **R** carbohydrase hydrolysis ; trypsinogen ; epithelial / exocrine / acinar ; **A** acini **R** any ref to islets maltase / sucrase / lactase / dipeptidase / aminopeptidase / exopeptidase / carboxypeptidase ;; ***A** any 2 in any order*	**7**
(b)	*allow in either section* ref to (release from), epithelial cells in / cells lining, duodenum ; *secretin* release stimulated by acidic substances ; stimulates release of, hydrogen carbonate / alkaline solution / bile ; **R** enzymes from, pancreas / liver ; *CCK* release stimulated by products of, fat / protein, digestion ; stimulates release of, enzymes / named enzyme ; **R** alkaline fluid from pancreas ; **R** liver stimulates gall bladder emptying ; stimulates <u>smooth</u> muscle contraction ; *max 3*	**max 4**
(c)	incomplete digestion ; less surface area ; less absorption ; of <u>named</u> nutrient(s) ; weight loss / stunted growth ; malnutrition ; breakdown / use up, of (named) energy stores ; named deficiency disease ; diarrhoea / rectal bleeding ; wind / bloating / pain ; AVP ;	**max 5**
		[Total: 16]

Question		Expected Answers	Marks
4	(a) 1	idea circular and radial muscles are antagonistic ;	
	2	(drug) acts like noradrenaline / AW ;	
	3	ref to sympathetic, neurones / nervous system ;	
	4	radial muscle contracts ;	
	5	(drug) blocks ACh / prevents ACh release / breaks down ACh ; **A** acetylcholine	
	6	ref to parasympathetic, neurones / nervous system ;	
	7	circular muscles, (in iris) relax / not stimulated to contract ;	
	8	AVP ; e.g. (neurotransmitter / drug) combines with receptors	**max 4**
	(b)	less damage to, cornea / eye ; cornea heals faster ; vision returns sooner ; less chance of infection ; **R** 'more side effects' or 'complications' less scar tissue ; AVP ; e.g. less need for antibiotics	**max 2**
	(c) 1	change in, nucleotide / base / triplet sequence ;	
	2	transcription described ;	
	3	translation described ;	
	4	new / altered, amino acid sequence / primary structure ;	
	5	new / different, R groups ;	
	6	new bonds formed / position of bonds altered ;	
	7	loss of / change in, secondary / tertiary structure ;	
	8	crystallins, no longer globular (proteins) / become fibrous (proteins) ;	**max 4**

(d) *macula degeneration*

1 image focused on fovea **;**
2 (fovea mainly) cones **;**
3 one cone to one, bipolar / ganglion, cell **;**
4 (cell, death / damage) deposits iodopsins **;**
5 (causes) loss in visual acuity (so reading difficult) **;**
6 rods in, remainder / periphery, of retina **;**
7 not affected so only central vision lost / peripheral vision unaffected **;**

max 4

retinitis pigmentosa

8 rods (mainly / only) in periphery **;**
9 several rods to each, bipolar / ganglion, cell **;**
10 (cell, death / damage) deposits rhodopsin **;**
11 loss of, retinal / synaptic, convergence **;**
12 ref to loss of summation (so difficult to see in dim light) **;**
13 cones not affected so only peripheral vision lost **;** *max 4*

14 AVP **;** e.g. loss of visual sensitivity in retinitis **max 6**

QWC – clear, well organised using specialist terms ; **1**
award the QWC mark if four of the following are used in correct context

iodopsin	convergence
rhodopsin	summation
rods	bipolar
cones	ganglion
acuity	

(e) ref to eye tests **;**
laser treatment **;**
reduce intake of, fat / saturated fat / cholesterol **;**
increase, activity / exercise **;**
lose weight / go on diet **;**
stop / reduce, smoking **;**
take antioxidants **;**
e.g. vitamin C / vitamin E / red wine / tomato (ketchup) / lycopene **;**
less salt **;**
less caffeine **;**
avoidance of 'stress' **;**
AVP **;** e.g. take aspirin **max 3**

[Total: 20]

Question			Expected Answers	Marks
5	(a)	(i)	noradrenaline / adrenaline / thyroxine / growth hormone / glucocorticosteroid ; **R** steroid	1
		(ii)	insoluble ; unreactive / stable / inert ; cannot diffuse out of cell / AW ; no effect on water potential ; compact / branched ; lots of glucose in small space / AW ; **R** lots of energy in small space easy to, convert to glucose / hydrolyse ; lots of 'ends' for enzyme action ;	max 3
	(b)	1 2 3 4 5 6 7 8 9 10	increases activity of glycogen synthetase ; slow initial effect / AW ; ref to figures to show an increase ; (overall effect) increases, production of glycogen / glycogenesis ; **R** storage of glycogen lowers activity of glycogen phosphorylase ; rapid effect ; ref to figures to show a decrease ; prevents / reduces, breakdown of glycogen / glycogenolysis ; (glucose binds to) allosteric site / AW ; (glucose acts as) inhibitor / activator ; **R** competitive inhibitor	max 5
	(c)		*either* deamination of amino acids / removal of NH_2 from amino acids ; pyruvate / carbon skeleton / AW ; triose phosphate / TP ; condensation / increasing number of carbon atoms ; *or* breakdown of, lipid / triglyceride ; glycerol ; triose phosphate / TP ; condensation / increasing number of carbon atoms ;	max 3

[Total: 12]

Question			Expected Answers		Marks
6	(a)		*cerebellum* coordination of, (voluntary) movement / skeletal muscles ; (control of) posture ; (control of) balance ; AVP ;		**max 2**
			medulla oblongata initiation / control of, breathing rate ; control of heart rate ;	**R** initiation of heart rate	
			control of blood pressure ; control of peristalsis (in alimentary canal) ; AVP ;		**max 2**
	(b)	**(i)**	build up of, tau / protein ;		**1**
		(ii)	secretion of / high levels of, Aβ42 / beta amyloid 42 / abnormal Aβ;	**R** Aβ40	**1**
	(c)		similar shape to, acetylcholine / ACh ; binds to / enters, active site ; prevents ACh entry ; competitive (inhibitor) ; different shape to ACh ; enters / binds, but not at active site ; allosteric / indirect ; change in, tertiary structure / shape of active site ; non-competitive (inhibitor) ;		**max 3**
	(d)		prevents ACh breakdown / increase ACh level ; ACh binds to, proteins / receptors ; on <u>post</u>-synaptic membrane ; depolarisation / action potential / impulse (produced ; activates memory circuit / AW ;		**max 2**

(e) control group ;
given, placebo / tablet / injection / no drug ;
idea of 'double-blind' trial, i.e. neither patient nor doctor aware of which treatment each patient receives ;
random assignment of each patient to one group ;
similar severity of symptoms before trial ;
control of age ;
control of gender ;
control of diet ;
control of drug, dosage / administration ;
not taking any other, drug / medication ;
ref to suitable sample size ;
AVP ; **max 3**

[Total: 14]