

**2805/05 Mammalian Physiology and Behaviour**

**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 ( $\frac{1}{2}$ ) 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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<b>Abbreviations, annotations and conventions used in the Mark Scheme</b>	/ = 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 <u>      </u> = (underlining) key words which <b>must</b> be used to gain credit ecf = error carried forward AW = alternative wording A = accept ora = or reverse argument
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Question	Expected answers	Marks
1 (a)	from below / ventral / AW ; <b>A</b> idea of brain being seen from below <b>R</b> upside down, looking upwards	1
(b)	<i>reject choice of answers, accept any reasonable spelling</i>  <b>A</b> = cerebrum / cerebral hemisphere / cerebral cortex / frontal lobe ; <i>ignore refs to right or left</i> <b>R</b> incorrect lobe <b>B</b> = pituitary (gland) ; <b>R</b> hypothalamus <b>C</b> = cerebellum ; <b>D</b> = medulla (oblongata) ;	4
(c)	sensory / afferent ; <b>R</b> any reference to glial cells motor / efferent ; <b>R</b> intermediate, relay, effector neurone	2
(d)	<u>short term</u> memory loss ; <b>A</b> adequate description <b>R</b> forgetfulness unqualified deterioration in language / slurred speech ; loss of, analytical / logical / reasoning, skill ; increased anxiety / feelings of persecution / paranoia / hallucination ; become aggressive / depressed ; <i>ignore 'personality change' unqualified</i>  AVP ; e.g. confusion mood change loss of social skills loss of motor skills not recognising, relatives / people they know	max 2

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(e) *look for points 1 and 6 together, and points 6 and 7 together*

*indomethacin*

- 1 lowers A $\beta$  42 ;
- 2 large(st) reduction (in A $\beta$ 42) ; *must be expressed in words not data*
- 3 does not lower / increases, A $\beta$  40 (as total A $\beta$  is unaltered) ;
- 4 less chance of plaques forming ; *must be in context of indomethacin or ibuprofen treatment*

*naproxen*

- 5 little effect (on A $\beta$  42 levels) ;

*ibuprofen*

- 6 reduced A $\beta$  42 ;
- 7 less reduction (in A $\beta$  42) than indomethacin ;
- 8 at highest dose / 500 ( $\mu\text{mol dm}^{-3}$ ), A $\beta$  40 reduced ;
- 9 any **two** references to data (approx. concentration and level) ;;
- 10 *must be correct units A  $\mu\text{mols}$*
- 11 AVP; e.g. ref to side effects of any drug / suitable example such as  
liver or kidney damage  
ref to correct cost of treatment  
ref to error bars / standard deviation

**max 7**

**QWC – legible text with accurate spelling, punctuation and grammar ; 1**

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- (b) (i) both benefit ; **A** both organisms need each other  
mammal gains, energy / named source of energy ; **A** glucose / fatty acids  
**R** refs to cellulase and cellobiose  
mammal gains, source of nitrogen / protein / amino acids (from bacteria) ;  
microorganisms gain, carbohydrate / source of nitrogen / urea ;  
**R** food, nutrients, place to live, habitat **max 2**
- (ii) water is used ;  
to break a, glycosidic / covalent , bond / link ; **R** incorrect bond  
ref to  $\beta$  / 1-4 ; **max 2**
- (c) oxygen enters, (stomach) cells / other microorganisms ;  
**R** mutualistic / cellulose-digesting microbes  
ref respiration ;  
oxygen enters blood ;  
AVP ; e.g. ref to special pigment / protein molecule in gut (to bind O<sub>2</sub>)  
**max 2**
- (d) (i) lubricated ;  
palatable / easier to swallow / eases peristalsis ;  
identifiable / allows distinction between faeces ;  
prevents drying out of, microorganisms / plant material ;  
prevents entry of, microorganisms / microbes ;  
keeps pellet anaerobic ;  
protects microorganisms from, acid / enzymes in stomach ;  
(continued) digestion of, cellulose / plant material (inside caecotrope) ; **max 2**
- (ii) *idea of* more digestion (of cellulose / plant material) ;  
more absorption of, products / suitable (named) example; **R** nutrients  
in ileum / small intestine ; **max 2**

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Question	Expected Answers	Marks
3	(a) (i) transamination ;	1
	(ii) gluconeogenesis ;	1
	(iii) deamination ;	1
	(iv) condensation / polymerisation / glycogenesis ;	1
(b)	(i) <i>award two marks if correct answer (86.6) is given award one mark for calculation if answer is incorrect</i>  valid method of working i.e. $\frac{8.4}{0.097}$ ;  answer = 86.6 ; <b>R</b> rounding down to 86 or rounding up to 87	2
	(ii) blood glucose, falls / low (due to respiration of cells) ; <b>A</b> blood sugar glycogen is converted to glucose / glycogenolysis ; glucose used <u>in respiration</u> ; to release energy for, movement / muscle tone / posture ; <b>R</b> makes energy ref to glucagon (action on liver) ;	max 3
(c)	<i>idea of strength / stability</i> ; <b>R</b> structural role maintains / regulates, fluidity / flexibility ; prevents passage of , polar molecules / ions ; ora <b>R</b> ref to water	max 2
(d)	hydrophobic / insoluble (in water) / lipid soluble ; <i>treat non-polar as neutral</i>	1
(e)	(LDLs) attach to receptor ; ref to specific / complementary, (receptor) ; <b>R</b> if ref to active site endocytosis ; <b>A</b> pinocytosis <b>R</b> phagocytosis a description mentioning vesicle or vacuole ;	max 2
(f)	saturated fatty acids, <u>enter</u> / <u>in</u> , <u>liver cells</u> ; inhibit production of (LDL) receptors / prevent recycling of receptors ; further detail ; e.g. inhibit <u>protein</u> synthesis / less exocytosis fewer receptors on cell surface ; fewer LDLs taken into liver cell / LDLs remain in blood ;	max 3

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(g) *mark first idea*

*either*

deposit, cholesterol / lipid, in bile duct ;                    **R** fat or LDL  
gall stones ;

*or*

deposit, cholesterol / lipid, in arteries (wall) ;

**R** fat or LDL    **R** on artery wall

ref to, atherosclerosis / plaques / atheroma ;

**A** damage to lining of arteries

**R** narrowing of arteries

high blood pressure / CHD / stroke / heart attack / heart failure /  
thrombosis / blood clot / angina ;

**max 2**

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Question	Expected Answers	Marks
4 (a)	<p>1 refraction / bending of light, by cornea ;  2 fine focusing / <u>small</u> amount of refraction, by lens ; ora  3 size of iris controls depth of field ;</p> <p><i>(for distant objects)</i></p> <p>4 ciliary muscles relaxed ;  5 sclera stretches / pulls on, ciliary muscle / body / ring / processes ;  6 suspensory ligaments pulled ;  <b>R</b> refs to contraction or relaxation  7 lens, 'stretched' / thin / bends light less ;</p> <p><i>(for near objects)</i></p> <p>8 ciliary muscles contract ;  9 no tension from sclera on lens ;  10 suspensory ligaments 'slacken' ;  <b>R</b> refs to contraction or relaxation  11 lens, not stretched / becomes 'fatter' / becomes <u>more</u> convex /  bends light more ;</p> <p><i>allow any of these points if shown on clearly labelled diagrams  if no mention of distant or near objects, or if 'distant' and 'near' transposed,  then max 3</i></p>	max 5
(b)	<p>lens, loses elasticity / cannot return to normal shape / hardens ;  <b>A</b> 'cannot be made fat enough'  ref to change in composition (of lens) ;  (lens) cannot, bend / refract, light, (sufficiently from close object) ;  <b>R</b> cannot focus on near object  AVP ; loss of efficiency of ciliary muscles</p>	max 2
(c)	<p>1 wide pupil allows more light to enter eye ;  2 narrow pupil to prevent 'glow' when approaching prey ;  3 <i>tapetum lucidum</i> / extra layer, allows light to pass through, <u>retina</u> /  <u>receptors</u> , twice / AW ;  4 <i>tapetum lucidum</i> / extra layer, prevents absorption of light by <u>choroid</u> ;  5 <u>more</u> light absorbed by, rods / cones / receptors ;  6 <u>only</u> rods operate in dim light ;  <b>A</b> rods more sensitive to light  7 greater number of rods so more likely to detect objects ;</p>	max 4

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- (d) (i) hyoscine; **1**
- (ii)
- 1 acetylcholine still released by parasympathetic, system / neurones / nerves ;
  - 2 no / less, contraction of circular muscles ;
  - 3 no / less, narrowing of pupil ;
  - 4 ref noradrenaline / sympathetic nervous system ;
  - 5 (causes) contraction of radial muscle ;
  - 6 all (three) other drugs would cause narrowing of pupil ;
  - 7 correct explanation of action of one of the three remaining drugs on, the ANS / iris muscles ; **max 3**

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Question	Expected Answers	Marks
5 (a) (i)	arrows correctly drawn ;      A arrowheads on existing lines	1
(ii)	<i>allow chemical symbol for sodium but must have correct charge, although penalise only once</i>	
1	(sodium / potassium) ion channels, opened / deformed, in <u>receptor</u> / <u>receptor</u> membrane more permeable ;	
2	<u>sodium</u> ions <u>enter</u> ; <i>entry of potassium negates mark</i>	
3	ref to positive feedback ;	
4	depolarisation / description of changes in electrical potential ;	
5	receptor / generator, potential ;	
6	size of depolarisation / receptor potential, depends upon, strength of stimulus / pressure from pin / number of channels open / amount of sodium entering ;	
7	if change in potential, large enough / reaches threshold ;	
8	action potential is produced ;	
9	travels along, (sensory) neurone / axon / dendron ;	max 5
(b)	<i>advantage</i> faster (response) ;	1
	<i>disadvantage</i> less chance of modifying response (by brain) / fewer possible (variety of) responses ;	1
(c) (i)	performed by all chimps ; inherited / inborn / genetic ; <i>treat hard-wired as neutral ignore</i> preset, inbuilt instinctive ; no, learning / practice / not modified by environment ; <i>ignore</i> unlearned / not taught stereotyped / response is always the same ;	max 2
(ii)	<i>look for two correct answers</i>  more likely to, grip onto / be carried, by parent / hold onto branch; R refs to climbing avoid danger / AW ; <i>must be linked to first point</i> find food ; retain food ; AVP ;      e.g. bonding (to parent)	max 2

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
<b>6 (a)</b>	<b>A</b> = (muscle) fibre ; <b>R</b> (myo)fibril <b>B</b> = nucleus ; <b>C</b> = (motor) end, plate / foot / bulb / button / bouton ; <b>A</b> neuromuscular junction <b>R</b> synapse or presynaptic knob or motor unit	<b>3</b>
<b>(b)</b>	<i>if using chemical symbols, the charges must be correct, although penalise only once for each ion</i>	
	<b>1</b> leads to opening of (sodium / potassium) ion channels (in sarcolemma) ; <b>2</b> <u>entry of sodium</u> ions ; <i>entry of potassium negates mark</i> <b>3</b> ref to positive feedback ; <b>4</b> depolarisation / description of changes in electrical potential (of sarcolemma) ; <b>5</b> by diffusion / electrical attraction ; <b>6</b> action potential / wave of depolarisation / impulse ; <b>7</b> spreads along / down fibre ; <b>8</b> T-tubules ; <b>9</b> opening of calcium channels <u>in sarcolemma</u> / calcium entry into muscle cells ; <b>10</b> opening of calcium channels in SR membranes ; <b>11</b> calcium ions, <u>diffuse</u> / move down concentration gradient (out of SR) ; <b>12</b> calcium <u>ions</u> bind to troponin ; <b>13</b> AVP ; e.g. ref to triad or closeness of T-tubule to SR active transport of calcium ions back into SR	<b>max 7</b>
	<b>QWC - clear, well organised answer, using specialist terms;</b>	<b>1</b>

**[Total: 11]**