Mark Scheme 2805/05
June 2005

Mammalian Physiology and Behaviour

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)	(cortex is group of), specialised / similar / same, cells / neurones ; performing, similar / same / named, function ; brain is made of, more than one / different tissue(s) ; carrying out more than one function / AW ;	max 3
	(b)	large(r) surface area ; idea of more cells / neurones (in given space) ; idea of more 'processing power' / AW ;	max 2
	(c)	'shock absorber' / mechanical protection ; R protection unqualified removes (excess) heat / cools the brain ; supplies oxygen ; supplies (named) nutrient ; removes, (named) waste / carbon dioxide ; ref to osmoregulation ; AVP ; (e.g. ref to macrophages or white blood cells)	max 2
	(d)	planning a task ;	1
	(e)	*accept 'white and grey matter' for neurones throughout*	
		1 idea of largest, loss of neurones / damage, in **rear** of brain ; 2 explains poor understanding of words / poor memory of objects ;	
		3 (some / less) damage / loss of neurones, in **middle** (region) ; 4 affecting motor control ; 5 (but) not affecting hearing ;	
		6 no damage / increase in neurones, in **front** (region) ; 7 speech (production) unaffected ;	
		8 ref to paired figures / manipulated figures ;	max 4
			[Total: 12]

Question		Expected Answers	Marks
2 (a)		X = oxyntic / parietal ; Y = chief / peptic ; **A** zymogen lipase / mucus / water / (Castle's) intrinsic factor / HCO_3^- ;	3
(b)	(i)	aerobic respiration / supply ATP / supply energy ; **R** produce energy (for) active transport / pumping ; of hydrogen ions / protons ; exocytosis ;	max 2
	(ii)	modification / processing / idea of change in structure, of protein ; packaging / making vesicles ; of, pepsinogen / inactive enzyme / precursor ; **R** protein or pepsin	max 2
(c)	1	impulses along, parasympathetic / motor, neurone / axon ; **A** vagus	
	2	vesicles move towards membrane ;	
	3	release of acetylcholine ;	
	4	(causes) release of gastrin (from G cell) ;	
	5	gastrin, enters capillary / carried in blood / AW ;	
	6	gastrin binds to receptors on E cell ;	
	7	(causes) histamine release ;	
	8	histamine / gastrin, binds to receptors on, cell **X** / oxyntic cell / parietal cell ;	
	9	exocytosis of, ACh / gastrin / histamine ;	
	10	diffusion between cells of, histamine / gastrin / ACh ;	max 5
(d)		idea of complementary shape ; bind to / blocks, (histamine) receptors / histamine binding site ; less / no, secretion of HCl ;	max 2
)		*endopeptidase* breaks / hydrolyses, peptide bond ; within, polypeptide / protein ; **A** 'breaks up into smaller pieces' *hydrolysis* breaking of, suitable named bond ; using / adding, water ;	max 3
			[Total: 17]

3 (a) **M** = neural spine / neural process ;
attachment of, ligaments / muscles ; **R** articulates

N = neural canal / neural channel / foramen ;
protects / allows passage of, spinal cord ; **R** spine 4

(b) support greater, load / weight ; *comparative statement* 1

(c) **T** correctly labelled ;
A correctly labelled ; 2

(d) *C1 to C14 to max 5*

C1 osteoarthritis affects cartilage ;
C2 osteoporosis affects bone ;

C3 osteoarthritis due to 'wear and tear' on joints ; **A** ref to 'load bearing'
C4 vigorous use / overuse, of joints ;
C5 ref to, sport / dance / lifting job ; **A** relevant activity
C6 more cartilage breakdown than replacement ;
C7 less, collagen / glycoprotein ;

C8 osteoporosis due to loss of bone, mass / density ;
C9 idea of <u>osteoclasts</u> more active than <u>osteoblasts</u> ;

C10 loss of calcium phosphate / demineralisation ;
C11 ref to, menopause / low oestrogen ;
C12 diet low in, calcium / vitamin D ;
C13 bone density less than 648 mg cm^{3} ;
C14 AVP ; e.g. smoking / steroid use

S1 to S6 to max 3

S1 pain during movement in osteoarthritis ;
S2 reduced mobility (of joint / limb) ;
S3 inflammation of joint ;

S4 (increased chance of) fractures in osteoporosis ;
S5 immobility ;
S6 pain qualified ; e.g. sciatica ;
S7 AVP ; **max 7**

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

[Total: 15]

Question		Expected Answers	Marks
4	(a)	ref parasympathetic NS / AW ; sympathetic NS less active / AW ; more impulses in vagus nerve / less impulses in accelerator nerve ; more acetylcholine / less noradrenaline ; effect on SAN ;	max 3
	(b)	*any two of* fibrinogen ; **R** fibrin prothrombin ; **R** thrombin albumin ; **A** albumen (named) globulin ; **R** immunoglobulin or antibodies AVP ; e.g. transferrin	max 2
	(c)	*similarities* **1** production of urea ; **2** urea transported in blood ; **3** urea filtered from blood ; **4** synthesis of proteins from amino acids ; *differences (assume refs are to brown bears unless otherwise stated)* **5** amino acids synthesised from ammonia ; **6** <u>all</u> urea reabsorbed ; **7** from kidney <u>and</u> bladder ; **8** urea converted to ammonia by <u>bacteria</u> ; **9** AVP ; e.g. (humans) less tolerant to high ammonia (in blood)	max 5
	(d)	component of cell membranes / AW ; ref to, mechanical stability / impermeability / fluidity ; *ignore* rigidity production of, steroid hormone / named hormone ; production of vitamin D ; production of bile salts ;	max 3
	(e)	increases high density lipoproteins (HDLs) ; reduces low density lipoproteins (LDL) ; prevents, deposition of cholesterol / plaques / atherosclerosis ;	max 2
			[Total: 15]

Question			Expected Answers	Marks
5	(a)		ulna ;	1
	(b)		rapid / almost immediate / AW ; automatic / no conscious thought / does not involve brain ; (co-ordinated by) spinal cord / (only) three neurones involved ; no learning / innate / instinctive / AW ;	max 3
	(c)	1	depolarisation of spindle ;	
		2	generator / receptor, potential ;	
		3	ref to threshold ;	
		4	action potential / impulse ;	
		5	sensory neurone ;	
		6	synapse with, relay / intermediate, neurone ;	
		7	exocytosis of, neurotransmitter / ACh ; A description of exocytosis	
		8	diffusion (of neurotransmitter / ACh) across cleft ;	
		9	action potential in motor neurone ;	
		10	to, end plate / neuromuscular junction ;	
		11	binding of transmitter to receptors (on sarcolemma) ;	
		12	depolarisation of sarcolemma / AW ;	
		13	spreads down T-tubules ; **A** T-tubes	
		14	calcium ions released from, sarcoplasmic reticulum / SER / cisternae ;	
		15	calcium ions bind to troponin ;	
		16	tropomyosin moves ;	
		17	exposes myosin binding site (on actin) ;	
		18	ref to, sliding filaments / cross-bridges / ratchet mechanism ;	
		19	AVP ; e.g. sarcomere shortens / ATPase involved	max 8
			QWC – clear well organised, using specialist terms ;	1
			award the QWC mark if four of the following are used in correct context depolarisation T-tubules threshold sarcoplasmic reticulum synapse troponin sarcolemma tropomyosin	
	(d)	1	proteins needed for repair / AW ;	
		2	more transcription of, DNA / genes ;	
		3	more translation ;	
		4	protein synthesis ;	
		5	named protein ; e.g. actin / myosin / troponin / tropomyosin	
			ignore all refs to muscle contraction	
		6	more aerobic respiration ;	
		7	so more, energy released / ATP produced ;	
		8	(energy required for) condensation / anabolic, reactions ;	
		9	(energy required for) formation of peptide bonds ;	
		10	(energy required for) formation of extra mRNA ;	max 5
				[Total: 18]

Question			Expected Answers	Marks
6	(a)		**X** = tympanum / tympanic membrane / eardrum ; passes vibrations to, ossicles / malleus / hammer ; **Y** = Eustachian, tube / canal ; equalises pressure (on either side of tympanum) ;	4
	(b)		prevent damage to ossicles ; prevent damage to, cochlea / organ of Corti / sensory hair cells ;	2
	(c)	(i)	**1** little difference / similar results, up to 1,000 (Hz) ; **R** no difference **2** no, loss of hearing / increase in volume of test sounds, for person **A** ; **3** increasing, hearing loss / volume of test sounds, for person **B** (above 1,000Hz) ; **4** large, hearing loss / increase in volume of test sound, for person **C** at 4,000 (Hz) ; **5** quote fig(s) with both units ;	max 3
		(ii)	loud / damaging, sound was of, one frequency / 4 000 Hz ; (causes) damage to / loss of, stereocilia / hair cells ; in (only) one region ; of, basilar membrane / organ of Corti / hair cells ;	max 2
		(iii)	(testing) apparatus ; background noise / no background noise ; time of day ; same number of tests at each frequency ; same range of frequencies ; AVP ; e.g. alertness of patient **R** gender, age	max 2
				[Total: 13]