

**Mark Scheme 2805/05**  
**June 2005**

Mammalian Physiology and Behaviour

|                                                                             |                       |                                                                    |
|-----------------------------------------------------------------------------|-----------------------|--------------------------------------------------------------------|
| Abbreviations,<br>annotations and<br>conventions used in the<br>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                     |
|                                                                             | <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 |                                                                    |

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

[Total: 12]

| Question | Expected Answers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Marks |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| (a)      | X = oxyntic / parietal ;<br>Y = chief / peptic ;    A zymogen<br>lipase / mucus / water / (Castle's) intrinsic factor / $\text{HCO}_3^-$ ;                                                                                                                                                                                                                                                                                                                                                                                                                | 3     |
| (b) (i)  | <u>aerobic</u> respiration / supply ATP / supply energy ;    R produce energy (for) active transport / pumping ;<br>of hydrogen ions / protons ;<br>exocytosis ;                                                                                                                                                                                                                                                                                                                                                                                          | max 2 |
| (b) (ii) | modification / processing / idea of change in structure, of protein ;<br>packaging / making vesicles ;<br>of, pepsinogen / inactive enzyme / precursor ;    R protein or pepsin                                                                                                                                                                                                                                                                                                                                                                           | max 2 |
| (c)      | 1 impulses along, parasympathetic / motor, neurone / axon ;    A vagus<br>2 vesicles move towards membrane ;<br>3 release of acetylcholine ;<br>4 (causes) release of gastrin (from G cell) ;<br>5 gastrin, enters capillary / carried in blood / AW ;<br>6 gastrin binds to receptors on E cell ;<br>7 (causes) histamine release ;<br>8 histamine / gastrin, binds to receptors on, cell X / oxyntic cell / parietal cell ;<br>9 <u>exocytosis</u> of, ACh / gastrin / histamine ;<br>10 <u>diffusion</u> between cells of, histamine / gastrin / ACh ; | max 5 |
| (d)      | idea of complementary shape ;<br>bind to / blocks, (histamine) receptors / histamine binding site ;<br>less / no, secretion of HCl ;                                                                                                                                                                                                                                                                                                                                                                                                                      | max 2 |
| (e)      | <i>endopeptidase</i><br><br>breaks / hydrolyses, peptide bond ;<br>within, polypeptide / protein ;    A 'breaks up into smaller pieces'<br><br><i>hydrolysis</i><br><br>breaking of, suitable named bond ;<br>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 osteoclasts more active than osteoblasts ;
- C10 loss of calcium phosphate / demineralisation ;  
C11 ref to, menopause / low oestrogen ;  
C12 diet low in, calcium / vitamin D ;  
C13 bone density less than  $648 \text{ mg cm}^{-3}$  ;  
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 ;<br>sympathetic NS less active / AW ;<br>more impulses in vagus nerve / less impulses in accelerator nerve ;<br>more acetylcholine / less noradrenaline ;<br>effect on SAN ;                                                                                                                                                                                                                                                                                             | max 3                               |
| (b)      | <i>any two of</i><br>fibrinogen ; <b>R</b> fibrin<br>prothrombin ; <b>R</b> thrombin<br>albumin ; <b>A</b> albumen<br>(named) globulin ; <b>R</b> immunoglobulin or antibodies<br>AVP ; e.g. transferrin                                                                                                                                                                                                                                                                                              | max 2                               |
| (c)      | <i>similarities</i><br><br>1 production of urea ;<br>2 urea transported in blood ;<br>3 urea filtered from blood ;<br>4 synthesis of proteins from amino acids ;<br><br><i>differences (assume refs are to brown bears unless otherwise stated)</i><br><br>5 amino acids synthesised from ammonia ;<br>6 <u>all</u> urea reabsorbed ;<br>7 from kidney <u>and</u> bladder ;<br>8 urea converted to ammonia by <u>bacteria</u> ;<br><br>9 AVP ; e.g. (humans) less tolerant to high ammonia (in blood) | max 5                               |
| (d)      | component of cell membranes / AW ;<br>ref to, mechanical stability / impermeability / fluidity ;<br>production of, steroid hormone / named hormone ;<br>production of vitamin D ;<br>production of bile salts ;                                                                                                                                                                                                                                                                                       | <i>ignore rigidity</i><br><br>max 3 |
| (e)      | increases high density lipoproteins (HDLs) ;<br>reduces low density lipoproteins (LDL) ;<br>prevents, deposition of cholesterol / plaques / atherosclerosis ;                                                                                                                                                                                                                                                                                                                                         | max 2                               |

[Total: 15]

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

**[Total: 18]**

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