

**2802 Human Health and Disease**

**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 ( $\frac{1}{2}$ ) 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. 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.



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| Question | Expected Answers   | Marks |
|----------|--|-------|
| 2 (a)    | <p><i>Plasmodium</i> / <i>P. vivax</i> / <i>P. falciparum</i> ;<br/> <i>Anopheles</i> ;<br/> infected ;<br/> blood ;<br/> vector ; <b>R</b> carrier<br/> (blood) transfusion / shared needle / across placenta / at birth / AW ;<br/> <b>R</b> mixing blood unless qualified</p>   | 6     |
| (b)      | <p style="text-align: center;"><i>reduce mosquito numbers</i></p> <p>stock ponds with fish (<i>Gambusia</i>) to eat larvae ; <b>R</b> kill mosquitoes<br/> oil on surface ;<br/> spray bacteria (<i>Bacillus thuringiensis</i>) to kill mosquito larvae ;<br/> DDT / pesticide spray ;<br/> release of sterile male mosquitoes ;<br/> draining, ponds / bodies of water ;</p> <p style="text-align: center;"><i>avoid being bitten by mosquitoes</i></p> <p>wear insect repellent ;<br/> long sleeved clothes ;<br/> sleep under nets ;<br/> nets soaked in, insecticide / repellent ;<br/> sleep with, pigs / dogs ;</p> <p style="text-align: center;"><i>use drugs to prevent infection</i></p> <p>use, prophylactic drug / quinine / chloroquine / larium / artemesinin / vibrimycin<br/> / tetracycline / antimalarial ;<br/> use malaria vaccine ;</p> | 2 max |

**[Total: 8]**

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| Question | Expected Answers   | Marks              |
|----------|--|--------------------|
| 3 (a)    | rickets ; <b>R</b> osteomalacia  | 1                  |
| (b)      | (more) exposure to, sunlight / uv light ;  | 1                  |
| (c) (i)  | enough to meet needs of almost all the population / AW ;<br><b>R</b> ref to average amount needed, or enough for every person  | 1                  |
| (ii)     | strengthen / harden, bones <i>or</i> prevent rickets ; <b>R</b> growth of bone<br>strengthen / harden, teeth ;<br>ref to (control of) muscle contraction ;<br>used in, synapse / neuromuscular junction ;<br>involved in blood clotting ;<br>enzyme cofactor ;<br>AVP ; e.g. ref to breast milk  | 2 max              |
| (d) (i)  | calcium levels in blood of group 2 higher than group 1 after treatment / ora ;<br>% showing some healing is higher than group 1 (vit D treatment) / ora ;<br>% showing complete healing is much higher than group 1 (vit D treatment) / ora ;<br>reference to figures <b>with units</b> comparing one of above ;<br>e.g. calcium concentration 90 mg dm <sup>-3</sup> against 83 (7 mg dm <sup>-3</sup> higher)<br>% showing some healing 86 against 83 (3% difference)<br>% showing complete healing 61 against 19 (42% difference) |                    |
|          | calcium levels in blood of group 2 match levels in, group 3 (treatment with both vit D<br>and calcium) / group 4 (control) ;   | 3 max              |
| (ii)     | members of the group do not realise they are having a different treatment / ora ;<br>members of the group do not expect to show better healing than others / ora ;<br><br>(when X-rays re-examined) doctors unaware which treatment each individual had ;<br>doctors do not look for better results in one group than another ;<br><br>AVP ; e.g. double blind test <i>or</i> single blind test if doctors know the treatment  | 2 max              |
| (iii)    | for comparison ; <b>R</b> control<br>of extent of healing / of blood calcium levels / of X-rays ;<br>to see, how well treatment has worked / what values are normal ;<br>use of figs <b>with units</b> ;<br>AVP ;  | 2 max              |
|          |  | <b>[Total: 12]</b> |

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| <b>Question</b> | <b>Expected Answers</b>  | <b>Marks</b> |
|-----------------|--|--------------|
| <b>4 (a)</b>    | (substance that) causes, cancer / tumour / abnormal growth / AW ;<br><br>invasive / spreading / destructive / results in secondary tumours / metastasis / AW ;   | <b>2</b>     |
| <b>(b)</b>      | acts on, genes / chromosomes / DNA ;<br>causing, mutation / change in genetic code ;<br>of genes that control cell division / oncogenes ;<br>cells divide out of control / AW ; <b>R</b> rapidly <b>R</b> grow<br>AVP ; e.g. detail of change / substitution / deletion / insertion<br>/ chromosome abnormality<br>cells do not undergo apoptosis                    | <b>3 max</b> |
| <b>(c)</b>      | shortage of breath / difficult to breathe / AW ; <b>R</b> wheezing<br>persistent / constant, cough ; <b>R</b> smoker's or severe cough<br>coughing up blood ;<br>chest pain / pain when breathing ;<br>swollen / painful, lymph glands ;<br>weight loss ;  | <b>2 max</b> |
| <b>(d)</b>      | bronchoscopy / use of an endoscope / described ;<br>(chest) X-ray ;<br>CT (computed tomography) scan ; <b>A</b> CAT <b>A</b> MRI <b>R</b> scan unqualified<br>AVP ; e.g. position of distinct, patch / shadow, is position of tumour<br>use of stethoscope to tell if tumour is in left or right, lung / lobe<br>lung volume test<br><br><b>R</b> biopsy, ultrasound | <b>2 max</b> |

**[Total: 9]**

|                                   |                                 |                           |                     |                         |
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| Question  | Expected Answers  | Marks        |
|-----------|---|--------------|
| 5 (a) (i) | X = (smooth) muscle ; <b>A</b> involuntary muscle / non striated muscle<br>Y = (ciliated) epithelium ;  |              |
| (ii)      | Z = (branch of) blood vessel / artery / vein / arteriole / venule ; <b>R</b> capillary  | <b>3</b>     |
| (b)       | <p><i>cartilage</i></p> <p>1 in, trachea / bronchi ;<br/>2 holds airway open / prevents collapse ;<br/>3 prevents bursting (of trachea / bronchi as air pressure changes) ;<br/>4 low resistance to air movement ;</p> <p><i>ciliated epithelium / cilia</i></p> <p>5 move mucus ;<br/>6 ref to how movement brought about ;<br/>e.g. metachronal rhythm / wave / sweep / waft</p> <p><i>goblet cells</i></p> <p>7 secrete mucus ;<br/>8 trap, bacteria / dust / pollen / particles ;<br/>9 remove particles from lungs ;</p> <p><i>blood vessels</i></p> <p>10 supply, oxygen / nutrients (to tissues of lung) ;<br/>11 surround alveoli / good blood supply to alveoli ;<br/>12 deliver carbon dioxide / pick up oxygen ;<br/>13 ref to wall of capillary being thin ;<br/>14 ease of / rapid, gaseous exchange or short diffusion pathway ;</p> <p><i>smooth muscle</i></p> <p>15 adjust size of airways (in, exercise / asthma) ;</p> <p><i>connective tissue / elastin / elastic tissue</i></p> <p>16 stretch (inhalation) ;<br/>17 prevents alveoli bursting ;<br/>18 recoil ; <b>R</b> contract<br/>19 helps exhalation / forces air out (of lungs) ;</p> <p><i>squamous epithelium / described</i></p> <p>20 alveolus wall thin ;<br/>21 ease of / rapid, gaseous exchange or short diffusion pathway ;</p> <p>22 AVP ; e.g. ref to large surface area of numerous alveoli<br/>23 AVP ; ref to macrophages removing pathogens</p> <p><b>QWC – legible text with accurate spelling, punctuation and grammar;</b></p> | <b>8 max</b> |
|           |   | <b>1</b>     |

[Total: 12]

|                                   |                                 |                           |                     |                         |
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| Question | Expected Answers  | Marks        |
|----------|---|--------------|
| 6 (a)    | (a disease that) spreads quickly / affects many people ;  | 1            |
| (b)      | pandemic ;  | 1            |
| (c) (i)  | (antigens) injected / taken orally ; ora ('not caught') R vaccination   | 1            |
| (ii) 1   | injection of antigen <i>or</i> attenuated / weakened / dead / similar, pathogen ; R disease   |              |
| 2        | immune system activated / causes immune response ;  |              |
| 3        | attacked / engulfed, by, phagocytes / macrophages ;   |              |
| 4        | ref antigens presented ;  |              |
| 5        | selection / production, of active T, cells / lymphocytes ;  |              |
| 6        | T cells, clone / divide / mitosis ;   |              |
| 7        | secretion of cytokines ;  |              |
| 8        | activation of B cells;  |              |
| 9        | B cells, clone / divide / mitosis ;   |              |
| 10       | production of, plasma / effector, cells ;   |              |
| 11       | production of antibodies (by plasma cells) ;  |              |
| 12       | production of memory cells ;  |              |
| 13       | memory cells remain in body ;   |              |
| 14       | (secondary) response to infection quicker ;   |              |
| 15       | (secondary) response to infection greater ;   |              |
| 16       | no symptoms when infected / AW ;  |              |
|          | <b>4 max</b>  |              |
| (iii)    | herd vaccination ;<br>vaccinate, most / all, people ;<br>stops infection spreading (within population) / lack of people to pass infection on to ; |              |
|          | ring vaccination ;<br>vaccinate all people around victim ;<br>contains spread (within ring) ;   |              |
|          | surveillance / spotting and reporting victims ;<br>isolation of victim ;  |              |
|          | trace contacts ;<br>isolation of contacts ;   |              |
|          | ref to making it notifiable ;   |              |
|          | travel restrictions ;   |              |
|          | AVP ; e.g. if notified can organise ring vaccination  | <b>3 max</b> |

**[Total: 10]**