

**2802 Human Health and Disease**

**June 2003**

**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) (i)	tidal (volume);	1
	(ii) smooth / unstriated / unstriped / involuntary / visceral; <b>R</b> skeletal / AW;	1
(b)	<i>low resting pulse</i> , indicates physically fit / ora; large stroke volume / large quantity of blood pumped out with each beat; large heart / more muscular heart / more efficient heart; <b>R</b> strong heart <i>idea that</i> during exercise, heart rate does not increase much / heart does not work hard; decreases during training using aerobic exercise; easy to measure / does not need elaborate apparatus ; correlates with VO <sub>2</sub> max; used to measure recovery time; <b>R</b> fit people have faster recovery rate	max 2
(c)	oxygen deficit / AW; supply of / demand for, oxygen, in <u>muscles</u> ; <b>R</b> body tissues / muscles / organs, still respiring above resting level; <b>A</b> metabolic rate remains high; oxygen concentration in blood is low; carbon dioxide concentration is high / more CO <sub>2</sub> removed; <b>A</b> ref to pH; ref to anaerobic respiration; lactate is, metabolised / respired / broken down / converted into glucose; <b>A</b> 'gets rid of' / removes, if linked with oxygen oxygen debt; reoxygenation of haemoglobin / AW; NOT oxidise reoxygenation of myoglobin / AW; NOT oxidise ref to phosphocreatine; AVP; ref to liver / ref to adrenaline;	max 2

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(d) *increase in*

size of muscle (fibres); **A** more muscle fibres / thicker muscle  
 fibrils (per fibre) ;  
 mitochondria / bigger mitochondria; **A** more cristae  
 respiratory enzymes;  
 vessels / capillaries; **R** increase blood supply to muscles  
 myoglobin;  
 glycogen / fat / energy stores;  
 muscle tone;  
 phosphocreatine / creatine phosphate;  
 more tolerance to lactate / less lactate produced;  
 AVP; e.g. ref to fast twitch / slow twitch

*treat 'muscles become stronger' as neutral*

**max 2**

**[Total: 8]**

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
<b>2 (a) (i)</b>	carbon monoxide / CO;	<b>1</b>
	(ii) nicotine;	<b>1</b>
	(iii) tar;	<b>1</b>
<b>(b)</b>	beagles / dogs , exposed to smoke; developed, cancerous cells / precancerous cells / tumours / cancers, in lungs / throat / bronchi;  smoking machines, collected tar / filtered cigarette smoke;  painted tar on skin of animal (rat or mouse); abnormal growths / cancers / tumours, on the skin;  cells in tissue culture exposed to chemicals from cigarettes; develop cancerous changes / AW;  use of a control group;  further detail about ways of detecting, cancerous changes / tumours;	<b>max 3</b>
		<b>[Total: 6]</b>

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
3 (a)	bone marrow / fetal liver;	1
(b)	(pathogen inside) vacuole / vesicle / phagosome; lysosomes; <b>A</b> phagolysosome toxins / named chemical (e.g. H <sub>2</sub> O <sub>2</sub> , free radicals, acid) kills pathogen; enzymes / named enzyme (e.g. protease); digestion / hydrolysis; waste material, egested / excreted; <b>A</b> ref to exocytosis ref to use of digested products inside phagocyte;  (macrophage) starts immune response; presents antigens / described; further detail;	max 4
(c)	<i>look for aspect of structure related to suitable function for each mark variable region or site must be given for first marking point, descriptions or use of Fig. 3.2 may be used for award of other points</i>  <u>variable</u> region(s) are antigen binding sites; <b>R</b> receptors / 'sticky ends' binding site(s) / variable regions / AW, specific / complementary, to antigen / pathogen; <b>A</b> 'match' 'fit' 'lock and key' variable region has different amino acid sequences for different antigens; disulphide bonds hold polypeptides together; <b>A</b> amino acid chains / peptides / heavy and light chains hinge region allows flexibility in binding; constant region, for binding to receptors (on phagocytes / mast cells); AVP; more than one binding site linked to agglutination immobilisation opsonisation	max 2
(d)	artificial, passive; artificial, active; natural, active; artificial, active; natural, passive;	5
		<b>[Total: 12]</b>

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
<b>4 (a)</b>	(cholesterol) deposited in, walls / lining, of <u>arteries</u> ; <b>R</b> 'in arteries / in blood vessels' atherosclerosis / atheroma; <b>R</b> 'arth....' in coronary artery; forming plaques; roughens lining; narrows lumen / narrows artery / reduces blood flow; <b>R</b> arteries become smaller / 'blocks' increase in blood pressure; ref blood clotting / thrombosis;	<b>max 4</b>
<b>(b)</b>	less, (total) fat / saturated fat / animal fat; <b>A</b> increase (poly)unsaturated fat; less cholesterol; less salt; e.g. of a food to avoid - red meat, eggs, dairy products, full fat milk, ice cream, prawns, avocado, etc; eat, fruit / vegetables / fibre; increase intake of, antioxidants / named antioxidant; e.g. vitamin E / red wine eat, oily fish / named oily fish / Sushi / olive oil; eat, cholesterol-lowering foods / named example;	<b>max 2</b>
<b>(c)</b>	(heart / coronary) by-pass; described; e.g. carries blood around the blockage <b>R</b> replaces it source of blood vessel(s) used; <b>A</b> vein or artery or synthetic material  heart transplant; from donor / from transgenic pig / artificial heart; immunosuppressant drugs;  angioplasty; described (inflated balloon +/- laser); further detail; e.g. use of stents (wire mesh to hold open artery), use of catheter, insert in vessel in groin / leg / arm;  AVP; e.g. ref to tissue matching / rejection	<b>max 3</b>

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(d) allows, early diagnosis; **A** ref to babies / children / young adults  
screen / test / check, for alleles / genes, that make them susceptible to  
disease / AW;  
advise parents on risks to children / counseling;  
provide check ups (at regular intervals) / ref monitoring;

specific advice on, diet / exercise / obesity / smoking / alcohol;  
e.g. specific diet comment  
regular exercise  
reduce weight  
do not smoke  
moderate intake of alcohol

specific treatment; e.g. drugs to lower blood cholesterol / ref to gene  
therapy

AVP;

**max 3**

**[Total: 12]**



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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
5 (a)	<i>Mycobacterium (tuberculosis / bovis)</i> ; accept <i>M. tuberculosis</i> and <i>M. bovis</i> <b>R</b> 'micro / mycro / myo'	<b>1</b>
(b)	disease is all over, the world / a continent;	<b>1</b>
(c) 1	(transmitted by) droplets / droplet infection / airborne; <b>A</b> spitting / sneezing coughing / sputum	
2	ref to overcrowded conditions / high density populations / people (sleeping) in close proximity;	
3	homeless / poor / poor living conditions; <b>A</b> ref to common in poor countries	
4	war / civil unrest;	
5	ref migrants / refugees;	
6	ref to international travel / circulation of air in aeroplanes;	
7	carriers / people not diagnosed (spread TB) / TB not easy to diagnose;	
8	problems with contact tracing;	
9	increasing prevalence in western countries (especially inner cities);	
10	<u>multiple drug resistance</u> / MDR –TB;	
11	bacteria, intracellular / inside lung cells / inside macrophages;	
12	protected from, immune system / phagocytes;	
13	difficult for drugs to reach;	
14	slow growing / dormant / remains for a long time;	
15	vaccine (BCG) not equally effective across the world;	
16	not life time protection;	
17	needs a long period of treatment; 6 – 12 months	
18	people may stop taking drugs / do not finish the course;	
19	(this encourages development of) resistant strains; <b>R</b> strands	
20	ref to TB from cattle / herds not tested / meat not tested / milk not pasteurised;	
21	link with malnutrition;	
22	link with HIV/AIDS / TB is an opportunistic disease;	
23	named problem for, developing countries / LEDCs;	
24	AVP; e.g. ref to badgers, shortage of vaccine, objections to vaccines,	
25	AVP; problems with isolating (infectious) people, ageing population	<b>max 9</b>
	<b>QWC - legible text with accurate spelling, punctuation and grammar</b>	<b>1</b>

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
<b>6 (a) (i)</b>	<i>credit either figures taken directly from Table 6.1 or results of a calculation, both figures must be present for one mark</i>  18.2 – 18.4 <u>and</u> 17.7 – 17.9;	<b>1</b>
<b>(ii)</b>	<i>two marks for correct answer one mark for correct working if no correct answer given one mark if not rounded down working – e.g.</i>  $\frac{3.9}{16.0} \times 100$  24;;	<b>2</b>
<b>(iii)</b>	increase; use of figures to show an increase; units to appear at least once	<b>max 2</b>
<b>(b)</b>	<i>accept ‘number of...’ as alternative to ‘percentage of...’</i> (all ages) higher % of men have hypertension; (40.8% men v 32.9% women) higher % men with hypertension in groups from 16-64; (16.0 v 4.2%) men have higher (mean systolic) blood pressure (18.2 v 17.7 kPa) men have higher blood pressure in groups 16-64 (17.1 v 16.0 kPa, etc)  women have higher % with hypertension >65; (72.8 v 69.9 %) women have higher blood pressure > 65; (19.9 v 19.7 kPa) <b>A</b> similar from 55 women’s (systolic) blood pressure increases more between 16 – 75; <i>idea that men and women reach (mean systolic) blood pressure of 18.7 kPa at same age; ref to threshold for hypertension as given in the stem of the question</i> use of figures to make a comparison; (figures quoted or ratio used) <i>allow if no units given</i>	<b>max 3</b>

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- (c) identifies people at risk of, disease / hypertension / AW;  
target, prevention / drug treatment / advice;  
identifies health, priorities / policies;  
check on progress of, health programmes / health initiatives;  
public education / public awareness / patient awareness;  
ref to economics;  
AVP; e.g. useful in research

**max 2**

**[Total: 10]**