

**Subject: Human Health and Disease Code: 2802**

**Session: June Year: 2001**

**Mark Scheme**

<b>MAXIMUM MARK</b>	<b>90</b>
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## 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 ( ) = 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 ora = or reverse argument
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Question	Expected Answers	Marks
1 (a)	<b>A</b> goblet cell; <b>B</b> ciliated cell / epithelial cell / columnar cell / epithelium; ® if inappropriate epithelium or endothelium given <b>C</b> cartilage; <b>D</b> (smooth) muscle / elastic fibres / elastin / elastic tissue; <b>A</b> collagen / fibrous protein	4
(b)	(goblet cells) secrete mucus; sticky; (mucus) catches / traps, particles / dust / pollen / viruses / bacteria / sand / pathogens / spores;; <i>allow max 2 for listing items trapped by mucus</i> ® foreign bodies / dirt cilia beat in coordinated fashion / AW; (particles in) mucus, moved / wafted / carried, by cilia; mucus swallowed / pathogens killed in stomach; white blood cells / macrophages / phagocytes, destroy / engulf / ingest / eat, bacteria / pathogens;	4 max
(c)	(elastic fibres) expand / stretch, when inhaling / breathing in; alveoli expand; contract / recoil, when breathing out; help to force, air / gas, out (of the alveoli); ® CO <sub>2</sub> ref to increased pressure in alveoli during breathing out; prevent alveoli from bursting;	3 max
(d)(i)	6 000 <u>cm<sup>3</sup> per minute</u> / 6 <u>dm<sup>3</sup> per minute</u> ;	1
(ii)	maximum, volume / amount (of air) ; <b>A</b> total in one breath / using diaphragm <u>and</u> ribcage / exhaled after deep breath; <b>A</b> breathing in / breathing out / in and out total lung volume, minus residual volume;; IRV + ERV + TV;; ® whole answer if ref to rate given i.e. maximum volume of air per minute	2 max
(iii)	deeper breaths / larger tidal volume;	1
<b>[Total:</b>		<b>15]</b>

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
<b>2 (a)(i)</b>	<p><i>for 'rest only during recovery' line on graph</i> <i>if no units do not award the first fig marking point in the candidate's answer</i></p> <p>rapid increase; <b>A</b> 'dramatic' increase to peak of 11 mmol dm<sup>-3</sup>; decrease, gradually / immediately / steadily / slow / slower; to (approx) 3 mmol dm<sup>-3</sup>; <b>A</b> 3.0 – 3.5 other use of figures; e.g. other concentrations / comparative time ref</p>	<b>3 max</b>
<b>(ii)</b>	<p>Ⓜ <i>aerobic / anaerobic exercise with no ref to respiration</i></p> <p><i>during exercise</i> increase in demand for energy / increase in respiration; <b>A</b> metabolism in muscle; Ⓜ 'body' not enough oxygen, reaching muscle / for aerobic respiration; anaerobic respiration; oxygen deficit; takes time for heart / lungs, to adjust; lactate is product of anaerobic respiration; <b>A</b> implied from earlier in the answer lactate enters the blood;</p> <p><i>after exercise</i> oxygen debt; <b>A</b> 'debt' lactate, respired / metabolised / broken down / oxidised; converted into, glucose / glycogen; liver;</p> <p>AVP;; e.g. Cori cycle, ref to Krebs, named enzyme(s), pyruvate, glycolysis</p>	<b>4 max</b>
<b>(iii)</b>	<p>respiration, still high / higher than at rest; lactate provides energy; oxygen provided to, tissues / muscles; Ⓜ body respiration, can be aerobic / not anaerobic; (lactate) respired by muscles / tissues / heart / liver; maintenance of high heart rate / blood flows faster / faster delivery of lactate / muscles 'squeeze' veins / vasodilation; prevents blood pooling in the muscles / removes lactate from muscles;</p>	<b>2 max</b>

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- (b) *accept both short term changes and long term changes depending on how the question has been interpreted*

*cardiovascular system*

increase, in size of heart / left ventricle / heart muscle;  
larger (cardiac) muscle fibres;  
more mitochondria in heart muscle;  
more capillaries in heart muscle / capillaries in heart muscle dilate;  
increase in, stroke volume / volume of blood pumped per beat;  
increase in, cardiac output / volume of blood pumped per minute;  
ref to blood pressure;  
decrease in resting, heart rate / pulse rate; **A** increase if short term  
redirection of blood from named organ(s) to, muscles / skin;

® heart become stronger

*muscles*

more capillaries;  
larger muscle (fibres); ® more muscle fibres  
increased flow of blood through muscles / ref to dilation of capillaries or  
arterioles;  
more mitochondria;  
more enzymes;  
ref myoglobin;  
increased lactate tolerance;

AVP;; e.g. any advantages of changes described, for example ref to  
endurance,  
detail of muscle structure  
ref to glycogen  
more red blood cells / more haemoglobin

**5 max**

**[Total: 14]**

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
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**3 (a)**

*assume that crossed ticks are crosses*

statement	cholera	tuberculosis (TB)	AIDS
causative organism is a bacterium	✓	✓	
transmission is via drinking water	✓		
sexually transmitted			✓

*one mark per disease – i.e. per column;*

**3**

**(b)** *look for these ideas*

(some organisms / bacteria) are resistant to antibiotics; ® immune or 'immune and resistant'

antibiotics are not effective against, viruses / named viral disease; ora e.g. some microbes are not bacteria

no suitable target for antibiotic / antibiotic acts on specific target;

AVP; e.g. dangers of overuse, other treatments that may be just as effective such as ORT for cholera

**2 max**

**(c)** (a disease that is) always in a population / area;

**1**

**(d)** *look for these ideas*

to make a (valid) comparison;

between, different countries / different populations;

avoids decimals (e.g. 0.001 etc) / easier to interpret / easier to read / AW;

**2 max**

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(e) *description*

- 1 a statement that describes a difference between developed and developing;
- 2 use of figs to show a difference; e.g. data quote from table
- 3 manipulation of figs; e.g. 5x greater etc

*explanations – accept ora for developed / developing as appropriate*

*infectious diseases in developing countries*

- 4 limited control programmes for infectious diseases;
- 5 remote areas;
- 6 poor medical facilities / few medical personnel / poor health care;
- 7 sanitation / sewage treatment;
- 8 (drinking) water supply;
- 9 ref cholera / diarrhoeal diseases
- 10 overcrowded conditions;
- 11 ref TB;
- 12 poor control of spread of HIV / AW; @ contraception unless ref to condom / femidom
- 13 ref antibiotics;
- 14 ref vaccination;
- 15 ref nutrition / malnutrition;
- 16 ref housing / poverty;
- 17 ref education;
- 18 ref to cost;

*non-infectious diseases / lung cancer and COPD*

- 19 degenerative diseases;
- 20 smoking-related diseases;
- 21 diseases of, affluence / lifestyle; **A** self-inflicted
- 22 these diseases more important as people live longer;
- 23 AVP; e.g. ref to immunity, correct ref to Western diet (NOT cause of lung
- 24 AVP; cancer and COPD), air pollution, natural disaster, civil unrest **7 max**

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

*look for ten lines of writing before awarding QWC – be lenient with small handwriting* **8 max**

**[Total: 16]**

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
4 (a)	<p><b>P</b> variable region / antigen-binding region; <b>A</b> 'site' / fraction antigen binding / Fab</p> <p><b>Q</b> constant region / non-variable region; <b>A</b> fraction crystallisable / Fc</p>	2
(b)	<p>(different) sequences of amino acids / primary structures; different shapes / 3D structures; different, tertiary structures / quaternary structures; <b>A</b> ref to folding ref to R groups / side chains; different shapes of, active sites / antigen binding sites; <b>A</b> ref to specific shape complementary to, substrate / antigen;</p>	3 max
(c)	bone marrow; ® as part of a list	1
(d)	<p><i>beware: 'engulf' is in the question</i> <b>A and B</b> chemotaxis / moves towards bacteria / attracted by chemicals; bacteria, adhere / stick to / in contact with / attach to, cell surface membrane; <b>A</b> surface of phagocyte ® ref to 'wall' receptors (on cell surface membrane); fit onto, bacterium / bacterial wall / bacterial antigens; membrane infolds / cytoplasm extends / pseudopods; forms, vacuole / vesicle; endocytosis / phagocytosis; membrane fuses;</p> <p><b>C</b> lysosomes; fuse with vacuole; toxins / H<sub>2</sub>O<sub>2</sub> / free radicals (secreted into vacuole); kill bacteria; enzymes (secreted into vacuole); break down / destroy / digest / dissolve (bacteria); lysozyme; proteases / other named enzymes;</p>	6 max
(e)	<p>agglutinins / stick bacteria together / agglutination; stop spread / more engulfed at the same time; opsonins / coat bacteria / opsonisation / attach to bacteria / label bacteria / AW; (phagocyte has) receptors for antibodies; helps stick bacteria to cell surface membrane; inactivate flagella; slow / stop, movement (of bacteria); <b>A</b> immobilised ref specificity;</p>	3 max

**[Total: 15]**



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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
<b>5</b>	<i>ignore bacteria and virus in these answers</i>	
<b>(a)</b>	<i>Plasmodium / P. falciparum / P. vivax / P. malariae / P. ovale;</i>	<b>1</b>
<b>(b)</b>	(sub-Saharan) Africa; Central America; South America; South Asia / India; China; Middle East; South-East Asia; Caribbean / West Indies; AVP;; e.g. tropics / between the tropics, subtropics, named countries, rainforest	<b>2 max</b>
	® Asia unless qualified as above	
<b>(c)(i)</b>	<i>mosquito</i>  takes blood / has blood meal; from infected person / from carrier / takes up parasites in the blood; feeds from uninfected person; <b>A</b> 'gives it to another person' idea (parasites in) saliva / anti-coagulant; <b>A</b> salivary gland in correct context	<b>3 max</b>

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(ii) *difficulties in controlling mosquito*

- 1 resistant to, insecticides / pesticides / chemicals used for control;
- 2 named effect of chemicals on the environment; e.g. build up in food chains / kills predators
- 3 breeds quickly / very common / lays many eggs;
- 4 breeds in, small bodies of water / inaccessible places;
- 5 especially in rainy seasons;
- 6 difficult to, drain / spray / cover;
- 7 difficult to encourage everyone to use nets;
- 8 wide range / range increasing because of climate change;
- 9 rests / hides, in houses;

*difficulties in controlling Plasmodium*

- 10 side effects of (anti-malarial) drugs / people not taking drugs for long enough;
- 11 many, strains / species;
- 12 resistance to, drugs / named drug;
- 13 eukaryote / protist / has many genes;
- 14 many surface antigens / antigenic variation;
- 15 inside, red blood cells / liver cells;
- 16 antigen concealment;
- 17 dormant / in body for a long time / symptomless carriers / long incubation;
- 18 different stages in life cycle in the body;
- 19 no vaccine / difficult to develop a vaccine;
- 20 people lose immunity if malaria eradicated;

21 AVP; e.g. ref to sexual reproduction, meiosis, wildlife reservoir,

22 AVP; movement of people into or out of malarial areas

**6 max**

**QWC – clear, well organised using specialist terms;**

**1**

*look for ten lines of writing before awarding QWC – be lenient with small handwriting*

**7 max**

*look for logical organisation, appropriate use of terms*

**[Total: 13]**

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
<b>6 (a)(i)</b>	<p>increase in force of heart, contraction / beat; <b>A</b> heart 'works harder' heart muscle requires more oxygen; (carbon monoxide) reduces oxygen, transported in blood / combined with Hb; hypertension / long term high blood pressure;</p> <p>nicotine makes platelets sticky; leads to / increases risk of, thrombosis / clotting;</p> <p>carbon monoxide damages lining of arteries; promotes atherosclerosis / atheroma; detail of atherosclerosis; ref LDLs; (low density lipoproteins) ref high blood cholesterol;</p> <p>ref coronary arteries;</p> <p>AVP;; e.g. increased resistance to blood flow, vasoconstriction</p>	<b>3 max</b>
<b>(ii)</b>	<p>mucus glands / goblet cells, produce more mucus; cilia, destroyed / paralysed / less effective; ® killed mucus, collects / not removed; coughing; bacteria, collect / grow; <b>A</b> infection inflammation; scar tissue develops; airways / bronchioles / bronchi, narrow / blocked; increase in muscle / ref to muscle contraction;</p>	<b>3 max</b>
<b>(b)</b>	<p>carcinogens / contains cancer-causing chemicals; mutations / change to DNA; excessive / uncontrolled, division / replication / multiplication; ® rapid mitosis; AVP; ref to oncogenes / no cell death</p> <p>® many divisions by mitosis causing a mutation</p>	<b>3 max</b>

**[Total: 9]**

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
7 (a)	95 / 95.4 / 95.44;	1
(b)(i)	<p><i>note that Q says 'such as iron'</i></p> <p>for haemoglobin / prevents anaemia / prevents deficiency;  provides enough for most of the population / meets needs (of most people);  data quote – 97.72 / 97.7%;  allows enough to be stored (in the body);  not enough to be harmful / guide to safe amount / ensure people do not take too much; @ idea that iron is harmless in large quantities  AVP; e.g. people's requirements vary / difficult to know how much people require</p>	2 max
(ii)	<p>blood lost;  at menstruation / during menstrual cycle / ref periods / at birth;  females at higher risk of anaemia;  ref to pregnancy;</p>	2 max
(c)	<p>periods stop / no menstruation;  anaemia / fewer red blood cells / less haemoglobin;  ref iron in, haem group / haemoglobin;  less oxygen, transported / in blood / pumped around body / attached to Hb;  weak / little energy / lethargic / tired / fatigued / apathetic / dizzy / faint / pale;  AVP; e.g. force feeding, death</p>	3 max
		<b>[Total: 8]</b>