



**2802 Human Health and Disease**

**January 2004**

**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 ( ) = 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 R = reject ora = or reverse argument
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**Question      Expected Answers      Marks**

1      *in the third column take the first example given, unless first one is neutral (e.g. badly spelt correct answer). Use ✓ and ✗*

category of disease or illness	definition	example
deficiency;		scurvy / xerophthalmia / blindness / (night) blindness / rickets / osteomalacia / protein-energy malnutrition / marasmus / kwashiorkor / anaemia / osteoporosis / AVP ; <b>A</b> malnutrition
	not caused by, pathogen / organism / parasite ;  <b>A</b> non-communicable / not transmitted / not passed from person to person <b>A</b> virus, bacterium, fungus / protoctist	
	disease affecting the, brain / mind / behaviour ; <b>A</b> psychological	
	caused by, gene / allele / mutation / DNA / chromosome ; <b>A</b> genetic disease <b>R</b> passed from one generation to another unless qualified	

[5]

[Total: 5]

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
2 (a)	<p>cannot be made within the body; <b>R</b> ref to amino acids  no enzyme(s);  not able to form a double bond between final (omega / <math>\omega</math>) carbon and  existing double bond;  ref to deficiency, disease / condition;  required for cell membrane (phospholipids); <b>A</b> lipid membrane / lipid  bilayer  required to make, signaling molecules / prostaglandins;  required for, immune system / renal system / blood clotting;</p>	<b>max 1</b>
(b)	<p><i>award two marks if correct answer (84) is given – must be rounded up  award one mark for calculation e.g. showing that 35% should be calculated /  dividing by 37</i></p> <p>35% of 8 830 / 3 090.5 /</p> <p><math>\frac{3\,090.5}{37} / 83.53 / \frac{x}{37}</math> ;</p> <p>84 ;</p>	<b>2</b>
(c)	<p>saturated fat, raises concentration of LDLs in the blood;  raises (blood) cholesterol;  (increases risk of) atherosclerosis / described; <b>A</b> atheroma / plaque /  fat or cholesterol in <u>wall of artery</u>;  raises blood pressure;  (increases risk of) blood clots / thrombosis;  (coronary) heart disease / heart attack / heart failure / MI / angina / CVD;  stroke;  overweight / obesity;</p> <p>increase body mass index (BMI);</p> <p>AVP;; e.g. obesity-related diseases such as arthritis, named cancer (<b>R</b>  lung) , gall stones, diabetes, hypertension, hernia, varicose veins,  haemorrhoids, joint / knee damage, depression (<b>R</b> mental health  problems)  ref to surgery being difficult  ref to <u>adipose</u> tissue</p>	<b>max 4</b>

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- (d)
- 1 any two references to differences in quantities;  
A rich / richer / good source of
  - 2 use of figures to make a comparison between quantities for any one nutrient;
  - 3 protein needed for, repair / replacement / ref pregnancy / ref lactation / AW;
  - 4 vitamin A, ref to function *or* deficiency;  
rods / retina / night vision / xerophthalmia / ref epithelia / immune system
  - 5 vitamin D, ref to function *or* deficiency;  
absorption *or* deposition of calcium / osteomalacia R rickets
  - 6 calcium, ref to function *or* deficiency;  
skeleton / teeth / bones / fetal growth / muscles / nerves
  - 7 iron, ref to function *or* deficiency;  
haemoglobin / anaemia / menstrual loss / red cells
  - 8 other foods needed to provide iron *or* calcium / need to take supplements;
  - 9 AVP; consequences of deficiencies, e.g. osteoporosis, fatigue
  - 10 AVP; any ref to RNI for any one of these nutrients  
ref to polyunsaturated fatty acids in 'oily fish'  
*idea that one food does not make a diet*

**max 4**

**[Total: 11]**

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
<b>3 (a)</b>	brings no further benefit in fitness; may damage / put strain on, the heart / blood vessels; AVP;	<b>max 1</b>
<b>(b)</b>	<i>one mark for both</i>  <b>R</b> = 13 - 14 <b>S</b> = 10 - 10.5 ;	<b>1</b>
<b>(c)</b>	<b>S, but accept ora for R</b> <i>units not essential</i>  stops at a lower speed / AW; <b>A</b> fatigue sets in earlier resting heart rate is higher; ref to heart rate is higher (at all speeds) throughout exercise; reaches, maximum heart rate / 180, at slower speed / earlier; steeper increase in heart rate (after 9 kph);  lactate concentration rises more steeply; starts to rise at lower speed on treadmill / sooner; lower lactate threshold; higher lactate concentration;  <b>A</b> refs to anaerobic respiration for marking points about lactate  use of figures from the graph to show a comparison between <b>S</b> and <b>R</b> ; could be heart rate / speed / lactate concentration	<b>max 4</b>
<b>(d)</b>	<i>increase in</i>  tidal volume; <b>A</b> breathes deeper breathing rate; <b>A</b> breathes faster / faster contraction of diaphragm / AW ventilation rate; width of airways / named airway; expansion / diameter of, alveoli; blood pumped to lungs / vasodilation in lungs / AW; <b>R</b> capillaries become wider idea	<b>max 3</b>

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- (e) named aerobic exercise; e.g. swimming, running, cycling, aerobic, step ups, jogging **R** use of treadmill unless qualified within 'training zone' / at 65-85% of maximum heart rate (for age) / 50-55% of VO<sub>2</sub> max;  
any appropriate ref to length of duration of exercise, e.g. approx 20-30 minutes or more;  
at least three times a week; **R** regularly / frequently (gradually) increase, intensity / length of time ;

less intense exercise but for longer duration;

AVP; e.g. use of (step) test to check on fitness,  
safety comment e.g. warm up / cool down

**max 3**

**[Total: 12]**

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
4 (a) (i)	passive;	1
	(ii) cross the placenta; <i>treat breast milk as neutral</i>	1
(b)	B / plasma; <b>A</b> B effector cells <i>treat white blood cell(s) as neutral</i>	1
(c)	antigen presentation; correct ref to T helper cells; clonal selection / selection of appropriate clone / AW; ref to (surface / glycoprotein) receptors / binding sites; ref to specificity (of cells / receptors to antigen / antibody to antigen); clonal expansion / described; e.g. more B cells must be made mitosis / division, of B cells; <b>A</b> replicate / multiply formation / differentiation, of, plasma cells / effector cells; any detail; e.g. development of ER / ribosomes ref to time taken for, making antibodies / protein synthesis;	<b>max 3</b>
(d)	memory cells / immunological memory; constant exposure to, measles / virus / antigen; fast, secondary response / antibody production; <b>A</b> works before symptoms develop greater, secondary response / antibody production; AVP; e.g. not necessary to increase number of specific cells / AW ref to clonal selection quicker / AW	<b>max 2</b>
(e)	ref to antibodies (from mother); <b>A</b> (passive) immunity from mother remove / combine with, measles antigen / vaccine;  no immune response / no primary response / AW; immune system not yet fully functioning / AW;  malnutrition; lack of protein / energy, to make, antibodies / cells; ref to children who were born premature; AVP; e.g. mutation involved in lymphocyte development	<b>max 2</b>
<b>[Total:</b>		<b>10]</b>



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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
<b>5 (a)</b>	<p><i>Plasmodium</i>;</p> <p>accept <i>P., falciparum / ovale / vivax / malariae</i>;</p>	<b>1</b>
<b>(b)</b>	<p>bitten by mosquito carrying malarial parasite; <b>A</b> 'infected' (genus) <i>Anopheles</i> / female; injects parasites with, saliva / anticoagulant; ref to vector; (mosquito) fed on / bit / took a blood meal from, an <u>infected</u> person;</p> <p><i>accept transmission by needle</i></p> <p>injected into blood; after use by someone with malaria; (needle) shared / reused / used but not sterilised;</p> <p><b>A</b> transmission across the placenta; <b>A</b> blood transfusions;</p>	<b>max 3</b>

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- (c)
- 1 resistance of, *Plasmodium* / pathogen, to drugs;
  - 2 eukaryote / protist, has many genes;
  - 3 many surface antigens / antigenic variation; **A** ref to mutation
  - 4 inside red blood cells / in liver cells / antigen concealment;
  - 5 difficult for immune system to operate / idea;
  - 6 dormant / in body for a long time / symptomless carriers / long incubation;
  - 7 different stages in life cycle in the body;
- 
- 8 resistance of, vector / mosquito, to insecticides; **A** mutation / selection
  - 9 mosquito, breeds in small areas of water; **A** implications
  - 10 breeds quickly;
  - 11 mosquitoes, spread over large area / widely distributed / fly a long way;
  - 12 mosquito control programmes disrupted by war etc;
  - 13 lack of infrastructure (for control programmes);
  - 14 problems with sleeping nets, described;
  - 15 more effective when soaked in insecticide;
  - 16 no vaccine;
  - 17 people lose immunity if, malaria eradicated / move to non-endemic area;
- 
- 18 poor primary health care / few doctors or other medical personnel;
  - 19 ref to poor housing / slums / shanties;
  - 20 ref to remote rural areas;
  - 21 ref to cost of control programmes;
  - 22 ref to travel / migration;
  - 23 ref to change in climate;
  - 24 ref to education;
  - 25 ref to problems of biological control;
- 
- 26 AVP; e.g. effects of insecticides on, ecosystems / humans
  - 27 AVP; side effects of drugs  
impossible to isolate infected people  
ref to sterilising male mosquitoes  
opening new areas of tropics  
different, species / strains, of malaria  
cost to individual  
ref to detection in bloodstream  
blood transfusions  
mother to fetus across placenta
- max 8**
- QWC – legible text with accurate spelling, punctuation and grammar; 1**
- [Total: 13]**

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
<b>6 (a)</b>	<p>high death rate; preventable / avoidable, deaths; premature deaths / younger than life expectancy / people of working age; AVP; e.g. cost of care / medical facilities</p>	<b>max 1</b>
<b>(b)</b>	<p><i>mark (i), (ii) and (iii) together to max 5</i></p> <p><b>(i)</b> data support hypothesis (no mark)</p> <p>death rates (for both men and women) are lower; ref to any two figures from the table to show a comparison (e.g. Spain v Latvia);</p> <p><b>(ii)</b> data support / do not support hypothesis (no mark)</p> <p><i>support</i> – all figures for men (in 35-74 age range) are higher than those for women;</p> <p><i>do not support</i> – no data for men and women over 74 / only applies to 35-74 age range / no data for men and women under 35 / smoking-related not gender-related;</p> <p>ref to any two figures from the table to show a comparison (e.g. men and women in the same country);</p> <p><b>(iii)</b> data do not support / do support (no mark)</p> <p><i>idea that</i> prevalence of smoking is, higher / no lower, in, Mediterranean countries / named country, than in some countries with higher death rates from CHD;</p> <p>ref to men in Latvia and Russian Federation who show high prevalence of smoking and have high death rates from CHD;</p> <p><b>A</b> no correlation between prevalence of smoking and mortality from CHD</p> <p>ref to any figures from the table to show a comparison;</p>	<b>max 5</b>

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(c) *reward any appropriately worded statements, e.g.*

lifestyle increases susceptibility to degenerative diseases;  
e.g. diabetes, CHD, atherosclerosis;  
smoking increases risk of developing, (lung) cancer / COPD / CHD;  
no signs of symptoms of disease, may be developing or increasing risk of  
developing (non-infectious) diseases;  
father's heart attack, may mean that there is a genetic predisposition to  
heart disease;  
not a balanced diet;  
little fresh fruit and veg, little, dietary fibre / antioxidants / vitamins;  
little (aerobic) exercise;  
except on one occasion a week, may put strain on heart /AW;  
health risks associated with, binge drinking / alcohol;

AVP;;; e.g. social well-being

**max 3**

**[Total: 9]**