RECOGNISING ACHIEVEMENT

2802 Human Health and Disease

January 2006

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 (½) 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.

Abbreviations, annotations and conventions used in the 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
	____	=	(underlining) key words which **must** be used to gain credit
	ecf	=	error carried forward
	AW	=	alternative wording
	A	=	accept
	ora	=	or reverse argument

Question **Expected Answers** **Marks**

(a)

		energy source / energy storage / component of, glycoprotein *or* glycolipid *or* DNA *or* RNA *or* ATP / AVP **;** e.g. function of glycoprotein such as cell membrane receptor *or* in vitreous humour / in synovial fluid **R** converted into energy **R** respiration on its own **R** energy on its own
fat / fatty acid / lipid / triglyceride / oil / AW **;** **A** phospholipid		
		growth *or* repair *or* replacement / supply *or* source of *or* produce, amino acids / formation of, named protein *or* protein-containing tissue / AVP **;** **A** energy source **R** protein synthesis
		(good) night vision / allows rods to function / prevents night blindness *or* xerophthalmia / make, rhodopsin *or* retinal *or* retinene / AVP **;** e.g. maintain epithelial cells / reduce risk of infection **R** helps vision, retinal pigments, retinol
		absorption of calcium *or* phosphorus / use *or* deposition of, Ca *or* P, in bones *or* teeth / hardens bone *or* teeth / prevents, rickets *or* osteomalacia *or* osteoporosis / AVP **;** **A** reduce risk of, heart disease / cancer **R** strengthen / healthy, bone

5

(b) bar for pregnancy higher than normal **;**
bar for breast feeding higher than pregnancy (and normal) **;** **2**

(c) protein needed to allow fetus to, grow / develop **; A** baby
growth of mother's, cells / tissues **;**
used for growth of named tissue (maternal or fetal) **;**
e.g. placenta, umbilical cord, bone, muscle
for production of, milk / colostrum **; A** milk contains protein
after birth baby growing more quickly **;**
repair mother's tissues damaged during birth **;**
AVP **;** e.g. making antibodies for baby

A *ecf from answer to (b)* e.g. baby gets milk from other source, weaning (if breast feeding lower than pregnancy) **2 max**

[Total: 9]

2 (a) *mental*
Alzheimer's / schizophrenia / phobia / anorexia / depression / Parkinson's / Huntington's / CJD / AVP **;**

self-inflicted
alcoholism / cirrhosis / smoking addiction / drug addiction / lung cancer / obesity / CHD / anorexia / AVP **;** **R** unnamed cancer

inherited
sickle cell / haemophilia / cystic fibrosis **A** CF / diabetes / Huntington's / Down's syndrome / AVP **;** **3**

(b) (i) to find out where, rates are highest / people are most at risk **;**
to keep track of infection rates over time **;**
to see where, disease is likely to spread / epidemic most likely **;**
to help research (into how it is spread / into effectiveness of drugs) **;**
to allow organisations to provide aid where it is needed most **;**
to allow organisations to provide education (about disease) where it is needed most **;**

AVP **;** e.g. tourist industry **3 max**
e.g. limit potential spread by migration or imports

(ii) education on HIV/AIDS less effective in Africa **;**
sexual attitudes / number of partners **;**
availability of condoms **;** **R** general reference to contraceptives, not used / refused
poverty / poorer / less money **;**
sex industry **;**
less primary health care / less likely to be diagnosed **;**
AVP **;** e.g. ref. to unscreened or untreated blood
unsterilised needles or surgical apparatus
civil war / rape
no alternative to breast feeding
R access to drugs for treatment
R no vaccine
R ref to intravenous drug addiction **2 max**

(c) find person who is immune **;**
isolate gene that provides immunity **;**
identify protein (receptor) that provides immunity **;**
develop drug (to fit normal receptor) that provides immunity **;**

(gene used to) manufacture, drug, protein / antibody / immunoglobulin, giving immunity **;**
protein used as, vaccination / cure / AW **;**

gene therapy used in at risk groups / AW **;**

AVP **;**
AVP **;** **2 max**

[Total: 10]

Question			Expected Answers	Marks
3	(a)	(i)	phagocyte / macrophage / dendritic cell ; **A** antigen presenting cell / APC **R** white blood cell / lymphocyte / neutrophil	1
		(ii)	bacteria in vacuole / phagosome ; **A** lysosome bacterium, cut up / partly, digested / partly broken down / AW (so antigens still whole) ; enzymes / lysins / lysozyme ; AVP ; e.g. hydrolysis / hydrolases	2 max
		(iii)	receptors / binding sites ; on cell surface membrane (of T helper cell) ; complementary to antigen ; **R** matching **A** analogy to lock and key	2 max
		(iv)	mitosis ; **R** cloning	1
		(v)	produced during, primary / first, immune response / exposure to antigen ; remain in body ; **A** blood / tissue fluid etc (memory cell or antibody) specific to antigen ; produce secondary response ; more quickly / no symptoms ; divide / clone, to make plasma cells ; (plasma cells) manufacture antibodies ; more antibodies made / antibodies accumulate faster ; gives long term immunity / immunological memory / AW ;	4 max
	(b)		variable region binds to, antigen / pathogen ; **A** antigen-binding site variable region specific to, antigen / pathogen ; **A** antigen-binding site agglutinate pathogens / stick pathogens together ; immobilise pathogens / attach to flagellum (of pathogen) ; combine with pathogen to stop entry to cell ; break wall of bacterium open / lysis ; constant region, attracts phagocytes / makes it easier to engulf bacterium ; AVP ; e.g. ref to hinge region in context	2 max

[Total: 12]

Question		Expected Answers	Marks
4	(a)	*Mycobacterium tuberculosis / Mycobacterium bovis* **;** **A** *M. tuberculosis / M. bovis / Mycobacterium* **R** *Microbacterium / Myobacterium*	**1**
	(b)	many, air spaces / alveoli **;** large surface area **; R** ref to surface area to volume ratio thin wall of, alveolus / capillary **; A** one cell thick **R** 'thin wall' on its own good blood supply / large capillary network **;** air passage / bronchiole **;** capillary close proximity to alveolus **;** **R** refs. to cilia, mucus, elasticity	**3 max**
	(c)	short of breath / breathless / less easy to inflate lungs *or* breathe **;** due to less surface area for gaseous exchange **;** less oxygenation of, blood / haemoglobin **; R** oxidation coughing due to irritation in lungs (alveoli filled with some substance) **;** coughing up blood **;** longer diffusion pathway **;** as alveoli walls thicker **;** AVP **;** e.g. destruction / loss of, alveoli and blood vessels AVP **;** weight loss chest pain when coughing	**2 max**
	(d)	opportunistic disease / immune system already weakened **;** long course of treatment not always completed **;** drug / antibiotic, resistance **; R** strand **R** mutation alone vaccine is less than 100% effective / no vaccine for mutated strains / more effective in some parts of world **;** symptomless carriers / dormant in body **;** lack of education about TB **;** overcrowding (in poorly ventilated accommodation) **;** Less Economically Developed Countries cannot afford, treatment / drugs / vaccines **;** **A** lack of access malnutrition **;** untreated milk / uncooked meat **;** breakdown of treatment programmes due to, war / civil unrest **;** migration of carriers / refugees / tourists / AW **;** AVP **;** e.g. link to HIV/AIDS AVP **;** ref badgers as carriers spitting / in sputum poverty, increased homelessness vaccine, refused / not wanted	**5 max**
			Total: 11]

Question		Expected Answers	Marks
5	(a)	(chronic) bronchitis ; emphysema ; COPD ; heart disease ; stroke ; *two marks available for the following* lung / mouth / throat / breast / bladder / oesophagus / prostate other named cancer ;; AVP ; e.g. gangrene, erectile dysfunction AVP ;	**2 max**
	(b)	*max 3 for each named component* *carbon monoxide (no mark)* **c1** binds to haemoglobin / forms carboxyhaemoglobin ; **c2** irreversibly / permanently ; **A** greater affinity than for oxygen **c3** less effective oxygenation of haemoglobin ; **R** oxidation **c4** shortage of breath ; **c5** damages lining of arteries ; **c6** AVP ; max 3 *nicotine (no mark)* **n1** addictive ; **n2** adrenaline released ; **n3** increases heart rate ; **n4** reduced circulation to extremities / vasoconstriction ; **R** contract **A** narrow lumen **n5** sticky platelets ; **n6** cause blood clotting / thrombosis ; **n7** AVP ; e.g. ref to effect on synapse / brain function max 3 *tar (no mark)* **t1** coats the (internal) surfaces of breathing system ; **A** lungs **t2** reducing efficiency of exchange ; **t3** irritation of mucous membranes ; **t4** goblet cells stimulated / over secretion of mucus ; **t5** inactivation of, cilia / ciliated epithelium ; **A** destroys / damages **R** kills **t6** mucus not moved ; **t7** coughing ; **t8** carcinogenic / cancer-causing / causes mutations ; **t9** causes emphysema / described ; **R** ref to elastin damage alone **t10** AVP ; e.g. ref to more infections / increased risk of chronic bronchitis max 3 *may be awarded anywhere* AVP ; strain on heart / heart disease AVP ; raised blood pressure / hypertension	**8 max**
		QWC – clear well organised using specialist terms ; *award the QWC mark if four of the following are used in the correct context* haemoglobin carboxyhaemoglobin affinity oxygenation addictive adrenaline vasoconstriction lumen platelets thrombosis mucous membranes goblet cell cilia epithelium carcinogenic emphysema bronchitis hypertension	**1**

[Total: 11]

Question			Expected Answers	Marks
6	(a)	(i)	*award two marks if correct answer (0.55 – 0.65) is given* *incorrect answer (or no answer) but correct working = 1 mark* *ecf rules apply for 1 mark max* working ; (marks on graph or calculation) 0.55 – 0.65 ;	**2**
		(ii)	vital capacity ;	**1**
	(b)	(i)	tidal volume increases / AW ; **A** amplitude (of trace) increases rate of breathing increases / AW ; **A** frequency (of trace) increases / wavelength gets shorter trace will fall more steeply / AW ;	**2 max**
		(ii)	increased, heart / pulse rate ; **R** blood pumped faster increased stroke volume ; increased cardiac output ; blood pressure rises ; blood diverted to muscles / vasodilation in muscle ; blood diverted away from digestive system / vasoconstriction in, digestive system / kidney ; less (at first) / more (later on), blood to skin ;	**2 max**
				[Total: 7]