OCR
RECOGNISING ACHIEVEMENT

GCE

Human Biology

Advanced GCE **A2 7886**

Advanced Subsidiary GCE **AS 3886**

Mark Schemes for the Units

June 2006

3886/7886/MS/R/06

Oxford Cambridge and RSA Examinations

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Advanced Subsidiary GCE Human Biology (3886)

MARK SCHEME ON THE UNITS

Mark Scheme 2856
June 2006

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
1	(a)	(i)	A red blood cell / erythrocyte ; B (squamous/pavement) epithelial ;	2
		(ii)	surfactant reduces cohesive nature of water molecules / AW ; reduces surface tension ; prevents lining of alveolus sticking together / allows alveoli to expand ; **R** *allowing lungs to expand*	2 max
	(b)	(i)	trace **D** is showing more frequent and deeper breaths ; *ora*	1
		(ii)	26-27 ;	1
		(iii)	use medical grade oxygen ; renew hydroxide / sodalime regularly ; check for asthmatics / other respiratory disorder ; check for heart conditions ; disinfect mouthpiece ; **R** *clean* risk assessment ; AVP ; e.g. check medications, infection, qualified time	2 max
		(iv)	oxygen being used (from drum / container) ; CO_2 being breathed out combines / absorbed (with hydroxide) ; volume of gas decreases ;	2 max
				[Total: 10]

Question			Expected Answers	Marks
2	(a)	(i)	(many) substances soluble in water / can dissolve in it **;** transported in, tissue fluid / lymph / blood **;** allows chemical reactions to take place in solution **;** allows active transport / facilitated diffusion to take place **;** **R** *reactant*	**2 max**
		(ii)	evaporation (of sweat) causes cooling / AW **;** as heat (energy) needed to change liquid to gas / vapour / AW **;**	**2**
	(b)		(a measure of) the ability of water molecules to move / AW **;** and apply pressure **;** correct reference to effect of solute **;** **R** *water concentration*	**2 max**
	(c)		decrease / become more negative **; A** *low*	**1**
				[Total: 7]

3

G1 detail of obtaining blood e.g. sterilise skin with alcohol **;**
G2 dilution of sample **;**

H1 Haemiglobincyanide (HiCN) method ;
H2 sample of blood mixed with cyanide solution **;**
H3 tube left at room temp for 5(+) mins **;**
H4 haemoglobin converted to HiCN **;**
H5 HiCN is <u>stable</u> red colour **;**
H6 blank explained **;**
H7 use of yellow/green, filter/light **;**
H8 use of <u>cuvette</u> **;**
H9 sample placed in colorimeter **;**
H10 known standard solution of haemiglobincyanide (HiCN) placed in colorimeter **;**

A1 haemoglobin concentration measured automatically **;**
A2 sample is centrifuged **;**
A3 a haemolysing agent / agent to rupture RBC's added **;**
A4 sulpholyser **;**
A5 figs to illustrate eg read at 540 nm **;**

D1 greater concentration causes greater absorbance of light **;**
D2 results compared **;**

AVP **;** e.g. HiCN absorbs yellow / green light, 1 in 200, 13-18g $110ml^{-1}$ / 135–150 g dm^{-3} , ease of use
AVP **;** **7 max**

QWC – quality and use and organization of scientific terms ;
e.g. haemiglobincyanide/HiCN, cyanide, cuvette, colorimeter, calibrate, absorbance, dilution, centrifuge, rupture, lyse, lancet, sulpholyser, **1**

[Total: 8]

Question	Expected Answers	Marks
4 (a)	blood goes through/pumped by the heart twice for each circuit of the body ; ref. to pulmonary circuit ; ref. to systemic circuit ;	2 max
(b)	E artery ; F vein ;	2
(c)	C ; E ; A ; C ;	4
(d)	*rapid heart rate (removed :)* release of adrenaline ; maintains blood flow ; maintain cardiac output / AW ; *paleness:* blood diverted to major organs / routes /AW ; *ora* vasoconstriction / constriction of <u>arterioles</u> ; of arterioles to skin ;	4 max
		[Total: 12]

Question		Expected Answers	Marks
5	(a)	phagocytes / named phagocyte / macrophages / B cells / T cells / lymphocyte ;	1
	(b)	**1** competitive inhibitor ; **2** fits active site ; **3** blocks active site ; **4** similar shape to substrate ; **R** *same* **5** non-competitive inhibitor ; **6** binds elsewhere on enzyme ; **7** changes active site ; **8** allostery ; **9** substrate can no longer fit ; **10** AVP ; e.g. ref to enzyme substrate complexes, reversible / irreversible, permanent / temporary	**5 max**
	(c)	tissue damage ; platelets activated ; release of thromboplastin ; prothrombin to thrombin ; fibrinogen to fibrin; fibrin insoluble ; RBC's caught in mesh / fibres / threads to form a clot; role of calcium ions ; AVP ; e.g. ref to cascade reaction, clotting factors, fibrin fibrous protein **A** *annotated flow diagram*	**4 max**
	(d)	prevents formation of blood clots in coronary arteries ; blood flow maintained AW, to heart / cardiac, muscle ; AVP ; e.g. reduces embolisms **R** *thinning of blood*	**2 max**
			[Total: 11]

Question		Expected Answers		Marks
6	(a)	amount of blood pumped from left ventricle ; in one minute (**A** in a given amount of time) ; CO = HR x SV ;		**2 max**
	(b)	(as exercise intensity increases) blood to muscles increases ; (as exercise intensity increases) blood to brain / skin / decreases ; figs to support ;	*2 max*	
		more respiration in muscles ; more blood with glucose/oxygen ; diversion due to vasoconstriction / shunting ; AVP ; removal of heat / CO_2 / lactate, increased ATP production	*2 max*	**3 max**
	(c) (i)	14.3 ;; *one mark for* 12 – 10.5 / 10.5 x 100 ;		**2 max**
	(ii)	training increases <u>heart muscle</u> size ; correct reference to hypertrophy ; greater force of contraction of heart ; AVP e.g. starlings law of the heart ;		**2 max**
	(iii)	different morphs / body shapes ; different masses ; different genders ; different genetic factors ; different diets ; different training regimes ; AVP ; e.g. smokers / non smokers e.g. medications, different initial fitness AVP ; **R** *different ages*		**2 max**
				[Total: 11]

Mark Scheme 2857
June 2006

Abbreviations, annotations and conventions used in the Mark Scheme	/	=	alternative and acceptable answers for the same marking point
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	___	=	(underlining) key words which **must** be used to gain credit
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Question		Expected Answers	Marks
1	(a)	proto-oncogenes / repressor genes / named genes ;	1
	(b)	division becomes uncontrolled ; cell continues to divide ; shorter interphase ; cell divides more rapidly ;	2 max
	(c)	family history / inherited faulty gene ; post-menopausal / over 50 ; smoking / chemical carcinogen ; contraceptive pill use / HRT ; not having children / having children later in life ; not breastfeeding ; being female ; exposure to, ionizing radiation / X-rays / gamma rays ; alcohol / obesity ; early puberty and late menopause ;	2 max
	(d)	mammogram ; electromagnetic radiation ; passed through breast ; tumours denser (than surrounding tissue) ; so absorb more (radiation); and look white / shadow ; **R** *darker* on photograph / image on screen ; AVP ; e.g. methodological information such as from different angles	3 max
			[Total: 8]

Question			Expected Answers	Marks
2	(a)	(i)	boys weight increases with age / comparative figs in support ; mean weight has increased between 1994-2002 / comparative figs in support ; boys greatest weight increase occurs between ages of 12-14 years / comparative figs in support ; AVP ; e.g. other correct interpretation / comparative figures in support	**2 max**
		(ii)	girls have an earlier growth spurt ; *ora for boys* girls enter puberty earlier ; correct ref to action of hormones on growth ; girls increased fat reserves / named body part gets bigger in girls ; girls may do less exercise than boys ;	**3 max**
		(iii)	5% ;; *one mark for* (54.5 – 52.0) ÷ 52.0 x100 ; ecf for correct method wrong measurement *1 max* failure to round up *1 max*	**2 max**
		(iv)	children eating more ; so more, fat / carbohydrate / protein, in diet ; **R** *nutrients* take away meals / fast food ; so more overweight / obese ; less exercise / more sedentary lifestyles / taken to school by car / decreased PAL ; (so) less energy used / more energy stored ; AVP ; e.g. supermarkets / advertisements, encouraging children to buy sweets / crisps / parental anxiety about playing outside etc	**3 max**
	(b)		height / from back of heels to top of head / length / head circumference ; **R** *refs to foetal growth measurements*	**1**
	(c)		measure at start and end of a time interval ; calculate, difference / increase in weight ; divide by weight at start ; stating correct units ; AVP ;	**3 max**
				[Total: 14]

Question	Expected Answers	Marks
3 (a)	*1 max for method + 1 max for detail* blood sample / test **;** checks for presence of <u>antibodies</u> to HIV **;** *or* <u>HIV antigen</u> test **;** checks for specific viral protein **;** *or* RNA viral load test **;** checks for quantity of viral RNA **;** *or* oral test **;** saliva tested for presence of <u>antibodies</u> to HIV **;** enzyme immunoassay (EIS) / enzyme-linked immunosorbent assay (ELISA) / Western blot test **;** AVP **;** e.g. CD4 count	**2 max**
(b) (i)	sub-Saharan Africa **;**	**1**
(ii)	number of adults living in each area / population number **;** to work out per 1000 of population **;** percentage of population **;**	**1 max**

(c) *social / economic factors ora*

S1 use of condoms to prevent transmission **;**
S2 condoms not available in some countries **;**
S3 cultural / religious, objection **;**
S4 not enough money for condoms **;**
S5 not enough health professionals / named **;**
S6 lack of, hospitals / medical centres **;**
S7 not enough money to buy antiviral drugs **;**
S8 HIV testing not available **;**
S9 lack of education **;**
S10 ignorance of how HIV is spread **;**
S11 stigma associated with being HIV positive **;**
S12 people unwilling to be tested **;** *5 max*

biological factors

B1 HIV is transmitted in body fluids / implied **;**
B2 IV needles sterilised before reuse **;**
B3 blood / blood products, screened before transfusion **;**
B4 special care for HIV positive pregnant women (may pass virus to unborn child) **;**
B5 encourage HIV positive mothers not to breast feed **;**
B6 difficult to produce vaccine **;**
B7 as HIV, constantly mutates / changes viral coat protein **;**
B8 no cure **;**
B9 no, signs / symptoms, of infection during initial stages **;**
B10 those infected unknowingly infect others **;** *4 max*

AVP **;** e.g. health promotion campaign / described **7 max**

QWC – legible text with accurate spelling (no more than three errors), punctuation and grammar; 1

[Total: 12]

Question		Expected Answers	Marks
4	(a)	substitution ;	1
	(b)	**X** Leu ;	1
	(c)	insertion ; shift triplets by one base ; Ser still first amino acid ; UAA, second / next, codon ; UAA codes for stop (codon) ; polypeptide / protein, not be made ;	3 max
	(d)	each amino acid coded for by more than one codon ; code is degenerate ; change to one base may not change amino acid ; example from Table 4.1 ; affected part of protein may not be involved in its function ; mutated allele may be recessive to normal allele ; 2 alleles on homologous pair of chromosomes ;	3 max
			[Total: 8]

Question			Expected Answers	Marks
5	(a)		disease caused by pathogen ; has a causative organism / named ; can be transmitted from one person to another ;	2 max
	(b)	(i)	disease can't be cured ; usual, antibiotics / drugs, do not kill TB bacterium ; higher mortality from TB ; idea of more infection increasing the rate of subsequent infection ; subsequent / new, infections will also be antibiotic resistant ;	2 max
		(ii)	associated with poor cramped living conditions where easily spread ; contact tracing difficult ; people in these conditions less likely to access medical care ; course of treatment long ; people less likely to comply with long term treatment regimes ; HIV accelerating spread of TB ; vaccine not always effective ; not always easy to diagnose ; people, don't know they have the disease / show no symptoms ; passed easily through air by, droplet infection / coughing / sneezing ; some countries cannot afford antibiotics ; side effects of antibiotics ;	2 max
	(c)	(i)	many, drugs / medicines, come from plants ; rain forests a rich source of many plants (new to science) ; source of new antibiotics ; source of new vaccine ; AVP ;	2 max
		(ii)	local people depend on forests for livelihood ; rain forests contain timber / named resource ; can clear land for farming ; need income from, rainforest products / farming ; exploitation of forests is destroying them ; contributes to global warming ; loss of habitats ; loss of biodiversity ; endangered, species / communities ; AVP ;	2 max
				[Total: 10]

Question		Expected Answers	Marks
6	(a)	unspecialised / undifferentiated ; continually, reproduce / divide / replicate ; give rise to specialised cells / make different types of cells ; AVP ; e.g. large nuclear / cytoplasmic ratio / pluripotency	2 max
	(b)	stem cells enable bone growth ; due to, cell division / mitosis ; differentiation occurs ; new bone cells made; repair / replace, damaged bone ; gene switch / on or off ;	3 max
	(c) (i)	T-lymphocytes / T-cells / T helper cells / killer T cells / cytotoxic T cells ; macrophage / antigen presenting cell / APC ; **Ignore** *white blood cell / leucocyte*	1 max
	(ii)	memory cells remain over time ; if same, pathogen / antigen, encountered second time ; produce faster immune response ; antibodies produced more quickly ; **R** *memory cells making antibodies* symptoms / signs of disease may not occur ;	2 max
			[Total: 8]

Mark Scheme 2858/01
June 2006

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Question	Expected Answers	Marks
1 (a)	*Assume candidate is referring to plant cell unless otherwise stated* (mistletoe has) cell wall ; (large / permanent) vacuole ; chloroplasts ; AVP ; e.g. regular shape / no centrioles / plasmodesmata / chlorophyll AVP ;	**3 max**
(b)	acupuncture ; hypnotherapy ; AVP ; **R** *diet unless qualified* **R** *homeopathy*	**1 max**
(c) (i)	313 ;; *one mark for* 69/100 x 453 ;	**2 max**
(ii)	sample size too small / AW ; controls not done / AW ; methods not standard / AW ; AVP ; e.g. anecdotal evidence	**1 max**
(d) (i)	translation ; detail (e.g. ref to ribosome as protein polymerase / ref to sub units) ; mRNA binds ; ref 2 sites / peptidyl and acyl site / AW ; (framework for) tRNA and amino acid complex / AW ; reads / moves along mRNA / AW ; ref to polyribosomes / polysomes ; AVP ; e.g. ref to peptide bond formation / base pairing / codon	**4 max**
(ii)	fewer structural / membrane proteins made ; ref fewer enzymes ; AVP ; **R** *fewer cells unless qualified*	**1 max**

(e) **(i)** bone marrow **;** **1**

(ii)

macrophage	*lymphocyte*	
phagocytic	non phagocytic	**;**
bean shaped nucleus	rounded / not bean shaped	**;**
lots of cytoplasm	little cytoplasm	**;**
does not produce antibodies	produces antibodies	**;**

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

(iii) proto-oncogenes, become oncogenes **;**
mutation **;**
ref to repressor gene **;**
uncontrolled cell division **;**
ref tumour / mass of cells **;**
ref to lack of differentiation **;**
metastases / metastasis **;** **A** description
AVP **;** e.g. ref mitosis / (named) carcinogen *4 max*

ref to cytotoxic / killer T cells / lymphocytes **;**
recognition / described, of (mutated) cell receptors / antigens **;**
ref clonal selection / expansion **;**
detail of mechanism for cell destruction **;**
ref T helper cells **;**
role/cytokine release **;**
ref role of B cells / antibody production **;**
role of antibody / opsonin / described **;**
AVP **;** e.g. ref to role of phagocytes *4 max* **7 max**

[Total: 22]

Question			Expected Answers	Marks
2	(a)	(i)	6 ;	1
		(ii)	sphygmomanometer ;	1
		(iii)	(heart rate) beats, per minute / min^{-1} / bpm ;	1
		(iv)	ref to (carotid / radial / brachial / temple),artery ; calculation detail (e.g.30 multiplied by 2) ; further detail (e.g. not using thumb/ref to electronic method) ; ref to mean/repeats ; AVP ;	2max
	(b)	(i)	(systolic) 118-120 mmHg ; (diastolic) 82 mmHg ; one mark for both figures without units	2
		(ii)	no blood flow when cuff pressure exceeds systolic / AW ; as pressure drops / tapping sounds / phase 1 / AW, blood flow intermittent / only flowing during ,maximum/ systolic / AW ; phase 2-4 / AW, longer periods of blood flow ; ref change in noise,linked to blood flow ; blood flowing ,except at diastolic pressure / AW ; phase 5 / AW, blood flows at systolic and diastolic pressure / AW (e.g. uninterrupted flow) ; ref to figures ; AVP ; e.g. ref to heart action	4 max
	(c)		(up to) 4 ;	1
	(d)		(shape due to) tertiary structure ; bonds between R groups disrupted ; ref. to correct bond / ionic / hydrogen ; AVP ; e.g. ref to hydrogen ion concentration increasing / ref denaturing / ref. to specificity	2 max
	(e)	(i)	chronic obstructive pulmonary disease ; **A** *disorder*	1
		(ii)	peak expiratory flow rate ;	1
	(f)		phagocytes to (inflamed) lungs / AW ; **A** *neutrophils* release of elastase / AW ; loss / breakdown of elastic (fibres)/ elastin (in alveolar wall) ; detail / lack of elastase inhibitor ; alveoli burst / loss of surface area (for gas exchange) ; loss of elastic recoil ; bronchioles collapse ; **A** *restricted* (internal intercostals muscles) pull ribcage down / AW / breathing out requires effort ; AVP ;	4 max

(g)
1 diameter (of airways) increases / AW **;**
2 lumen (of airway) becomes wider **;**
3 (dilator) relaxes muscle **;**
4 in walls of named airway / trachea / bronchi / bronchiole **;**
5 ref smooth muscle **;**
6 bronchodilator / chemical / drug, enters airways / AW **;**
7 AVP **;** e.g. for named dilator / bronchodilator gets steroid in
8 AVP **;** **3 max**

[Total: 23]

Mark Scheme 2866
June 2006

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Question			Expected Answers	Marks
1	(a)	(i)	ultrasound (scan) ; listen for heartbeats using stethoscope ; AVP ;	1 max
		(ii)	two foetuses identified /AW ; only one foetus develops / AW ; reabsorption of foetus ; formation of mummified / compressed, foetus ; AVP ;	2 max
		(iii)	usually only one oocyte / egg per cycle / month ; splitting / division of, zygote also rare ; uterus is not designed for multiple pregnancies / AW ; foetus is at risk / described, therefore may miscarry / AW ; AVP ;	2 max
		(iv)	(the use of) IVF / GIFT / ZIFT ; may introduce more embryos to ensure conception / AW ; AVP ;	2 max
	(b)	(i)	identical twins are <u>genetically</u> identical ; because the reaction is (partly) <u>genetically</u> controlled / environment plays a role ; non-identical twins have some genes in common / AW ; AVP ;	2 max
		(ii)	check progress of the allergy ; find out which people at risk ; estimate number of people affected / chart incidence and prevalence ; identify factors which increase risk of allergy ; use of figures in, education / health promotion ; check effectiveness of control measures ; AVP ; e.g. ethical issues of not being able to experiment on humans	2 max
				[Total: 11]

Question			Expected Answers	Marks
2	(a)	(i)	*Increase in* tolerance to lactate ; number of mitochondria ; size of mitochondria ; enzymes in, Krebs cycle / glycolysis / AW ; electron transport molecules ; myoglobin ; size of muscle fibres ; glycogen / fat, stored ; enzymes for fat metabolism ; AVP ; e.g. number of myofibrils / further detail of points above	**4 max**
		(ii)	VO_2 max reached / small amount of aerobic respiration possible / AW ; anaerobic respiration ; lactate ; hydrolysis of ATP ; to form ADP + P_i ; ATP resynthesised from CP ; AVP ; ;	**3 max**
	(b)		**A** myosin ; **B** actin ; **C** Z line / disc ;	**3**
	(c)		**1** calcium ions, bind to troponin / cause exposure of binding sites on **actin** ; **2** troponin displaces tropomyosin / troponin-tropomyosin complex, moves / changes shape ; **3** myosin heads attach to actin filament ; **4** myosin head is an ATPase ; **5** myosin head changes position / actin filaments slide past myosin filaments ; **6** each movement is 10nm ; **7** myosin detaches from actin filament ; **8** ATP cause this release / AW ; **9** hydrolysis of ATP / myosin head cocked ; **10** myosin head reattaches ; **11** ADP + Pi released ; **12** ratchet mechanism ; **13** process continues provided enough ATP / calcium ions present ; **14** AVP ; e.g. I band shortens / Z lines closer together / H zone shortens / sarcomere shortens	**7 max**
			QWC – clear well organised using specialist terms ;	**1**
	(d)		increased protein ; specific / essential amino acids ; for proteins within muscle fibres ; named mineral qualified ; creatine ; AVP ; e.g. carbohydrate qualified	**3 max** **[Total: 21]**

Question			Expected Answers	Marks
3	(a)		allows action potential / impulses, pass to next neurone / muscle ; allows transmission in one direction only ; allows impulses to travel, to / from, many neurones, to / from one / increase range of response ; allows inhibition ; involved in memory / learning ; AVP ;	2 max
	(b)	(i)	by diffusion / described ; through channels / calcium gates / specific proteins ; open when impulse arrives ;	2 max
		(ii)	vesicles (in synaptic knob) move towards presynaptic membrane ; fuse with it ; release acetylcholine / neurotransmitter / other named into synaptic cleft ; exocytosis ; transmitter substance / ACH, <u>diffuses</u> across cleft ; binds to receptors on postsynaptic membrane ; channel / proteins / sodium gates, open ; allowing Na^+ to enter ; AVP ;	4 max
	(c)	(i)	to prevent constant stimulation of postsynaptic membrane ; by breaking down acetylcholine ; into acetate + choline ; for recycling ;	2 max
		(ii)	competitive inhibitor / <u>competes</u> with substrate for active site ; similar structure to substrate ; **R** *same* prevents substrate molecules occupying active site ; non-competitive inhibitor ; attach to enzyme at, place other than active site / allosteric site ; alters shape, of enzyme / active site ;	3 max
	(d)	(i)	pain relief / named e.g. ;	1
		(ii)	prevents influx of calcium ions ; prevents release of neurotransmitter ; impulse does not reach, CNS / brain / spinal cord ; removes perception of pain ; *or if answering in context of postsynaptic binding* binds to receptors ; mimics endorphins / enkephalins / natural opiates ; action potential generated ; stimulates pleasure centre / AW ; masks / overrides feelings of pain ;	3 max

[Total: 17]

Question			Expected Answers	Marks
4	(a)	(i)	CO_2 dissolves ; to form carbonic acid / H_2CO_3 which dissociates ; to form H^+ ; and HCO_3^- ; diffusion / AW ; through phospholipid bilayer ; hydrophilic channels ; AVP ;	**3 max**
		(ii)	a cell which initiates an action potential / AW ; responds to / converts a stimulus ; from a particular type of energy / named e.g. light, to electrical energy ; cell / organ detecting change in internal / external environment ;	**1 max**
		(iii)	stimulated as lungs fill with air so prevents over-stretching / AW ; by inhibiting the respiratory centre ; allows expiration to occur / AW ;	**2 max**
	(b)		hydrogen ions lower the pH of the blood ; produced continuously from respiration ; enzymes work best at optimum pH ; denatured by extremes of pH ;	**3 max**
	(c)		reduced ; energy ; gradient ; ATPase / ATP synthase ; **A** *ATP synthetase*	**3 max**
				[Total: 12]

Question			Expected Answers	Marks
5	(a)	(i)	21 million ;	1
		(ii)	26 % ;;	
			one mark for	
			$\frac{21 \times 10^6}{80 \times 10^6} \times 100$;	
			1 max for ecf	2 max
	(b)		*For Philippines – ora where appropriate for UK.*	
		1	higher birth rate ;	
		2	less contraception ;	
		3	explained ;	
		4	high infant mortality rate ;	
		5	fewer doctors / nurses / medical personnel ;	
		6	fewer clinics / hospitals / healthcare ;	
		7	rural / isolated communities ;	
		8	civil unrest / war ;	
		9	(internal) migration / displaced persons / refugees / slum conditions ;	
		10	famine / crop failure / poor food supply ;	
		11	malnutrition ;	
		12	poor sanitation / sewage treatment ;	
		13	poor supplies of clean drinking water / treated water ;	
		14	increased risk of infectious disease ;	
		15	named disease ; (e.g. malaria, TB ,HIV,cholera)	
		16	poor housing / overcrowding ;	
		17	lack of medicines / vaccines / medical technology ;	
		18	AVP ;	6 max
			QWC – spelling, punctuation and grammar ;	1
	(c)		*extensive* — *intensive*	
			no fertiliser added / manure — fertiliser added ;	
			recycles nutrients — does not recycle nutrients / nutrients lost ;	
			low yields — high yields ;	
			no pesticides — pesticides used ;	
			little machinery — large amounts of machinery ;	
			low density animal husbandry — high density animal husbandry ;	
			more sustainable — less sustainable ;	2 max
	(d)		grain yield increases ;	
			height of stem decreases ;	
			biomass increases ;	
			use of comparative figs to describe a trend ;	2 max
				[Total: 14]

Question			Expected Answers	Marks
6	(a)	(i)	B ; A ;	2
		(ii)	forms corpus luteum ; degenerates ; secretes progesterone ; stimulates glandular activity in endometrium ; maintains thickness of endometrial wall ; inhibits, FSH / LH secretion ; from pituitary ; inhibits GnRH ; from hypothalamus ;	4 max
	(b)	(i)	it has many dividing cells / AW ; AVP ;	1 max
		(ii)	ultrasound scan ; MRI / PET / CT scan ; biopsy / described ; C125 test / blood test for C125 ; AVP ; *4 max* ooectomy / AW ; radiation ; chemotherapy ; destroy dividing cells ; AVP ; e.g. complementary therapy / named stem cell research / immunotherapy *4 max*	5 max
		(iii)	cancer is not a single disease ; only underlying cause is uncontrolled cell division / mutation of proto-oncogene ; cannot experiment on humans (to find cause) ; animal experiments do not necessarily produce same response as humans / AW ; evidence circumstantial ; epidemiology ; many causes / explained or implied ; AVP ;	3 max
				[Total: 15]

Mark Scheme 2867
June 2006

Abbreviations, annotations and conventions used in the Mark Scheme	/	=	alternative and acceptable answers for the same marking point
	;	=	separates marking points
	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
	R	=	reject
	ora	=	or reverse argument

Question			Expected Answers	Marks
1	(a)	(i)	437 / 438 ;;	
			one mark for	
			$\frac{70\,000}{160}$;	
			ecf 1 max	**2 max**
		(ii)	no duct ; numerous capillaries ; secretes hormones / named ; directly into blood ; AVP ; e.g. correct ref to homeostasis **R** *non-diagnostic aspects of cell structure*	**2 max**
		(iii)	causes alpha cells ; to secrete glucagon ; converts glycogen into glucose / glycogenolysis ; increases the conversion, of amino acids / protein / lipid / fat, into glucose / gluconeogenesis ; ref to negative feedback / set point / inhibition / stopping, of insulin production / AW ;	**3 max**
	(b)	1	condensation reaction / reaction between two glucose described ;	
		2	forms a glycosidic bond / between OH groups / 1- 4 / 1- 6 / α / β ;	
		3	no other reactants required / AW ;	
		4	to form polymer / polysaccharide / glycogen ;	
		5	compact molecule ;	
		6	insoluble storage molecule ;	
		7	a lot of energy in the bonds ;	
		8	AVP ; e.g. many terminals for enzyme action in glycogen glycogen not osmotically active easily reversed / converted back to glucose ref to ease of transport	**3 max**

continued

Question 1 cont'd **Expected Answers**

(c) *Max 4 if **none** of points 1-6 scored* *Only need one to remove max*

1 glucose decreases the water potential of the blood **;**
2 water moves down water potential gradient / from cells / tissue fluid (into blood) **;**
3 ref to changes in water balance / large volumes of water / urine excreted **;**
4 cells / tissue fluid / body, becomes dehydrated / (excessive) thirst **;**
5 enzymes cannot function efficiently / AW **;**
6 disturbs electrolytes / named **;**
7 particularly damaging in brain / coma / become unconscious / dizziness **;** **R** *fainting*
8 excess glucose converted to fat / ref to ketones / ketoacidosis / breath smelling of pear drops / AW **;**
9 ref to atheroma **;**
10 in coronary arteries / CHD **;**
11 risk of gangrene in extremities **;**
12 glucose crystallises in lens / denatures lens **;**
13 cataract **;**
14 damage to capillaries in retina **;**
15 macular degeneration **;**
16 glucose in urine **;**
17 tiredness / fatigue qualified **;** **R** *organ damage* **6 max**

[Total: 16]

Question			Expected Answers	Marks
2	(a)	(i)	*These points may be implied by the way the figures are quoted.* women's fertility 100% / women most fertile at 20 / at maximum, from 20 to 30 / men reach maximum fertility at 30 years / start **;** women then drops sharply / male declines gradually / decrease more slowly than female **;** women infertile / lose fertility at 50 / men still 30% of fertility at 80 **;**	**3**
		(ii)	male matures later **;** women have all / finite number oocytes at birth / sperm production continuous in men **;** oocytes are older / fewer, (ovarian) follicles / oocytes **;** **R** *ova, eggs, gametes* woman's body gets too old to support a foetus / AW **;** oocytes exposed to pollution longer than sperm **;** AVP **;** e.g. approaching / AW, the menopause / decrease in oestrogen male evolved to have time to spread his genes / AW	**3 max**
	(b)	(i)	as hormones decline / become irregular / lose balance / AW **;** may release two oocytes / ova per cycle **;** **R** *eggs* ref to age, of gametes **;** zygote / ball of cells / blastula, may divide into two **;** AVP **;** e.g. more likely to need IVF hormonal treatment may result in two follicles **R** *two follicles unqualified*	**1 max**
		(ii)	identical twins are genetically identical / non-identical twins are not / no more identical than ordinary siblings **;** can indicate an environmental effect / AW **;** other variables are similar / AW **;** e.g. of variable controlled **;** therefore if both identical twins react in the same way / ora **;** shows a genetic effect influencing response / ora **;** can compare degree of concordance / similarity, between two groups **;** AVP **;** e.g. ref to control group	**3 max**

continued

Expected Answers

Question 2

cont'd

(c) **(i)** **1** menstruation becomes irregular / stops **;** **R** *bleeding*
2 number follicles decline **;**
3 follicles become less sensitive to FSH **;**
4 ovulation becomes irregular / stops **;**
5 FSH increases/ oestrogen decreases **;**
6 parathormone increases **;**
7 dry skin / vagina / eyes **;**
8 loss of bone calcium / osteoporosis **;**
9 mood swings **;**
10 night sweats / hot flushes **;** **3 max**

(ii) contains oestrogen / oestrogen and progesterone **;**
antagonises parathormone **;**
stops, mobilisation of bone calcium / decrease in bone density / AW **;**
AVP **;** e.g. ref to named side effects e.g. breast cancer
reduces / stops the surge in FSH / LH
inhibits osteoclasts **2 max**

(iii) steroids / fat soluble **;**
in lipoprotein / phospholipid **;**
will diffuse / move down concentration gradient **;**
through differentially permeable membrane **;** **2 max**

(iv) cyclical pills taken in varying combinations **;**
for up to 25 days / three weeks **;**
may be oestrogen continuous, progestin 10-14 days **;**
then get withdrawal bleeding / 'period' **;** *2 max*

fewer side effects / lower dose **;**
attached to skin / skin patches / implant **;**
replaced twice a week **;**
if under skin need replacing after three months **;**
oestrogen and progesterone tablets taken continuously **;** *2 max*

AVP **;** e.g. continuous avoids hormone surges,
named risk for either, e.g. endometrial cancer **4 max**

[Total: 21]

Question			Expected Answers	Marks
3	(a)	(i)	group of organisms which interbreed **;** to produce fertile young / AW **;** similar structure / physiology / behaviour / characteristics **;** **R** 'similar' unqualified genetically similar / same number chromosomes / gene loci **;** reproductively isolated (from any other species) / AW **;** ref to ecological niche **;**	**3 max**
		(ii)	**A** *English names of groups* **Kingdom** Animalia **Phylum** Chordata **Class** Mammalia / sub-class Eutheria **Order** Primata **Family** Hominidae **Genus** Homo *all correct ; ; ;* *4/5 correct ; ;* *2 / 3 correct ;*	**3 max**
	(b)	(i)	albumin is a protein / made up of amino acids **;** ref to codons / bases **;** reflects differences / similarities, in genes / relationships / AW **;** AVP **;** e.g. ref to DNA / RNA	**2 max**
		(ii)	antibody, has a specific binding site ***/*** complementary shape / perfect match**,** for human albumin **;** which is protein / an antigen **;** other primates must have similar albumin **;** not a perfect match to antibody / AW **;** the more antibody precipitated the closer the relationship **;** comparative figs **;** gorilla closest relative **;** gibbon most distant relative **;** AVP **;** e.g. only some of the epitopes match, other detail, orangutan and gibbon most closely related	**4 max**

[Total: 12]

Question			Expected Answers			Marks
4	(a)	(i)	*male*	Nn ; I^AI^O ;	/ I^A N I^O n *or vice versa*	
			female	nn ;	/ I^O n I^O n	
				I^OI^O ;	**A** *upper or lower case for ABO superscript* **A** *ecf in female if N locus written as superscript*	**4**
		(ii)	autosomal / not sex linked **;** equal distribution in both sexes **;** dominant **;** found in each generation **;** ref' to on same chromosome / loci are close **;** **R** 'close together' unqualified linked **;** to blood group A**;**			**3 max**

continued

Question 4 cont'd		Expected Answers	Mark
(b)	**1**	explanation of how female 1 inherited the disease **;**	
	2	dominant **;**	
	3	will occur in every generation **;**	
	4	no sex bias / AW **;**	
	5	associated with A group (in your family) **;**	
	6	has a high frequency / AW, (with group A) / described **;**	
	7	can be (severe) handicap / described / AW **;**	
	8	no cure **;**	
	9	(could be advised on) genetic screening / IVF **;**	
	10	no genetic test for disease **;**	
	11	could test / screen, for blood group A **;**	
	12	amniocentesis / CVS **;**	
	13	need to know parents' genotypes / stated **;**	
	14	could recommend a scan **;**	
	15	other skeletal deformities may show on scan **;**	
	16	probability 0.5 / AW, (for dominant condition) **;**	
	17	less for this condition because linked to I^A **;**	
	18	AVP **;** e.g. will discuss the risks/probability if they have children / risk/benefit of amniocentesis / genetic counsellors do not make decisions for couple/only give facts	
	19	AVP **;**	**8 max**
		QWC – legible text with accurate spelling, punctuation and grammar ;	**1**
		*Candidates should have no more than three different spelling errors **;** sentences should be accurately punctuated according to spoken English and text should be legible.*	
			[Total: 16]

Question			Expected Answers	Marks
5	(a)	(i)	B ; D ;	2
		(ii)	*mark the name of the fluid and the explanation as stand alone* *'blood' unqualified 1 max for first two arrows*	
			➡ oxygenated / arterial, blood ; blood containing waste products **/** named ; carries blood at high pressure for ultrafiltration ; oxygen / glucose to keep the tissue alive ; waste products / named, to remove from body ; *2 max*	
			⟹ deoxygenated / venous, blood ; blood containing reabsorbed substances / named / ref to water balance / correctly adjusted water / ions ; removes metabolic waste / named, from kidney, tissue / AW ; removes blood cleared of (nitrogenous waste) / named / AW ; *2 max*	
			→ urine ; contains nitrogenous waste / named ; flows into bladder for excretion ; *2 max*	6 max
	(b)	(i)	contraction of the left ventricle ; constriction of efferent arteriole / vessel leaving glomerulus ; diameter / AW, of efferent vessel varies **/** diameter / AW, of afferent vessel greater than the diameter of the efferent vessel ; ref to capillaries (in glomerulus) increasing pressure ;	2 max
		(ii)	dehydration ; haemorrhage / heavy blood loss ; heart attack / myocardial infarction ; obstruction in afferent vessel / renal artery (e.g. atherosclerosis / atheroma in afferent vessel) ; AVP ; e.g. leukaemia / any appropriate blood disease e.g. sepsis / inflammation/infection of glomeruli AVP ;	2 max

continued

Question 5 cont'd **Expected Answers** **Mark**

(c) **(i)**
1 full bladder **;**
2 (stimulates stretch) receptors, in wall / lining / bladder **;**
3 impulse / action potential, along sensory neurone **;**
4 dorsal root of spinal cord **;**
5 transmitted to intermediate neurone **;**
6 impulse along motor neurone **;** *ecf if impulse / action potential not given above*
7 to (smooth) muscle in bladder wall **;**
8 contracts to expel urine **;**
9 ref to synapse **;**
10 AVP **;** e.g. a reflex **4 max**

(ii) learning / training / conditioned reflex **;**
correct ref to influence of the brain **;** e.g. impulses from brain to the spinal cord **;** *ora* inhibit the reflex / stop the action potential / AW **;**
at the synapse **;**
AVP **;** **2 max**

[Total: 18]

Question		Expected Answers	Marks
6	(a)	**1** GH gene synthesised / located / AW **;** **2** as the non-transcribed / AW, strand of DNA / cut from human genome **;** **3** or from mRNA **;** **4** using reverse transcriptase **;** **5** correct ref to cDNA **;** **6** cut with restriction, enzyme / endonuclease **;** **7** named**,** restriction enzyme / endonuclease **;** **8** to form sticky ends / sticky ends added **;** **9** specific ***/*** palindromic base sequence **;** **10** (genetically engineered / recombinant) plasmid **;** **11** pBR322 **;** **12** cut with same (restriction) enzyme **;** **13** through the antibiotic resistance gene **;** **14** complementary sticky end / AW **;** **A** *match* **R '***the same'* **15** form hydrogen bonds **;** **16** complementary base pairing **;** **17** DNA ligase **;** **18** seals sugar phosphate backbone **;** **19** (E coli/ bacterium, takes up plasmids) in presence of calcium ions / Ca^{2+} **;** **20** detail **;** e.g. makes membrane / wall, permeable to the plasmid **21** AVP **;** e.g. multiply and produce hGH, ref to recombinant DNA, plasmid is vector, transgenic bacterium **22** AVP **;**	**8 max**
		QWC - for the quality of use and organisation of scientific terms ; *At least 4 of the terms shown in bold : genome, mRNA, reverse transcriptase, cDNA, restriction enzyme / endonuclease, named restriction enzyme, sticky ends, plasmid, pBR322, tetracycline resistance, complementary, DNA ligase, recombinant DNA*, *vector, transgenic*	**1**

continued

Question 6 cont'd	Expected Answers	Mark

(b) (i) the boy was shorter than 90% of other boys / only 10% of boys that short / AW **;**
of the same age **;** **2**

(ii) *family history*
height is (partly) genetically determined **;** **R** *inherited*
he could have a genetic disease **;**
e.g. / achondroplasia / CF **;**
AVP **;** e.g. same problem in family *2 max*

malnutrition
too little food would retard growth **;**
lack of protein / energy, for hGH production **;**
too little iodine / named vitamin / other named mineral, qualified **;**
AVP **;** *2 max*

CT scans
anterior pituitary gland (in brain) produces growth hormone **;**
tumour / trauma, interferes with production / described **;**
hypothalamus produces hGH releasing factor / stimulates hGH production **;**
R *releases*
AVP **;** *2 max* **6 max**

(iii) growth spurt at puberty **;**
very little growth afterwards / grow more during childhood **;**
ends of long bones / epiphyses fuse **;**
AVP **;** hGH would only increase muscle mass,
absence of hGH could produce weak muscles

R *will remain short* **2 max**

[Total: 19]

Question			Expected Answers	Marks
7	(a)	(i)	**1** amyloid plaque is 'foreign' / antigen **;** **2** vaccine (that contains it) will trigger an immune response **;** *'antibody production' = neutral* **3** ref' to macrophage / T_4 cells / T helper cells **;** **4** ref' to B lymphocytes producing plasma cells **;** **5** specific to amyloid / tau protein **;** **6** antibodies lyse / attack protein **;** **7** antibodies, could destroy enzyme / protein **;** plaque / abnormal tau **;** **R** *vaccine* **8** memory cells **;** **9** permanent protection **/** prevents development of plaques**;** **10** AVP **;**	**4 max**
		(ii)	vaccine may be destroyed by the patient's own immune system **;** patient may be allergic to the vaccine / may have life threatening immune response **;** <u>anaphylaxis</u> **;** may result in autoimmunity / destruction of normal tau / amyloid **;** may cause (unexpected) side effect / effect not known **;** the vaccine may not cross the blood brain barrier / reach site of action **;** results in mice not necessarily same in humans **;** AVP **;**	**3 max**
	(b)		genetic (potential) / family history / AW **;** **R** *inherited* head injury (associated with unconsciousness) / (severe) blow **;** ethnic origin **;** AVP **;** e.g. alcohol abuse, aluminium, smoking, HRT, high cholesterol **R** *CHD* AVP **;**	**2 max**
	(c)	**(i)**	decrease in sensory perception / reduction of named sense / neuropathy **;** increase pressure in eye / glaucoma **;** macular degeneration / described **;** lens hardens / less elastic / goes cloudy **;** cataract **;** hair cells in cochlea degenerate **;** ear drum loses elasticity **;** slower nerve impulse conduction **;** loss of sensation in finger / toe tips **;** AVP **;** neurones / dendrites, die / shorten damage to receptors *'effector' = neutral*	**4 max**

continued

Question 7 cont'd **Expected Answers**

(ii)

1 burden on carer **;**
2 reduction economic input from carer / carer dependent on state **;**
3 increased pressure on welfare / NHS services / named **;**
4 increase in costs to NHS / described **;**
5 increase in need for pensions **;**
6 balance between those contributing to state funds and those using them shifts / increase in dependency ratio / named effect of this e.g. longer working / AW **;**
7 increase in need for residential / respite, care / homes / carers **;**
8 older people need work / AW **;**
9 increased incentive to find cures for degenerative diseases / named **;**
10 increased accessibility needed (to shops / other named area) **;**
11 ref' to ageism **;**
12 AVP **;** e.g. experience of older people is valuable
pressure on environment

5 max

[Total: 18]

Advanced GCE (Human Biology) (7886/3886)
June 2006 Assessment Series

Unit Threshold Marks

Unit		Maximum Mark	a	b	c	d	e	u	Entry
2856	Raw	60	39	33	27	21	15	0	1407
	UMS	90	72	63	54	45	36	0	
2857	Raw	60	45	39	33	27	22	0	1380
	UMS	90	72	63	54	45	36	0	
2858A	Raw	120	95	83	71	59	47	0	1782
	UMS	120	96	84	72	60	48	0	
2858B	Raw	120	95	83	71	59	47	0	24
	UMS	120	96	84	72	60	48	0	
2866	Raw	90	65	56	47	39	31	0	358
	UMS	90	72	63	54	45	36	0	
2867	Raw	120	82	72	62	52	43	0	663
	UMS	120	96	84	72	60	48	0	
2868	Raw	90	72	64	56	48	40	0	663
	UMS	90	72	63	54	45	36	0	

Specification Aggregation Results

Overall threshold marks in UMS (i.e. after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
3886	300	240	210	180	150	120	0
7886	600	480	420	360	300	240	0

The cumulative percentage of candidates awarded each grade was as follows:

	A	B	C	D	E	U	Total Number of Candidates
3886	3.8	13.3	32.0	56.8	79.8	100.0	1472
7886	6.4	20.5	47.8	75.3	94.5	100.0	655

For a description of how UMS marks are calculated see;
www.ocr.org.uk/OCR/WebSite/docroot/understand/ums.jsp

Statistics are correct at the time of publication

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Information Bureau

(General Qualifications)
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