

# **Human Biology**

Advanced GCE **A2 7886**

Advanced Subsidiary GCE **AS 3886**

## **Mark Schemes for the Units**

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**January 2010**

**3886/7886/MS/R/10J**

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**Advanced Subsidiary GCE Human Biology (3886)**

### **MARK SCHEME FOR THE UNITS**

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# 2866 Energy, Control and Reproduction

<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)	<pre> graph TD     NS[nervous system] --&gt; P[peripheral]     NS --&gt; C[central ;]     P --&gt; S[somatic]     P --&gt; A[autonomic ;]     C --&gt; SC[spinal cord ;]     C --&gt; B[brain]     A --&gt; Sy[sympathetic]     A --&gt; Pa[parasympathetic ;] </pre>	

4

- (b) (sudden) blow to head / head suddenly & violently hits an object ; **Ignore** injury causes (physical) damage to the brain ;  
named e.g. ;  
(may) cause, loss of consciousness / stroke / paralysis / bleeding into brain ;

2 max

- (c) (i) X ;  
Y ;  
X ;  
Z ;  
X ;

5

- (ii) homeostasis / named example e.g. osmoregulation / thermoregulation ;  
controls secretion of hormones (from pituitary gland) ;      A named pituitary hormone  
R non pituitary hormone  
  
produces / secretes, hormones ;  
regulates autonomic nervous system ; 1 max
- (d) (patient's head placed in) magnet / magnetic field ;      A uses magnets  
computer, measures / detects, (small) differences in magnetic field ;  
detail of molecular response to MRI ;  
e.g. aligns, hydrogen nuclei / water molecules  
e.g. oxyhaemoglobin has smaller effect on magnetic field (than haemoglobin)  
(detailed) image of internal / AW, structure (of brain) ;      A 3D  
haemoglobin contains iron ;  
shows distribution of oxyhaemoglobin ;  
shows which areas of brain are, respiring / metabolically active ;  
no / little, respiration / metabolic activity, in damaged areas ;      A ora  
shows, blood clots / bleeds / swelling / demyelination ; 5 max

**[Total: 17]**

Question	Expected Answers	Marks
2 (a)	<p><i>exercise that</i></p> <p>improves, cardiovascular system / heart ;</p> <p>improves, lung function / AW ;</p> <p>increases, heart rate / breathing rate, for at least 20 minutes ;</p> <p>uses / develops, predominately, red / slow twitch, fibres ;</p> <p>use of oxygen. in aerobic <u>respiration</u> / ATP production ;</p> <p>submaximal / e.g. 70 - 80% of max., heart rate ;</p>	<p><b>A</b> at or below VO<sub>2</sub> max      <b>3 max</b></p>
(b)	<p>increase in, heart rate / stroke volume / cardiac output ;</p> <p>increase in blood pressure ;</p> <p>more complete emptying of ventricles ;</p> <p>vasodilation / AW, in muscle / in skin ;</p> <p>vasoconstriction / AW , in gut ;</p> <p>increased blood flow through muscles ;</p> <p>correct ref. to effects of adrenaline on CV system ;</p> <p>e.g. release of adrenaline increases heart rate</p>	<p><b>R</b> speed / rate</p> <p><b>4 max</b></p>
(c)	<p>(idea that) programme has progressive overload ;</p> <p>20-60 mins exercise per day, 3-5 times per week ;</p> <p>e.g. of type of aerobic exercise ;</p> <p>ref. to warm up / warm down ;</p> <p>working at approx, 70 - 80% of VO<sub>2</sub> max / 60-85% max heart rate ;</p> <p>AVP ; e.g. health problem(s) taken into account first</p> <p>e.g. may be in 10 min bouts or continuous</p>	<p><b>A</b> altitude training</p> <p><b>4 max</b></p>
(d)	<p>(slow-twitch fibres) contain high number of myoglobin ;</p> <p>(slow-twitch fibres) contain many mitochondria ;</p> <p>will release oxygen when ppO<sub>2</sub> low ;</p> <p>(slow-twitch fibres) have, high capacity / AW, for <u>aerobic</u> respiration ;</p> <p>(therefore) more ATP available for, muscle contraction / AW ;</p> <p>less, muscle fatigue / cramp / lactate build-up ;</p>	<p><b>A</b> acts as O<sub>2</sub> store</p> <p><b>A</b> can sustain aerobic respiration for longer</p> <p><b>4 max</b></p>
		<b>[Total: 15]</b>

Question	Expected Answers	Marks
3 (a) (i)	D ;	1
(ii)	B ;	1
(b)	allows penetration of vagina / AW ; fills with blood / AW ; makes <u>penis</u> , erect / rigid / AW ;	R erectile tissue unqualified 2 max
(c)	as age increases the percentage of motile sperm decreases ; <u>negative correlation</u> / AW ; results show wide variation / points scattered ; trend not strong / many exceptions / some outliers ;	A ora A annotations on graph 3 max
(d)	<i>Causes</i> 1 low sperm count / absence of sperm ; 2 sperm non- <b>motile</b> / abnormal sperm ; 3 due to infection by, <b>mumps</b> / <b>chlamydia</b> ; 4 abnormal <b>testes</b> development ; 5 named genetic defect / named ; e.g. cystic fibrosis / Klinefelter's 6 <b>testicular</b> cancer / chemotherapy / radiotherapy ; R cancer treatment unqualified 7 obstruction of <b>vas deferens</b> ; A sperm duct 8 <b>testosterone</b> deficiency ; 9 (accidental) exposure to carcinogen ; e.g. smoking / radiation 10 failure to <b>capacitate</b> ;	4 max
	<i>treatment</i> 11 (secondary) <b>oocyte</b> <u>fertilised</u> by sperm, outside body / in dish, via IVF ; 12 sperm injected into (secondary) <b>oocyte</b> in ICSI ; 13 donor sperm / artificial, <b>insemination</b> ; 14 surgical sperm retrieval ; 15 surgical methods to remove obstruction ; 16 drug therapy to improve sperm production ;	4 max
	17 AVP ; e.g. impotence / <b>vasectomy</b> / GIFT qualified / ZIFT qualified / sperm washing	7 max
	QWC ; clear and well organised using specialist terms At least 3 of the emboldened terms: <b>motile, mumps, chlamydia, testes, oocyte, testicular, testosterone, capacitate, insemination, vasectomy, vas deferens</b>	1
(e)	240 ;;	A 230 - 250
	<i>one mark for</i> 24mm / 100 ; correct answer but out by a factor of ten ; e.g. 2400 correct answer but included units ; e.g. 240 $\mu\text{m}$	A 23mm -25mm 2 max

- (f) oocyte has a large volume for food reserves (for early development of embryo) ;  
oocyte has more mitochondria for high metabolic activity ;  
oocyte has a nucleus, to pass on / AW, genetic information ; 2 max

erythrocyte has no nucleus to allow biconcave shape ;  
erythrocyte is biconcave in order to maximise surface area (so volume reduced) ;  
large SA : V to, maximise gas exchange / AW ;  
(therefore) small volume so erythrocyte can pass through capillaries ; 2 max      3 max

**[Total: 20]**



Question	Expected Answers	Marks
4 (a) (i)	Bohr (shift) ;	1
(ii)	<p>1 (haemoglobin molecule) has 4 haem groups and each can bind to 1 oxygen molecule ;</p> <p>2 at low partial pressures of O<sub>2</sub>, little / no, O<sub>2</sub> bound to haem groups so, % saturation low / curve not steep / AW ; <b>A</b> ora</p> <p>3 first O<sub>2</sub> binds slowly but makes binding of other O<sub>2</sub> molecules, faster / easier ; <b>A</b> cooperative binding</p> <p>4 allosteric effect ; <b>A</b> description</p> <p>5 (therefore) curve steep in middle ;</p> <p>6 curve levels off when, most / all, haems combined with O<sub>2</sub> ;</p>	3 max
(iii)	<p>lowers the percentage saturation (of haemoglobin) ;</p> <p>figs. to support ; <b>A</b> 2 figs. From x-axis and 1 from y-axis</p> <p>lowers most at moderate oxygen, partial pressures / AW ;</p> <p>has less effect at (very) high or (very) low oxygen, partial pressures / AW ;</p>	3 max
(b)	<p><i>blood doping</i></p> <p>1 removal of own blood ;</p> <p>2 body restores normal levels of haemoglobin / RBC ; <b>A</b> increases erythropoietin</p> <p>3 own red cells transfused ;</p> <p>4 after plasma removed ;</p> <p><i>EPO</i></p> <p>5 activates bone marrow ;</p> <p>6 stimulates red cell production ;</p> <p><i>performance improvement</i></p> <p>7 increased haematocrit ; <b>A</b> RBC</p> <p>8 increased haemoglobin concentration ;</p> <p>9 increased oxygen carrying capacity of blood ;</p> <p>10 <u>more</u> oxygen delivered to respiring tissues ;</p> <p>11 <u>aerobic</u> respiration can continue for longer ; <b>A</b> ora</p> <p>12 less lactate produced ;</p> <p>13 fatigue delayed ;</p>	4 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: 15]

Question	Expected Answers	Marks																				
5 (a)	<p>cows are at a higher <b>trophic</b> level ;</p> <p>energy lost in each stage of a food chain ;</p> <p>correct ref. to figures ;</p> <p>energy lost between levels ; e.g. some parts of, plants / cows, cannot be eaten e.g. energy loss in faeces</p> <p>energy lost within level ; e.g. energy lost by respiration in, plants / cows ; e.g. homeostasis / movement, in cows</p>	<p>A more trophic levels</p> <p>4 max</p>																				
(b)	<table><thead><tr><th></th><th>light-dependent stage of photosynthesis</th><th>glycolysis</th><th>Krebs cycle</th></tr></thead><tbody><tr><td>ATP is produced</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>ATP is required</td><td>X</td><td>✓</td><td>X</td></tr><tr><td>NAD is reduced</td><td>X</td><td>✓</td><td>✓</td></tr><tr><td>NADP is reduced</td><td>✓</td><td>X</td><td>X</td></tr></tbody></table>		light-dependent stage of photosynthesis	glycolysis	Krebs cycle	ATP is produced	✓	✓	✓	ATP is required	X	✓	X	NAD is reduced	X	✓	✓	NADP is reduced	✓	X	X	<p>;</p> <p>;</p> <p>;</p> <p>;</p> <p>4</p>
	light-dependent stage of photosynthesis	glycolysis	Krebs cycle																			
ATP is produced	✓	✓	✓																			
ATP is required	X	✓	X																			
NAD is reduced	X	✓	✓																			
NADP is reduced	✓	X	X																			
(c)	CO <sub>2</sub> / carbon dioxide ;	1																				
(d)	<p>decreases biodiversity / AW ;</p> <p>increased soil erosion ;</p> <p>increased greenhouse effect ;</p> <p>as less carbon dioxide used by trees / AW ;</p> <p>may contribute to global warming ;</p> <p>loss of habitat for animals / plants ;</p> <p>may lose medicinally important species ;</p> <p>loss of gene pool / seed bank (for agriculture) ;</p> <p>unpredictable effects on food webs ;</p> <p>more flash flooding ;</p> <p>AVP ;</p>	4 max																				

[Total: 13]

Question	Expected Answers	Marks
6 (a)	P mitochondrion ; Q nucleolus ; R nucleus ;	3
(b) (i)	diffusion ; from high concentration to low concentration ;	2
(ii)	shape of neurotransmitter molecules complimentary to site on receptors / receptors specific to neurotransmitters / AW ;	1
(iii)	competitive inhibitor ; fits active site ; blocks active site ;  non-competitive inhibitor ; binds, at a site other than active site / elsewhere on enzyme ; changes active site ;  neurotransmitter / substrate, can no longer fit ;	4 max

[Total: 10]

Paper Total: 90

## 2867 Genetics, Homeostasis and Ageing

Question	Expected Answers	Marks
1 (a)	production of urine / excretion / removal of metabolic waste ; osmoregulation / control of water balance ; regulation of pH ; regulation of salts ; production of erythropoietin ; <b>R</b> <i>homeostasis unqualified</i>	3 max
(b) (i)	27.4µm ;; <b>A</b> <i>correct numerical answer from range of 27 to 28µm</i>  $\frac{85 \times 1000}{3 \times 100}$ 1 max <b>A</b> <i>X-Y = 84-86mm</i>  correct numerical answer in mm    1 max	2 max
(ii)	<u>microvilli</u> to increase surface area ; (increased surface area) for, carrier proteins / active transport / co-transporters ; mitochondria to provide, ATP / energy ; for, active transport / protein synthesis ;	2 max
(iii)	section of actual cell may not contain certain structures / AW ; electron microscope preparation may create artefacts ; electron microscope preparation may destroy structures ;	2 max
(c) (i)	capillaries in glomerulus are narrow ; the diameter of the efferent <u>arteriole</u> is less than the afferent ; making it difficult for blood to flow away / AW ;	3
(ii)	<i>Any two from:</i> named cells ; <b>A</b> <i>blood cell</i> protein ; <b>A</b> <i>named protein</i> substance more than RMM 65 000 – 69 000 ; platelets ;	2 max
(iii)	damage to, glomerulus / capillaries / arterioles ; (hypertension) damages the basement membrane ; affects ultrafiltration / idea that, cells / larger proteins can enter tubule ; effect of damage on, renin / angiotensin, production ; damage may cause positive feedback on blood pressure / AW ;	2 max
		<b>[Total: 16]</b>

Question	Expected Answers	Marks
2 (a)	disease that lasts a long time ; may develop slowly / has slower onset ; (often) degenerative ;	2 max
(b)	<ol style="list-style-type: none"> <li>1 rise in blood glucose detected by <math>\beta</math> cells ;</li> <li>2 secrete <b>insulin</b> ;</li> <li>3 decreases blood glucose ;</li> <li>4 target cells in, liver / muscle, increase glucose uptake ;</li> <li>5 <b>transporter proteins</b> for glucose move to cell membrane ;</li> <li>6 increases <b>facilitated diffusion</b> ;</li> <li>7 glucose is converted to <b>glycogen</b> ;</li> <li>8 <u>increase</u> in, <b>metabolic rate</b> / <b>metabolism</b> / rate of respiration ;</li> <li>9 inhibits <b>glucagon</b> ;</li> <li>10 converted to fat in <b>adipose</b> tissue ;</li> </ol>	5 max
	<ol style="list-style-type: none"> <li>11 drop in blood glucose concentration detected by <math>\alpha</math> cells ;</li> <li>12 <b>glucagon</b> released (into blood) ;</li> <li>13 converts glycogen to glucose ;</li> <li>14 and fats into glucose ;</li> <li>15 correct ref <b>glycogenolysis</b> / <b>gluconeogenesis</b> ;</li> </ol>	2 max
	16 normal glucose concentration, 70 – 100 mg per 100 cm <sup>3</sup> blood / 4.2 – 6.6 mmol dm <sup>-3</sup> A figure within range ;	
	17 $\alpha$ cells and $\beta$ cells, are <b>endocrine</b> cells in <b>Islets of Langerhans</b> ;	
	18 <b>negative feedback</b> / maintains, <b>set point</b> / <b>norm</b> ;	7 max
	<p><b>QWC</b> - clear, well organised answer using at least 4 of the specialist terms (shown in bold) in correct context ;</p> <p><b>insulin, transporter proteins, facilitated diffusion, glycogen, metabolic rate / metabolism, glucagon, adipose, glucagon, glycogenolysis / gluconeogenesis, endocrine, Islets of Langerhans, negative feedback, set point / norm</b></p>	1
(c) (i)	<p>correct ref. to BMI ;</p> <p>must be within percentile for normal weight / AW ;</p> <p>if weight is gained, carbohydrate / fat is being stored ;</p> <p>carbohydrate / fat, intake too high to control diabetes ;</p>	2 max

(ii) *importance must match substance*

glucose ;

indicates blood glucose, high / above renal threshold ;

protein ;

indicates kidney damage ;

large molecules pass through damaged, basement membrane / tissue ;

ketone bodies ;

indicate, metabolising fat / very high blood glucose concentration

/ hyperglycaemia / hypoglycaemia / acidosis ;

creatinine or protein : creatinine ratio ;

indicates tissue damage ;

4 max

(d) (i) vision will deteriorate ;

blood will prevent light reaching, receptors / rods / cones ;

(damaged capillaries may cause) lack of, oxygen / glucose, to cells ;

damage to (cells in) retina / retina is scarred ;

retina may detach ;

3 max

(ii) concentration of cone cells / area of best colour vision ;

where light is focussed when looking directly at an object / AW ;

part of the retina with greatest visual acuity / AW ;

provides the brain with the most detailed (visual) information ;

3 max

[Total: 22]

Question	Expected Answers	Marks
3 (a) (i)	DNA breaks down over time / AW ; DNA may be contaminated ; (DNA) difficult to find in fossil material / small amount ; living tissue is the best source of DNA ;	1 max
(ii)	DNA is characteristic of the species / ora ; <b>R</b> <i>ref to karyotype</i> could be compared with, human genome / DNA of Homo sapiens sapiens / other hominid DNA / AW ;	1 max
(b)	lower metabolic rate ; less, energy / ATP, from respiration ; needed for growth ; (so) reduced protein synthesis ; lower rate of transcription of genes controlling growth hormones / enzyme systems ;	2 max
(c)	<b>R</b> <i>refs to iodine uptake and concentrations at times other than 6 hours</i>  <i>description</i> <b>P</b> has more iodine in thyroid <u>than in urine</u> / <b>Q</b> has less iodine in thyroid <u>than in urine</u> ; <b>P</b> has more iodine in thyroid <u>than Q</u> / <b>Q</b> has less iodine in thyroid <u>than P</u> ; <b>P</b> has less iodine in urine than <b>Q</b> / <b>Q</b> has more iodine in urine than <b>P</b> ; comparative figs to illustrate ;  <i>explanation</i> <b>P</b> has a more active thyroid / thyroid takes up iodine quickly / AW / ora ; <b>P</b> produces more thyroxine (than <b>Q</b> ) / <b>Q</b> produces less thyroxine (than <b>P</b> ) ; <b>P</b> uses much of iodine administered / <b>Q</b> uses much less of administered dose ; <b>Q</b> loses excess iodine in urine ;	5 max

- (d) (i) *points may be given if included in a description / diagram of a named homeostatic mechanism*

negative feedback system ;  
involves a receptor and an effector ;  
communication between them described ;  
maintains constant internal environment / AW ;  
any change from the norm is reversed by homeostatic mechanism / AW ;  
involuntary ;

**3 max**

- (ii) enzymes work best at optimum temperature ;  
if body temperature too low enzymes slow down ;  
if body temperature too high enzymes denatured / described ;  
body temperature has an effect on the, metabolic rate / rate of respiration ;  
ref to hypothermia / hyperthermia ;

**3 max**

**[Total: 15]**



Question	Expected Answers	Marks
4 (a)	<b>A</b> information from labelled genetic diagram	
D1	(sickle cell allele) is codominant ;	
D2	autosomal ;	
D3	homozygotes with two normal alleles / AW, have no sickle Hb / AW ;	
D4	heterozygotes have sickle cell <u>trait</u> ;	
D5	some erythrocytes express mutant Hb and some normal Hb ;	
D6	homozygotes, have two mutant alleles / produce mutant Hb ;	
D7	this <u>causes</u> sickle cell <u>disease</u> ;	
D8	two parents with sickle cell trait have 0.25 probability of having a child with sickle cell disease ;	
	5 max	
S1	mutant Hb molecules, stick together / form long fibres / form crystals ;	
S2	at low oxygen concentrations ;	
S3	erythrocytes with mutant Hb form sickle shape ;	
S4	block capillaries / sickle cell crisis ;	
S5	shortness of breath / poor oxygen carrying capacity ;	
S6	extreme pain ;	
S7	potentially fatal ;	
	5 max	8 max
	<b>QWC</b> - legible text with accurate spelling, punctuation and grammar ;	1
	<i>Candidates should have no more than <b>three</b> different spelling errors; sentences should be accurately punctuated according to spoken English and text should be legible.</i>	
(b) (i)	point / gene, mutation ; in the, allele / gene, coding for the beta chain of Hb ; base substitution ; DNA triplet GAG changed to GTG ; (amino acid) glutamate to valine ;	2 max
(c) (i)	<i>Plasmodium</i> cannot, cross / bind to, the cell surface membrane of a sickled cell ; <i>Plasmodium</i> cannot <u>metabolise</u> sickle cell Hb ; sickle cell Hb is a different shape to normal, Hb ; enzymes of <i>Plasmodium</i> , specific to normal Hb / may not fit sickle cell Hb ;	1 max
(ii)	normal homozygotes are likely to develop malaria / ora ; resulting in illness / death ; reduces the frequency of the normal allele in the population / AW ; heterozygotes have a selective advantage / AW / ora ; are less susceptible to malaria / do not die of sickle cell disease / AW ; more likely to survive to pass on sickle allele / AW ;	4 max
		[Total: 16]

Question	Expected Answers	Marks
5 (a)	intake of calcium (for bone structure) ; intake of vitamin D (necessary to absorb calcium) ; exercise regularly / described ; do not smoke ;	2 max
(b) (i)	X      quantity of synovial fluid decreases ; <u>synovial membrane</u> damaged ;	1 max
	Y      friction occurs between bone ends ; bone becomes rough ;	1 max
	Z      cartilage thins / breaks down / surface of cartilage roughened / AW ; changes occur in collagen / glycoproteins so collagen loses its flexibility / AW ; collagen replacement slows down ;	1 max
		3 max
(ii)	heavy use of joints / described e.g. impact sports ; injury to joint / named ; obesity ; multiple pregnancies ;	2 max
(c)	variable region ; is, <u>complementary</u> / <u>specific</u> , to ; <u>epitopes</u> / <u>antigens</u> , of the collagen ; mechanism described of how antibody destroys collagen ; the maturing lymphocytes that make autoimmune antibodies are not filtered out ;	3 max
(d)	non steroidal anti-inflammatory drugs / NSAIDs / named drug e.g. aspirin ; supports for the affected joint ; joint replacement surgery ; physiotherapy on the affected joints ;	2 max

- (e) (i) at menopause oestrogen concentration drops ;  
fractures increase as the oestrogen concentration drops ;  
oestrogen inhibits parathormone ;  
(parathormone) mobilises bone calcium / AW ;  
decrease in bone, density / mass ;  
osteoclasts more active / osteoblasts less active ;  
bones become more brittle ; **R soften**
- (ii) radius less dense ;  
radius narrower ;  
radius usually takes the impact of a fall ;  
radius not load-bearing ;

**3 max****1 max****[Total: 16]**

Question	Expected Answers	Marks
6 (a) (i)	indicates the variation around the mean / AW ; indicates reliability of the sample ; calculates spread of the means / AW ; indicates whether the samples overlap / AW ;	1 max
(ii)	less oxygen to, neurones / muscles (of jaw) ; less ATP produced for active transport ;  sodium / potassium, pump slows / AW ; necessary for action potential ; resting potential not restored ;  ATP necessary for transport of calcium ions ; ATP necessary to release the myosin head / AW ;	3 max
(iii)	individual variation / genetics / described ; maintaining fitness / described ; healthy diet / antioxidant intake ;	2 max
(b) (i)	<i>identical</i> monozygotic ; twins developed from a single, fertilised ovum / zygote ; they are, formed by mitosis / clones ; they are genetically identical ;	R refs to two sperm 2 max
	<i>non-identical</i> dizygotic ; developed from two fertilised ova ; fraternal twins ; no more identical than any sibling ;	2 max
		3 max
(ii)	if Fred is a monozygotic twin he has an increased chance of developing dementia ; the data suggest that genetics is not the only influence on developing dementia ; figs to support ; environmental factors / described ; Fred benefits by not living alone / AW ;	ora dizygotic 3 max
(iii)	exercise his brain regularly / named example e.g. crosswords ; take regular exercise ; maintain, a wide circle of friends / social activities ;	2 max
(c) (i)	identification from photographs of well-known people ; ask the patient to remember what was on a tray of objects ; other suitable cognitive test ;	1 max

- (ii) it is difficult to get drugs across the blood brain barrier ;  
a higher concentration of the drug is delivered to the brain ;  
in cerebrospinal fluid / CSF ;  
the drug is not, metabolised / broken down, elsewhere in the body ;

**2 max**

- (iii) ethical problem ;  
qualified ;

*e.g.*

the sample was too small to give a valid result  
may raise the hopes of, patients / carers, without foundation / AW

the result could be due to other causes / stimulation / placebo effect  
may not work on others

drug may have serious / unexpected side effects used in this way  
patient could suffer

new drugs take years to, be adequately tested / gain a licence  
may be too late for the patient

**2****[Total: 19]**

Question	Expected Answers	Marks
7 (a)	<p>diagnosis not reliable ;  only 60% with level above <math>10 \text{ ng cm}^{-3}</math> will have it / ora ;  level will depend on initial size of prostate / AW ;  prostate size varies between individuals ;  false positives ;  not cost effective ;</p>	3 max
(b)	<p>regular, mammograms / screening, in women most at risk / AW ; ora <i>for prostate</i>  publicity campaign (to raise awareness) greater for breast cancer ; ora  money raised for breast cancer research ; ora  women are more health conscious / ref to self checks / AW ; ora  treatment for breast cancer more effective ; ora</p> <p>men more likely to have issues regarding that area of their anatomy / AW ;  treatment may not be sought for prostate cancer / AW ;  prostate cancer, is slow growing / may spread before symptoms become obvious ;</p>	3 max
(c) (i)	<p><i>similarities</i>  large nuclear : cytoplasmic ratio ;  undifferentiated ;  can still divide ;  can migrate ;  controlled by chemical environment / AW ;</p> <p><i>differences A ora throughout</i>  stem cells, differentiate / become specialised ;  pluripotent ;  have controlled division ;  do not invade other tissues / AW ;  are not mutated ;</p>	2 max  2 max
(ii)	<p>stem cells may continue to divide ;  proto-oncogenes are continuously active ;  <u>increases</u> the risk of mutation ;  proto-oncogenes become oncogenes ;  lose control of cell division ;</p>	2 max
(d) (i)	<p>unspecialised / undifferentiated ;  <u>pluripotent</u> ; A multipotent  can develop into any, tissue / named tissue ;  no / reduced, rejection ;</p>	2 max
(ii)	<p>embryonic ;  (umbilical) cord blood ;  bone marrow ;  skin ;</p>	2 max

[Total: 16]

Paper Total: 120

# Grade Thresholds

Advanced GCE Human Biology (7886)  
Advanced Subsidiary GCE Human Biology (3886)  
January 2010 Examination Series

## Unit Threshold Marks

Unit		Maximum Mark	a	b	c	d	e	u
2866	Raw	90	66	58	51	44	37	0
	UMS	90	72	63	54	45	36	0
2867	Raw	120	84	74	64	54	44	0
	UMS	120	96	84	72	60	48	0

## Specification Aggregation Results

Overall threshold marks in UMS (ie 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	0.0	0.0	0.0	20.0	100.0	100.0	5
7886	0.0	12.0	36.0	72.0	92.0	100.0	25

## 30 candidates aggregated this series

For a description of how UMS marks are calculated see:

<http://www.ocr.org.uk/learners/ums/index.html>

Statistics are correct at the time of publication.

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

**OCR Customer Contact Centre**

**14 – 19 Qualifications (General)**

Telephone: 01223 553998

Facsimile: 01223 552627

Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

**[www.ocr.org.uk](http://www.ocr.org.uk)**

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**Telephone: 01223 552552**  
**Facsimile: 01223 552553**