

Human Biology

Advanced GCE

Unit **F225**: Genetics, Control and Ageing

Mark Scheme for January 2012

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations

Annotation	Meaning
	Correct answer
	Incorrect response
	Benefit of Doubt
	Not Benefit of Doubt
	Error Carried Forward
	Given mark
	Underline (for ambiguous/contradictory wording)
	Omission mark
	Ignore
	Correct response (for a QWC question)
	QWC* mark awarded
	Verbal Construction

*Quality of Written Communication

Question		Answer	Marks	Guidance
1	(a) (i)	speeds up conduction of nerve impulse ; (allow) saltatory conduction / impulse jumps from node to node ;	2	IGNORE references to sheath acting as an insulator as the question is about the function of the sheath in transmission Look for idea of speeding up <i>conduction</i> or <i>transmission</i> DO NOT CREDIT 'speeds up the action potential' ACCEPT phonetic spelling
	(ii)	present on preganglionic neurone ; absent on postganglionic neurone ;	2	"only present on preganglionic neurone" = 2 marks
	(iii)	Mark the first answer given on each prompt line. <i>similarity</i> both have cell body (in spinal cord) OR both synapse to / AW, effectors ; <i>difference</i> somatic motor neurone continuous between spinal cord and effector / AW OR autonomic in two parts / AW OR autonomic has ganglion OR somatic effectors are, skeletal / AW, muscles OR autonomic effectors are smooth muscle ;	2	If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks IGNORE reference to nodes of Ranvier and myelin sheath ACCEPT neuromuscular junction OR motor end plate DO NOT CREDIT idea that <i>neurone</i> is travelling to an effector ACCEPT reference to absence of ganglion DO NOT CREDIT reference to 'root ganglion' as neither neurone has a root ganglion

Question		Answer	Marks	Guidance
2	(a)	A – cornea ; B – sclera ; C – lens ;	3	IGNORE conjunctiva ACCEPT phonetic spelling
	(b)	(i) sudden onset / AW OR angle becomes smaller ;	1	ACCEPT idea of a short term condition DO NOT CREDIT an angle less than 90° since this is not in the context of acute glaucoma
		(ii) reduces field of vision / reduces peripheral vision / AW ; (leading to) tunnel vision ; circles / AW, seen around lights ; misty vision ;	2 max	IGNORE ref to blindness (as given in question) ACCEPT idea of blurred vision
	(c)	(i) <i>in developed countries</i> more blindness due to diabetes <u>and</u> AMD ; less blindness due to cataracts ; (% of) glaucoma blindness is, similar / not significantly different / slightly higher ; data quote with units (%) in support of one statement ; <i>in developing</i> LEDCS, there must be other (major) causes of blindness ; these conditions account for, only 67%, two thirds, of cases of blindness ;	4	CREDIT reverse argument for economically developing countries DO NOT CREDIT 'glaucoma is higher' unqualified as the difference (3%) is much smaller than other differences Look for two countries and two percentage figures OR a calculated difference

Question	Answer	Marks	Guidance
	<p>(ii) developed countries have higher standard of health care / AW ; access to regular screening / eye checks ; cataract operations are, easily carried out / AW ; less use of eye protection / more exposure ;</p>	2	<p>ACCEPT idea that fewer people will be wearing sunglasses or working in offices or indoors</p>

Question	Answer	Marks	Guidance
	<p>(iii) <i>Yes it does support the statement:</i></p> <p><i>evidence from table</i> higher percentage in developed countries OR named example ;</p> <p><i>reason</i> high intake of, fatty / processed / sugary, foods OR lack of exercise / AW OR obesity ;</p> <p><i>No it does not support the statement:</i></p> <p>do not know if it is Type 1 or 2 diabetes / figures not given for Type 1 and Type 2 ;</p>	2	<p>CREDIT reverse argument for developing eg data quote</p> <p>DO NOT CREDIT 'poor diet' unqualified</p>
	<p>(iv) (in Africa), lifespan shorter / people die younger ;</p> <p>in Africa more likely to die from, (named) infectious diseases / malnutrition ;</p> <p>AMD difficult to diagnose / regular eye checks required ;</p> <p>insufficient resources to detect AMD ;</p> <p>genetic difference leading to, advantageous phenotype / description of phenotype ;</p>	2 max	
	Total	16	

Question		Answer	Marks	Guidance
3	(a)	<p><i>identity</i> male ; (with) Down's syndrome ;</p> <p><i>reason</i> X and Y (sex) chromosomes ; 3 copies of chromosome <u>21</u> / trisomy <u>21</u> ;</p>	4	<p>DO NOT CREDIT reference to <i>this</i> karyotype of Down's being due to translocation</p>
	(b)	<p>Mark the first 3 answers only</p> <p>D ; F ; G ;</p>	3	ACCEPT letters in any order

Question	Answer	Marks	Guidance
(c)	<p><i>ethical</i></p> <p>E1 enables child to lead a normal life / in child's best interest ;</p> <p>E2 (so) child is not discriminated against ;</p> <p>E3 oestrogen, enables secondary sex characteristics to develop ;</p> <p>E4 (oestrogen) reduces risk of, osteoporosis / CHD ;</p> <p>E5 HGH enables child to reach normal (adult) height ;</p> <p><i>unethical</i></p> <p>U1 idea that child is not given a choice (for HGH) ;</p> <p>U2 treatment could be, uncomfortable / unpleasant / AW ;</p> <p>U3 idea that people should be accepted as they are ;</p> <p>U4 long term treatment with oestrogen could increase risk of cancer ;</p>	5 max	<p>E1 and E2 are general marks and not linked to either hormone</p> <p>U2 ACCEPT example eg 'injections can hurt' or 'treatment interferes with normal life' or has 'unpleasant side effects'</p> <p>U3 ACCEPT reverse argument eg implies that everyone should be perfect</p>
	QWC ;	1	Award if candidate has scored at least 2 E and 2 U marks

Question		Answer	Marks	Guidance
	(d)	(i)	Mark the first answer centromere ;	1 If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks
		(ii)	<i>idea that</i> different <u>genes</u> on different parts of the chromosome ; phenotype due to expression of, genes/genotype/alleles ;	2 DO NOT CREDIT 'alleles'
	(e)	(i)	Award 1 mark per correct line 1 XY ; 2 X and Xp X and Y ; 3 XXp XX ; 4 female Turner's normal female ;	4 DO NOT CREDIT XYq or XYp Line 3 ACCEPT in any order DO NOT CREDIT if male genotypes included Line 4 ONLY CREDIT female phenotypes that are linked to the correct genotype IGNORE male phenotypes
		(ii)	males have only one X chromosome ; XpY genotype not viable / AW ; Xp(Y) is missing (essential) genes ;	2 max ACCEPT idea that males will either be XpY or XY
			Total	22

Question			Answer	Marks	Guidance
4	(a)	(i)	B A E D C ; ; ;	3	If order is incorrect B at beginning and C at end = 1 mark A followed by E (anywhere in the sequence) = 1 mark E followed by D (anywhere in the sequence) = 1 mark
		(ii)	Mark the first answer. (DNA) ligase ;	1	If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks
		(iii)	so AAT <u>only</u> produced in, mammary gland cells / AW OR so AAT not produced in other tissues ; AAT easily purified from milk ; AVP ;	1 max	DO NOT CREDIT 'so AAT is produced in mammary gland cells' as this is given in the question DO NOT CREDIT 'so AAT is found in milk' as this is given in the question DO NOT CREDIT 'so AAT is produced in milk' Look for the idea that the AAT is <i>ONLY</i> being produced in milk (and not in any other tissue) eg do not have to kill sheep to obtain AAT OR idea that AAT can be produced continuously
		(iv)	Mark the first 2 answers oxytocin ; prolactin ;	2	ACCEPT in either order

Question		Answer	Marks	Guidance
	(b)	<p>1) (this is) reproductive cloning ;</p> <p>2) illegal / AW (in UK) ;</p> <p>3) could lead to eugenics / AW ;</p> <p>4) technique not tried on humans / AW ;</p> <p>5) could lead to named problem ;</p> <p>6) other options available (to parents) ;</p> <p>7) specific named example ;</p> <p>8) AVP ;</p>	3 max	<p>1 ACCEPT germ line therapy or description (eg that the gene introduced will be passed on)</p> <p>3 ACCEPT idea of 'designer babies'</p> <p>4 ACCEPT idea of new technology/not tried and tested</p> <p>5 eg mutations high failure rate in pregnancy</p> <p>7 eg IVF using donor sperm or egg pre-implantation screening adoption</p> <p>8 eg parents are only carriers they could have a normal child</p> <p>IGNORE references to stem cells or embryonic stem cells</p>
	(c)	(i) <p>Mark the first answer on each prompt line</p> <p><i>pulmonary emphysema</i> smoking ; cystic fibrosis ;</p> <p><i>liver cirrhosis</i> drinking too much alcohol / alcohol abuse / AW OR hepatitis OR cystic fibrosis ;</p>	2	<p>If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>DO NOT CREDIT if cause linked to wrong condition</p> <p>DO NOT CREDIT 'drinking alcohol' or 'drinking' without qualification</p>

Question	Answer	Marks	Guidance
	<p>(ii) <i>genetic engineering non-human organs</i></p> <p>1) 'foreign' / non-self, tissue will be rejected by the body ;</p> <p>2) genetic modification to prevent (immune) rejection ;</p> <p>3) (due to) antigens / AW, on cell surface membranes (of donated organs) ;</p> <p>4) modifying / silencing, genes for antigen (expression) ;</p> <p>5) example, specific gene ;</p> <p>6) fewer / weaker, antigens present (on cell surface membranes) ;</p> <p><i>objections</i></p> <p>7) may involve unethical treatment of animals / AW ;</p> <p>8) may lead to virus transfer to humans / AW ;</p> <p>9) (may hold) specific objections on religious grounds / AW ;</p> <p>10) (idea of) turning animals into a commodity ;</p> <p>11) AVP ;</p>	<p>7 max</p>	<p>1 ACCEPT idea that a tissue match is necessary for a transplant organ</p> <p>3 ACCEPT idea of glycoproteins or proteins</p> <p>5 eg galactosyl transferase gene</p> <p>8 ACCEPT idea of disease spread from animals to humans</p> <p>eg a detail such as introducing human genes into animal stem cells</p> <p>DO NOT CREDIT references to <i>HUMAN</i> stem cells</p>
	<p>Total</p>	<p>19</p>	

Question			Answer	Marks	Guidance
5	(a)	(i)	has a, healing / beneficial, effect ;	1	IGNORE 'pain killer' or 'sedative' or explanations of these terms as these are given in the stem IGNORE 'does not cure'
		(ii)	multiple sclerosis / MS ; cancer / named cancer ; Parkinson's disease ; arthritis ; cystic fibrosis; migraine ; glaucoma ; Alzheimer's ; AVP ;	2 max	 eg ME (myalgic encephalomyelitis), insomnia
	(b)	(i)	R = 85 <u>hours</u> ; S = 45 hours ;	2	Penalise omission of units once only
		(ii)	(by) ultrafiltration ; from, glomerulus / capillaries ; into Bowman's / renal, capsule ; forced out by, high hydrostatic pressure / AW ; not (all) reabsorbed / remains in kidney tubule ; passes (out) into, collecting duct / ureter / bladder ;	4 max	DO NOT CREDIT 'ultrafiltration' if given as part of a list with 'selective reabsorption'

Question		Answer	Marks	Guidance
	(iii)	<p><i>idea that drinking too much / more water in urine, lowers concentration ;</i></p> <p>dehydration / less water in urine, raises concentration ;</p> <p>variation in ADH levels ;</p> <p>AVP ;</p>	2 max	
(c)	(i)	<p>THC levels in, blood / brain, produce intoxication ;</p> <p>THC carboxylic acid, is inert / not active ingredient/AW ;</p> <p>THC carboxylic acid appears in urine after (high levels of) THC in blood ;</p> <p>metabolism varies (in different people) / rate of breakdown varies ;</p> <p>AVP ;</p>	2 max	<p>ACCEPT 'the drug' for THC</p> <p>eg breakdown products can be, stored / released over time</p>

Question		Answer	Marks	Guidance
	(ii)	<p>talkative / cheerful ;</p> <p>not aware of, time / surroundings / disoriented ;</p> <p>hallucinations / described ;</p> <p>anxiety / depression / paranoia ;</p> <p>dilated pupils ;</p> <p>relaxed / slow reaction times ;</p>	2 max	<p>The question is about the symptoms of cannabis intoxication rather than the after effects of cannabis use</p> <p>ACCEPT 'chilled out'</p> <p>ACCEPT 'spaced out'</p> <p>ACCEPT 'increased awareness of sounds / vision'</p> <p>IGNORE nausea, red eye, dry mouth</p>
Total			15	

Question		Answer	Marks	Guidance												
6	(a)	drop / fall, in <u>core</u> body temperature ; (to) below 35°C ;	2	temperature must have units												
	(b)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;"><i>symptom</i></th> <th style="text-align: center;"><i>moderate hypothermia</i></th> <th style="text-align: center;"><i>severe hypothermia</i></th> </tr> </thead> <tbody> <tr> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> </tr> <tr> <td style="background-color: #cccccc;"></td> <td style="text-align: center;">violent/AW, shivering</td> <td style="text-align: center;">shivering stops ;</td> </tr> <tr> <td style="background-color: #cccccc;"></td> <td style="text-align: center;">slow/shallow, breathing</td> <td style="text-align: center;">little/no, (obvious) breathing ;</td> </tr> </tbody> </table>	<i>symptom</i>	<i>moderate hypothermia</i>	<i>severe hypothermia</i>					violent/AW, shivering	shivering stops ;		slow/shallow, breathing	little/no, (obvious) breathing ;	2	CREDIT 1 mark for each correct row
<i>symptom</i>	<i>moderate hypothermia</i>	<i>severe hypothermia</i>														
	violent/AW, shivering	shivering stops ;														
	slow/shallow, breathing	little/no, (obvious) breathing ;														
	(c) (i)	24 631 ; ;	2	If answer is incorrect or given to the incorrect number of decimal places, ALLOW 1 mark for $36\,700 \div 1.49$ OR $(36\,700 \div 149) \times 100$												

Question		Answer	Marks	Guidance
7	(a)	<p>Mark the first answer on each prompt line</p> <p>progesterone/progestin ; oestrogen ;</p>	2	<p>If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT phonetic spelling</p>
	(b)	<p>Mark the first answer in each box</p> <p>R ; P ; Q ;</p>	3	<p>If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p>
Total			5	

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