OCR
Oxford Cambridge and RSA

GCE

Human Biology

Unit **F224:** Energy, Reproduction and Populations

Advanced GCE

Mark Scheme for June 2015

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Question			Answer	Mark	Guidance
1	(a)	(i)	vas deferens ;	1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks** **ACCEPT** phonetic spelling **IGNORE** sperm duct
		(ii)	*idea of* more fluid in semen / less fluid in epididymis ; from (secretions of), seminal vesicles / prostate (gland) ;	2	**IGNORE** references to 'dilution' **ACCEPT** alternative terms for fluid e.g. liquid
	(b)	(i)	*IVF* in vitro fertilisation **AND** *ICSI* intracytoplasmic sperm injection ;	1	**BOTH** responses required for one mark **ACCEPT** phonetic spelling **DO NOT CREDIT** '**inter**cytoplasmic sperm injection'
		(ii)	(For all types of sperm) sperm directly injected into, (secondary) oocyte, in ICSI ; *idea that* (for SSR sperm) sperm have not fully matured / AW ;	1	**ACCEPT** a description e.g. sperm may not be fully motile acrosome may not be fully functional

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>(coloured bead to) constant
AND
(HCG to) variable ;</td><td>1</td><td>BOTH responses required for one mark</td></tr>
<tr><td></td><td></td><td>(ii)</td><td><table><tr><th>Test strip</th><th>Conclusion</th></tr><tr><td>W</td><td>not pregnant</td></tr><tr><td>X</td><td>pregnant</td></tr><tr><td>Y</td><td>result not valid / AW</td></tr><tr><td>Z</td><td>result not valid / AW</td></tr></table>; ;</td><td>2</td><td>Mark the first answer in each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer = 0 marks

4 correct = 2 marks
3 correct = 1 mark

ACCEPT ‘inconclusive’ for ‘result not valid’
IGNORE ‘not clear’</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>8</td><td></td></tr>
</table>

Question			Answer	Mark	Guidance
2	(a)	(i)	*idea that* reduces, (risk/cases/ AW, of) atherosclerosis / atheroma (s) **;** *idea that* reduces,(risk/cases, of,) coronary heart disease / heart attacks **;**	2	*The question refers to the effect of blood cholesterol not exercise on the cardiovascular system.* **ACCEPT** a description e.g. less plaque, or less fatty deposit **in** artery walls **DO NOT CREDIT** 'less ON artery wall or IN artery' **DO NOT CREDIT** idea that atherosclerosis causes high blood pressure **ACCEPT** a description e.g. prevents CHD / MI / Angina **IGNORE** heart disease unqualified, **IGNORE** ref to strokes as the question is about benefits to the cardiovascular system
		(ii)	stronger bones / increased bone density / maintains bone density **;** thicker joint cartilage **;**	Max 1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks** **CREDIT** reduction in risk of osteoporosis **IGNORE** ref to muscles / tendon / ligament

Question			Answer	Mark	Guidance
	(b)	(i)	*organelle* mitochondrion **;** *stage in aerobic respiration* oxidative phosphorylation **;**	2	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks** **ACCEPT** mitochondria **IGNORE** ref to matrix or cristae **IGNORE** electron transport chain / chemiosmosis
		(ii)	*idea that* RhEPO increases production of, erythrocytes / red blood cells / more haemoglobin **;** Increased oxygen, transport / carrying capacity / AW **;**	2	

Question			Answer	Mark	Guidance
	(c)	(i)	**1** *idea of* type of exercise **;** **2** *idea of* intensity of exercise **;** **3** *idea of* gender **;** **4** *idea of* age **;** **5** AVP **;**	1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks** **DO NOT CREDIT** reference to fitness levels as the graph looks at *changes* in fitness **1 ACCEPT** examples e.g. should always, run / jog / swim **2 ACCEPT** example – e.g. always run at same speed **IGNORE** ref to 'level' of exercise / ref to 'amount' **5** e.g. altitude racial mix in each group all non smokers all non-asthmatics **IGNORE** references to weight, diet, health (unqualified)
		(ii)	62.5 **OR** 63 **; ;**	2	**Correct answer = 2 marks** If answer is incorrect, then award **1 mark** for seeing 6.5 – 4 **or** 2.5

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td></td><td></td><td>(iii)</td><td>idea that comparable increases in VO_2 max can be achieved by either
increases in frequency or duration ;

correct data quote ;</td><td>2</td><td>
<table>
<tr><td>Frequency / Days (per week)</td><td>No training (0)</td><td>1</td><td>3</td><td>5</td></tr>
<tr><td>$cm^3kg^{-1}min^{-1}$</td><td>-1.5</td><td>3.7</td><td>5.5</td><td>7.0</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>Duration (min)</td><td>No training (0)</td><td>15</td><td>30</td><td>45</td></tr>
<tr><td>$cm^3kg^{-1}min^{-1}$</td><td>-0.5</td><td>4.0</td><td>6.5</td><td>7.2</td></tr>
</table>
LOOK FOR
one figure for duration (minutes)
and
one figure for frequency (days)
and
VO_2 max figure(s) with correct units ($cm^3\ kg^{-1}min^{-1}$)</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>12</td><td></td></tr>
</table>

Question			Answer	Mark	Guidance
3	(a)		*Rhizobium* / *Azotobacter* **;**	1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks** **ACCEPT** phonetic spelling
	(b)	(i)	amino acid(s) **;**	1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks** **ALLOW** iron **IGNORE** mineral unqualified (as given in question)
		(ii)	(Vitamin) B3 / nicotinamide **;**	1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks**
		(iii)	antioxidant(s) / vitamin C **;**	1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks**
		(iv)	(Vitamin) B9 / folate / folic acid **;**	1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks**

Question	Answer	Mark	Guidance
(c)	***Up to 3 marks for mark points 1 - 5***		
	1 *idea that* **carbon dioxide** / CO_2, is combined with **,** **ribulose bisphosphate /** RuBP **;**		**1. ACCEPT** carbon is fixed OR RuBP is carboxylated
	2 by **enzyme** **ribulose bisphosphate carboxylase /** Rubisco **;**		
	3 *idea that* two 3 carbon compounds are formed from a, 5+1 / 6 **,** carbon compound **;**		
	4 **glycerate phosphate /** GP, is converted to **triose phosphate /** TP **;**		
	5 using, reduced NADP and ATP **;**	Max 3	**5 ACCEPT** NADPH / NADPH + H^+ / $NADPH_2$ / red NADP
	6 **triose phosphate /** TP, is converted to lipids **;**	1	**AWARD** using a **tick** and '**GM**' annotation
	QWC – use of 3 terms in correct context and with correct spelling **;**	1	**DO NOT CREDIT** abbreviations for QWC mark **DO NOT CREDIT** if terms used in incorrect context Use 3 terms from: **carbon dioxide** **ribulose bisphosphate** **enzyme** **ribulose bisphosphate carboxylase** **glycerate phosphate** **triose phosphate** Use a **GREEN DOT** to identify where a term has been credited. Insert a tick **(✓)** against the pencil icon if the **QWC** is awarded and a cross **(x)** if not.

Question			Answer	Mark	Guidance
3	(d)		*idea that* a larger human population could be supported **;** *when eating Spirulina directly* *idea of* humans as primary consumers / AW **OR** energy lost in transfer (from cattle to humans) **;** minerals / vitamins, lost (as retained in parts of cattle not eaten) **;**	2	**CREDIT** reverse argument for humans eating cattle fed on *Spirulina* **IGNORE** 'nutrients'
			Total	**12**	

Question			Answer	Mark	Guidance
4	(a)	(i)	J / oogonium **AND** K / primary spermatocyte **AND** M / sertoli cell **;**	1	All three required for one mark
		(ii)	J / oogonium **;**	1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks**
		(iii)	L / secondary oocyte **;**	1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks**
	(b)	(i)	**1** FSH and /or LH cannot, cross / AW, membrane **OR** oestrogen can cross the , membrane / phospholipid bilayer **;** **2** (because) oestrogen is lipid soluble **OR** FSH and /or LH are not lipid soluble **;** **3** membrane / bilayer **,** is hydrophobic **;**	2	**CREDIT** 'glycoproteins' for FSH and LH and 'steroids' for oestrogen throughout **1.DO NOT CREDIT** reference to molecular size **2. CREDIT** idea that molecule is lipid – like or hydrophobic **ACCEPT** non-polar / hydrophobic (for lipid soluble) and polar / hydrophilic (for not lipid soluble) **3**. **ACCEPT** reference to hydrophobic core (of membrane)
		(ii)	(anterior) pituitary gland **;**	1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks**

<table>
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<tr><td></td><td>(c)</td><td>(i)</td><td>
<table>
<tr><th>Letter</th><th>Name</th></tr>
<tr><td>Molecule A</td><td>messenger RNA /mRNA ;</td></tr>
<tr><td>Organelle B</td><td>ribosome / rough ER / rough endoplasmic reticulum / RER ;</td></tr>
<tr><td>Organelle C</td><td>Golgi (apparatus / body) vesicle ;</td></tr>
</table>
</td><td>3</td><td>Mark the first answer in each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer = 0 marks

IGNORE ‘RNA’ alone</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>(cell in) primary / Graafian, follicle
OR
(in) ovary ;

because
(these cells) detect a, rise / surge in, LH concentrations
OR
(follicle) responds to (increased) LH by releasing (secondary) oocyte ;</td><td>2</td><td>DO NOT CREDIT follicle unqualified

CREDIT ovarian follicle

Needs to include idea of increased LH

ACCEPT answers which refers to male tissues
e.g.
Leydig cells / interstitial cells /testis/testes for mp 1
AND
(testes) respond to (increased) LH by releasing testosterone for mp 2</td></tr>
</table>

Question			Answer	Mark	Guidance
	(d)		(stimulates / causes DNA) replication / AW **OR** *idea of* switching on genes **;** *idea that* so, mitosis / cell division / AW can occur **;**	2	**CREDIT** a description **ACCEPT** cell numbers increase **IGNORE** references to thickening of endometrium
			Total	**13**	

Question			Answer	Mark	Guidance
5	(a)		*idea that* all households have to respond (to Census) **OR** *idea that* registration of births and deaths is, compulsory / AW **;**	1	**ACCEPT** idea that it is illegal to provide false information
	(b)		*idea that* number of 30 – 39 year olds is, significantly greater / AW, than decades either side **;** data quote in support **;**	2	Candidates must compare this decade with the decades either side for this mark. **ACCEPT** 'number is largest' or 'numbers peak' **LOOK FOR** numbers of males **and** numbers of females **plus** units males 4 million, females 4.1 million (+ / - 0.2 million)
	(c)	(i)	the number of women of reproductive age / AW **OR** *idea of* number of fertile women in the population **;**	1	**ACCEPT** a reference to a specific fertile age to e.g.20 year olds, 20 – 30 year olds **ACCEPT** reference to number of women using contraception
		(ii)	*idea of* lower infant mortality **;** *idea of* longer life expectancy **;** *reason* improvements in health care / suitable example. (vaccination / antenatal care / antibiotics / surgery) **;** improvements in food production / intensive farming **;** reference to immigration **;**	2	

Question			Answer	Mark	Guidance
	(d)	(i)	*idea of* immigration (of people this age) **;**	1	
		(ii)	*effect* increase in number of children aged 0 – 9 **;** *reason* 20 – 29 year olds are having children **;** **OR** *effect* increase in number of older people aged, 40 – 49 / 50 – 59 / 60 – 69 / 70 - 79 **;** *reason* immigrants bring older family members with them **OR** immigrants / (20 – 29 year old) people, in health profession improving health of elderly people **;**	2	
			Total	**9**	

Question			Answer	Mark	Guidance
6	(a)	(i)	carbon dioxide / CO_2 **;**	1	**Mark the first answer on each prompt line**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks**
		(ii)	<u>ethanol</u> **;**	1	**Mark the first answer on each prompt line**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks**
	(b)	(i)	**triose phosphate** is, **oxidised** to pyruvate **OR** **triose phosphate** is **dehydrogenated** to produce pyruvate **OR** **triose phosphate** is converted to pyruvate (by a series of steps) producing / AW, reduced NAD **;** (during these steps) ATP is produced by **substrate level phosphorylation ;**	2	**ACCEPT** NADH / NADH + H^+ / $NADH_2$ / red NAD **ACCEPT** 'ATP produced directly' **IGNORE** ATP production unqualified
			QWC ;	1	**DO NOT CREDIT** abbreviations for QWC mark **DO NOT CREDIT** if terms used in incorrect context e.g. 'pyruvate converted to triose phosphate' Use 3 terms from: **triose phosphate** **<u>dehydrogen</u>**ated/ase **oxidised** **substrate level phosphorylation** Use a **GREEN DOT** to identify where a term has been credited. Insert a tick **(✓)** against the pencil icon if the **QWC** is awarded and a cross **(x)** if not.

Question			Answer	Mark	Guidance
6	(b)	(ii)	DNA replication **;** RNA synthesis **;**	1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer **= 0 marks** **CREDIT** transcription **DO NOT CREDIT** protein synthesis / translation
			Total	**6**	

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