OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE

Unit **F214:** Communication, Homeostasis & Energy

Mark Scheme for January 2011

Oxford Cambridge and RSA Examinations

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Question	Expected Answers	Marks	Additional Guidance
1 (a)	***Award 1 mark per correct row***		**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 then = **0 marks** **ACCEPT** phonetic spelling **except for** ethanal and ethanol
	name of hydrogen acceptor after glycolysis: mammal – pyruvate; yeast – ethanal ;		**ACCEPT** pyruvic acid (instead of pyruvate) **ACCEPT** acetaldehyde (instead of ethanal) **IGNORE** formulae The spelling of ethanal must be unambiguous
	is CO_2 produced?: mammal – no / ✗ / none / no molecules; yeast – yes / ✓ / some / one molecule ;		**ACCEPT** 2 molecules for yeast (from 1 glucose molecule)
	name of final product: mammal – lactate; yeast – ethanol ;	3	**ACCEPT** lactic acid (instead of lactate) **ACCEPT** ethyl alcohol (instead of ethanol) **IGNORE** alcohol **IGNORE** formulae The spelling of ethanol must be unambiguous

Question			Expected Answers		Marks	Additional Guidance
1	(b)					**IGNORE** ref to specific metabolic reactions other than glycolysis (mp 3) **IGNORE** ref to respiration without oxygen
			1	*idea that* ATP produced / energy released **;**		***1*** **DO NOT CREDIT** this mark point with any ref to energy , generated / produced / made [eg energy made in the form of ATP = 0 ATP (energy) is produced = 0]
			2	*idea that* recycles NAD / NAD can be used again **;**		***2*** **ACCEPT** 'reoxidises red NAD' (as implies recycling) **CREDIT** NADH / $NADH^+$ / $NADH_2$ for red NAD **DO NOT CREDIT** 'oxidises red NAD' without further qualification
			3	allows **, glyco**lysis / description of glycolysis **,** to take place / to continue **;**	**1 max**	***3*** If glycolysis used as a term, the spelling of 'glyco' must be correct.
				TOTAL	**4**	

Question			Expected Answers		Marks	Additional Guidance	
2	(a)	(i)	1	structure A / Schwann cell / it , produces **myelin** ;		*1*	Needs the idea of production rather than simply stating 'it is a myelin sheath'
			2	(electrical) insulation / insulates ;		*2*	**CREDIT** insulate or derived term. **IGNORE** impermeable **DO NOT CREDIT** *idea of* thermal insulation
			3	prevents movement of ions , into / out of , neurone / axon ***or*** prevents **depolaris**ation ;		*3*	**CREDIT** 'across membrane' instead of , in / out, of axon **IGNORE** ion exchange **IGNORE** impermeable **DO NOT CREDIT** ions moving , into / out of , membrane **DO NOT CREDIT** movement of ions without qualification
			4	speeds up , **conduct**ion / transmission / passage , of , **impulse** / action potential ;		*4*	Statement must be comparative eg faster **DO NOT CREDIT** message / signal / wave of depolarisation
			5	**action potential**s / **local circuit**s / depolarisation / only occur at , gaps / **node**s (of Ranvier) ;		*5*	**ACCEPT** longer local circuits **ACCEPT** 'local currents' instead of local circuits
			6	**saltatory** conduction / described ;	3 max	*6*	eg • impulse jumps from , node to node / gap to gap **Note:** 'saltatory conduction' = 2 QWC terms
			QWC – technical terms used appropriately with correct spelling ;		**1**	Correct use and spelling of 3 terms from: **myelin, depolarisation (or other derived term),** **impulse, conduct (or other derived term),** **action potential, local circuit,** **node, saltatory** **You should use the GREEN DOT to identify the QWC terms that you are crediting.** **Please insert a QWC symbol next to the PENCIL ICON, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded**	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(ii)	exocytosis ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** bulk transport
2	(a)	(iii)	diffusion ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** facilitated diffusion
2	(a)	(iv)	**1** *idea that only* the presynaptic neurone , produces / releases / contains , acetylcholine / ACh / (neuro)transmitter ; **2** only the presynaptic membrane has , $Ca^{(2+)}$ / calcium (ion) , channels ; **3** *idea that only* the postsynaptic , membrane / neurone , has (ACh) receptors ; **4** ACh broken down at postsynaptic membrane ;	1 max	**IGNORE** ref to refractory period (as not a feature of synapse) **ACCEPT** ACH / ach throughout ***1*** **CREDIT** knob / terminal bouton / bulb (instead of neurone) ***2*** ***3*** **DO NOT CREDIT** ref to bouton / bulb / etc ***4*** **IGNORE** ref to (acetyl)cholinesterase without ref to action at postsynaptic membrane

Question			Expected Answers		Marks	Additional Guidance	
2	(b)	(i)				**IGNORE** ref to atropine and ACh having similar shapes (as given in Q) **ACCEPT** ACH / ach throughout **Only credit ORA for the mark points if candidate clearly states that these events do <u>NOT</u> take place with atropine.**	
			1	*idea that* atropine **,** binds to / occupies / competes for **,** (ACh) <u>receptor</u> on postsynaptic **,** membrane / neurone **;**		***1***	**IGNORE** ref inhibition **DO NOT CREDIT** active site **DO NOT CREDIT** ref to bouton / bulb / etc
			2	*idea that* prevents ACh binding / blocks binding site / blocks receptor **;**		***2***	
			3	ion gates / ion channels / sodium channels / protein channels **,** do not open / remain closed **;**		***3***	**CREDIT** fewer ion channels open
			4	Na^+ cannot enter / K^+ cannot leave **,** neurone / (nerve) cell **;**		***4***	**CREDIT** sodium ions / potassium ions **DO NOT CREDIT** Na / K **DO NOT CREDIT** ions entering the membrane
			5	no / insufficient **,** depolarisation / postsynaptic potential / excitatory postsynaptic potential / epsp / generator potential **;**		***5***	**IGNORE** action potential (as given in Q)
			6	(so) does not reach threshold (value / potential) **;**	**3 max**	***6***	

Question			Expected Answers		Marks	Additional Guidance	
2	(b)	(ii)				**ACCEPT** ACH / ach throughout	
			1	*idea that* will **,** bind to / occupy / compete for / block **,** (some of ACh) receptors **;**		***1***	**DO NOT CREDIT** ref to active site
			2	*so* acetylcholine / ACh **,** cannot bind / less likely to bind (to receptor / to postsynaptic membrane) **;**		***2***	**ACCEPT** *idea that* ACh remains in synaptic cleft
			3	prevents / reduces **,** constant stimulation / overstimulation / constant depolarisation **,** of postsynaptic neurone **or** prevents / reduces **,** constant firing of action potentials / tetanus / (muscle) spasm **;**		***3***	
			4	AVP **;**		***4***	eg • effective if administered soon after exposure • cannot counteract inhibition of acetylcholinesterase
					2 max		
				TOTAL	**12**		

Question				Expected Answers	Marks	Additional Guidance	
3	(a)	(i)				**Mark the first answer for each letter.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**	
			W	**glycol**ysis ;		***W***	**CREDIT** glycolytic pathway **ACCEPT** phonetic spelling but must have 'glycol' **IGNORE** respiration
			X	Calvin cycle / light-independent stage (of photosynthesis) ;		***X***	**IGNORE** dark reaction / photosynthesis **ACCEPT** phonetic spelling
			Y	Krebs cycle ;		***Y***	**ACCEPT** citric acid cycle / TCA cycle / (tri)carboxylic acid cycle **ACCEPT** phonetic spelling **IGNORE** respiration / link reaction
					3		
3	(a)	(ii)	**1**	take place in different **,** parts / organelles **,** of the cell **or** compartmentalisation / reactions separated by membranes ;		***1***	Must be a clear statement and not implied from others. **DO NOT CREDIT** different parts of the leaf **DO NOT CREDIT** no interference between pathways (as rephrasing the Q)
			2	W / glycolysis **,** in cytoplasm ;		***2***	
			3	X / Calvin cycle **,** in **,** chloroplast / stroma (of chloroplast) ;		***3***	**DO NOT CREDIT** if thylakoid / membranes stated or implied
			4	Y / Krebs cycle **,** in **,** mitochondrion / matrix (of mitochondrion) ;		***4***	**DO NOT CREDIT** if cristae / membranes stated or implied
			5	AVP ;		***5***	eg • different enzymes for each pathway • different conditions for each pathway
					3 max		

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(iii)	X ; W **and** Y ;	**2**	**IGNORE** names. The question has asked for letters. *photosynthesis* **Mark the first answer.** If the answer is correct and an additional letter is given then = **0 marks** *aerobic respiration* **Mark the first two answers.** If these answers are correct and an additional letter (ie 3rd etc) is given then = **0 marks** **Both letters required for this mark, in any order.**
3	(a)	(iv)	ATP / adenosine triphosphate ; water / H_2O ; (oxidised) NAD / FAD ;	**2**	**If any answer(s) incorrect then Max 1** **IGNORE** energy / heat **IGNORE** numbers eg oxygen (×) and ATP (✓) and water = max 1 oxygen (×) and energy (*ignore*) = 0 ATP (✓) and energy (*ignore*) and H_2O (✓) = 2 reduced NAD (×) and ATP (✓) and energy (*ignore*) and H_2O = max 1

Question				Expected Answers	Marks		Additional Guidance
3	(b)		1	NAD / FAD / NADP , can , accept hydrogen / accept H / be reduced ;		*1*	**DO NOT CREDIT** hydrogen ions / protons , unless there is an electron as well **DO NOT CREDIT** accepts hydrogen molecules / H_2 **CREDIT** equation showing the reduction **ACCEPT** eg NAD converted to NADH **IGNORE** 'carries hydrogen'
			2	reduced , NAD / FAD , supplies / carries , electrons , to the electron transport chain / for oxidative phosphorylation ;		*2*	Must refer to *reduced* NAD **or** *reduced* FAD **or** NADH / $NADH^+$ / $NADH_2$ / FADH / $FADH^+$ / $FADH_2$
			3	reduced , NAD / FAD , supplies / carries , hydrogen ions for , chemiosmosis / oxidative phosphorylation ;		*3*	Must refer to *reduced* NAD **or** *reduced* FAD **or** NADH / $NADH^+$ / $NADH_2$ / FADH / $FADH^+$ / $FADH_2$
			4	reduced NADP , supplies / carries , hydrogen to , light independent stage / Calvin cycle / X ;		*4*	Must refer to *reduced* NADP **or** NADPH / $NADPH^+$ / $NADPH_2$
			5	coenzyme A / CoA , carries , acetate / ethanoate / acetyl group , to , Krebs cycle / Y ;		*5*	**DO NOT CREDIT** acetyl CoA carries acetate
			6	AVP ;		*6*	eg • co-enzyme(s) / cytochrome(s) , transfer / accept and release , electrons along the electron transport chain • can be , recycled / oxidised **and** reduced
					3 max		
				TOTAL	**13**		

Question			Expected Answers		Marks	Additional Guidance
4	(a)		1	water potential / Ψ , of plasma / outside cells , would be higher than that of the (blood) cells ;	2 max	*1* Must be a clear comparative statement relating to outside and inside cells **CREDIT** ora **IGNORE** water concentration *2* **IGNORE** osmosis / down water potential gradient *3* **CREDIT** haemolysis / haemolysed **DO NOT CREDIT** plasmolysis / turgid ***Note:*** 'cells become turgid and burst' = 0 'cells swell and become turgid' = 0
			2	water would enter (blood) cells ;		
			3	blood cells , swell / (might) burst / lyse ;		
4	(b)		*type of monomer* amino acid ; *name of bond* peptide / amide ;		2	**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 then = **0 marks** **DO NOT CREDIT** amine **IGNORE** covalent **DO NOT CREDIT** dipeptide / polypeptide

Question				Expected Answers	Marks	Additional Guidance
4	(c)					**Mark the first answer on each prompt line in the passage.** If the answer is correct and an additional answer is given for that 'gap' that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** phonetic spelling throughout
			1 **2** **3** **4** **5** **6** **7** **8**	osmoreceptor / neurosecretory ; hypothalamus ; axon(s) ; posterior pituitary ; collecting duct ; (plasma / cell) membrane(s) ; aquaporins(s) ; osmosis ;	**8**	***1*** **ACCEPT** osmotic receptor ***2*** ***3*** ***4*** **DO NOT CREDIT** 'pituitary' without correct qualification ***5*** **ACCEPT** distal (convoluted) tubule / second convoluted tubule ***6*** ***7*** **DO NOT CREDIT** aqua pores ***8***

Question			Expected Answers		Marks	Additional Guidance	
4	(d)			*how ADH is dealt with as a protein*			
			1	in **,** liver / hepatocytes **;**		***1***	**DO NOT CREDIT** if linked directly to excretion eg 'excreted by the liver'
			2	hydrolysis / acted on by protease **;**		***2***	'broken down' is not quite enough
			3	deamination / amine group removed / formation of ammonia / formation of NH_3 **;**		***3***	**DO NOT CREDIT** 'amine group deaminated'
			4	ornithine cycle / formation of urea / formation of $CO(NH_2)_2$ **;**		***4***	**DO NOT CREDIT** 'amino acid enters ornithine cycle'
			5	amino acids / keto acids **,** used in (named) metabolic pathway **;**		***5***	eg • amino acids used for protein synthesis • keto acids used in **,** Krebs cycle / respiration • used in gluconeogenesis
				how ADH or urea is dealt with as a small molecule			
			6	in kidney **;**		***6***	
			7	(ultra)filtered from blood / moves from blood into nephron **;**		***7***	
			8	(because) small molecule **;**		***8***	
			9	urea not (all) reabsorbed / ADH not reabsorbed / (ADH or urea) present in urine **;**		***9***	**DO NOT CREDIT** 'removed **as** urine'
			10	excreted **;**		***10***	**DO NOT CREDIT** if linked directly to the liver eg 'excreted by the liver'
					3 max		
				TOTAL	**15**		

Question			Expected Answers		Marks	Additional Guidance	
5	(a)	(i)	*2nd messenger* cAMP / cyclic AMP / cyclic adenosine monophosphate ; *1st messenger* adrenaline / adrenalin ;		2	**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 then = **0 marks** **ACCEPT** CAMP / camp **DO NOT CREDIT** adenine monophosphate **IGNORE** chemicals not named in Fig. 5.1	
5	(a)	(ii)	**1**	glycogen → glucose / glycogenolysis ;	1 max	*1*	**DO NOT CREDIT** gluconeogenesis / glycogenesis
			2	by hydrolysis ;		*2*	This term must be used, or a derived term.
			3	*correct ref to* protein kinase / glycogen phosphorylase kinase (activates glycogen phosphorylase) ***or*** glycogen phosphorylase (stimulates conversion of glycogen) ***or*** inhibition of glycogen synthase (preventing glucose conversion to glycogen) ;	*3*	

Question				Expected Answers	Marks	Additional Guidance
5	(a)	(iii)				**IGNORE** reasons not related to adrenaline (as Q specifies 'how the adrenaline molecule can cause ...') **IGNORE** descriptions of stated effects in different tissues as Q asks *how* adrenaline causes these different effects
			1	different tissues have different (types of adrenaline) receptors **;**		***1***
			2	(causing) cAMP concentration to increase or decrease **;**		***2*** **ACCEPT** adenyl cyclase / cAMP **,** inhibited
			3	second messenger (may be) different **;**		***3***
			4	cAMP / second messenger **,** activates **,** different / other **,** enzymes / enzyme reactions (in different target cells) **;**	**2 max**	***4***

Question			Expected Answers		Marks	Additional Guidance
5	(b)		1	**adrenalin**(**e**) increases **,** heart rate / stroke volume / cardiac output **;**		*1*
			2	**cardiovascular centre** in **medulla oblongata ;**		*2* **ACCEPT** 'cardiac' instead of cardiovascular but not for QWC
			3	*idea of* nervous connection to **,** SAN / **sino-atrial node ;**		*3* **ACCEPT** SAN for mp 3 but not for QWC
			4	(which) controls frequency of waves of **,** excitation / depolarisation **;**		*4* **CREDIT** in relation to mp 2 or mp 3
			5	**vagus** / **parasympathetic ,** nerve decreases heart rate **;**		*5* **ONLY CREDIT** vagus ***or*** parasympathetic for QWC
			6	**accelerator** / **sympathetic ,** nerve increases heart rate **;**		*6* **ONLY CREDIT** accelerator ***or*** sympathetic for QWC **ACCEPT** phrenic nerve
			7	high blood pressure detected by **,** stretch receptors / baroreceptors **;**		*7* **DO NOT CREDIT** proprioreceptor
			8	low blood pH / increased levels of blood CO_2 **,** detected by **chemoreceptor**s **;**		*8*
			9	(receptors) in **,** aorta / **carotid** sinus / carotid arteries **;**	**4 max**	*9*
			QWC – technical terms used appropriately with correct spelling **;**		**1**	Correct use of **adrenalin**(**e**) (**Identify using the tick 1** ✓**1** AND MUST BE INCLUDED FOR QWC TO BE AWARDED) **plus** use of **2** terms from: **cardiovascular centre, medulla oblongata, sino-atrial node, vagus** or **parasympathetic, carotid, accelerator** or **sympathetic, chemoreceptor** **You should use the GREEN DOT to identify the remaining QWC terms that you are crediting.** **Please insert a QWC symbol next to the PENCIL ICON, followed by a tick (✓) if QWC has been awarded or a cross (×) if QWC has not been awarded**
				TOTAL	**10**	

Question			Expected Answers	Marks	Additional Guidance
6	(a)		124 (%) / 123.7 (%) ; ;	2	• Correct answer = 2 marks (208 – 93) ÷ 93 x 100 • **ACCEPT** 55 (%) / 55.3 (%) for 2 marks (208 – 93) ÷ 208 x 100 • Correct numerical answer but inappropriate units (eg 124 μm) = 1 mark • If answer not rounded correctly (to nearest whole number or to 1 dp) or if answer incorrect, then allow 1 mark for seeing **either** 115 **or** (208 – 93)

Question			Expected Answers		Marks	Additional Guidance
6	(b)					**Read through complete answer.** **Award 2 marks if a benefit and explanation <u>are</u> correctly linked.** **If benefit and explanation <u>are not</u> correctly linked:** **Award Max 1 for <u>either</u> a benefit <u>or</u> an explanation.**
				benefit		
			1a	allows entry of **more** CO_2 **;**		***1a*** Must indicate the idea of ***more*** *and* ***imply going in*** eg 'allows more gas exchange so that there is more CO_2 for photosynthesis' the mention of gas exchange implies that the CO_2 must be going in
				explanation		
			2a	(CO_2) for **,** light-independent reaction / Calvin cycle		***2a*** **DO NOT CREDIT** 'CO_2 fixed' without further qualification (eg ref to Rubisco / GP formation)
				or		
			2b	light-dependent reaction is taking place quickly / reduced NADP building up / ATP building up		***2b***
				or		
			2c	CO_2 not as limiting (than when there are fewer stomata)		***2c*** **CREDIT** with fewer stomata CO_2 is limiting
				or		
			2d	*idea that* increases access to air spaces for distribution of CO_2 **;**		***2d***
				OR		
				benefit		
			1b	reduces transpiration **;**		***1b*** **DO NOT CREDIT** description of transpiration **ACCEPT** 'plant less likely to wilt'
				explanation		
			2e	*idea of* stomata sheltered from **,** air currents / heat (when on lower surface)		***2e***
				or		
			2f	*idea that* diffusion shells maintained **;**	**2**	***2f***

Question			Expected Answers		Marks	Additional Guidance
6	(c)					**DO NOT CREDIT** refs to controlling temperature **or** light **or** wind **or** time
			1	equal sample size for sun and shade leaves / increase sample size of shade leaves / greater numbers of sun and shade leaves ;		***1***
			2	measure thickness of cuticle / make cuticle observations quantitative ;		***2***
			3	record range / calculate SD / calculate SE / (named) statistical analysis ;		***3***
			4	record data on leaf, length / width / area / colour / chlorophyll content ;		***4***
			5	record data on , size of stomata / stomatal count on upper surface ;		***5***
			6	define what is a sun or shade leaf / measure light levels to classify type of leaf ;		***6***
			7	repeat / replicate , the (whole) experiment / using other plants of the same species ;		***7*** **IGNORE** ref to other species **DO NOT CREDIT** 'repeats' unqualified or implying the same individual plant
					2 max	
				TOTAL	**6**	

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