

Markscheme

May 2016

Biology

Standard level

Paper 2

Section A

Question		Answers	Notes	Total
1.	a	<p>a. nerve cells increase the <u>least</u> OR control cells the <u>most</u> ✓</p> <p>b. «endodermal and control cells are the same at 48 hours» <u>but</u> the control cells increase exponentially/much more than endodermal cells by 96 hours OR last 48 hours/from 48 hours to 96 hours, constant «small» increase in cell numbers for nerve, <u>but</u> greater/increased change for control and endodermal ✓</p> <p>c. from 48 to 96 hours much more increase in cell number in control than in endodermal ✓</p>	<p><i>Do not accept numbers without distinguishing terms.</i></p> <p><i>Award [1 max] if all three (nerve, endodermal and control cells) not mentioned at some point in the answer as stem requires all three.</i></p>	2 max
	b	<p>cell differentiation slows down/retards/decreases population growth OR population growth is slower in differentiating/differentiated cell lines ✓</p>	<p><i>Accept converse eg: nondifferentiation accelerates growth.</i></p>	1
	c	<p>a. the percentage of «cells in» G1 in nerve is greater than in control OR the S phase has greater «percentage of cells» in control than in nerve ✓</p> <p>b. G2 phase is similar in both OR least/lower percentage of cells of the phases in both lines ✓</p>	<p><i>Do not accept numbers without distinguishing terms.</i></p>	2
	d	<p>a. more cells in G1 «of cell lines/nerves» with slow population growth ✓</p> <p>b. more cells in S «of cell line/control» with fast population growth/«significantly» fewer cells in S in both slow growth lines/nerves and endodermal cells ✓</p> <p>c. G2 seems not to be related with pop growth as it is very similar in the three cell lines ✓</p>	<p><i>Accept converse statements.</i></p>	2 max

Question		Answers	Notes	Total
e		<p><u>two genetically identical</u> daughter nuclei/cells OR <u>two identical</u> daughter <u>nuclei</u> ✓</p>		1
f		<p>a. cyclin D1 is less in control OR cyclin D2 is not present/very faint in control, but present in large quantity in nerve OR cyclin D3 more in nerve ✓</p> <p>b. cyclin D1 is present in both OR cyclin D3 is similar/same in both ✓</p>	OWTTE	2
g		<p>a. cyclin D1 is similar in both nerve and endodermal AND more than in control so both may be responsible for general/early differentiation ✓</p> <p>b. there is much more cyclin D2 in nerve «cell lines» so may be specific for nerve differentiation OR may negatively affect/reduce cell division/growth capacity in nerve ✓</p> <p>c. cyclin D2 is most likely what causes differentiation as control group contains none of it ✓</p> <p>d. there is slightly more cyclin D3 in endodermal «cell lines» so may be related to endodermal differentiation ✓</p> <p>e. limited data to determine roles of cyclins as very complex processes ✓</p>	<p><i>Both needed.</i> OWTTE</p> <p>OWTTE</p> <p>OWTTE</p> <p>OWTTE</p>	3 max

Question			Answers	Notes	Total
2.	a	i	60 kg ✓	<i>Unit needed.</i>	1
		ii	coronary heart disease or coronary artery disease or thrombosis or stroke or hypertension or high blood pressure or atheroma or fatty deposits in arteries or plaque «in arteries» or arteriosclerosis or atherosclerosis ✓		1
	b		[CH ₂] _n or hydrocarbon chain with single bonds and at least four carbons ✓ COOH head at one end AND three hydrogens on other end ✓	<i>The four carbons can include the carboxyl carbon.</i> <i>Both needed.</i>	2
	c		a. hormone produced by <u>adipose/fat cells/adipose tissue</u> ✓ b. acts on/target cells are in the hypothalamus «of the brain» ✓ c. inhibits/reduces appetite OR inhibits hunger OR causes feeling of satiety OR makes you feel full/makes you eat less ✓ d. more leptin with more adipose tissue ✓ e. decreases/reduces food intake OR in humans obese people can have leptin resistance ✓	<i>Do not accept “pituitary” or “fat”.</i>	3 max

Question			Answers	Notes	Total
3.	a	i	a. boiling point of water is greater than methane ✓ b. melting point of water is greater than methane ✓ c. latent heat of vaporization of water is greater than methane OR specific heat capacity of water is greater than methane ✓		2 max
		ii	a. water is polar OR O atom more negative OR H atoms more positive ✓ b. this causes «strong» hydrogen bonds to form <u>between the molecules</u> ✓ c. which require more/high amount of energy to break ✓ d. which increases the melting/boiling/latent heat properties ✓		2 max

Question		Answers	Notes	Total
	b	<p>a. short wave radiation/UV «shown as» having its origin in the Sun gives off light as short radiation ✓</p> <p>b. short wave radiation/UV «shown as» passing through the greenhouse gases «some reflected» ✓</p> <p>c. some short wave radiation/UV is absorbed by the Earth and some is reflected ✓</p> <p>d. the reflected radiation is long wave radiation «reflected as heat» ✓</p> <p>e. long wave radiation/IR «shown as» being unable to pass through/being absorbed/reflected by the greenhouse gases ✓</p>	<p><i>Award marks for diagrammatic explanations of these marking points.</i></p> <p><i>Accept UV and IR as long as they are drawn with the correct wavelength.</i></p>	3 max

Question		Answers	Notes	Total
4.	a	a. <i>I</i> : <u>nitrogenous</u> base OR adenine OR purine base ✓ b. <i>II</i> : deoxyribose ✓ c. <i>III</i> : phosphate ✓		3
	b	a. <i>A</i> : gills or fins or scales or no limbs or external fertilization ✓ b. <i>B</i> : homeothermic or endothermic or warm-blooded or lungs or tetrapod or <u>four</u> limbs or pentadactyl limbs or internal fertilization ✓ c. <i>C</i> : hair or fur or mammary glands or milk ✓		3
	c	eukaryotes ✓		1

Section B

Clarity of communication: [1]

The candidate's answers are clear enough to be understood without re-reading. The candidate has answered the question succinctly with little or no repetition or irrelevant material.

Question		Answers	Notes	Total
5.	a	a. catalyse/speed up «biological» reactions ✓ b. are substrate-specific ✓ c. lower the activation energy «of a chemical reaction»/makes reaction go more easily/increases likelihood of reaction happening ✓ d. substrate collides with/binds to <u>active site</u> ✓ e. enzyme–substrate complex/transition state formed OR bonds in substrate weakened ✓	<p><i>“activation energy” is not in SL but allow marking point if given.</i></p> <p><i>Do not award mark for stating “lock and key” unless obviously shown in a diagram with enzyme and substrate labelled.</i></p>	4 max

Question	Answers	Notes	Total
b	<p>a. key or text giving alleles with upper case for dominant allele and lower case for recessive allele/allele causing disease ✓</p> <p>b. Punnett grid showing that both parents can pass on either a dominant or a recessive allele in their gamete ✓</p> <p>c. four possible genotypes for child correctly shown on grid ✓</p> <p>d. double/homozygous recessive shown having the disease ✓</p> <p>e. 25 % or 0.25 or $\frac{1}{4}$ chance of inheriting the disease ✓</p>	<p><i>Reject key showing a sex linked gene such as hemophilia. Reject if X or Y chromosomes are shown with the alleles. Accept Aa or any other upper and lower case letters.</i></p> <p><i>For example row and column headings with A and a. This mark can be awarded if X or Y chromosomes are shown but each parent has one recessive and one dominant allele as if for autosomal inheritance.</i></p> <p><i>AA, Aa, aA and aa for example. This mark can be awarded if X or Y chromosomes are shown but the genotypes are correct for autosomal inheritance.</i></p> <p><i>Cannot be awarded with sex linkage.</i></p> <p><i>This mark can be awarded if X or Y chromosomes are shown but the ratio is correct for autosomal inheritance.</i></p>	4 max

Question	Answers	Notes	Total
<p>c</p>	<p>a. neurotransmitter attaches to receptor site, initiating transmission ✓</p> <p>b. nerve impulses are action potentials propagated along the axons of neurons ✓</p> <p>c. resting potential is more negative inside/−70 mV/ more positive outside the membrane OR a resting potential has greater concentration of Na ions outside than K ions inside the axon ✓</p> <p>d. «voltage gated» channels open and Na ions diffuse in ✓</p> <p>e. causes depolarization of the membrane/−70 mV to +40 mV ✓</p> <p>f. local currents affect adjacent channels/cause action potential ✓</p> <p>g. depolarization is followed by repolarization of the neuron ✓</p> <p>h. «voltage gated» channels open and K ions diffuse out/repolarize the membrane ✓</p> <p>i. Na-K pumps restore Na/K balance/resting potential ✓</p> <p>j. myelin around the neuron insulates the axon OR speeds the transmission ✓</p> <p>k. myelin permits saltatory conduction OR permits jumping from node to node ✓</p>	<p><i>Award [6 max] if no mention of the role of myelin.</i></p>	<p>7 max</p>

(Plus up to [1] for quality)

Question		Answers	Notes	Total
6.	a	<p>a. <u>cell wall</u> shown with two lines to indicate the thickness ✓</p> <p>b. <u>plasma/cell membrane</u> shown as a single continuous line ✓</p> <p>c. <u>nuclear membrane/nucleus</u> shown with double membrane and nuclear pores ✓</p> <p>d. <u>vacuole «membrane»/tonoplast</u> shown as a single continuous line ✓</p> <p>e. <u>chloroplast/plastid</u> shown with double or single membrane ✓</p> <p>f. ribosomes correctly shown OR RER correctly shown OR golgi correctly shown OR mitochondrion shown with double membrane/cristae ✓</p>	<p><i>Accept inside of wall labelled "plasma membrane" as if turgid.</i></p>	<p>4 max</p>

Question		Answers	Notes	Total
	b	a. oxygen must be taken up AND carbon dioxide must be released ✓ b. gases pass through a cell membrane by simple diffusion ✓ c. require a concentration gradient OR pass from high concentration to low concentration ✓ d. without requiring energy OR passive process ✓ e. large SA: vol ratio ✓	<i>Both needed.</i>	3 max

