Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

May 2017

Biology

Standard level

Paper 2

16 pages

Section A

Question			Answers	Notes	Total
1.	a		shells might dissolve/deteriorate / become smaller/thinner/weaker / OWTTE ***OR*** shell formation reduced / more difficult ✓		1
	b		a. positive correlation between shell thickness and shell size ***OR*** as shell thickness increases, shell size «also» increases ✓ b. (positive correlation) occurs at two different CO_2 concentrations / both high and normal concentrations ✓ c. trend for thickness is «slightly» lower with high CO_2 ✓		2 max
	c		«approximately» 0.2 mm^2 ***OR*** «approximately» 40 % «smaller» ✓	*unit required*	1
	d	i	a. significant factor: concentration of CO_2 in which oysters were raised ✓ b. insignificant factor: concentration of CO_2 at which oysters were presented to gastropods ✓		2

(continued…)

(Question 1d continued)

Question			Answers	Notes	Total
	d	**ii**	a. (because) shells are thinner/smaller when the oyster is raised in high CO_2/lower pH ***OR*** «because» lower pH/higher acidity prevents/reduces deposition of calcium carbonate ✓ b. gastropods target smaller/thinner-shelled oysters more ✓ c. gastropods can eat/drill thin-shelled/smaller oysters at a faster rate (and move onto another) ✓ d. eating smaller oysters «from high CO_2 environments» means given population of gastropods require more oysters for same food intake ✓		**2 max**
	d	**iii**	a. data shows that similar numbers are drilled regardless of conditions ✓ b. since radulas are not affected by acidification ***OR*** radulas not made of calcium carbonate so (remain) strong/successful at drilling ✓		**2 max**

Question			Answers	Notes	Total
1.	e		a. the data/trend lines indicate that a higher CO_2 concentration diminishes the shell thickness, making gastropod predation more successful ***OR*** the bar graphs suggest that oysters raised in a higher CO_2 concentration are smaller, making gastropod predation more successful ✓ b. CO_2 concentrations «during feeding» do not change the occurrence of drilling/predation «by gastropods» ✓ c. «limitation» no information about how exaggerated the CO_2 concentrations were ***OR*** «limitation» no information about numbers of gastropods used «in each setting»✓		**2 max**

Question			Answers	Notes	Total
2.	a		a. spontaneous generation is life appearing from nothing / from non-living / cells only come from pre-existing cells/life ✓ b. broth/culture medium (for bacteria) (used/placed) in flasks ✓ c. broth boiled/sterilized «in some flasks» to kill microbes ✓ d. no clouding/signs of bacterial growth/reproduction / microbes did not appear «in flasks of boiled broth» ✓ e. after necks of flasks were snapped boiled broth became cloudy/growth of microbes ✓ f. because microbes from the air contaminated the «boiled» broth ✓ g. curved necks allowed indirect exposure to air but prevented entry of microbes✓	*Allow bacteria or organisms instead of microbes.*	**3 max**
	b	**i**	movement / locomotion ***OR*** feeding/nutrition ✓		**1**
		ii	homeostasis ***OR*** maintain osmotic balance / expels «excess» water / maintains «cell» water content ✓		**1**

Question			Answers	Notes	Total
	c		*Advantages:* a. «adult stem cells» can divide «endlessly» / can differentiate ✓ b. «adult stem cells» can be used to repair/regenerate «tissues» ✓ c. fewer ethical objections «than with embryonic stem cells» ✓ d. adults can give «informed» consent for use of their stem cells ✓ e. adult source is not killed / «source» would not have grown into new human / no death of embryos used to provide stem cells ✓ f. no rejection problems / patient's own cells used ✓ g. less chance of cancer/«malignant» tumor development «than from embryonic stem cells» ✓ h. most tissues in adults contain some stem cells ✓ *Disadvantages:* i. difficult to obtain/collect/find in adult body/very few available ✓ j. some «adult» tissues contain few/no stem cells ✓ k. «adult stem cells» differentiate into fewer cell types «than embryonic cells» / OWTTE ✓		**3 max**

Question			Answers	Notes	Total
2.	d		a. saprotrophs/decomposers feed on/break down dead «organic» matter ✓ b. saprotrophs/decomposers release energy «heat» accelerating decomposition/warming soil ✓ c. saprotrophs/decomposers recycle nutrients / make nutrients available (to producers) ***OR*** improves soil fertility / returns nutrients (minerals/nitrates/phosphates/carbon) to soil/water/environment ✓ d. saprotrophs/decomposers detoxify waste ✓		**2 max**

Question			Answers	Notes	Total
3.	**a**		X: short-/ultraviolet/UV/visible/EMR/electromagnetic radiation ✓ Y: long-/infrared/IR ✓		**2**
	b		a. greenhouse gases present (at Z) ✓ b. greenhouse gases «CO_2, methane, nitrous oxide, water vapour» absorb long-wavelengths/infrared ***OR*** long wavelengths/infrared waves blocked from leaving the atmosphere ✓ c. (long-wavelengths/infrared absorbed and) reradiated/re-emitted (heat Earth) ✓		**2 max**
	c		a. rising ocean levels/more extreme weather «due to global warming» may destroy breeding/nesting sites ***OR*** rising sea level may put island underwater causing young birds/chicks to drown ✓ b. populations may not find/adapt to new colony sites ✓ c. warming seas may affect the food supply ✓		**1 max**

Question			Answers	Notes	Total
4.	a	i	Tuatara ✓		1
		ii	some «taxa» are extinct ***OR*** convergence «of body form» could have occurred (confusing interpretation of the data) ✓		1
	b	i	a. base sequences of a gene/DNA/mtDNA ***OR*** amino acid sequences of a protein ✓ *b.* species with the most similarities «in base sequence/amino acid sequence/genomes» have recently diverged/a common ancestor/are closely related ***OR*** members of a clade accumulate the fewest mutations on same base sequences / *vice versa / OWTTE* ✓		2 max
		ii	fossils / comparative anatomy / homologous structures / vestigial structures✓		1
	c		a. «because» it allows easier identification of a species ✓ b. «because» it can help identify common ancestors/evolutionary paths/close relationships (showing degree of biodiversity) / OWTTE ✓ c. «because» it is universal/cross-cultural language that avoids problems of local names of organisms ***OR*** «because» it promotes international collaboration ***OR*** «because» it facilitates access to the history/background of the species / indexing for retrieval of relevant «taxonomic» information / OWTTE ✓ d. «because» it allows «biodiversity» research of larger taxa «*ie* examination of a family of large cats rather than one species» ✓		2 max

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. translation converts a sequence of mRNA nucleotides/codons to a sequence of amino acids/polypeptide/protein ✓ b. «triplets of» nucleotides/bases on «activated» tRNAs pair with complementary «triplets of» nucleotides/bases on mRNA / *vice versa* ✓ c. base pairing occurs when adenine/A pairs with uracil/U and guanine/G pairs with cytosine/C ✓ d. specific amino acids are attached to specific of tRNA ✓ e. mRNA has codons ***AND*** tRNA has anticodons ✓		**3 max**
	b		a. PCR is process by which a small sample of DNA can be amplified/copied many times ✓ b. PCR involves repeated cycling through high and lower temperatures «to promote melting and annealing of DNA strands» ✓ c. «mixture» is heated to high temperatures to break «hydrogen» bonds between strands of DNA/to separate the double-stranded DNA ✓ d. Taq DNA polymerase can withstand high temperatures without denaturing ✓ e. primers bind to «targeted» DNA sequences at lower temp ✓ f. Taq DNA polymerase forms new «double-stranded» DNA by adding «complementary» bases/nucleotides ✓		**4 max**

Question			Answers	Notes	Total
5.	c		*Environment benefits:* a. pest-resistant crops can be made ✓ b. so less spraying of insecticides/pesticides ✓ c. less fuel burned in management of crops✓ d. longer shelf-life for fruits and vegetables so less spoilage ✓ e. greater quantity/shorter growing time/less land needed ✓ f. increase variety of growing locations / can grow in threatened conditions ✓ *Environment risks:* g. non-target organisms can be affected ✓ h. genes transferred to crop plants to make them herbicide resistant could spread to wild plants making super-weeds ✓ i. GMOs (encourage monoculture which) reduces biodiversity ✓ j. GM crops encourage overuse of herbicides ✓ *Health benefits:* k. nutritional value of food improved by increasing nutrient content ✓ l. crops could be produced that lack toxins or allergens ✓ m. crops could be produced to contain edible vaccines to provide natural disease resistance ✓		**8 max**

(continued…)

(Question 5c continued)

Question			Answers	Notes	Total
5	**c**		*Health risks:* n. proteins from transferred genes could be toxic or cause allergic reactions ✓ o. antibiotic resistance genes used as markers during gene transfer could spread to «pathogenic» bacteria ✓ p. transferred genes could cause unexpected/not anticipated problems ***OR*** health effects of exposure to GMO unclear ✓		

Question			Answers	Notes	Total
6.	a		a. contraction of muscle «layers»/peristalsis helps move food ***OR*** circular muscle contraction prevents backward movement of food ***OR*** longitudinal muscle contraction moves food along gut ✓ b. peristalsis/muscle contractions mix food with intestinal enzymes ✓ c. enzymes digest macromolecules into monomers ✓ d. pancreatic enzymes/amylase/lipase/endopeptidase «chemically» digest food in «lumen of» small intestine ✓ e. «pancreatic» amylase digests starch ***OR*** lipases digest lipids/fats/triglycerides ***OR*** endopeptidases/dipeptidases digest proteins/polypeptides ✓ f. bile/bicarbonate secreted into the small intestine creates favorable pH for enzymes ***OR*** bile emulsifies fat ✓ g. some final digestion into monomers is associated with epithelial cells/epithelium «of small intestine» ✓ h. mucosa layer/inside surface/lining of small intestine contains villi/finger-like projections ✓ i. villi/microvilli increase surface area for better absorption ✓ j. villi absorb products of digestion/monomers/mineral «ions»/vitamins ✓	*Accept an example for mp c*	**8 max**

(continued…)

(Question 6a continued)

Question			Answers	Notes	Total
6	a		k. glucose/amino acids enter blood «capillaries» ***OR*** lipids enter lymph vessels/lacteals ✓ l. absorption involves active transport/diffusion/facilitated diffusion ✓ m. different nutrients are absorbed by different transport mechanisms ✓		
	b		a. fatty acids can be saturated or unsaturated ✓ b. unsaturated can be monounsaturated or polyunsaturated ✓ c. saturated fats have no double bonds/have maximum number of hydrogen atoms ***OR*** unsaturated fatty acids have «at least one» double C=C bond ***OR*** polyunsaturated fatty acids have more than one double bond / OWTTE ✓ d. cis-form has hydrogen atoms on same side of carbon double bond ***OR*** cis-form has bend at carbon double bond ✓ e. trans-form has hydrogens on opposite sides of carbon double bond ***OR*** trans-form makes a straight carbon chain ✓ f. length of hydrocarbon chain can vary ***OR*** position/number of carbon double bonds can vary ✓	*Accept labeled diagrams that illustrate these marking points*	**4 max**

Question			Answers	Notes	Total
	c		a. leptin suppresses/inhibits appetite ✓ b. is secreted by adipose tissue/fat «storage» tissue ✓ c. level is controlled by amount of adipose tissue/«ongoing» food intake ✓ d. leptin targets cells in hypothalamus/appetite control centre in brain ✓ e. causes hypothalamus/control centre in brain to inhibit appetite ✓ f. if amount of adipose tissue increases, blood leptin concentration rises ✓		**3 max**