

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the March 2016 series

0610 BIOLOGY

0610/42

Paper 4 Theory (Extended), maximum raw mark 80

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0610	42

Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- I ignore
- R reject
- A accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- ecf credit a correct statement / calculation that follows a previous wrong response
- ora or reverse argument
- () the word / phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0610	42

Question	Expected answers	Mark	Additional Guidance
1 (a) (i)	A cytoplasm ; B nucleus ;	[2]	
(ii)	forms a barrier between the cell and its surroundings ; keeps contents of cell inside ; allows / controls / (movement of) substances, into / out, of the cell / across membrane ;	[max 1]	
(iii)	irregular shape / rounded shape / not columnar / not cylindrical / not rectangular / no specific shape ;	[1]	A ORA if palisade cell specified
(b)	large surface area ; more surface for respiration ; allows, increased / faster / efficient, respiration ;	[max 1]	A more surface area for enzymes
(c)	1 mitochondria are site of <u>aerobic</u> respiration / production of (most of the) ATP ; 2 liver cell / heart cell, is very active / use lots of energy / respire more ; 3 e.g. function of liver cell or heart cell ; 4 sperm cells, are active / swim / beating flagella ; 5 sperm cells have few mitochondria, as they are small ; 6 red blood cells, full of haemoglobin / more space for oxygen / AW ; 7 red blood cells, use less energy / do not actively move ;	[max 4]	mpt 1 I respiration R anaerobic mpt 3 e.g. active transport / making enzymes / making bile / muscle contraction / heart pumping mpt 4 I move unqualified mpt 7 I do not need any energy
		[Total: 9]	

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0610	42

Question	Expected answers	Mark	Additional Guidance
2 (a)	ADCFBGE	[1]	
(b)	<ol style="list-style-type: none"> 1 <i>ref to</i> chemical neurotransmitter ; 2 from / in, vesicles / sacs ; 3 neurotransmitter <u>diffuses</u> ; 4 across synaptic <u>cleft / gap</u> ; 5 neurotransmitter binds with receptors ; 	[max 3]	A named neurotransmitter mpt 3/5 R impulse
(c) (i)	sleeplessness ; hallucinations ; muscle cramps / restless legs ; nausea ; vomiting ; headaches ; sweating ; aggression / agitation / restlessness / anxiety / mood swings / panic attacks ; AVP ; e.g. shivering / diarrhoea	[max 2]	I symptoms of use
(ii)	(addicts) turn to crime to finance their addiction / AW ; more opportunity to become drug dealers / mule / AW ;	[max 1]	
(d) (i)	<ol style="list-style-type: none"> 1 harmless / dead / weakened / attenuated, (named) pathogen / microorganisms ; 2 injected / ingested ; 3 <i>ref to</i> antigens ; 4 antigen / vaccine, triggers antibody production ; 5 by lymphocytes ; 6 memory cells are produced ; 7 long-term immunity / rapid immune response ; 	[max 4]	mpt 7 R resistance I permanent

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0610	42

Question	Expected answers	Mark	Additional Guidance
(ii)	1 short-term defence against pathogens ; 2 no immune response/immediate protection/no memory cells produced / no antibodies produced by the body ; 3 from <u>antibodies</u> , acquired from elsewhere / AW ; 4 e.g. across placenta / breast-feeding / breast milk / colostrum / antitoxin / antivenom / tetanus injection / immunoglobulins ;	[max 2]	
		[Total: 13]	
3 (a)	$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$; ;	[2]	1 mark for correct equation 1 mark for correct balancing
(b) (i)	4.1 (cm ³ per min) ;	[1]	
(ii)	a single line below the original curve on the graph and following the same shape ; line starts at origin ;	[2]	tolerance of ½ small square mpt 1: <ul style="list-style-type: none"> no touching / crossing, lines if line continues past beyond 6.0, must not drop or go above 4.1 cm³ per min no feathery line
(iii)	enzymes denatured / yeast died ;	[max 1]	R enzyme killed / yeast denatured
(c)	(named) alcohol production ; producing biofuels / ethanol ; production of yeast extract ; GM yeast ;	[max 1]	I fermentation / baking

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0610	42

Question	Expected answers	Mark	Additional Guidance
(d) (i)	<p><i>stirrer</i> keeps microorganism suspended / prevent it from sinking ; enables microorganisms to always have access to nutrients ; maintain even temperature ; to create uniform / even / homogenous mixture ; to form pellets of fungus / avoid mat formation ;</p> <p><i>water-filled jacket</i> reduces heat energy / temperature ; maintains, a constant / suitable / optimum, temperature ;</p> <p><i>probes</i> monitor / detect / measure, temperature / pH / gas concentration / pressure / nutrients ;</p>	<p>[1+1+1]</p> <p>[3]</p>	<p>max 1 from each part <i>stirrer</i> I mixing unqualified I providing microorganisms with nutrients</p> <p><i>water-filled jacket</i> A regulates temperature I cooling</p> <p><i>probes</i> I controls / ensures</p>
(ii)	prevent contamination ;	[1]	I ref to purity / impurities
		[Total: 11]	
4 (a)	<p>1 overall carbon dioxide concentration increases ; 2 at a steady rate ; 3 there are minor fluctuations in carbon dioxide concentration ; 4 the fluctuations occur, regularly / yearly / seasonally ; 5 use of comparative figures with year and concentration with units ;</p>	[max 3]	A gradual I constant
(b) (i)	methane ;	[1]	I carbon dioxide / carbon monoxide / water unqualified. A other correct greenhouse gases

Page 8	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0610	42

Question	Expected answers	Mark	Additional Guidance
5 (a)	<p><i>canine</i> piercing/tearing the food ;</p> <p><i>molar</i> chewing/grinding the food ;</p>	[2]	<p>A ripping/pulling I cutting/biting</p>
(b) (i)	<p>1 tiger has more pointed incisors / rabbit has less pointed incisors ;</p> <p>2 tiger has canines / rabbit has no canines ;</p> <p>3 tiger has jagged, premolars / molars ;</p> <p>4 tiger has fewer molars / rabbits have more molars ;</p> <p>5 rabbit has a diastema / (larger) gap between incisors and pre molars ;</p>	[max 2]	<p>mpt 1 I flat mpt 1 A chisel/wedge- shaped mpt 2 I tiger has more canines mpt 3 A rabbits have flat, premolar/ molars A tigers have no, diastema / smaller gap between incisors and pre molars I ref to size (photo are not to scale)</p>
(ii)	<p>canines ;</p> <p>jagged, premolars / molars ;</p> <p>eyes positioned at the front of the skull ;</p> <p>pointed ridge / crest, on skull ;</p>	[1]	<p>I ref to incisors A carnassial / sharp for jagged I ref to absence of diastema</p>
(c) (i)	<p>$12/44 \times 100$ 27 ;;</p>	[2]	
(ii)	<p><i>arguments for carnivore:</i></p> <p>1 has same number of incisors as, other carnivores / 5/6 ;</p> <p>2 has same number of canines as, other carnivores 5/6 ;</p> <p>3 has same number of molars as, 6/a carnivore ;</p> <p><i>arguments against carnivore:</i></p> <p>4 same number of premolars as, herbivores / 3/4;</p> <p>5 1/2/3/some herbivores/omnivores, also have 12 incisors ;</p> <p>6 1/2/3/some herbivores/omnivores, also have 4 canines ;</p>	[max 4]	

Page 9	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0610	42

Question	Expected answers	Mark	Additional Guidance
(d)	<ol style="list-style-type: none"> 1 denatures enzymes in microorganisms ; 2 kills, microorganisms/ (named) pathogens ; 3 optimum pH for <u>pepsin</u> activity ; 4 proteins are digested/broken down, to (poly)peptides/ amino acids ; 	[max 3]	R kills enzymes R denatures
(e)	<ol style="list-style-type: none"> 1 villi lining/epithelium, only one cell thick/thin ; 2 good blood supply/ many capillaries ; 3 <u>microvilli</u> ; 4 large surface area ; 5 lacteal for fats/ fatty acid, absorption ; 6 protein channels ; 7 mitochondria for active transport ; 	[max 3]	I villi is 1 cell thick
(f)	<ol style="list-style-type: none"> 1 weight loss/ poor growth/ lack of energy/ stomach pain/ abdominal pain/ cramps/ diarrhoea/ weaker immune system ; 2 <u>malnutrition/ deficiency disease</u> ; <p>3,4 named, nutrient deficiency/ effect, with deficient nutrient ;;; &5 e.g. anaemia → iron/ vitamin B12 kwashiorkor → protein ; marasmus → all nutrients scurvy → vitamin C night blindness → vitamin A/ retinol</p>	[max 3]	I weak/ sluggish
		[Total: 20]	
6 (a)	<u>Osteocephalus</u> ;	[1]	
(b) (i)	<ol style="list-style-type: none"> 1 two strands twisted to form helix ; 2 cross-links between the strands ; 3 A joins with T/ C joins with G ; 4 all labels correct ; 	[max 3]	A base/ sugar/ deoxyribose/ phosphate / hydrogen bond/ nucleotide/ crosslinks / double helix

Page 10	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0610	42

Question	Expected answers	Mark	Additional Guidance
(ii)	the sequence of bases in DNA are used ; base sequences / DNA / genes, that are more similar mean that organisms are more closely related ; ORA	[2]	I genetic material
(c) (i)	<u>gene</u> ;	[1]	
(ii)	<ol style="list-style-type: none"> 1 mRNA carries a copy of the gene / DNA / base pair sequence ; 2 mRNA travel from the nucleus ; 3 to the ribosome / cytoplasm ; 4 order of amino acids depends on the sequence of bases in mRNA / AW ; 	[max 3]	