CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0610 BIOLOGY

0610/31 Paper 31 (Extended Theory), maximum raw mark 80

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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	Answer	Marks	Guidance for Examiners
1 (a)		[5]	

pollutant	source	effect on the environment
heavy metals, e.g. lead and mercury	factories / industries / mining / exhaust from transport / chemical plants / sewage (sludge) ;	
phosphate	fertiliser / detergents / sewage ;	
sulfur dioxide	(combustion of) coal / oil / factories / power stations / chemical plants / exhaust from transport ;	
ionising radiation	nuclear fall-out / radioactive waste / nuclear industries / nuclear power plants / uranium / plutonium / X-rays ;	mutations / cancers ; A changes genes / changes DNA

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(b)	**1** **2** **3** **4** **5** **6** **7** **8** **9**	growth of algae / algal bloom **;** light blocked (by algae) **;** reduced / no, photosynthesis **;** (so) algae / (fixed) water plants, die **;** less / no, oxygen released by plants **;** algae / plants, fed on / decayed / decomposed, by bacteria **;** bacteria, multiply / increase / grow / divide **;** (aerobic) respiration **;** low levels of oxygen cause, death / suffocation / migration, of, (named) fish / animals / invertebrates / (aquatic) creatures / organisms / consumers **;**	max [5]	
(c)	**1** **2** **3** **4** **5** **6** **7**	add lime(stone) / calcium carbonate / $CaCO_3$ / alkali, to, lakes / rivers / soils **;** use less fossil fuels **; ignore** stop using fossil fuels use low sulfur fuels **; A** stop using sulfur fuels desulfurisation of, coal / oil **;** flue gas desulfurisation / 'use (wet) scrubbers' / neutralise waste gases with lime **;** catalytic converters / use electric cars **;** *idea of* international treaty for reducing emissions **;**	max [2]	
2 (a)	*full marks may be possible from a fully annotated genetic diagram* females are XX, males are XY **;** female gametes are X, male gametes are X or Y **;** ref to random fusion of gametes / shown in a Punnett square or alternative **;** 1:1 / 50:50 / described, shown / stated **;**		[4]	

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(b)	ref to, identify / separate, sperm with X (chromosome) **;** semen / sperm, inserted/injected, into, uterus / oviduct **;** at / around time of, ovulation / AW **;**		max [2]	
(c)	**1** **2** **3** **4** **5** **6** **7** **8**	formula milk is, similar / closer in composition, to human milk **;** any nutrient with similar quantities in formula and human milk **;** *idea that* human milk meets requirements of human babies **;** *comparisons with cow's milk* formula supplies less protein which is harder to digest **;** formula supplies more iron, for haemoglobin formation / to prevent anaemia **;** formula supplies more vitamin D for, absorption of calcium / formation of bone / for strong bones / prevention of rickets **;** formula supplies more vitamin A, for immune system / retina / rods / vision in dim light / prevention of night blindness **;** use of comparative figures <u>with correct units</u> **;**	max [4]	
(d)	biological / made by cells **;** catalyst / speeds up the rate of a reaction **;** made of protein **;**		max [2]	

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(e)		***tubes 1 and 3 – the effect of pH***		
	1	lysozyme is active in, 1 / pH 4.0 / acid **;**		
	2	<u>cell walls</u>, broken down / digested / destroyed in tube 1 **;**		
	3	no (bacterial) growth in tube 1 **;**		
		tubes 1 and 4 – the effect of type of bacteria		
	4	lysozyme, destroys / AW, bacteria, **A** / in tube 1 **;**		
	5	lysozyme does not, destroy / AW, bacteria, **B** / in tube 4 **;**		
	6	ref to specificity to bacteria **A** / bacteria **B** is resistant **;** **ignore** bacteria are immune		
	7	*idea that* nothing in (cell wall of) bacteria **B** for lysozyme to digest **;**		
		tubes 1 and 2 – the effect of boiling		
	8	lysozyme denatured (by boiling) **;**		
	9	lysozyme not, active **;**		
	10	*idea that* tube 2 is a control to show that lysozyme is responsible for no growth in tube 1 **;**	max [6]	
(f)	**1**	gives (passive) <u>immunity</u> **;**		
	2	defends against, infection / illness / disease / pathogens / AW **;**		
	3	ref to diseases that the mother has had **;**		
	4	any one function of antibodies **;**	max [2]	

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3	(a) (i)		eaten / absorbed, a (sugary / high carbohydrate) meal / AW ; (secretion / effect, of) adrenaline ; (secretion / effect, of) glucagon ; dehydration / loss of water ;	max [1]	
	(ii)		used in respiration ; (named) exercise / physical activity ; hungry / fasting / starvation ; (secretion / effect, of) insulin ;	max [1]	
	(iii)		liver ; muscle ; kidney ; testes ;	max [2]	
	(b)	**1**	pancreas / islets of Langerhans, detects increase in glucose concentration ;	max [3]	
		2	(pancreas / islets) secretes / produces, insulin ;		
		3	transported in, blood / plasma ;		
		4	liver / muscle / cells, convert glucose to glycogen ;		
		5	ref to, enzymes (converting glucose to glycogen) ;		
		6	homeostasis / negative feedback ;		
	(c)		water, diffuses out of (red blood cells) ; through, partially permeable membrane ; by osmosis ; down water potential gradient / from high water potential to low water potential ; (red cells) decrease in volume / shrink / crenated / AW ;	max [3]	

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4	**(a)**	(chemical) <u>reactions</u> that breakdown, (named) nutrient(s) **;** to, release / transfer, energy **;** inside cells **;**	max [2]	**R** produces / creates / AW, energy
	(b)	biceps contracts **;** pulls on forearm / radius **;** ref to the tendon **;** bends / flexes, the arm **;** triceps relaxes **;**	max [3]	
	(c) (i)	increase in muscle contraction **;** increase in demand for, energy / ATP **;** increase in rate of respiration **;** <u>aerobic</u> respiration **;** heart beats faster / breathes faster *or* breathes deeper **;**	max [4]	*For MP1, 2 and 3 'more' / increase must be given at least once*
	(ii)	line decreases immediately at 20 min **;** line reaches 0.2 $dm^3 min^{-1}$ at 30 min **;**	[2]	
	(iii)	**1** <u>oxygen debt</u> **;** **2** (during exercise) oxygen not supplied fast enough (from lung / heart) **;** **3** to muscles **;** **4** <u>anaerobic</u> respiration occurred during exercise **;** **5** lactic acid produced **;** **6** builds up in muscle / not carried away fast enough in blood **;** **7** extra oxygen required after exercise **;** **8** lactic acid is, broken down / respired / oxidised / converted to glucose **;**	max [4]	

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5 (a) (i)	*Caenorhabditis* ;	[1]	
(ii)	thread-like bodies / filamentous / filament-like ; unsegmented body ; hydrostatic skeleton ; body, tapers / is pointed, at, one / both, ends ; through gut / mouth and anus ; relatively large pharynx / sucking mouthparts ;	max [2]	
(b)	prevents accumulation of dead matter / removes (organic) waste ; recycles nutrients / named nutrient(s) ; releases (carbon as) carbon dioxide ; (carbon dioxide) for photosynthesis ; decreases particle size of food for decomposers ; ref to energy flow in, food chain / food web / ecosystem ;	max [3]	**R** energy cycling / recycling
(c) (i)	gametes from same individual ; self-fertilisation / described ; only new source of variation is mutation ; variation produced by meiosis ;	max [2]	
(ii)	6 ;	[1]	

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(iii)	***P*** *meiosis* reduction division / chromosome number is halved ; prevents doubling of chromosome number, with each generation / when gametes fuse together / at fertilisation ; ref to haploid (cells / gametes / sex cells) ; gamete / sex cell, production ; ***Q*** *mitosis* growth is taking place ; producing (genetically) identical cells ; more diploid cells ;	max [3]	producing haploid gametes = 2
(d)	in chromosomes ; in the nucleus ; in mitochondria ;	max [2]	**A** in plasmids ;

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6	**(a)**	1.8 / 1.83 / 1.825, mm **;**	[1]	
	(b)	nitrogen fixation **;** convert nitrogen into, ammonia / NH_3 / ammonium ions / NH_4^+ **;** convert ammonia to amino acids **;**	max [2]	
	(c) **(i)**	photosynthesis **;** carbon dioxide + water / CO_2 + H_2O **;** use of, <u>light</u> (energy) / <u>sunlight</u> **;**	max [2]	
	(ii)	translocation / mass flow **;** phloem **;** as sucrose **;** from, source / leaf **;** then from phloem to root nodule by diffusion **;**	max [2]	
	(d)	active, transport / uptake **;** use of, energy / ATP (from respiration) **;** use of, proteins / carrier molecules, in membrane **;**	max [2]	

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