CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2013 series

0610 BIOLOGY

0610/31 Paper 3 (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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- **R** reject
- **A** accept (for answers correctly cued by the question)
- **I** ignore as irrelevant
- **ecf** error carried forward
- **AW** alternative wording (where responses vary more than usual)
- **AVP** alternative valid point
- **ORA** or reverse argument
- underline actual word given must be used by candidate (grammatical variants excepted)
- ( ) the word / phrase in brackets is not required but sets the context
- **D, L, T, Q** quality of: drawing / labelling / table / detail as indicated
- max indicates the maximum number of marks

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	Answer	Marks	Guidance for Examiners
1 (a)	<table><tr><td>structure</td><td>letter from Fig. 1.1</td></tr><tr><td>left lung</td><td>**D**</td></tr><tr><td>bronchus</td><td>**J**</td></tr><tr><td>diaphragm</td><td>**E**</td></tr><tr><td>intercostal muscle</td><td>**H**</td></tr><tr><td>rib</td><td>**C**</td></tr><tr><td>trachea</td><td>**B**</td></tr></table>	[5]	*Only one letter per box; if more than one letter no mark* *If letter crossed out but not rewritten mark it* **JEHCB**
(b) (i)	3750 **;** *no mark for working alone*	[1]	*if the answer is not in the table look for it in the space for working*
(ii)	number of breaths (per minute) / different rate of breathing **;** exhaled breath has a higher temperature **;**	[max 1]	**A** faster, slower, change in frequency **ignore** depth (as in the table) / heavier
(iii)	water vapour / H_2O / any **named** rare *or* inert gas *or* pollutant **;**	[1]	*names, correct symbols or formulae for any of the following*: H_2, Ar, He, Xe, Ne, Rn, Kr, SO_2, O_3, CO, NO_2, N_2O, CH_4, NH_3, I_2

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	Answer	Marks	Guidance for Examiners
(iv)	*in breathed out air* **1** after exercise less oxygen and more carbon dioxide / ora **;** **2** use of data with % to quantify (for either oxygen or carbon dioxide) **;** *explanation in terms of the following increasing* **3** more oxygen, absorbed / is needed / used up **;** **4** more carbon dioxide, produced **;** **5** more gas exchange **;** **6** more respiration **;** **R** more anaerobic respiration **7** more energy required **;** **8** repaying / AW, oxygen debt **;**	[max 3]	**MP2** oxygen – 17.2 to 15.3% / 1.9% carbon dioxide – 3.6 to 5.5% / 1.9% **R** inhaled **R** exhaled **R** produce energy
2 (a) (i)	**L** = (primary) producer(s) **;** **N** = secondary consumer(s) **;**	[2]	**ignore** (green) plant **ignore** carnivore
(ii)	energy, of / at, each trophic level **;** **A** shows that energy, decreases / is lost (at each trophic level) e.g. '**L** has more energy than **M**'	[1]	**R** biomass / numbers **R** 'production of energy' **ignore** energy passed on – shown by the arrows not the boxes
(iii)	*idea that* **1** no, energy left **;** **2** use figures from Fig. 2.1 to show that all energy to **O** is already **3** little / not enough, energy available from eating, tertiary consumers / **O** / AW **;** **4** loss of (90%) energy, at / between, each trophic level / AW **;** **5** would be very small population of predators of **O** **;** **6** (population of) predators of **O** unlikely to survive **;** **7** AVP **;** e.g. *idea that* difficult to be a predator of **O** because **O** is likely to be 'large and fierce'	[max 3]	**A** 'needing to eat a lot to get enough energy' MP4 *no need to use the term trophic level if idea is implied*

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<table>
<tr><th></th><th colspan="2">Answer</th><th>Marks</th><th>Guidance for Examiners</th></tr>
<tr><td>(iv)</td><td>1
2
3
4</td><td>loss of energy (from, each / all, trophic level(s)) ;
(by) <u>respiration</u> ;
(to the) environment / atmosphere / surroundings ;
as, heat / thermal energy ;</td><td>[max 2]</td><td>accept once only</td></tr>
<tr><td>(b)</td><td>1
2
3
4
5
6</td><td>M is the herbivore
more (biomass of / energy in), producers / L ;
as fewer / no, herbivores / primary consumers / predators (to eat L) / M ;
fewer / extinction of, carnivores / secondary consumers / N ;
fewer / extinction of, tertiary consumers / O ;
as less, food / energy ;
more competition ;</td><td>[max 3]</td><td>ignore any changes to decomposers / recycling
A the argument that more primary consumers will migrate into the ecosystem
ignore predators / organisms unqualified</td></tr>
<tr><td>3 (a)</td><td colspan="2"><table><tr><th>function</th><th>name of organ</th><th>letter from Fig. 3.1</th></tr><tr><td>production of gametes</td><td>ovary</td><td>T ;</td></tr><tr><td>site of implantation</td><td>uterus</td><td>X ;</td></tr><tr><td>site of fertilisation</td><td>oviduct / fallopian tube</td><td>R ;</td></tr><tr><td>dilates during birth</td><td>cervix</td><td>V</td></tr></table></td><td>[3]</td><td>ignore lining / endometrium – not an organ
R uterus wall
R ‘egg, canal / tube’</td></tr>
<tr><td>(b) (i)</td><td colspan="2">ovary / ovaries ; ignore T</td><td>[1]</td><td>R follicle – not an organ</td></tr>
<tr><td>(ii)</td><td colspan="2">makes (Graafian) follicle, form / develop / mature / be produced ;
causes, secretion / release / production, of oestrogen ;</td><td>[max 1]</td><td>A egg / ovum / gamete for follicle
R ovulation / described</td></tr>
</table>

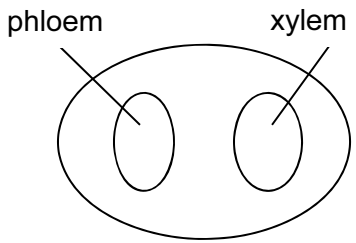
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<table>
<tr><th></th><th colspan="2">Answer</th><th>Marks</th><th>Guidance for Examiners</th></tr>
<tr><td>(c) (i)</td><td colspan="2">
<table>
<tr><td>award the following to max 3</td><td>award max 2 for data quotes including changes in concentration over stated number of days - units must be used at least once in the answer</td></tr>
<tr><td>increase from, day 1 / first day, to day 11 ;
A peaks at day 11 / increases over first 10/11 days</td><td>155 / 156 (arbitrary) units on day 11 ;</td></tr>
<tr><td>decreases from day 11 to day 15 ;</td><td>54 / 55 (arbitrary) units on day 15 ;</td></tr>
<tr><td>increases to day 20 / peaks (again) at day 20 ;</td><td>136 (arbitrary) units on day 20 ;</td></tr>
<tr><td>decreases to, day 27 / last day ;</td><td>40 (arbitrary) units on day 27 ;</td></tr>
</table>
[max 4]
</td><td></td><td></td></tr>
<tr><td>(ii)</td><td colspan="2">release of, egg / egg cell / ovum / oocyte / female gamete ;

either
from, ovary / follicle
or
into fallopian tube / oviduct ;</td><td>[2]</td><td>R ovule</td></tr>
<tr><td>(d)</td><td>1
2
3
4
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6
7
8
9</td><td>sperm cell digests way through, jelly coat / AW ;
uses enzymes (from acrosome) ;
sperm, attaches to / fuses with, egg / AW ; A fusion of gametes
whole sperm cell enters egg / head of sperm enters egg ;
(egg membrane changes so that) no other sperm can enter ;
haploid / 23 chromosomes ;
nuclei, fuse / join ; A ref to chromosomes ‘coming together’
diploid / 46 chromosomes ;
zygote ;</td><td>[max 3]</td><td>ignore egg wall / cell wall

ignore events after fertilisation</td></tr>
</table>

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	Answer	Marks	Guidance for Examiners
(e) (i)	length / molecule / thread / strand, of DNA (and proteins) ; made of (string of), genes / alleles ; **A** contains genes	[max 2]	**R** pair of genes
(ii)	46 ; **A** 23 pairs	[1]	
4 (a)		[2]	1 mark for drawing and 1 mark for labelling *drawing must represent correct position of xylem and phloem as shown in Fig. 4.1* *if cells are drawn, these must be in the correct positions for xylem and phloem as in the photograph*
(b)	sucrose ;	[1]	**ignore** sugar / non-reducing sugar **A** phonetic spellings
(c)	**1** during growing season / when photosynthesising / when food is made ; **2** (substances are) transported (down), to the roots *or* to (named) **3** transported (up) to the, growing points / flowers / fruits / seeds / new leaves / AW ; **4** (time of year) when no photosynthesis / when food is not made ; **5** (substances are transported upwards) from, roots / storage organ / seed ; **6** (substances transported) from source to sink ;	[max 4]	**A** when there is plenty of light **A** move for are transported **MP3 A** transported up for either time of year once only *source may be a storage organ or a leaf depending on the time of year*

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	Answer		Marks	Guidance for Examiners
(d)	1 2 3 4	<u>evaporation of water</u>, from (surfaces of) mesophyll ; movement / diffusion / loss of, water vapour ; from, leaves ; **A** (named) aerial / upper, parts ; through / from, stomata / cuticle ;	[max 3]	
(e)	1 2 3 4 5 6 7	evaporation / transpiration, causes movement of water ; in xylem ; reduces pressure at the top of the plant / ref to a water potential transpiration pull ; maintained by <u>cohesion</u> between water molecules ; maintains a continuous column of water / AW ; adhesion of water / AW, to walls of xylem ;	[max 4]	**ignore** capillarity (except if discussing events at interface between water and air in mesophyll in leaf)
5 (a) (i)	1 2 3 4	without enzymes reactions, occur too slowly / not at all ; **A** enzymes speed up reactions reduce, activation energy / energy needed for a reaction ; reactions take place at lower temperatures ; enzymes are catalysts ;	[max 3]	**MP1** **A** some aspect of metabolism as an alternative to reactions, e.g. digestion
(ii)	lipase – pancreas ; protease – stomach / pancreas ; amylase – salivary gland / pancreas ;		[3]	organs have to be different if the answer for lipase is incorrect **A** pancreas for either protease or amylase but not both
(b) (i)	control ; **R** control(led) variable to show differences in, colour / pH / fat, due to, enzyme / lipase ; to use for comparing, colours / pH ;		[max 2]	**A** to show what happens without, enzyme / lipase, and bile salts
(ii)	acid pH / below pH 5 / lowers the pH / becomes acidic ; fat has been, digested / broken down ; fatty acids (and glycerol) ;		[3]	**R** ref to lipase / bile salts being acidic

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	Answer		Marks	Guidance for Examiners
(iii)	1	ref to specific, pH / colour in, **B** / **C** ; i.e. **B** is blue / 8-10 / alkaline i.e. **C** is yellow / 4-5 / slightly acid **ignore** bile salts / lipase is alkaline in **B**		<table><tr><th>test-tube</th><th>contents</th><th>colour of pH indicator after 5 minutes at 40 °C</th></tr><tr><td>**A**</td><td>milk, alkaline solution, lipase and bile salts</td><td>orange</td></tr><tr><td>**B**</td><td>milk, alkaline solution, bile salts and water</td><td>blue</td></tr><tr><td>**C**</td><td>milk, alkaline solution, lipase and water</td><td>yellow</td></tr><tr><td>**D**</td><td>milk, alkaline solution and water</td><td>blue</td></tr></table>
		B 2 no, (chemical) digestion / breakdown (of fat) ; 3 no fatty acids ; 4 no lipase ; **C** 5 some, (chemical) digestion / breakdown (of fat) ; 6 fat not <u>emulsi</u>fied ; 7 so slower reaction (than A) ; 8 fewer fatty acids produced ; *award for **B** / **C*** 9 bile salts <u>emulsify</u> fats ; 10 ref to increasing surface area of fat (globules / AW) ; 11 bile salts are not enzymes ;	[max 4]	
6 (a)	1	cell wall ;		**R** size **A** fimbriae / pili **ignore** ‘thread of DNA’ unqualified *some of these structures are not in all bacteria, but are often shown in diagrams of bacteria*
	2	plasmid ;		
	3	flagella ;		
	4	capsule ;		
	5	loop of DNA / circular chromosome / no chromosome(s) ;		
	6	no nucleus ;		
	7	no, organelles / named organelle ;		
	8	AVP ; e.g. smaller ribosomes	[max 2]	
(b) (i)	**A** – lag ; **B** – exponential / log ;		[2]	*please look carefully at spelling of lag and log*

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	Answer	Marks	Guidance for Examiners
(ii)	**1** **D** – 'birth' = death ; **2** **E** – death > 'birth' ; *for either **D** or **E*** **3** less / no, food / nutrients ; **4** less / no, oxygen ; **5** accumulation of, wastes / toxins ; **6** limiting factor(s) *used in appropriate context* ; **7** carrying capacity / described ;	[max 3]	**A** rate of growth / reproduction for birth **A** limit / limits in context
(c) (i)	jointed, legs / limbs / appendages ; exoskeleton ;	[max 1]	
(ii)	*either* / *or*		
	1 *idea that* bottom of sea, predators / prey, unable to see ; **2** camouflage not needed (ref to, avoiding predators / **3** (therefore) no need to make pigment ; **4** less energy needed (to make pigment) ; **5** mutation / change in gene *or* DNA ; **6** so no pigment made (allow only if MP5 is given) ; **7** white crabs / albino crabs, survive and reproduce ; **8** pass on their, gene(s) / allele(s) (for no pigment) ; **9** ref to (natural) <u>selection</u> in context ; **R** if artificial *or* **1** bottom of the sea is covered in white, sand / rock ; **2** dark coloured crabs, are conspicuous / easily seen, by predators / more likely to be predated ; **3** no need to make pigment ; **4** less energy needed (to make pigment) ; **5** mutation / change in gene / DNA ; **6** so no pigment made (allow only if MP5 is given) ; **7** white crabs / albino crabs, survive and reproduce ; **8** pass on their, gene(s) / allele(s) (for no pigment) ; **9** ref to (natural) <u>selection</u> in context ; **R** if artificial	[max 4]	

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