Cambridge
O Level

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Cambridge Ordinary Level

BIOLOGY **5090/22**

Paper 2 Theory **May/June 2017**

MARK SCHEME

Maximum Mark: 80

Published

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Mark schemes will use these abbreviations:

;	separates marking points
/	alternatives
()	contents of brackets are not required but should be implied
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
Ig	ignore (for incorrect but irrelevant responses)
AW	alternative wording (where responses vary more than usual)
AVP	alternative valid point (where a greater than usual variety of responses is expected)
ORA	or reverse argument
underline	actual word underlined must be used by candidate
+	statements on both sides of the + are needed for that mark

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Question	Answer	Marks	Guidance
1(a)	**1** line starts and ends at body wall **+** crosses abdomen below ribs **;** **2** circle with all or part of it touching / on the sternum **;** **3** middle of cross below diaphragm **;**	**3**	
1(b)(i)	**1** any reference to up / rises / raised **;** **2** out / forwards **;** **3** reference to muscle **;** **4** (muscle) contract(ion) **;** **5** reference to (requires) energy **;**	**2**	
1(b)(ii)	(movement of person's chest) **1** involuntary **AW** **;** **2** intercostal (muscles) **;** **3** (muscles) between the ribs / in the chest (wall) **;** **4** (move) bone / ribs / ribcage **;** **5** attached / hinged **+** to vertebrae / backbone / at back **;** **6** *leads to increase in volume / decrease in pressure **;** (movement of bucket handle) **7** voluntary **AW** **;** **8** muscle in arm / finger **OR** reference to bicep(s) **;** **9** external to / not part of **+** the bucket / handle **;** **10** (move) metal / plastic **OR** reference to a single handle **;** **11** attached / hinged **+** to bucket / at side **;** **12** *does not lead to change in volume / pressure **;**	**5**	* **A** once only for either chest or handle * **A** once only for either chest or handle

Question	Answer	Marks	Guidance
2(a)(i)	assimilation ;	1	
2(a)(ii)	(egestion) line ending / letter written below rectum + labelled '**A**' / 'egestion' ; (ingestion) line ending / letter written to left of or inside mouth + labelled '**B**' / 'ingestion' ;	2	
2(b)	(component) protein ; (where absorbed) ileum / small intestine / villi / capillaries ;	2	**R** amino acids **Ig** any reference to fat **A** jejunum
2(c)	**1** reference to bile (salts) ; **2** (bile) not stored ; **3** less / slower + release (of bile) ; **4** less / slower + emulsification **AW** ; **5** less / slower / not optimum + digestion (of fats) / (lipase) enzyme action ; **6** fewer fatty acids / less glycerol + produced / absorbed ; **7** incorrect pH / more acidic / less alkaline + in small intestine / duodenum ;	5	

Question	Answer	Marks	Guidance
3(a)	line ending either on or in sepal **+** labelled either '**S**' or 'sepal' **;** line ending either on or in carpel **+** labelled either '**C**' or 'carpel' **;**	**2**	
3(b)	(flower **D**) **1** anther(s) / stamen(s) **;** **2** pollen **+** mature / produced / present / released / collected **;** **3** stigma **+** closed / immature **AW** / does not receive pollen **;** (flower **E**) **4** stigma **+** open / mature / receives pollen **;** **5** anthers **+** withered **AW OR** reference to no pollen produced / present / released / to be collected **;**	**3**	
3(c)	**1** large **+** petal(s) **;** **2** reference to insect / bee landing **AW** on petal **;** **3** colour(ful) **+** petal(s) **;** **4** reference to scent / smell **;** **5** reference to nectar(ies) / (nectar) guides **;** **6** pollen **+** stick(y) / hooked (to attach to insect / bee) **;** **7** insect / bee makes contact **AW** with anther / stigma **+** while collecting nectar **;**	**4**	

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Question	Answer	Marks	Guidance
4(a)	10.00–12.00 / noon / midday **;**	**1**	**A** any single time or range between 10.00–12.00
4(b)(i)	**1** plants may be of different species **;** **2** plant **G +** more / fast(er) <u>transpiration</u> **;** **3** plant **G +** more / big(ger) leaves **;** **4** plant **G +** more stomata / pores / guard cells **OR** stomata bigger / wider **AW ;** **5** plant **G +** better / big(ger) root system / absorbs more water **;** **6** plant **G +** thin(ner) (waxy) cuticle **;**	**3**	**ORA** for plant **F** for each of marking points **2** to **5**
4(b)(ii)	**1** increased **+** light (intensity) **;** **2** increased **+** temperature / heat **;** **3** reference to wind **OR** increased **+** air movement **;** **4** decreased **+** humidity **;** **5** stomata / pores / guard cells **+** open /wider **;**	**3**	
4(c)	**1** high<u>est</u> / fast<u>est</u> (rate of) / most **;** **2** (evapo) <u>transpiration</u> / <u>evaporation</u> **;** **3** reference to previous 4 hours / between 8:00–12:00 / from 8:00 **;** **4** (evaporation) cools (plant /leaves) / removes heat / temperature falls **;**	**2**	

Question	Answer	Marks	Guidance
5(a)	(**H**) nucleus drawn in cytoplasm **+** labelled **;** (**J**) nucleus drawn in cytoplasm **+** labelled **;** (**K**) nucleus drawn in cytoplasm **+** labelled **;** chloroplast(s) drawn only in (**H**) **+** at least one labelled **;**	**4**	
5(b)	(cell) sperm / male gamete / (cell) **K** **;** (organ) testis / testicle / testes **;**	**2**	
5(c)	(cell **H**) **1** traps / absorbs / needs / uses / converts **+** light (energy) **;** **2** reference to photosynthesis **OR** production of glucose / starch / carbohydrate **OR** into chemical energy **OR** cell division / mitosis **OR** growth **OR** protein synthesis **;** (cell **J**) **3** active transport / against a concentration gradient **AW** **;** **4** intake **AW** of **+** ions / minerals / salts **;** (cell **K**) **5** movement / use / action **+** of tail / flagellum **;** **6** movement / motility / mobility / locomotion / swimming **AW** **;**	**6**	

Question	Answer	Marks	Guidance
6(a)	**1** correct reference to (CO_2) <u>diffusion</u> ; **2** cytoplasm ; **3** (across) cell membrane ; **4** tissue fluid ; **5** * <u>capillary</u> ; **6** plasma / (red) blood (cell) ; **7** vein / vena cava ; **8** heart **+** right (side of heart) ; **9** reference to atrium / auricle **+** <u>followed by</u> ventricle ; **10** <u>pulmonary</u> artery / arch ; **11** * <u>capillary</u> ; **12** alveolus / alveoli ;	**7**	* **A** once only either here or below **Ig** inferior / superior vena cava * **A** once only either here or above **Ig** reference to air sac
6(b)	**1** (blood is under) pressure ; **2** (moved) by (contraction of skeletal) muscles ; **3** reference to veins / correct named vein ; **4** reference to valves (in veins) ; **5** (valves) prevent backflow of blood **AW** ;	**3**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>7(a)</td><td>(seed)

1 seed + results from fertilisation AW / sexual reproduction ;
2 (fusion / fertilisation of) <u>gametes</u> OR pollen <u>nucleus</u> + egg /ovum / ovule ;
3 reference to (gametes often) from different plants / flowers ;
4 (gametes produced by) meiosis / reduction division ;
5 combination AW of (different) genes / alleles ;

(fruit)

6 fruit (wall) + results from mitosis ;
7 reference to (genetically) identical / clones ;</td><td>4</td><td>A maximum of three of marking points 1 to 5 (i.e. for 'seed')</td></tr>
<tr><td>7(b)</td><td>
<table>
<tr><td></td><td>(wind)</td><td></td><td>(animal)</td></tr>
<tr><td>1</td><td>small</td><td>OR</td><td>large ;</td></tr>
<tr><td>2</td><td>light / buoyant</td><td>OR</td><td>heavy ;</td></tr>
<tr><td>3</td><td>wings / parachutes</td><td>OR</td><td>hooks / hairs ;</td></tr>
<tr><td>4</td><td>large surface area</td><td>OR</td><td>attachment (to animal) ;</td></tr>
<tr><td>5</td><td>large number</td><td>OR</td><td>small number ;</td></tr>
<tr><td>6</td><td>not coloured / dull</td><td>OR</td><td>colour / named colour / bright ;</td></tr>
<tr><td>7</td><td>not sweet/juicy/flesh(y)/scented</td><td>OR</td><td>sweet / juicy / flesh(y) / scented ;</td></tr>
<tr><td>8</td><td></td><td></td><td>reference to
food / eaten / digested ;</td></tr>
<tr><td>9</td><td></td><td></td><td>seed + enzyme resistant / cannot be digested / is egested / is lost in faeces / is thrown away ;</td></tr>
</table>
</td><td>6</td><td></td></tr>
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Question	Answer	Marks	Guidance
8(a)	standard pyramid shape with 4 levels **;** correctly labelled 'tree' **+** 'insect' **+** 'bird' **+** 'fox' **;**	**2**	
8(b)	**1** not all insects / not all parts of insect **+** eaten (by birds) **;** **2** (therefore) energy remains in insects (not eaten) **;** **3** not all parts of insect digested / some lost as faeces / egested (by birds) **;** **4** (insects) release **AW** energy in respiration **;** any **two** uses of energy (by insects) from the following: **5** (electrical) impulses **;** **6** active transport **;** **7** movement / muscle contraction **;** **8** heat (production / loss) **;**	**4**	
8(c)	**1** pyramid with 5 levels **+** 'flea' level at top **;** **2** 'flea' level larger than **+** immediately above 'fox' level **;** **3** 'fox' level smaller than **+** immediately above 'bird' level **;** **4** 'bird' level smaller than **+** immediately above 'insect' level **;** **5** 'tree' level at bottom **+** of smallest width **;**	**4**	each level referred to in a marking point must be labelled to gain credit

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Question	Answer	Marks	Guidance
9(a)	(to discourage insects from biting) **1** insect repellent ; **2** long-(sleeved) clothes ; **3** nets on / close **+** doors / windows ; **4** nets **+** over beds / while sleeping ; **5** paint walls white ; (to kill insects / mosquitoes) **6** insecticides / pesticides / reference to fogging / electric insect killer ; **7*** mosquito coils ; **8** irradiated / sterile male mosquitoes ; (to prevent mosquitoes laying eggs / reproducing **OR** to kill larvae) **9** drain ponds / remove stagnant **AW** water / use closed water tanks ; **10** (spray) oil / insecticide on ponds ; **11** stock ponds / lakes with fish ; **12** use of Bti / *Bacillus thuringiensis (israelensis)* ;	**6**	
9(b)	**1** exposure to / used for **+** a long time / years / decades ; **2** mutation ; **3** natural selection ; **4** resistance (to quinine) ; **5** (quinine) no longer as effective / recent drugs more effective ; **6** reference to plasmodium / parasite ; **7** new drugs cheaper / more easily available / fewer side effects ;	**4**	

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