



**Cambridge International Examinations**  
Cambridge Ordinary Level

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**BIOLOGY**

**5090/22**

Paper 2 Theory

**May/June 2017**

MARK SCHEME

Maximum Mark: 80

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**Published**

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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Mark schemes will use these abbreviations:

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



Question	Answer	Marks	Guidance
2(a)(i)	<u>assimilation</u> ;	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) <u>protein</u> ;  (where absorbed) ileum / small intestine / villi / capillaries ;	2	<b>R</b> amino acids <b>lg</b> any reference to fat <b>A</b> jejunum
2(c)	<b>1</b> reference to <u>bile</u> (salts) ; <b>2</b> (bile) not stored ; <b>3</b> <u>less/ slower</u> + release (of bile) ; <b>4</b> <u>less/ slower</u> + emulsification <b>AW</b> ; <b>5</b> <u>less/ slower / not optimum</u> + digestion (of fats) / (lipase) enzyme action ; <b>6</b> <u>fewer</u> fatty acids / <u>less</u> glycerol + produced / absorbed ; <b>7</b> 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' ;	<b>2</b>	
3(b)	(flower <b>D</b> )  <b>1</b> anther(s) / stamen(s) ; <b>2</b> pollen + mature / produced / present / released / collected ; <b>3</b> stigma + closed / immature <b>AW</b> / does not receive pollen ;  (flower <b>E</b> )  <b>4</b> stigma + open / mature / receives pollen ; <b>5</b> anthers + withered <b>AW OR</b> reference to no pollen produced / present / released / to be collected ;	<b>3</b>	
3(c)	<b>1</b> large + petal(s) ; <b>2</b> reference to insect / bee landing <b>AW</b> on petal ; <b>3</b> colour(ful) + petal(s) ; <b>4</b> reference to scent / smell ; <b>5</b> reference to nectar(ies) / (nectar) guides ; <b>6</b> pollen + stick(y) / hooked (to attach to insect / bee) ; <b>7</b> insect / bee makes contact <b>AW</b> with anther / stigma + while collecting nectar ;	<b>4</b>	

Question	Answer	Marks	Guidance
4(a)	10.00–12.00 / noon / midday ;	1	<b>A</b> any single time or range between 10.00–12.00
4(b)(i)	1 plants may be of different species ; 2 plant <b>G</b> + more / fast(er) <u>transpiration</u> ; 3 plant <b>G</b> + more / big(ger) leaves ; 4 plant <b>G</b> + more stomata / pores / guard cells <b>OR</b> stomata bigger / wider <b>AW</b> ; 5 plant <b>G</b> + better / big(ger) root system / absorbs more water ; 6 plant <b>G</b> + thin(ner) (waxy) cuticle ;	3	<b>ORA</b> for plant <b>F</b> for each of marking points <b>2</b> to <b>5</b>
4(b)(ii)	1 increased + light (intensity) ; 2 increased + temperature / heat ; 3 reference to wind <b>OR</b> increased + air movement ; 4 decreased + humidity ; 5 stomata / pores / guard cells + open /wider ;	3	
4(c)	1 <u>highest</u> / <u>fastest</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)	<p>(H) nucleus drawn in cytoplasm + labelled ;            (J) nucleus drawn in cytoplasm + labelled ;            (K) nucleus drawn in cytoplasm + labelled ;</p> <p>chloroplast(s) drawn <u>only</u> in (H) + at least one labelled ;</p>	<b>4</b>	
5(b)	<p>(cell) sperm / male gamete / (cell) <b>K</b> ;            (organ) testis / testicle / testes ;</p>	<b>2</b>	
5(c)	<p>(cell <b>H</b>)</p> <p><b>1</b> traps / absorbs / needs / uses / converts + <u>light</u> (energy) ;  <b>2</b> reference to photosynthesis <b>OR</b> production of            glucose / starch / carbohydrate <b>OR</b> into chemical energy <b>OR</b> cell            division / mitosis <b>OR</b> growth <b>OR</b> protein synthesis ;</p> <p>(cell <b>J</b>)</p> <p><b>3</b> active transport / against a concentration gradient <b>AW</b> ;  <b>4</b> intake <b>AW</b> of + ions / minerals / salts ;</p> <p>(cell <b>K</b>)</p> <p><b>5</b> movement / use / action + of tail / flagellum ;  <b>6</b> movement / motility / mobility / locomotion / swimming <b>AW</b> ;</p>	<b>6</b>	

Question	Answer	Marks	Guidance
6(a)	1 correct reference to (CO <sub>2</sub> ) <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 ;	<b>7</b>	* <b>A</b> once only either here or below  <b>lg</b> inferior / superior vena cava  * <b>A</b> once only either here or above <b>lg</b> 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 <b>AW</b> ;	<b>3</b>	



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

Question	Answer	Marks	Guidance
9(a)	<p>(to discourage insects from biting)</p> <p>1 insect repellent ;            2 long-(sleeved) clothes ;            3 nets on / close + doors / windows ;            4 nets + over beds / while sleeping ;            5 paint walls white ;</p> <p>(to kill insects / mosquitoes)</p> <p>6 insecticides / pesticides / reference to fogging / electric insect killer ;            7* mosquito coils ;            8 irradiated / sterile male mosquitoes ;</p> <p>(to prevent mosquitoes laying eggs / reproducing <b>OR</b> to kill larvae)</p> <p>9 drain ponds / remove stagnant <b>AW</b> water / use closed water tanks ;            10 (spray) oil / insecticide on ponds ;            11 stock ponds / lakes with fish ;            12 use of Bti / <i>Bacillus thuringiensis (israelensis)</i> ;</p>	<b>6</b>	
9(b)	<p>1 exposure to / used for + a long time / years / decades ;            2 mutation ;            3 <u>natural selection</u> ;            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 ;</p>	<b>4</b>	