



BIOLOGY

5090/22

Paper 2 Theory

May/June 2017

MARK SCHEME

Maximum Mark: 80

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.

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.

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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
<u>underline</u>	actual word underlined must be used by candidate
+	statements on both sides of the + are needed for that mark

Question	Answer	Marks	Guidance
1(a)	<ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 1 any reference to up / rises / raised ; 2 out / forwards ; 3 reference to <u>muscle</u> ; 4 (muscle) contract(ion) ; 5 reference to (requires) <u>energy</u> ; 	2	
1(b)(ii)	<p>(movement of person's chest)</p> <ol style="list-style-type: none"> 1 involuntary AW ; 2 <u>intercostal</u> (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 <u>volume</u> / decrease in <u>pressure</u> ; <p>(movement of bucket handle)</p> <ol style="list-style-type: none"> 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 <u>single</u> handle ; 11 attached / hinged + to bucket / at side ; 12 *does not lead to change in <u>volume</u> / <u>pressure</u> ; 	5	<p>* A once only for either chest or handle</p> <p>* A once only for either chest or handle</p>

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	R amino acids lg any reference to fat A jejunum
2(c)	1 reference to <u>bile</u> (salts) ; 2 (bile) not stored ; 3 <u>less/ slower</u> + release (of bile) ; 4 <u>less/ slower</u> + emulsification AW ; 5 <u>less/ slower / not optimum</u> + digestion (of fats) / (lipase) enzyme action ; 6 <u>fewer</u> fatty acids / <u>less</u> 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	

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 <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>	4	
5(b)	<p>(cell) sperm / male gamete / (cell) K ; (organ) testis / testicle / testes ;</p>	2	
5(c)	<p>(cell H)</p> <p>1 traps / absorbs / needs / uses / converts + <u>light</u> (energy) ; 2 reference to photosynthesis OR production of glucose / starch / carbohydrate OR into chemical energy OR cell division / mitosis OR growth OR protein synthesis ;</p> <p>(cell J)</p> <p>3 active transport / against a concentration gradient AW ; 4 intake AW of + ions / minerals / salts ;</p> <p>(cell K)</p> <p>5 movement / use / action + of tail / flagellum ; 6 movement / motility / mobility / locomotion / swimming AW ;</p>	6	

Question	Answer	Marks	Guidance
6(a)	<ol style="list-style-type: none"> 1 correct reference to (CO₂) <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	<p>* A once only either here or below</p> <p>lg inferior / superior vena cava</p> <p>* A once only either here or above</p> <p>lg reference to air sac</p>
6(b)	<ol style="list-style-type: none"> 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	

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