



BIOLOGY

5090/21

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)	single-celled ; no nucleus / nucleus not membrane bound ; no organelles ; cell wall ; (cell wall) not cellulose ; cell membrane / cytoplasm ; flagella / flagellum ; DNA circular / loop OR plasmid / single chromosome ; smaller than animal / plant cells OR 1–2 μm ;	3	
1(b)(i)	<u>chlorophyll</u> ;	1	
1(b)(ii)	carbon dioxide / 6CO_2 + water / $6\text{H}_2\text{O}$; glucose / $\text{C}_6\text{H}_{12}\text{O}_6$ + oxygen / 6O_2 ;	2	
1(c)	iron + haemoglobin / red blood cells ; prevent anaemia ; protein + growth / repair ; protein + (production of) enzymes / antibodies ; carbohydrates / glucose / starch / vitamins / ions ; reference to a component of balanced diet / dietary supplement OR to alleviate malnutrition / famine ;	4	
	Total:	10	

Question	Answer	Marks	Guidance
2(a)	(A) petal ; (B) sepal ; (C) leaf / lamina / cuticle ; (D) vein / midrib / vascular (tissue) OR xylem + phloem ;	4	
2(b)	xylem ; to leaves / flower(s) ; between leaf cells ; surface of mesophyll cells ; (leaf) air spaces ; (through) stomata / guard cells ;	3	
2(c)(i)	6 ;	1	
2(c)(ii)	reduces / lower(s) AW ; less photosynthesis ; less water needed ; stomata / guard cells + open less / are closed ; less diffusion ; less evaporation / transpiration ;	3	
	Total:	11	

Question	Answer	Marks	Guidance
3(a)	(X) liver ; (P) hepatic vein ; (Q) hepatic portal vein ; (R) hepatic artery ;	4	
3(b)	(P / vein has) wide(r) + lumen AW ; thin(ner) <u>wall</u> ; less AW + muscle / elastic (tissue) ; valves ;	3	ORA for all points
3(c)(i)	<u>hormone</u> ;	1	
3(c)(ii)	ovary ; uterus ; repairs / thickens (uterus) lining ;	3	
	Total:	11	

Question	Answer	Marks	Guidance
4(a)(i)	section of / made of / piece of + DNA / chromosome ; controls production of <u>one</u> protein ; may be copied ; unit of inheritance / passed on to next generation ;	3	
4(a)(ii)	<u>mutation</u> ;	1	
4(b)	Tt + Tt ; t + t ; tt ; tt offspring clearly indicated as white ; 3 × labels on genetic diagram correct ;	5	A parent / offspring / gamete / genotype / phenotype
4(c)	<i>(unaffected by fur colour)</i> (controlled by) different gene(s) ; <i>(unique to each individual)</i> alleles ; (as a result of) mutation(s) ; meiosis AW ; different combinations (of alleles) ; reference to some may be homozygous / heterozygous ; reference to codominance ;	1 2	
	Total:	12	

Question	Answer	Marks	Guidance
5	<i>(sexual only)</i> H ; I ; J ;	3	R letters in more than one box lg letters in incorrect box
	<i>(asexual only)</i> (E) G ; K ;	2	
	<i>(both)</i> F ;	1	
	Total:	6	

Question	Answer	Marks	Guidance
6(a)	move mucus ; (containing) bacteria / pathogens / dust ; (moves) up / away from lungs AW ; prevent infection ;	3	
6(b)	reference to diffusion ; (for) O ₂ / CO ₂ + exchange AW ; alveolus / air sac ; large surface area ; one cell thick + wall ; moist AW / mucus ; (gases) to dissolve ; capillary ; one cell thick + wall ; connect AW arteries + veins ; blood + moving ; red blood cells / erythrocytes ; no nucleus ; biconcave ; contain haemoglobin ; live for 90 / 120 days OR 3 / 4 months ; carry oxygen ; plasma ; carriage of carbon dioxide ;	7	
	Total:	10	

Question	Answer	Marks	Guidance
7(a)	<p>M has clear area + N no clear area ;</p> <p><i>(for disc M)</i> reference to (bacteria) killed around M / not killed around N ; gene ; mutation ; resistant (to antibiotic) ; (resistant) survive ; (resistant) reproduce ; pass on resistance to next generation / offspring ;</p> <p><i>(for disc N)</i> antibiotic (solution) not strong / concentrated enough OR incorrect antibiotic (for the bacteria) ;</p>	6	ORA for disc N
7(b)	named example of (artificially selected) animal / plant ; reason named example is economically important ; reference to human / farmer AW ; reference to breed together / cross breed AW ; over several generations / repeated ;	4	
	Total:	10	

Question	Answer	Marks	Guidance
8(a)	reference to shape difference + plant and animal cell <u>named</u> ; <i>(plant cell)</i> cell wall ; nucleus pushed to outside / not towards centre ; vacuole ; chloroplast ; starch grains ;	4	ORA for animal cell
8(b)	<i>(xylem vessels)</i> (S) hollow / dead ; (S) strengthened / lignification ; (S) extend from root to stem / leaves ; (S) narrow / tubes ; (F) conduction / transport ; (F) capillarity ; (F) of water ; (F) of ions ; (F) support ;	3	each section must refer to at least one structure (S) marking point and one function (F) marking point to score maximum 3 marks
	<i>(red blood cells)</i> (S) haemoglobin ; (S) no nucleus ; (S) biconcave ; (S) able to change shape AW ; (S) increased / large + surface area ; (F) squeeze AW through + capillaries ; (F) absorption / transport of oxygen ;	3	
	Total:	10	

Question	Answer	Marks	Guidance
9(a)	glucose + required for both ; complete or incomplete breakdown (of glucose) ; ref. oxygen requirement ; amount of energy released ;	3	A each point only if linked to either 'aerobic' or 'anaerobic' respiration
9(b)	glucose + required for both ; reference to oxygen debt AW ; lactic acid ; carbon dioxide ; alcohol / ethanol ;	3	A each point only if linked to either 'muscles or 'yeast'
9(c)	movement of particles / molecules / named molecule ; concentration gradient ; membrane requirement ; living cell requirement ; energy requirement ; (energy from) respiration ; correct example ;	4	A each point only if linked to either 'diffusion' or 'active transport'
	Total:	10	