Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

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.

Cambridge is publishing the mark schemes for the May/June 2017 series for most Cambridge IGCSE®, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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

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)	chlorophyll ;	**1**	
1(b)(ii)	carbon dioxide / $6CO_2$ **+** water / $6H_2O$; glucose / $C_6H_{12}O_6$ **+** 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) wall **;** less **AW +** muscle / elastic (tissue) **;** valves **;**	**3**	**ORA** for all points
3(c)(i)	hormone **;**	**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)	*(unaffected by fur colour)* (controlled by) different gene(s) **;** *(unique to each individual)* 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	*(sexual only)* **H ;** **I ;** **J ;**	**3**	**R** letters in more than one box **Ig** letters in incorrect box
	(asexual only) (**E**) **G ;** **K ;**	**2**	
	(both) **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)	**M** has clear area **+ N** no clear area **;** *(for disc **M**)* 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 **;** *(for disc **N**)* antibiotic (solution) not strong / concentrated enough **OR** incorrect antibiotic (for the bacteria) **;**	**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 named **;** *(plant cell)* cell wall **;** nucleus pushed to outside / not towards centre **;** vacuole **;** chloroplast **;** starch grains **;**	**4**	**ORA** for animal cell
8(b)	*(xylem vessels)* (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
	(red blood cells) (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**	