Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

BIOLOGY **5090/22**

Paper 2 Theory **May/June 2016**

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 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

® IGCSE is the registered trademark of Cambridge International Examinations.

© UCLES 2016

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 (grammatical variants excepted)
max	indicates the maximum number of marks that can be given
+	statements on both sides of the + are needed for that mark

Question	Expected answers	Additional guidance	Marks
1 (a) (i)	sepals / calyx **;** petals / corolla **;** nectaries **;**		[max 2]
(ii)	*type of pollination:* self / wind **;** *reason for wind:* exposed / large + stamens / anthers **;** *reason for self:* position of anthers relative to stigma / carpel **;** *reason for either*: no petals / nectaries to attract insects **;**		[1] [max 1]
(b) (i)	seed / cotyledon **;**		[1]
(ii)	bird / animal / herbivore **;** sweet / sugary / coloured (skin) / juicy / succulent / taste / smell **;** eaten / consumed / food **;** spits out or drops / undigested / passes out with faeces **;** at a distance from parent plant / elsewhere AW **;**	**R** reference to excretion	[max 3]
(c) (i)	yeast / fungus **;**	**R** bacterium	[1]

© Cambridge International Examinations 2016

Question	Expected answers	Additional guidance	Marks
(ii)	sugar (or named) / correct formula ; fermenter/ fermentation / <u>anaerobic</u> respiration (or description of) ; reference to suitable temperature / warmth ; reference to enzymes ;	**A** sugar is broken down in the absence of oxygen	[max 3]
			[Total 12]
2 (a)	C / D / E ; C / D ; F ; E ;		[4]
(b) (i)	heroin / alcohol / nicotine / named addictive drug ;		[1]
(ii)	**Ig** reference to named drug / substance (e.g. CO, tar) mother's blood ; <u>diffusion</u> ; across or through placenta ; fetus / baby / embryo + blood ; umbilical cord / umbilical vein ;	**R** umbilical artery	[max 4]
			[Total 9]
3 (a) (i)	mineral salts / fibre / roughage ;		[1]
(ii)	fat / lipid ;		[1]

© Cambridge International Examinations 2016

Question	Expected answers	Additional guidance	Marks
(b)	*constituent:* water ; *reasons for importance:* solvent / constituent of urine / reference to chemical reactions / constituent cells OR cyto-, proto-plasm OR blood / temperature regulator OR sweating / transporter / osmoregulator AW / prevents dehydration / lubrication / prevents constipation ;; *constituent:* (named) vitamin ; *reasons for importance:* prevent deficiency disease AW / reference to correct specified benefit of any vitamin ;;		[1] [max 2] [1] [max 2]
(c)	little or no starch in diet / cannot digest starch AW ; relies on sugar or named sugar AW ; (needs to) eat fruit / animals / fewer plants ; may rely on fat / protein (for energy) ;		[max 2]
			[Total 10]
4 (a)	*process:* photosynthesis ; *explanation:* 1. leaves flat ; 2. face the sun / horizontal ; 3. large / maximum / increased + surface area ; 4. (for) trapping / absorbing / converting + light (energy) ; 5. (for) CO_2 absorption / reference to stomata ; 6. presence of chlorophyll / chloroplasts ; 7. reference to transparent cuticle / epidermis / thin leaves ; 8. reference to intercellular spaces / mesophyll cells ; 9. reference to veins to bring water / take away products ;		[1] [max 2]

© Cambridge International Examinations 2016

Question	Expected answers	Additional guidance	Marks
(b)	*effect:* reduces (transpiration) **;** **lg** wilting *explanation:* stomata **;** (mostly) on lower surface **;** any two of: humidity build up / reduced diffusion gradient / reduced evaporation (rate) / reduced surface area / (stomata / guard cells) close **;;** protection from breeze / wind **;**		[1] [max 3]
(c) (i)	reduced light levels **;** photosynthesis slowing down **;** less O_2 produced / lost AW **;** stomata closing / closed AW **;**		 [max 2]

© Cambridge International Examinations 2016

Question	Expected answers	Additional guidance	Marks
(ii)	reference to darkness / low light intensity ; photosynthesis stops ; O_2 used / absorbed / gained / uptake AW ; (for) respiration ;		[max 2]
			[Total 11]
5 (a)	✓ diffusion into the alveoli *(box 2)* ; ✓ the diaphragm relaxes *(box 4)* ; ✓ the ribs fall *(box 8)* ; ✓ pressure in the thorax increases *(box 9)* ;		[4]
(b)	1. any stated difference between inspired and expired % O_2 ; 2. O_2 used in respiration ; 3. **Person J** – the most / more (than normal) O_2 absorbed / used ; 4. **Person J** - active / taking exercise / athlete / pregnant / high respiratory rate / high blood cell or red blood cell count AW ; 5. **Person K** – moderate activity / normal ; 6. **Person L** – low O_2 absorption / use ; 7. **Person L** – (named) lung disease / anaemia / smoker / inactive / sleeping / elderly / dying / low respiratory rate / reference to low red blood cell count / carboxyhaemoglobin ;	**A** any disease that would restrict O_2 uptake	[4]
			[Total 8]

© Cambridge International Examinations 2016

Question	Expected answers	Additional guidance	Marks
6 (a)	*structure:* 1. cell wall thick / cell membrane thin ; 2. cellulose in cell wall ; 3. fat / protein in cell membrane ; 4. cell wall surrounds OR protects cell membrane **ORA** ; *function:* 5. wall <u>permeable</u> + membrane semi-<u>permeable</u> AW ; 6. cell wall no control / cell membrane has control over what enters cell ; 7. cell wall involved in turgor / support / protection / shape / prevents bursting ; 8. osmosis (only) through membrane ; 9. active transport (only) through membrane ;		[max 6]
(b)	1. (cell) the unit of life AW ; 2. tissues are made up of cells AW ; 3. cells in tissues have common / specific function ; 4. organs are made up of tissues AW ; 5. working / combining together ; 6. one example each of a named <u>cell</u> identified as such + a named <u>organ</u> identified as such ;	**A for tissue examples including:** blood, muscle, nervous, epithelial, connective, xylem, phloem, palisade, epidermis **A for organ examples including:** muscle, heart, leaf, flower, root, stem	[max 3] [1]
			[Total 10]

© Cambridge International Examinations 2016

Question	Expected answers	Additional guidance	Marks
7 (a)	*Each importance must be linked to a condition in order to score credit.* 1. oxygen ; 2. for respiration / energy release ; 3. growth / mitosis / cell division ; 4. water ; 5. solvent / reference to chemical reaction / transport ; 6. to rupture / break / soften testa (seed coat) ; 7. reference to temperature qualified e.g. suitable / warm ; 8. for enzyme action ; 9. digestion AW + of food / named food (stores) ; 10. seed must be viable / alive / no longer dormant ;		[max 6]
(b)	1. amino acids / sucrose or sugar ; 2. as a result of photosynthesis ; 3. in or from leaves / source / storage organ of parent – or parent clearly implied ; 4. in solution ; 5. translocated / in phloem ; 6. in veins / vascular bundles ; 7. functional reference to cotyledon / endosperm OR sink ;		[max 4]
			[Total 10]

© Cambridge International Examinations 2016

Question	Expected answers	Additional guidance	Marks
8 (a)	1. sterilised / aseptic technique ; 2. fermenter ; 3. bacterium / fungus / algae / named example ; 4. substrate / cultured medium or named / broth / any two chemicals in the medium ; 5. oxygen / air ; 6. bubbles / sparger / aerator / paddle / stirrer AW ; 7. temperature regulation / control / cooling jacket ; 8. pH ref ; 9. optimum or best for growth or reproduction of organism ; 10. filtration / collection / harvesting / separating (the product) ; 11. name / use of product e.g. mycoprotein / meat substitute / cattle feed ;		[max 8]
(b)	1. size reference / extremely small AW ; 2. reproduce only in living cells / pathogenic AW / parasitic ; 3. specific ; 4. may need to separate them from living tissue / difficult to isolate ;	**A** named viral disease	[max 2]
			[Total 10]
9 (a) (i)	1. allele(s) ; 2. responsible for a character(istic) / trait ; 3. only one needs to be present / reference to heterozygote AW ; 4. for the character to appear / be expressed (in phenotype) AW ; 5. e.g. I^AI^O + group A / I^BI^O + group B / I^AI^B + dominant to I^O ;	**A** *A, B, O instead of* I^A, I^B, I^O	[max 3]
(ii)	1. two alleles ; 2. neither being recessive / (equally) dominant ; 3. both have an effect / are expressed / phenotype intermediate ; 4. reference to heterozygote AW ; 5. I^AI^B/*AB* ;		[max 3]

© Cambridge International Examinations 2016

Question	Expected answers	Additional guidance	Marks
(b)	1. number of chromosomes in a gamete is half those in a somatic or body cell **ORA** / one versus two sets of chromosomes ; 2. correct use of the terms haploid + diploid ; 3. 46 v. 23 ; 4. gametes / haploid cells are the result of meiosis / reduction division ; 5. somatic / body cells occur in / produced by mitosis ; 6. (diploid) number restored + at fertilisation ; 7. each parent has equal share in genotype of offspring AW ;	**A** sex cell = gamete / one named gamete	[max 4]
			[Total 10]

© Cambridge International Examinations 2016