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.
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

<table>
<thead>
<tr>
<th>Question</th>
<th>Expected answers</th>
<th>Additional guidance</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (a) (i)</td>
<td>sepals/calyx ; petals/corolla ; nectaries ;</td>
<td></td>
<td>[max 2]</td>
</tr>
<tr>
<td>(ii)</td>
<td>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 ;</td>
<td></td>
<td>[1]</td>
</tr>
<tr>
<td>(b) (i)</td>
<td>seed/cotyledon ;</td>
<td></td>
<td>[1]</td>
</tr>
<tr>
<td>(ii)</td>
<td>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 ;</td>
<td>R reference to excretion</td>
<td>[max 3]</td>
</tr>
<tr>
<td>(c) (i)</td>
<td>yeast/fungus ;</td>
<td>R bacterium</td>
<td>[1]</td>
</tr>
<tr>
<td>Question</td>
<td>Expected answers</td>
<td>Additional guidance</td>
<td>Marks</td>
</tr>
<tr>
<td>----------</td>
<td>------------------</td>
<td>---------------------</td>
<td>-------</td>
</tr>
<tr>
<td>(ii)</td>
<td>sugar (or named)/correct formula ; fermenter/fermentation/anaerobic respiration (or description of) ; reference to suitable temperature/warmth ; reference to enzymes ;</td>
<td>A sugar is broken down in the absence of oxygen</td>
<td>[max 3]</td>
</tr>
<tr>
<td>2 (a)</td>
<td>C/D/E ; C/D ; F ; E ;</td>
<td></td>
<td>[4]</td>
</tr>
<tr>
<td>(b) (i)</td>
<td>heroin/alcohol/nicotine/named addictive drug ;</td>
<td></td>
<td>[1]</td>
</tr>
<tr>
<td>(ii)</td>
<td>Ig reference to named drug / substance (e.g. CO, tar) mother’s blood ; diffusion ; across or through placenta ; fetus/baby/embryo + blood ; umbilical cord/umbilical vein ;</td>
<td>R umbilical artery</td>
<td>[max 4]</td>
</tr>
<tr>
<td>3 (a)</td>
<td>mineral salts/fibre/roughage ;</td>
<td></td>
<td>[1]</td>
</tr>
<tr>
<td>(ii)</td>
<td>fat/lipid ;</td>
<td></td>
<td>[1]</td>
</tr>
</tbody>
</table>
### Question (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]

### Question (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);  

[Total 10]

### Question 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) CO₂ 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]
<table>
<thead>
<tr>
<th>Question</th>
<th>Expected answers</th>
<th>Additional guidance</th>
<th>Marks</th>
</tr>
</thead>
</table>
| **(b)** | *effect:* reduces (transpiration); *Ig* 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]** |
| **(c) (i)** | reduced light levels;  
photosynthesis slowing down;  
less $O_2$ produced/lost AW;  
stomata closing/closed AW; | | **[max 3]** |
<p>| | | | <strong>[max 2]</strong> |</p>
<table>
<thead>
<tr>
<th>Question</th>
<th>Expected answers</th>
<th>Additional guidance</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ii)</td>
<td>reference to darkness/low light intensity; photosynthesis stops; O₂ used/absorbed/gained/uptake AW; (for) respiration;</td>
<td></td>
<td>[max 2]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[Total 11]</td>
</tr>
<tr>
<td>5 (a)</td>
<td>✓ diffusion into the alveoli (box 2); ✓ the diaphragm relaxes (box 4); ✓ the ribs fall (box 8); ✓ pressure in the thorax increases (box 9);</td>
<td></td>
<td>[4]</td>
</tr>
<tr>
<td>(b)</td>
<td>1. any stated difference between inspired and expired % O₂; 2. O₂ used in respiration; 3. Person J – the most/more (than normal) O₂ 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 O₂ 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;</td>
<td>A any disease that would restrict O₂ uptake</td>
<td>[4]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[Total 8]</td>
</tr>
<tr>
<td>Question</td>
<td>Expected answers</td>
<td>Additional guidance</td>
<td>Marks</td>
</tr>
<tr>
<td>----------</td>
<td>------------------</td>
<td>---------------------</td>
<td>-------</td>
</tr>
<tr>
<td>6 (a)</td>
<td><strong>structure:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. cell wall thick / cell membrane thin ;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. cellulose in cell wall ;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. fat / protein in cell membrane ;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. cell wall surrounds OR protects cell membrane ORA ;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>function:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. wall permeable + membrane semi-permeable AW ;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. cell wall no control / cell membrane has control over what enters cell ;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. cell wall involved in turgor / support / protection / shape / prevents bursting ;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. osmosis (only) through membrane ;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. active transport (only) through membrane ;</td>
<td></td>
<td>[max 6]</td>
</tr>
<tr>
<td>(b)</td>
<td><strong>1. (cell) the unit of life AW ;</strong></td>
<td></td>
<td>[max 3]</td>
</tr>
<tr>
<td></td>
<td>2. tissues are made up of cells AW ;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. cells in tissues have common / specific function ;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. organs are made up of tissues AW ;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. working / combining together ;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. one example each of a named cell identified as such + a named organ identified as such ;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A for tissue examples including: blood, muscle, nervous, epithelial, connective, xylem, phloem, palisade, epidermis</td>
<td></td>
<td>[1]</td>
</tr>
<tr>
<td></td>
<td>A for organ examples including: muscle, heart, leaf, flower, root, stem</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Question 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 ;

**Question 7 (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 ;

**Marks**

- (a) [max 6]
- (b) [max 4]

**Total 10**
### Question 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 ;

### Question 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

### Question 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. \(I^A I^O\) + group A / \(I^B I^O\) + group B / \(I^A I^B\) + dominant to \(I^O\) ;

A \(A, B, O \) instead of \(I^A, I^B, I^O\)

### Question 9 (a) (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. \(I^A I^B/AB\) ;

### Question 9 (a) (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. \(I^A I^B/AB\) ;
<table>
<thead>
<tr>
<th>Question</th>
<th>Expected answers</th>
<th>Additional guidance</th>
<th>Marks</th>
</tr>
</thead>
</table>
| (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]