

**MARK SCHEME for the May/June 2012 question paper
for the guidance of teachers**

5090 BIOLOGY

5090/62

Paper 6 (Alternative to Practical), maximum raw mark 40

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.

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| | | |
|---------------|---------------------------------------|-----------------|
| Page 2 | Mark Scheme: Teachers' version | Syllabus |
| | GCE O LEVEL – May/June 2012 | 5090 |

Abbreviations

Mark schemes will use these abbreviations:

| | |
|------|--------------------------|
| ora | or reverse argument |
| A | accept |
| R | reject |
| ; | separates marking points |
| / | alternatives |
| AW | alternative wording |
| ref. | reference |

1 (a)

| Table 1.2 | | |
|-------------------------|----------|-------|
| maximum width leaf / mm | | |
| | sunlight | shade |
| 1 | 25 | 66 |
| 2 | 46 | 76 |
| 3 | 40 | 64 |
| 4 | 50 | 75 |
| 5 | 49 | 77 |
| 6 | 34 | 59 |
| mean | | |

- Measurements recorded in all 12 boxes ;
- Measurements in mm (mm need not be written) ;
R cms **R** inches
- sunlight 1 measurement in the range 24 to 26 ;
A 2.4 – 2.6 if all measurements in cm
A 0.9 – 1.1 if all measurements in inches
- all 6 sunlight measurements less than corresponding shade measurement ; [4]

- (b) (i) sunlight within the range 35 – 45 (inclusive)
+ shade within the range 65 – 75 (inclusive)
entered in Table 1.1 ; [1]
A inches or cm if ecf
R if more than 2 dps
R fractions

- (ii) leaves in sunlight narrower / smaller **ORA** ;
A (correct) statements about development, growth, size, or surface area e.g.
more growth / development **ORA**
growth / development restricted or promoted
growth / development slower **ORA**
R measurements quoted without qualification
R leaves shrinking / decreasing

leaves in sunlight less green / less coloured / paler / fewer chloroplasts / less chlorophyll
ORA ;
R grey / black unless qualified with paler / darker
R brighter

| | | |
|--------|--------------------------------|----------|
| Page 4 | Mark Scheme: Teachers' version | Syllabus |
| | GCE O LEVEL – May/June 2012 | 5090 |

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- (iii) *reliability*
 (use) more leaves;
 select leaves within each light intensity at random ;
 (use) leaves from plants of same age ;
 leaves from same plant / type of plant / genetic stock ;
 measure leaves' height / length / surface area / mass ;

going on

- use leaves from other species / other types of plant ;
 compare chloroplast / chlorophyll content ;
 compare starch content ;
 include petiole length ;
 use range of light intensities ;

[3]

- R** put shade leaves in sun and vice versa
R repeat the measuring (to get mean/avoid error)

(c) (i) **palisade cells:**

- two / more layers (sun) v one layer (shade) /
 more cells (sun) v fewer / less cells (shade) /
 fewer chloroplasts per cell (sun) v more (shade) /
 chloroplasts far apart (sun) v close together (shade) ;
 regular shape cells (sun) v irregular / varied, various shape (shade) ;

- A** uniform, non-uniform
R variable shape
R fixed shape

thickness of leaf: thicker / thick(sun) v thinner / thin / less thick (shade) ;

chloroplasts:

- fewer (sun) v more (shade) /
 far apart (sun) v close together (shade) /
 all mesophyll cells have similar numbers of chloroplasts (sun) v palisade cells have more chloroplasts than other mesophyll cells (shade) ;
R any implication that all cells in the leaf contain chloroplasts

air spaces: more (sun) v fewer (shade) ;
R refs. to shape or size of air spaces

[4]

- (ii) correct ref. to photosynthesis ;
 more chloroplasts / chorophyll to use all available light in shade / AW;
 thinner leaf has shorter diffusion distances ;
 larger surface area receives more light ;
 more air spaces increases of CO₂ / gaseous exchange ;

[2]

[Total: 16]

2 (a) (i)

| student | number of correct responses | | | |
|---------|-----------------------------|--------------|----------------|----------------|
| | finger tip | back of hand | palm of hand | forearm |
| 1 | | | | |
| 2 | | 5 | | |
| 3 | | | | |
| 4 | | | | |
| mean | 9.75 / 9.8 / 10 | | 8.25 / 8.3 / 8 | 6.25 / 6.3 / 6 |

[2]

4 correct, 2 marks

one error, 1 mark

more than one error, 0

If 9.7 + 8.2 + 6.2 count as one error

(ii) reliability / detect any anomalies / so that a mean /average can be obtained ; [1]

A e.g. so that the result is doubtless

A ref. to statistical significance

(iii) (most sensitive) finger tip; [2]
(least sensitive) forearm;

(iv) more / fewer nerve endings / receptors present ;
nerve endings / sensory receptors closer together / farther apart ;
need for fingers to be more sensitive than forearm because of their function / AW ; [1]

R nerves / sensory nerves / neurones / sensory cells

R refs to thickness of skin / receptors nearer surface

[Total: 6]

| | | |
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| Page 6 | Mark Scheme: Teachers' version | Syllabus |
| | GCE O LEVEL – May/June 2012 | 5090 |

- 3 (a) (i) outermost drawn line clear, clean, with no obvious beginning and ending, regular good shape of granule, at least 7cms max. length ;
at least 3 layers indicated inside ;
- (ii) 1. at least one line drawn, either on Fig or drawing, to show where measurement taken
+ 2 correct measurements with correct units at least once ;
2. correct expression ;
image/object (AW) in words or with values e.g. $\frac{80}{55}$
3. allowance for x 500 ;
3. **A** e.g. $\frac{80}{0.11}$ i.e. 55/500
4. magnification correctly calculated with × or times and no units [4]

R answers expressed to more than 2dps

- (b) (i) A – blue;
B – blue;
C – yellow / brown; [3]

- (ii) A reducing sugar present ;
A **A** named reducing sugar **R**. sugar **R** carbohydrate
- B protein present;
B **A** polypeptides
- C starch present;
for either A or B – small amount /AW ; [4]
A a little, a trace, not very much etc.
R weak
R some unqualified e.g. some reducing sugar present
A some qualified e.g. some r s as not turned brick red

[Total: 13]

- 4 (a) (i) distinct chromosome correctly identified ; [1]
- (ii) cytoplasm correctly identified ; [1]
- (b) (i) meiosis / reduction division ; [1]
NB meiosis must be correctly spelt
- (ii) haploid / half number of chromosomes / ensure no doubling of number of chromosomes
at fertilisation ; [1]
R to maintain correct number of chromosomes
- (c) anther / pollen / ovary / embryo sac / stamen / carpel / ovule ; [1]
A andrecium / gynesium / flower

[Total: 5]