

MARK SCHEME for the October/November 2013 series

0653 COMBINED SCIENCE

0653/61

Paper 6 (Alternative to Practical), maximum raw mark 60

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- 1 (a) (i) blue-black ;
- (ii) starch (still) present ;
- (iii) (for sugar accept glucose, maltose, etc.)
rows 2 to 4 correct, i.e.
sugar absent,
starch absent,
sugar absent ;
- rows 5 to 8 correct, i.e.
starch absent,
sugar present,
starch absent,
sugar present ; [2]
- (b) (i) (breaks down / converts) starch to sugar ; [1]
- (ii) sugar molecules can pass through ;
because molecules are small (enough to pass through) ;
sugar present in the water or the beaker ;
(any two, ignore refs to diffusion) [max 2]
- (c) (i) small intestine (allow duodenum, ilium) ; [1]
- (ii) blood / capillaries ; [1]
- (d) because molecules are too big / so that it can be absorbed / diffused ; [1]
- [Total: 10]
- 2 (a) (i) 67.8 ;
62.9 ; (no tolerance) [2]
- (ii) $67.8 - 45 = 22.8$ (ecf) ;
 $62.9 - 25 = 37.9$ (ecf) ; [2]
- (iii) $22.8/45 = 0.51$ (ecf) ;
 $37.9/25 = 1.52$ (ecf) ; [2]
- (b) (i) points plotted ± 1 small square ; (allow 1 error)
best straight line drawn ; [2]
- (ii) clear evidence shown on graph ;
 $14.5 - 15.5$ (ecf) ; [2]
- [Total: 10]

Page 3	Mark Scheme	Syllabus
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- 3 (a) (i) limewater becomes cloudy / milky / white ppt / white solid forms ;
(ii) carbon dioxide / CO_2 ;
(iii) solid **X** is a (metal) carbonate or hydrogen carbonate (bicarbonate); [1]
- (b) diagram shows filter funnel containing paper and collecting vessel ;
any two relevant labels ; [2]
- (c) (i) copper(II) hydroxide (allow copper hydroxide) ; [1]
(ii) (dark) blue solution (both words necessary) ; [1]
- (d) (i) (blue solution) becomes colourless / green (solution) ; [1]
(ii) (grey) filings become copper coloured / pink / brown / orange ; [1]
- (e) copper(II) carbonate (allow copper carbonate) **AND** CuCO_3 (both correct) ; [1]
- [Total: 10]**

- 4 (a) (i) diagram clearly drawn with sharp pencil ;
diagram roughly to scale ; [2]
(ii) In the range 52 mm to 57 mm ; [1]
(iii) answer according to students own diagram ; [1]
(iv) magnification correctly calculated from student's own data ; [1]
- (b) (i) line correctly drawn through main part of root to make a transverse section ; [1]
(ii) one area of xylem correctly labelled (the cross) ; [1]
- (c) cut seedling through stem ;
put in coloured liquid ;
and leave for a while ;
cut section through stem and view with microscope / hand lens ;
xylem will be coloured by the coloured liquid ; [max 3]

[Total: 10]

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- 5 (a) magnesium ;
silicon ;
- (b) phosphorus
sodium ; (must be in correct order) [1]
- (c) (element number 17) (chlorine) is yellow / green / not colourless / is coloured ; [1]
- (d) include the sample in an electrical circuit / try to make it conduct electricity ;
observation: bulb lights up / ammeter shows a reading ; [2]
- (e) (i) blue ; [1]
- (ii) to dissolve / make a solution ; [1]
- (iii) red / pink / orange ; (*accept yellow*) [1]
- (iv) blue / indigo / violet ; (*accept dark green*) [1]
- [Total: 10]**

- 6 (a) 0.26 A ;
1.55 V ; [2]
0.30 A ;
1.80 V ; all 2dp, penalise once [2]
- (b) (i) $1.55/0.26 = 6.0$ (ecf) ;
 $1.80/0.30 = 6.0$ (ecf) ; [2]
- (ii) voltage is read to the nearest 0.05 V, giving a possibility of inaccuracy / the
wire heats up ; [1]
- (iii) find the average / plot a graph and find the gradient ; [1]
- (c) (i) electrons ; [1]
- (ii) arrow shown pointing from left to right on the resistance wire ; [1]
- [Total: 10]**

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0653/62

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- 1 (a) (i) brown colour around where the seeds/grains were, (blue/black elsewhere) ;
(ii) enzyme/ seeds/grains breaking down/use/need/converted the starch ;
(iii) control/shows that breakdown depends on living seeds, ORA ; [1]
- (b) (i) (reducing) sugar is made (around the seeds/when the starch is broken down) ; [1]
(ii) starch digested/changed/converted to sugar ; [1]
- (c) (improved) reliability/because one seed might not be active/owtte ; [1]
- (d) (i) larger brown areas ; [1]
(ii) smaller brown areas (accept no brown area/all blue-black) ; [1]
- (e) (use different varieties of) seeds on different dishes/(different parts) of the same dish ;
keep (named) conditions constant ;
compare diameters/sizes of brown areas ; [max 2]

[Total: 10]

- 2 (a) (i) 68.0 ;
86.2 (± 0.1) ; [2]
- (ii) 8(0),
16.2 (ecf) ; ; [2]
- (b) (i) points plotted correctly ; (allow 1 error)
suitable straight line drawn ; [2]
- (ii) clear evidence on graph ;
allow 1.2 to 1.3 inclusive ; [2]
- (c) 150/candidates answer = between 125 and 115g (ecf) ; [1]
- (d) density = $m/l \times t \times w$ (any order) ; [1]

[Total: 10]

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- 3 (a) (i) *observation*: bubbles ;
conclusion: transition elements / metals ;
- (ii) milky / white / cloudy chalky ;
- (iii) *observation*: white precipitate ; [1]
- (b) (i) hydroxide [1]
- (ii) *test*: litmus (ignore colour) or Universal Indicator ;
observation: blue ; [2]
- (iii) brown, yellow or orange ; [1]
- (c) iron(III) chloride FeCl_3 and copper carbonate CuCO_3 ;
OR
iron(III) carbonate $\text{Fe}_2(\text{CO}_3)_3$ and copper chloride CuCl_2 ; [max 2]
(allow 1 for two correct names or formulae)

[Total: 10]

- 4 (a) (i) 11.7 cm (no tolerance) ;
13.9 cm (no tolerance) ; [2]
- (ii) suitable scale and label on x axis;
not starting y axis at 0 ;
smooth curve drawn ; [3]
- (iii) 0.0417 or 0.042 cm / g;
0.01 or 0.010 cm / g; [2]
- (b) (i) (allows aorta to stretch) to allow surge of blood through / recoil propels blood
between beats / smoothes out blood flow / change in pressure ; [1]
- (ii) resistant to bursting / breaking / tearing ; [1]
- (c) e.g. same width of sample taken / same part of body of animal / same animal ; [1]

[Total: 10]

Page 4	Mark Scheme	Syllabus
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- 5 (a) (i) 22.5 ;
25.1 ;
27.8 ;
- (ii) **C** is the most concentrated, **A** is the least concentrated ; [1]
- (b) (i) sodium ethanoate + water ; [1]
- (ii) orange or yellow, (reject red) ; [1]
- (c) same volume of acid and alkali ;
without indicator ;
evaporate ;
filter ;
dry crystals with e.g. filter paper ;
(any 4)
OR
evaporate ;
(heat/boil etc.) to concentrate/crystallisation point/saturation etc. ;
leave or cool ;
filter ;
dry crystals with e.g. filter paper ;
(any 4) [max 4]

[Total: 10]

- 6 (a) (i) the amplitude decreases/gets smaller ; [1]
- (ii) 4.0 cm (± 0.1 cm) ; [1]
- (iii) frequency = speed/wavelength, $10/4$;
= 2.5 (Hz) ; [2]
- (b) (i) 1.1 cm (± 0.1 cm) ; [1]
- (ii) $(1.1/0.25) = 4.4$ (ecf) ;
cm/s ; [2]
- (c) (i) distance = 2.2 cm (± 0.1 cm) ; [1]
- (ii) speed = $2.2/0.25 = 8.8$ (ignore units, ecf) ; [1]
- (d) speed at 9th wave is greater than speed at 4th wave, owtte (must refer to two things, wave numbers, part numbers or speeds) ; [1]

[Total: 10]

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- 1 (a) sensible scale on y-axis, 20 °C or 25 °C per 5 squares, labelled time / s ;
at least 4 out of 5 accurate plots, $\pm \frac{1}{2}$ square ;
smooth best fit curve between 1% and 5% IGNORE outside this range ;
- (b) (time at) 2% / **B** (is short,)/(time at) 3% / **C** (is too long,) **AND** because of wrong solution or dilution / volume / difficulty with end-point / variation in temperature / variability of biological material ; [1]
- (c) any estimate of less than 20 secs ; [1]
- (d) (i) repeat using different temperatures / heat the mixture ;
water bath mentioned / at least four different temperatures ;
keep urease concentration / %age constant ; [3]
- (ii) graph with temperature on horizontal axis, time on vertical axis IGNORE unit ;
time shows decrease then increase ;
OR
graph with temperature on horizontal axis, rate on vertical axis IGNORE units ;
time shows increase then decrease ; [max 2]
- [Total: 10]**

- 2 (a) (i) 1.2 (A) ;
2.3 (A) ;
6.5 (V) ; (no tolerance) [3]
- (ii) $6.5/1.2 = 5.4$ (ohms) (ecf) (accept any number of decimal places BUT rounding must be correct) ; [1]
- (iii) $6.5/2.3 = 2.8$ (ohms) (ecf) ; [1]
- (b) $6.5/0.75 = 8.67$ (ecf) ; [1]
- (c) $5.4 + 2.8 = 8.2$ and 8.67 (ecf) ;
either: 8.2 to 8.67 similar so within experimental error ;
OR 8.2 different to 8.67 and a reason for this e.g. variability of equipment such as different wires / different meters ignore pupil error e.g. read the meter wrong ; [max 2]
- (d) (i) lamp **X** is less bright than **Y** (or lamp **Y** is brighter than **X**) ; [1]
- (ii) lamps in Fig. 2.3 / series are less bright than in Fig. 2.1 / parallel, owtte ; [1]
- [Total: 10]**

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- 3 (a) 26.5 ;
27.5 ;
26.8 ; no tolerance
- (b) (i) 8.5, 8(.0) 8.3 (ecf) ; [1]
- (ii) exothermic because there was a temperature rise / heat was given out ; [1]
- (c) the same volume / amount / concentration of alkali / OH^- was used each time / the same mass / amount of water was formed each time ; [1]
- (d) errors in measuring (volume or temperature) will be the same ;
the temperature (rise) will be greater ;
OR
faster reaction ;
smaller heat loss ; [max 2]
- (e) *name of test solution:* silver nitrate (accept AgNO_3) / lead nitrate (accept $\text{Pb}(\text{NO}_3)_2$) ;
observation: white precipitate / solid / deposit / sediment (both words necessary) ;
(*observation dependent on the correct reagent*) [2]
- [Total: 10]**
- 4 (a) (i) increases then decreases ; [1]
- (ii) decreases and increases / increasing and decreasing / increases in dark and increases in the light ; [1]
- (iii) (carbon dioxide) decreases during (the day due to plants using it for) photosynthesis ;
(carbon dioxide) increases during (the night due to plants') respiration ; [2]
- (b) (i) letter **X** drawn on steepest part of the ascendant curve ; [1]
- (ii) (oxygen taken in due to) respiration (by the plant) ; [1]
- (iii) similar line to that provided but values generally lower no part of the line goes above the existing line ; [1]

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- (c) set up the same but in a darkened room for all experiments ;
 vary light intensity by changing distance of a lamp from aquarium/changing
 brightness of the bulbs by changing resistance/dimmer switch, etc. (active) ;
 leave time to settle to conditions ;
 measure amount of oxygen and time/datalogger ;

[max 3]

[Total: 10]

- 5 (a) (i) measuring cylinder, spatula/spoon, stirring rod (any 2) ;; [2]

- (ii) mixture stops bubbling ;
 magnesium carbonate added does not dissolve/solution is cloudy/solid in
 beaker ; [2]

- (b) diagram shows filter funnel and paper, beaker/collecting vessel;
 two relevant and correct labels ; [2]

- (c) (i) evaporate ;
 (heat/boil) to concentrate/saturate/to crystallisation point ;
 leave to cool ; [3]
(evaporating to dryness scores max 1 mark)

- (ii) suspend a crystal in (saturated) solution, observe ; [1]

[Total: 10]

- 6 (a) (i) reflected beams are parallel ;
 reflected beams are at 30° to the mirror at point of incidence (the line labelling
 screen should lie within the reflected beam) ;
(no ruler used 1 max) [2]

- (ii) angle of incidence = angle of reflection ; [1]

- (b) straight lines drawn (no mark)
 distance between the points where the lines hit the screen = 2.0 cm ($\pm$ 0.2 cm) ; [1]

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- (c) (i) at least 1 beam bent towards the normal (and not beyond) on entering block ;
 beams inside the block are parallel ;
 at least 1 beam bent away from the normal as it leaves the block ;
 beams leaving the block are parallel to each other ;
 beams leaving the block are parallel to incident rays ;
 (any four points)
 If no ruler lines must be straight

[max 4]

- (ii) line drawn at 90° to block ;
 both angles correctly labelled ;

[2]

[Total: 10]