

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the November 2005 question paper

0653/03 COMBINED SCIENCES

0653/03

Paper 3, maximum 80

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

The minimum marks in these components needed for various grades were previously published with these mark schemes, but are now instead included in the *Report on the Examination* for this session.

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- 1 (a) (i) R
P
Q; [1]
- (ii) add excess copper carbonate/solid remains on bottom of beaker/no more gas produced/reference to pH 7/reference to temperature no longer rises; [1]
- (iii) separate excess, copper carbonate/solid, from mixture *or* reference to need for purity of copper sulphate crystals; [1]
- (iv) H_2SO_4 CO_2 H_2O ; ; [all three for 2 any two for 1] [2]
- (b) (i) gas evolved/bubbles; [1]
- (ii) move towards cathode/negative electrode;
attraction between opposite charges;
ions gain electrons;
(discharged by gaining) two electrons; max [3]
- Total [9]**
- 2 (a) (i) use Geiger counter/Geiger Muller tube;
measure count rate/second;
the most effective has the lowest count rate; [3]
- (ii) alpha shown attracted to negative plate - it is positive;
beta shown attracted to positive plate - it is negative;
gamma continues straight - it is neutral/uncharged; [3]
- (b) (i) causes electrons to be lost from atoms; [1]
- (ii) alpha is more ionizing;
will be able to cause more damage to, cells/DNA/organs; [2]
- (c) splitting;
of nucleus; [2]
- Total [11]**

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- 3 (a) (i) automatic response;
to a stimulus; [2]
- (ii) faster; [1]
- (b) (i) to stop it, spoiling/going bad or to keep it fresh;
reactions/metabolism/enzymes, work faster at higher temperatures; [2]
- (ii) it increases it;
because it adds red cells (to the person's blood)
red cells contain haemoglobin; max [2]
- (iii) more haemoglobin means more oxygen can be carried;
so cells get more oxygen;
cells can respire faster;
cells/muscles, get more energy;
cyclist can, cycle faster/cycle (quickly) for longer; max [3]
- Total [10]**
- 4 (a) 30 35 30
8 8 8; ; one mark for each row [2]
- (b) Zn^{2+} ;
reference to the need for charge balance;
(reject vague "criss crosses") [2]
- (c) (i) (metal) displacement/redox; [1]
- (ii) Tube **B** – zinc less reactive than magnesium so no reaction;
Tube **C** – zinc more reactive than copper so reaction occurs;
producing copper/the brown solid is copper; [3]
- (iii) lead; [1]
- Total [9]**

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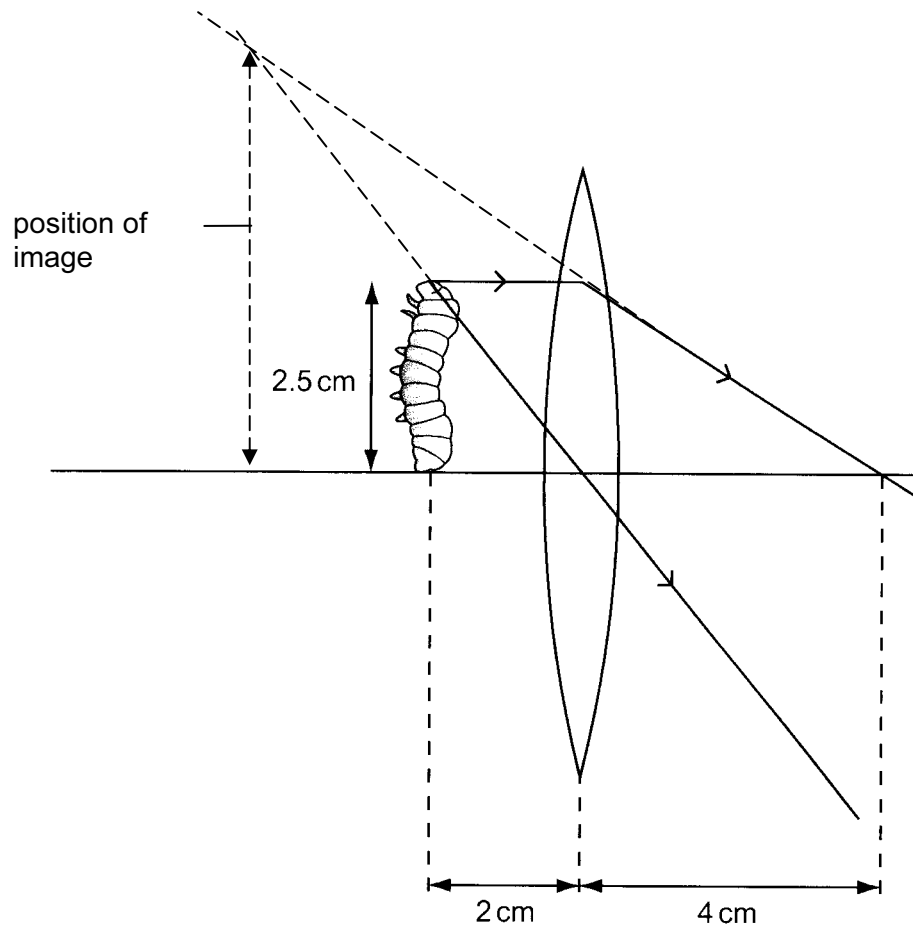
- 5 (a) (i) not a complete circuit; [1]
- (ii) 8Ω ; [1]
- (iii) $1/R = 1/R_1 + 1/R_2 = 1/2$;
 $R = 2 \Omega$; [2]
- (b) (i) current goes forwards and backwards; [1]
- (ii) transformers need a.c.;
increase voltage to reduce energy losses; [2]
- Total [7]**
- 6 (a) (i) line or arrow through stoma and air space to X; [1]
- (ii) it has chloroplasts;
which absorb sunlight;
it is close to the (upper) surface of the leaf;
so gets more sunlight; **max [2]**
- (b) other parent is **aa**;
gametes are **A** and **a** from first parent, all **a** from second parent;
offspring are half **Aa** and half **aa**;
half have the substance and half do not; **max [3]**
- (c) arrow from plants to air labelled respiration;
arrow from decomposers to air labelled, respiration/decomposition; [2]
- Total [8]**

Page 4	Mark Scheme	Syllabus	Paper
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- 7 (a) fractional distillation; both words required [1]
- (b) (i) transition metals have catalytic properties/owtte; [1]
- (ii) reaction rate is higher at higher temperature; [1]
- (c) (i) $2\text{NO} + 2\text{CO} \rightarrow \text{N}_2 + 2\text{CO}_2$ [1]
- (ii) reference to reaction between oxygen and the fuel;
incomplete combustion; [2]
- (iii) both oxidation and reduction occur at the same time;
CO is oxidised/gains oxygen;
NO is reduced/loses oxygen; max [2]
- (iv) correctly drawn shared electrons;
each atom has correct number of electrons; [2]
- Total [10]**

- 8 (a) (i) line is horizontal; [1]
(ii) B to C because speed is increasing/line goes up; [1]
(iii) 375 mm;
working; [2]
- (b) (i) 4 cm; [1]

(ii)



rays extended backwards until they meet;
position of image clearly shown; [2]

(iii) cannot be projected onto a screen; [1]

Total [8]

Page 6	Mark Scheme	Syllabus	Paper
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- 9 (a) (i) A urethra;
- C sperm tube/sperm duct/vas deferens; [2]
- (ii) B stores urine;
- D makes sperm; [2]
- (b) (i) 1 asexual has one parent/sexual may have one or two;
- 2 asexual all offspring are identical/sexual they are different;
- 3 genetically identical/genetically different;
- 4 sexual involves, gametes/fertilisation, *or* asexual does not; max [2]
- (ii) if parent is well suited to environment;
then offspring are also well suited;
- only one parent needed;
so can reproduce even if no others nearby/words to that effect;
- offspring produced around parent (plant);
so can cover large area/stop other plants growing near; max [2]
- Total [8]**