UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2006 question paper

0653 COMBINED SCIENCE

0653/03 Paper 3 (Extended Theory), maximum raw mark 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 instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

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 grade thresholds for various grades are published in the report on the examination for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses.

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UNIVERSITY of CAMBRIDGE International Examinations

1 (a) (i) peat / wood / straw / biomass / rubbish / biogas / biodiesel / hydrogen; **[1]**

(ii) 68% (40 + 25 + 3); **[1]**

(b) (i) to reduce energy losses; allow 'heat loss' ignore 'power loss' **[1]**

(ii) transformers use a.c./cannot use d.c./so voltage can be stepped up (or down);

alternating current produces changing magnetic field; **[2]**

(iii) sine wave centred on 0V;

amplitude and wavelength approximately steady; **[2]**

[Total 7]

2 (a) **A** oviduct / Fallopian tube

B amniotic fluid

C cervix

D umbilical cord

one mark for any two correct; **[2]**

(b) through the placenta;

from its mother's blood;

by diffusion;

along umbilical cord; **[max 3]**

(c) forms bond between mother and baby;

breast milk contains antibodies;

avoids possibility of bacterial contamination; (not 'clean' or 'pure')

at right temperature;

changes composition as baby grows; **[max 2]**

(d) virus / HIV, passed from mother to baby;

crosses the placenta / passes from mother's blood to baby's blood; **[2]**

[Total 9]

3 (a) (i) **1** carbon dioxide;

2 hydrogen;

3 carbon dioxide; **[3]**

(ii) HNO_3; (not 'NHO_3') **[1]**

(iii) nitric acid; **[1]**

(b) (i) experiment **6**;

(in 6) time to collect same volume of gas was the shortest / greatest volume in a given time; **[2]**

(ii) (assume in experiment **6** [v.v. if describing experiment 5])

temperature could have been higher;

particles (moving faster) colliding more frequently (with the solid) / collisions have more energy;

OR

acid concentration could have been higher;

more acid particles so greater collision frequency;

OR

greater surface area of solid;

so greater collision frequency (between solid and acid particles); **[max 2]**

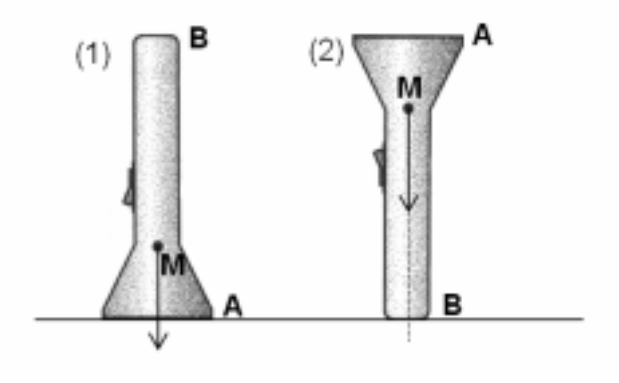
[Total 9]

4 (a) (i) 4.5V; **[1]**

(ii) 4.5V; **[1]**

(b) (i) A point at which the whole mass may be considered to act; **[1]**

(ii) diagram showing torch on end **B** and position of **M**;



centre of mass is closer to base;

base has larger area;

sensible tipping diagram / **[max 2]**

[Total 5]

5 (a) (i) transported, in blood / to muscles;

respiration;

oxygen combined with glucose;

to form water and carbon dioxide; **[max 3]**

(ii) 20 kJ (dm^{-3}); **[1]**

(b) (i) 0.3 (kJ per metre); **[1]**

(ii) the longer the race, the less energy used (per metre);

run faster in shorter race / higher proportion of run is acceleration in shorter race; *there are other possible answers* **[2]**

(c) oxygen debt;

he had been respiring anaerobically;

producing lactic acid;

which must now be broken down using oxygen;

(allow marks for good description of carbon dioxide build-up and how this increases breathing rate) **[max 3]**

[Total 10]

6 (a) (i) fractional distillation / fractionation; **[1]**

(ii) **F**; **[1]**

(b) (i) (1 x 2) + (1 x 16) / 18; **[1]**

(ii) (44 + 36) / 80g products / 32 000 is 2000 times 16 / other working;

2000 x 80 / 160 000**g**; **[2]**

(c) (i) methane / oxygen; **[1]**

(ii) idea that energy released is greater than energy absorbed; **[1]**

(d) ethene molecules join (allow on diagram);

into a long chain (or diagram clearly implies this);

reference to how double bonds open to allow the linkage; **[max 2]**

[Total 9]

7 (a) (i) series of straight lines + rays reflecting off walls of fibre,

at approx correct angles; **[1]**

(ii) idea of interference / distortion / confusion in what is seen; **[1]**

(iii) less interference / clearer information /

more messages can be sent at the same time /

signal needs boosting less often; **[1]**

(b) (i) speed = distance / time = 1000 / 3;

= 333 m/s; **[2]**

(ii) measure mass with, scales / balance;

measure volume;

displacement method for measuring volume described;

density = mass / volume; **[4]**

[Total 9]

8 (a) (i) phloem tubes are near surface (of stem); **[1]**

(ii) phloem contains substances the plant has made;

sugar / sucrose / amino acids; *not glucose,. not starch*

xylem contains (mostly) water; **[max 2]**

(b) (i) reach all parts of the plant (so kill all feeding insects);

only kill insects that eat the plant / do not kill beneficial insects;

need to use less;

not washed away (by rain); **[max 2]**

(ii) biological; **[1]**

(c) a group of cells;

similar to each other / carrying out the same function; **[max 2]**

[Total 8]

9 (a)

can be hammered into different shapes	**M**
poor conductor of heat	
is a gas at room temperature (20°C)	
good conductor of electricity	**M**
poor conductor of electricity	

both required for one mark; **[1]**

(b) 13; **[1]**

(c) **(i)** aluminium ion electron config. 2.8;

charge 3+;

oxide ion electron config. 2.8;

charge 2-; **[4]**

(ii) gains electrons / is discharged / becomes an (aluminium) atom;

(each ion gains) three electrons; **[2]**

(iii) $\mathbf{2}Al_2O_3 \rightarrow 4Al + \mathbf{3}O_2$; **[1]**

[Total 9]

10 (a) particles collide, more often / harder / faster;

with container walls; **[2]**

(b) speed is a scalar quantity / velocity is vector quantity;

OR

velocity specifies direction but speed does not; **[1]**

(c) alpha will be absorbed by, air / skin, from outside;

damage cells within the body / mutation / damage DNA / cause cancer;

not 'ionises cells' **[2]**

[Total 5]