UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2006 question paper

0653 COMBINED SCIENCE

0653/03 Paper 3, maximum raw mark 80

These mark schemes are published as an aid to teachers and students, to indicate the requirements of the examination. They show the basis on which Examiners were initially instructed to award marks. They do 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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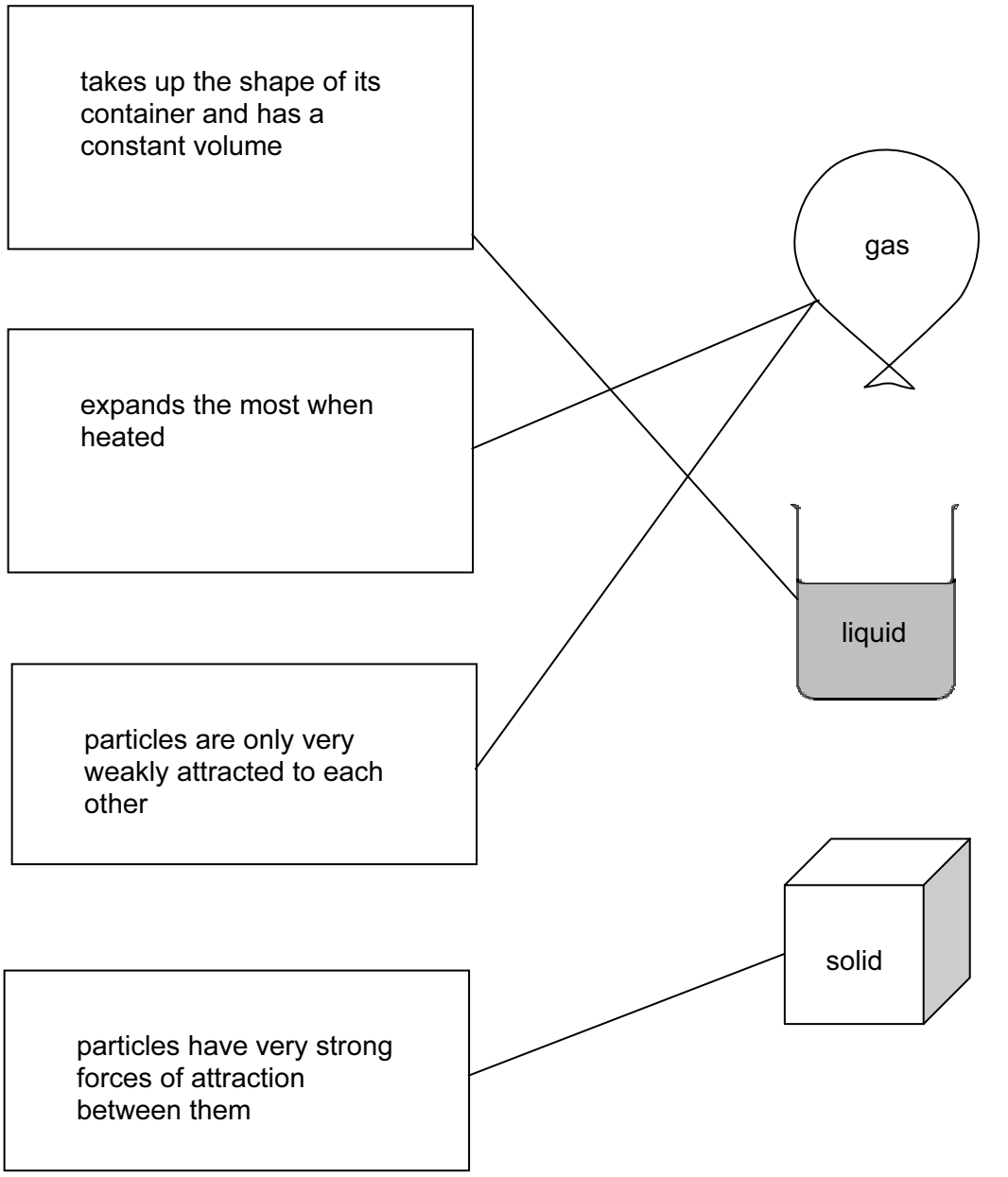
UNIVERSITY of CAMBRIDGE
International Examinations

1 (a)



[3]

(b) particles moving randomly;
particles collide with the walls of container;
collide more often;
so greater force exerted on walls of container;
increase in pressure; [3]

[Total: 6]

2 **(a)** variety of a gene ;
that only has an effect when dominant one not present ; [2]

(b) **(i)** aa ; [1]

(ii) parents are Aa and Aa ;
gametes from each parent are A and a ;
offspring are AA, Aa (twice) and aa ; [3]

(c) (foods containing) proteins ;
meat / fish / cheese / other e.g. of high protein food ;
proteins are made up of amino acids ; [2 max]

[Total: 8]

3 **(a)** (C*l*) gas
(Br) liquid
(I) solid; [1]

(b) **(i)** four shared pairs;
symbols correctly shown for each atom; [2]

(ii) **4**C*l*$_2$ + CH_4 → C*C*l_4 + **4**H*C*l; [1]

(iii) (fluorine)
reactivity decreases down Group 7 / owtte; [1]

(c) **(i)** (nucleus of) C*l* – 37 contains more neutrons than C*l* – 35;
2 more; [2]

(ii) (12 x 1) + (4 x 35.5);
= 154; [2]

[Total: 9]

4 **(a)** **(i)** reference to emission;
reference to products; [2]

(ii) relatively short half life but not too short; [1]

(iii) 3 half lives;
so 0.2 g; [2]

(b) **(i)** high voltage means low current;
this reduces energy losses; [2]

(ii) resistance = voltage/current;
= 22 ohms [2]

[Total: 9]

5 **(a)** nucleus A
cell wall C
chloroplast none (allow A)
cell surface membrane B

all correct two marks
three correct one mark
one or two correct no marks [2]

(b) **(i)** ref to water molecules ;
water passes from beaker through ppm ;
because more water outside than inside / correct ref to gradient ;
starch (molecules) cannot pass through the membrane ; [3 max]

(ii) add iodine (solution) ;
orange / brown / yellow ; [2]

(c) into root hair ;
across cells in root ; [2]

[Total: 9]

6 **(a)** carbon dioxide / carbon monoxide / carbon / soot / water; (any two) [1]

(b) **(i)** (**B** is methane)
methane molecules have five atoms (bonded) / is CH_4; [1]

(ii) (addition) polymerisation;
many small molecules / monomers join to form a long chain; [2]

(c) **(i)** heated / vaporised / boiled;
passed over catalyst; [2]

(ii) suggests that only single bonds between carbon atoms / saturated;
if double bonds present bromine would have been decolourised; [2]

[Total: 8]

7 **(a)** leaves / plants, stop rain hitting the ground (hard) ;
roots hold soil in place ;
terracing stops water running down slopes ; [2 max]

(b) colourless / green / small / no petals / dangling anthers / dangling stigmas ; [1]

(c) **(i)** by diffusion ;
through wall of small intestine ;
ref. to villi ; [2 max]

(ii) pancreas ;
secretes insulin ;
causes, cells / liver, to take glucose from the blood ; [3]

(iii) as level moves away from norm ;
process initiated to bring it back ;
take these points from a specific description [2]

[Total: 10]

8 **(a)** **(i)** element made of only one <u>type</u> of atom and compound contains different atoms bonded together;
element cannot be simplified and a compound can be broken into its elements / is made from different elements; [1 max]

(ii) Fe^{3+};
working refers to charge balance;
(reject vague criss cross answers) [2]

(b) a layer of zinc covers the steel / provides a barrier;
prevents reaction between steel and oxygen and water; [2]
(allow correct references to sacrificial protection)

(c) **(i)** H^+; [1]

(ii) no more gas evolved; [1]

(iii) grey crystals appear / magnesium reacts and dissolves;
a metal displacement reaction occurs / or equation;
because magnesium more reactive than zinc; [3]

[Total: 10]

9 **(a)** **(i)** acceleration; [1]

(ii) constant speed; [1]

(b) area under curve = ; (or other suitable)
150 + 25 = 175 m; [2]

(c) equal and opposite/ balanced [1]

(d) **(i)** force = mass x acceleration;
= 120 N; [2]

(ii) power = work/time;
= 600 W; [2]

(e) **Q** – no mark
lowest CoG;
base wider than **P;** [2]

[Total: 11]