CAMBRIDGE
INTERNATIONAL EXAMINATIONS

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International General Certificate of Secondary Education

MARK SCHEME for the November 2003 question papers

0652 PHYSICAL SCIENCE

0652/01	**Paper 1 (Multiple Choice), maximum raw mark 40**
0652/02	**Paper 2 (Core), maximum raw mark 80**
0652/03	**Paper 3 (Extended), maximum raw mark 80**
0652/06	**Paper 6 (Alternative to Practical), maximum raw mark 60**

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*.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the November 2003 question papers for most IGCSE and GCE Advanced Level syllabuses.

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Grade thresholds taken for Syllabus 0652 (Physical Science) in the November 2003 examination.

	maximum mark available	minimum mark required for grade:			
		A	C	E	F
Component 1	40	-	27	21	18
Component 2	60	-	32	22	17
Component 3	80	39	26	-	-
Component 5	30	-	-	-	-
Component 6	60	38	30	23	19

The threshold (minimum mark) for B is set halfway between those for Grades A and C.
The threshold (minimum mark) for D is set halfway between those for Grades C and E.
The threshold (minimum mark) for G is set as many marks below the F threshold as the E threshold is above it.
Grade A* does not exist at the level of an individual component.

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November 2003

INTERNATIONAL GCSE

MARK SCHEME
MAXIMUM MARK: 40
SYLLABUS/COMPONENT: 0652/01 PHYSICAL SCIENCE Multiple Choice

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Question Number	Key	*Question Number*	*Key*
1	**C**	21	**D**
2	**A**	22	**A**
3	**B**	23	**C**
4	**D**	24	**C**
5	**A**	25	**D**
6	**A**	26	**D**
7	**C**	27	**A**
8	**D**	28	**B**
9	**B**	29	**A**
10	**B**	30	**C**
11	**D**	31	**A**
12	**C**	32	**B**
13	**A**	33	**B**
14	**D**	34	**B**
15	**B**	35	**D**
16	**D**	36	**C**
17	**C**	37	**B**
18	**A**	38	**A**
19	**A**	39	**A**
20	**B**	40	**C**

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

November 2003

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 60

SYLLABUS/COMPONENT: 0652/02

PHYSICAL SCIENCE
Core

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1	**(a)**	**(i)**	Loss of <u>one</u> (outer) electron	**1**	
		(ii)	Gain of <u>one</u> (outer) electron	**1**	
		(iii)	Transfer of electron (from Na to Cl to form ions)	**1**	
			$\begin{bmatrix} Na^+ \\ Cl^- \end{bmatrix}$ ions attract	**1**	**[4]**
	(b)		Diagram or text or both for ideas of:		
			each atom provides one electron OR each atom needs one more electron	**1**	
			Therefore, shared pair of electrons	**1**	**[2]**
				Total	**[6]**
2	**(a)**		R: ultra violet	**1**	
			S: infra red	**1**	**[2]**
	(b)		Equal	**1**	**[1]**
	(c)		1.35 (micrometers) (accept 1.33 to 1.38)	**1**	**[1]**
				Total	**[4]**
3			Shake/mix with water	**1**	
			Filter	**1**	
			<u>Dry</u> residue (on filter paper) to obtain pepper	**1**	
			Leave filtrate/to crystallise/evaporate filtrate to dryness, to obtain salt	**1**	**[4]**
				Total	**[4]**

4		Proton mass 1	**1**	
		Neutron charge 0 (do NOT accept a dash [-])	**1**	
		Electron charge –1 (do NOT accept a dash [-])	**1**	**[3]**
			Total	**[3]**
5	**(a)**	Use of speed = distance/time or = 200/25	**1**	
		8	**1**	
		m/s	**1**	**[3]**
	(b)	R	**1**	
		Low centre of mass (equal to s)	**1**	
		Wide base	**1**	**[3]**
			Total	**[6]**
6	**(a)**	High density High melting point Coloured compounds Used as a catalyst	ANY TWO 1 + 1 (2)	
	(b)	Painting Greasing Coating with plastic Galvanising	ANY TWO 1 + 1 (2)	
			Total	**[4]**

7	**(a)**	**(i)**	(Nuclide with) the same Proton/Atomic Number	**1**	
			but different Nucleon/Mass number	**1**	
			(OR same number of protons	**1**	
			Different number of neutrons	**1)**	
		(ii)	G-M tube, solid state detector	**1**	
		(iii)	Alpha particles would be absorbed by the plastic bottle	**2**	**[5]**
			(alphas short range/not penetrating enough	**1)**	
	(b)		Clear attempt to halve once	**1**	
			Clear attempt to halve at least once more	**1**	
			60 (Bq)	**1**	**[3]**
			(Correct answer with no working = max 2)		
	(c)		Radiation from radioactive isotopes in the air/earth/building	**2**	
			(Vague statement, such as 'radiation from the surroundings' = max 1; do NOT accept 'radiation from the background')		
				Total	**[10]**
8	**(a)**		'Acid particles' (H^+ (aq), H_3O+ (aq) hydrogen ions …) are further apart	**1**	
			Therefore, fewer collisions <u>with zinc</u> (per second)	**1**	**[2]**
	(b)		'Acid particles' (as above) move about faster	**1**	
			Therefore, collisions (with metal) are more frequent OR more 'vigorous' or equivalent	**1**	**[2]**
				Total	**[4]**

9	**(a)**		Only single bonds between carbon atoms	**1**	**[1]**
	(b)	**(i)**	Water	**1**	
			Carbon dioxide	**1**	**[2]**
		(ii)	No carbon or soot produced No nitrogen oxides produced No sulphur oxides produced No carbon monoxide produced — ANY TWO 1 + 1 (2)		**[2]**
				Total	**[5]**
10	**(a)**		Differential expansion clear	**1**	
			Brass expands more than iron OR so brass on outside of curve or equivalent	**1**	**[2]**
	(b)	**(i)**	Clear that strip is heated by current	**1**	
			So circuit breaks	**1**	
			Cools remaking the circuit	**1**	
		(ii)	Any circuit requiring a flashing light, such as a car indicator	**1**	**[4]**
				Total	**[6]**
11	**(a)**		Metal densities HIGH – non-metals LOW	**1**	
			Metals are CONDUCTORS – non-metals INSULATORS	**1**	**[2]**
	(b)		Order of reactivity – gold, iron, aluminium	**1**	
			Further statement	**1**	
				Total	**[4]**

12	**(a)**	**(i)**	Voltmeter connected in parallel with the wire	**2**	
			(If connected in parallel across the battery	**1)**	
		(ii)	To vary the current through/pd across the wire	**1**	**[3]**
	(b)		Second wire has a smaller resistance (or vice versa)	**1**	**[1]**
				Total	**[4]**

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November 2003

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 80

SYLLABUS/COMPONENT: 0652/03

PHYSICAL SCIENCE
Paper 3 (Extended)

UNIVERSITY of CAMBRIDGE
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Question1

(a) Nitric (condone HNO_3) **1**

(b) $CuCO_3 + 2HN0_3 \longrightarrow Cu(N0_3)2 + H_20 + C0_2$ **1**

1 for formulae 1 for balanced **1**

(c) fizzing (gas bubbles or similar)
solid dissolves
solution turns green/blue
temperature increase ANY 2 **2**

(d) filter to remove excess solid – **must come first** **1**
evaporate solution (slowly) **1**
NOT heat over Bunsen – condone *heat gently*

(d) sodium carbonate is soluble in water **1** **[8]**
condone *all sodium salts are soluble*

Question 2

(a) **(i)** reference to dull or matt **1**
reference to black or dark **1**
does not reflect radiation or sentiments **1**

(ii) water would move up tube
level in tube drops initially
water in flask expands ANY 2 **2**

(b) **(i)** quantity of water too large **1**
limited temperature rise and expansion **1**

bore of tube too large
limited volume increase would not show up

heat needs to conduct through glass wall
glass insulator

any sensible idea plus support

(ii) smaller bulb – less liquid would show greater increase in temp **1+1**
thinner wall – easier for conduction to liquid **1+1**
narrower tube – small volume expansion will show up more easily
liquid with greater expansivity – easier to see increase in length ANY 2 **[11]**

Question 3

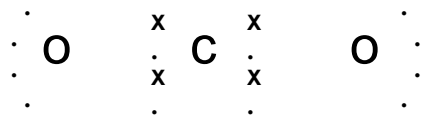
(a) **(i)** diamond much harder than graphite **1**

Any appropriate reference to **layers** in graphite **1**

(ii) graphite better conductor than diamond **1**

mobile (condone *free*) electrons (between layers) **1**

(b) **(i)**



1 for double bonds 1 for shells full **2**

(ii) restricted supply of O_2 or air **1**

(iii) CO combines with haemoglobin **1**

OR CO prevents O_2 from entering red blood cells

[8]

Question 4

(a) **(i)** 8 **2**

(2 scores 1)

single unit penalty to be applied in **(a)**

(ii) (i) value/10 or $V = IR$ **1**

0.8 A **1**

(iii) correct transformer equation **1**

Vs = 8 or ecf from **(a) (i)** **1**

12 V ecf from **(a) (i)** **1**

(iv) use of 4 divisions **1**

80 **1**

ms **1**

(b) **(i)** diode/rectifier **1**

(ii) half wave rectification shown (2 positive OR 1 negative hump(s)) **1**

[12]

Question 5

(a) diffusion **1**

(b) HC*l* **molecules** heavier than NH_3 **molecules**
OR reverse argument (condone *particles*)
HC*l* molecules slower or NH_3 molecules faster **2**

(c) proton donated to NH_3 molecule
forming NH_4^+ (OR ammonium) ion **2**

(d) Test: Dissolve NaOH (aq) and warm
Result: NH_3 gas evolved (turns red litmus blue) **2**
allow max 1 for litmus test **only if no other test included**

[7]

Question 6

(a) ratio sin *i* /sin *r* or $v_{substance}$ / $v_{air\ or\ vac}$ **1**
i and *r* or $v_{substance}$ and $v_{air\ or\ vac}$ correctly defined **1**
may score these marks if neutral comments in this part but correct in **(b) (ii)**

(b) (i) 60 > 40 or sentiments **1**
because light refracts towards the normal (as it enters the water) **1**

(ii) *n* = sin 60/sin 40 **1**
0.867 and 0.643 seen **1**
1.35 **1**

[7]

Question 7

(a) Al_2O_3 **1**

(b) behaves as acid or base **1**
reacts with acids and bases **1**

(c) aeroplanes or cooking utensils **1**
low density (light) low density (light) **1**
corrosion resistant (**not 'doesn't rust'**) high conductivity **1**

(d) basic oxide **1**

accept *thallium is a metal* (elements become more metallic down group) **1**

basic metal oxide scores 2

[8]

Question 8

(a) no current in coil **1**

coil loses its magnetism **1**

(b) conversion g ➔ kg or $w = mg$ **1**

0.20 **1**

200 scores 1

(c) steel high density or heavy or short distance fallen **1**

unlikely that effect of air resistance significant **1**

(d) appropriate equation(s) ($s = ut + ½ gt^2$ *or* $s = ½ gt^2$ *or* $a = (v-u)/t$) **1**

substitution(s) or idea that maximum speed = twice average **1**

10.4(2) **1**

m/s^2 condone N/kg **1**

5.2 m/s^2 scores 3

[10]

Question 9

(a) temperature between 5°C and 40°C (condone *warm*) **1**

glucose **in solution** **1**

yeast (allow zymase or invertase) present **1**

(b) (i) 180 seen **1**

46 seen **1**

(ii) 1 mol glucose ⟶ 2 mol EtOH

or

180 g glucose ⟶ 2 mol EtOH **1**

18.4 g (ecf from **(i)**) **1**

– 9.2 g scores 1

single unit penalty to be applied in **(b)**

(iii) 1 mol glucose ⟶ 2 mol CO_2

or

⟶ 48 dm^3 CO_2 **1**

36 g ⟶ 9.6 dm^3 CO_2 (ecf from (i)) **1**

4.8 dm^3 scores 1

[9]

Total 80

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MARK SCHEME

MAXIMUM MARK: 60

SYLLABUS/COMPONENT: 0652/06

PHYSICAL SCIENCE
Paper 6 (Alternative to Practical)

1 (a) Completion of table:

volume of beaker/cm^3	time/s
100	6
500	28
1000	58

(1 mark each, no tolerance) **3**

(b) relationship: greater the volume of the beaker, the longer the candle burns OWTTE (1)

explanation: *(more)* oxygen/air available (1) **2**

(c) carbon dioxide **1**

(d) test: use cobalt chloride paper OR anhydrous/ copper sulphate (1)

result: (blue) cobalt chloride paper turns pink

OR (white) anhydrous copper sulphate turns blue (1)

(initial colour not necessary for the mark)

Reject: "find the boiling point of the liquid" (impractical)

2

(e) Candle wax is a hydrocarbon/contains carbon and hydrogen (1)

Carbon burns to form carbon dioxide

hydrogen burns to form water OWTTE (1)

(both necessary for the second mark)

Alternative mark scheme for (e):

Carbon from the candle forms CO_2 (1)

Hydrogen from the candle forms water (1)

REJECT: water forms by condensation, CO_2 forms by combustion (if the source of carbon and hydrogen not correctly given) **2**

Total [10]

2 **(a)** Completion of table:

position of mass/cm	position of pivot/cm
4	38.5
8	39.4

(no tolerance) **2**

(b) **(i)** d_1 = 40 – 10 = 30 cm (1)

d_2 = 50 – 40 = 10 cm (1) **2**

(ii) mass = 30 x 100/10 = 300 (allow ecf from **(b) (i)**) (1)

unit given as g or grams (1) **2**

(c) Average all 5 of the masses calculated **1**

(d) Place 50 cm mark of rule on pivot (1)

Balance rule on pivot with 100 g mass on one side and rock on the other side (or show in diagram) (1)

Use Principle of Moments to calculate the mass of the rock OWTTE (1)

Alternative mark scheme for (d):

Replace the 100 g mass by the rock and move pivot until the rule balances (1)

Measure distances of rock (d_1) and 50 cm mark (d_2) from pivot (1)

Use the formula; mass = $\frac{d_2 \times 300}{d_1}$

OR use the Principle of Moments to calculate the mass (1)

REJECT: use the formula given above to calculate mass **3**

Total [10]

3 **(a)** 25, 3, 44 cm^3 (no tolerance) **3**

(b) **(i)** copper or zinc, no reaction with water **1**

(ii) iron (1)

iron rusts (and reacts with oxygen/air) (1) **2**

(iii) magnesium OR calcium (1)

reacts with water (to give a gas) (1) **2**

(In (ii) and (iii), if a second metal is given together with a correct one, ignore this as long as the explanation is correct)

(c) hydrogen **1**

Total [9]

4 **(a)** 70, 62, 55°C (no tolerance) **3**

(b) 140.0g (no tolerance) (calculation need not be shown) **1**

(c) points plotted within 1°C and 1g (2) (-1 for each error)

smooth curve (not straight line) (1)

IGNORE any extrapolation through the origin **3**

(d) 40g of potassium nitrate in 100g water at 60°C

OR 7 g in 17.5g water at 60°C

OR 20 g in 50 g water at 60°C (etc) **1**

(e) heat to (partly) evaporate (1)

allow solution to cool (and crystallise) (1)

Alternative answer: evaporate the solution (1) in a dish over a boiling water bath (1)

"Evaporate to dryness" gains 1 mark only **2**

Total [10]

5 **(a)** test 1 copper (oxide) or a transition metal present (1)

test 3 not a carbonate or hydrogencarbonate (1)

test 4 chloride/halide ions (1)

test 5 ammonia OR alkaline gas OR basic gas (1) **4**

(b) (moist) red litmus (paper) (OR Universal Indicator) (1)
turns blue (1) (or turns purple/blue)

OR gas forms white smoke with hydrogen chloride **2**

(c) **(i)** light blue (1) blue precipitate (1)

(ii) deep (1) blue solution (1) (any 3 points) **3**

(d) ammonium chloride (1)

copper oxide (1) **2**

Total [11]

6 **(a)** **(i)** radio (wave)

(ii) sound (wave) **2**

(b) The further away the source, the weaker is the sound OWTTE **1**

(c) **(i)** 3.0s (no tolerance, must say 3.0)

(ii) 3.8 +/- 0.1s **2**

(d) **(i)** 1000/3 = 333 m/s (ecf) **1**

(ii) 1000/3.8 = 263 m/s (ecf) **1**

(e) The first (d)(i) (1) because the other one may be affected by the responses of the observer (1) OWTTE **2**

(f) Repeat the experiment (and average the results)
Use a longer distance
Calibrate the c.r.o. screen to show 0.1 s (any one point) **1**

Total [10]