UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the June 2004 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**
0652/05	**Paper 5 (Practical), maximum raw mark 30**
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 discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the June 2004 question papers for most IGCSE and GCE Advanced Level syllabuses.

Grade thresholds taken for Syllabus 0652 (Physical Science) in the June 2004 examinatio

	maximum mark available	minimum mark required for grade:			
		A	C	E	F
Component 1	40	36	28	21	17
Component 2	80	-	45	29	24
Component 3	80	49	31	19	14
Component 5	30	23	19	16	14
Component 6	60	51	37	24	18

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.

JUNE 2004

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 40

SYLLABUS/COMPONENT: 0652/01

PHYSICAL SCIENCE
Paper 1 (Multiple Choice)

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

TOTAL 40

JUNE 2004

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 60

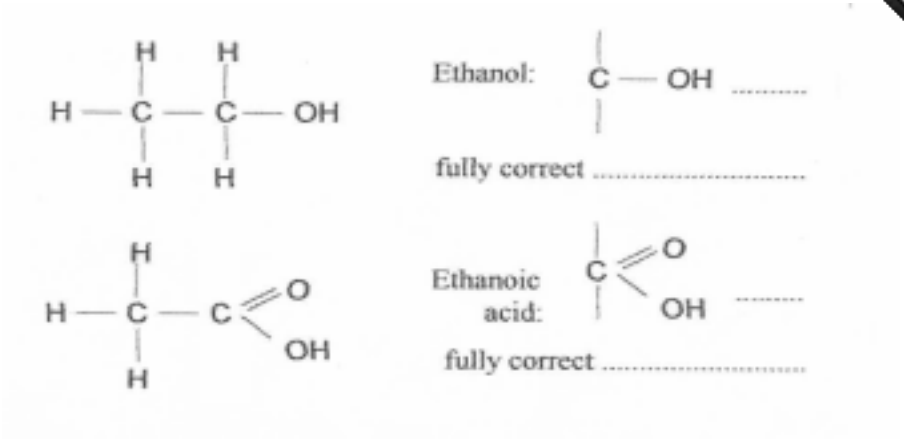
SYLLABUS/COMPONENT: 0652/02

PHYSICAL SCIENCE
Paper 2 (Core)

1	**(a)**		Points correctly plotted (-1 for each omitted/incorrectly plotted) Good straight line drawn with ruler		**1**	
	(b)		Suitable triangle/figures taken from graph Clear use of figures Correct answer = 0.75 cm		**1** **1** **1**	**[3]**
	(c)		930 +/-10 N (Accept 905 to 955 for 1 mark)		**2**	**[2]**
				Total		**[8]**
2	**(a)**		Mark vertically: 8; 8; 2,6 8; 10; 2,6 (Repeated error penalise once only)		**1** **1**	**[2]**
	(b)		Dot-cross diagram sharing pair of electrons And correct outer shell (OR H-O-H with correct statement)		**1** **1**	**[2]**
				Total		**[4]**
3	**(a)**		3		**1**	**[1]**
	(b)		12 + 3 + 16 + 1 = 32		**1** **1**	**[2]**
	(c)		Forces between molecules stronger in methanol (Accept other correct statements about hydrogen bonding in methanol, not in carbon dioxide)		**1**	**[1]**
				Total		**[4]**
4	**(a)**		Mention of surface area Much greater for a powder		**1 + 1**	**[2]**
	(b)	**(i)**	Dilute the acid (accept add water)		**1**	
		(ii)	Lower the temperature		**1**	**[2]**
				Total		**[4]**
5	**(a)**		(Current in the coil) magnetises the core Attracting the bolt		**1** **1**	**[2]**
	(b)		It is magnetic And loses its magnetism easily		**1** **1**	**[2]**
	(c)		No current can flow So bolt remains in situ		**1** **1**	**[2]**
				Total		**[6]**

6	**(a)**		Potential energy is released As particles move together (Do not accept answers which refer to loss of KE/slowing down of particles)	**1**	
	(b)	**(i)**	330˚C +/- 5˚C	**1**	
		(ii)	P solidifies at one temperature Q solidifies over a range of temperatures	**1** **1**	**[3]**
				Total	**[5]**
7	**(a)**		Potassium is more reactive than magnesium (OR is higher up the activity series)	**1**	**[1]**
	(b)	**(i)**	Energy is released	**1**	
		(ii)	Litmus paper/universal indicator Turns blue/green	**1 + 1**	
		(iii)	Lighted splint Causes small explosion/pop	**1 + 1**	**[5]**
				Total	**[6]**
8	**(a)**		Elastic/strain Kinetic/movement Heat/thermal/internal Work	**1** **1** **1** **1**	**[4]**
	(b)		2.5 × 3 7.5 Ncm (-1 if no/incorrect unit)	**1** **2**	**[3]**
	(c)		48/16 3 m/s (-1 if no/incorrect unit)	**1** **2**	**[3]**
				Total	**[10]**
9	**(a)**		Combines with haemoglobin (Accept blood) Preventing oxygen being absorbed	**1** **1**	**[2]**
	(b)		Combines with rain water To form acid (rain)	**1** **1**	**[2]**
				Total	**[4]**

10 **(a)**



1
1
1
1 **[4]**

(b) Any TWO from: Fuel, solvent, in drinks **1 + 1** **[2]**

Total **[6]**

11 **(a)** Ammeter **1**
Voltmeter **1**
Variable resistor **1** **[3]**

(b) By changing the resistance **1**
The current in the circuit can be changed **1** **[2]**

(c) Straight line through the origin OR curve so that R increases with increasing current **1**
In both quadrants **1** **[2]**

Total **[7]**

12 Acidic **1**
Non-metal **1**
Right **1** **[3]**

Total **[3]**

13 **(a)** Filament gets very hot ANY TWO **1 + 1** **[2]**
Must not be allowed to oxidise/burn
Argon provides inert atmosphere

(b) High density ANY TWO **1 + 1** **[2]**
High melting point
Transition part of the Periodic Table

Total **[4]**

14 **(a)** **(i)** Negative **1**
Attracted to positive collector **1**

(ii) Electron **1** **[3]**

(b) Deflect rays* **1**
Horizontally **1**
Deflect rays* **1**
Vertically **1** **[3]**
(* can be scored in either part but only once)

(c) **(i)** Amplitude smaller but frequency (about) the same **1**
Frequency greater but amplitude (about) the same **1**
Both a good shape **1** **[3]**

JUNE 2004

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 80

SYLLABUS/COMPONENT: 0652/03

PHYSICAL SCIENCE
Paper 3 (Extended)

1 **(a)** (average) mass of one atom (of element) (of normal isotopic mixture) compared to 1/12 mass of one atom of carbon-twelve
OR
on a scale on which one atom of carbon-twelve has a mass of 12 exactly **1**

(b) (i) $n = m/M_r$ *OR* *5.0 / 30* **1**
Accept 5 / 30 .

number of moles = 0.167 **1** **[2]**
Accept 1/6, 0.17, 0.16 but not 0.2.

(ii) (2.0 / 24) number of moles = 0.083 **1** **[2]**
Accept 1/12. Accept 0.08 only if 2/24 shown.

(iii) (answer from **(i)** ÷ answer from **(ii)**) number of moles = 2 **1** **[1]**
Accept answer from errors carried forward.

(iv) $2\mathbf{M} + O_2 \rightarrow 2\mathbf{M}O$

*Answer from **(iii)** must be used in front of **M.*** **1**
*correct formulae of elements **M** and O_2* **1**
*balanced using answer from **(iii)*** **[2]**

Total **[9]**

2 **(a)** put water into can up to spout **1**
place measuring cylinder under spout and lower object into can (until immersed) **1**
volume of water displaced into cylinder equals volume of object **1** **[3]**

(b) (i) g/cm^3 *OR* kg/m^3 *etc* **1** **[1]**
Symbols must be correct, as listed in the syllabus

(ii) density = mass / volume *OR* 15.4 / 0.8 **1**
density = 19.25 (g/cm^3) *numerical answer only* **1** **[2]**
Accept 19.3 or 19.2
(Also accept 19 because volume given only to 1 sig. fig.)

(iii) gold **1** **[1]**
*Accept error forward from **(ii)***

(iv) *ideas of…*
uncertainty of experimental method **1** **any**
uncertainty of experimental readings **1** **two**
may not be pure metal **1** **[2]**

Accept explanation in terms of significant figures for one mark.

(c) 85g → 0.085kg *OR* equivalent
W = mg *OR* g = W/m

Accept with values inserted whether mass is in grams or kilograms

g = 1.65 N/kg *complete answer* **1** **[3]**

Accept unit m/s^2. Symbols in unit must be correct, as listed in syllabus.
Accept 1.6 but not 1.7 because 0.14 / 0.085 = 1.647

Total **[12]**

3 **(a)** increase to silicon then decrease **1** **[1]**

Ignore P & S anomaly. Must mention silicon.

(b) strong (forces of attractions between atoms) **1**
due to covalent bonding *OR* giant (tetrahedral) structure **1** **[2]**

(c) *Any symbols used should be correct, as listed in syllabus*
(i) sodium **1**
(ii) phosphorus **1**
(iii) magnesium **1**
(iv) argon **1** **[2]**

(d) *ideas of…*
sodium ions have +1 charge and magnesium ions have +2 charge **1**
∴ forces of (attraction) in metallic bonding weaker in sodium than magnesium **1** **[2]**

Comparison must be clear.

Total **[9]**

4 **(a)** wire connected across voltmeter **1** **[1]**

Accept, for this circuit, wire connected across battery.
Be tolerant with symbol or drawing to represent this wire

(b) R = V/I *OR* 4.3 / 2.1 **1**
resistance = 2.05 Ω *numerical value (1) unit (1)* **2** **[3]**

Accept 2.0, 2.04 but not 2.1.
The mark for the unit Ω is a separate mark.

(c) twice the answer from **(b)** **1** **[1]**
Ignore unit.

(d) *state* resistance of shorter wire likely to be more than expected **1**
explain shorter wire … (less resistance) more current **1**
∴ hotter than longer wire **1** **[3]**
Comparison must be clear.

(e) large current **1**
could overheat ammeter **1** **[2]**

(f) oscilloscope *OR* c.r.o. *OR* multimeter **1**

Total

5 **(a) (i)** calcium 2,8,8,2 **1**
fluorine 2,7 **1** **[2]**

(ii) transfer of electrons from calcium atoms to fluorine atoms **1**
forming positive ions (Ca^{2+}) and negative ions (F-) that attract **1** **[2]**

(iii) CaF_2 **1** **[1]**

Do not accept Fl for fluorine.

(b) *solid calcium fluoride* ions are held in lattice *OR* cannot move about **1**
molten calcium fluoride ions are free to move about **1**
liquid fluorine molecules are not charged **1** **[3]**

Total **[8]**

6 **(a)** n = 8 **[1]**

(b) speed = distance/time *OR* time = distance/speed *OR* time = 80/340 **1**
∴ time = 0.235 s *complete answer (1)* **1** **[2]**
Accept 0.24 s or 0.23 s but not 0.2 s

(c) (i) *ideas of…*
start: fast speed of light means negligible delay in seeing smoke **1**
stop: slow speed of sound gives enough time for observer to respond **1** **[2]**

(ii) decreases possibility of echoes **1**
which would confuse observer **1** **[2]**

(d) 3.5 kHz → 3500 Hz **1**
v = fλ *OR* λ = v/f *(accept c = fλ or λ = c/f).* **1**
Accept with values inserted whether frequency is in kHz or Hz.

wavelength = 0.097 m *complete answer * (1)*
1 **[3]**

Do not accept 0.1 m.
** Only the first incorrect or missing unit is penalised*

Total **[10]**

7 **(a)** yeast **1**
temperature less than 40 °C **1** **[2]**

Do not accept 'warm' on its own.

(b) (i) fractional distillation *both words* **1** **[1]**

(ii) *labelled sketch of laboratory apparatus to show…*

fractionating column
thermometer **1**
condenser **1**
workable arrangement * **1** **[**

** showing flask of solution being heated, vapour rising up fractionating column, thermometer in the top of this column with its bulb opposite tube leading down through water-cooled condenser into collecting vessel; the condenser should have water entering and leaving the outer tube correctly.*

Total **[7]**

8 **(a)**

thermometer		**1**	
changes	*do not accept 'expands'*	**1**	
equal		**1**	
range		**1**	
sensitive	*do not accept 'accurate'*	**1**	**[5]**

(b) *examples…* **[2]**

liquid-in-glass thermometer
volume of liquid depends on temperature

accept named liquid, mercury or alcohol.

OR thermocouple ✔ e.m.f depends on temperature ✔

Total **[7]**

9 **(a)** to remove impurities (from the ore) **1** **[1]**

Do not accept 'to form slag' unless 'impurities' are mentioned.

(b) *Symbols and subscripts should be written correctly.*

(i) $CaCO_3 \rightarrow CaO + CO_2$
formulae (1) (then) balanced (1) **2**

(ii) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
formulae (1) (then) balanced (1) **2** **[4]**

Accept $2Fe_2O_3 + 3C \rightarrow 4Fe + 3CO_2$

(c) *ideas of…*

zinc is more reactive than iron ∴ when zinc-coating is damaged the iron is still protected **1**

however

paint is inert ∴ when paint-coating is damaged damp air causes iron to rust **1** **[2]**

Total

TOTAL FOR PAPER

JUNE 2004

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 30

SYLLABUS/COMPONENT: 0652/05

PHYSICAL SCIENCE
Practical

1	**(a)**	**(i)**	Value for h within 0.4 mm of supervisor	
		(ii)	Brief description of how volume was found Volume within 10 cm^3 of supervisor sensible volume	**2**
			Table:	
			Six pairs of values Good spread to include a value equal to 150 cm^3 Values in mm and decreasing with volume of water (Penalise 1 mark when all intervals are exactly the same)	**3**
	(b)		**Graph:**	
			Axes correctly labelled Sensible scales for plotted points Plotting correct for 4 values Best straight line drawn	**4**
			Volume correctly read needs evidence of extrapolation Within 10% of recorded volume	**2**
	(c)		Measure water level in cylinder Put in the block and record new level Volume of water displaced calculated is equal to the volume of block	**3**
				Total [15]
2	**(a)**		Gas/vapour burns Limewater milky Brown or charring/smoke/smell	**3**
	(b)		Goes out NOT 'nothing' Limewater milky	**2**
	(c)	**(i)**	Decolourised	**1**
		(ii)	UI goes red pH about 1-4 Acid present	**3**
	(d)		Blue/green pH about 8-10 No mark for conclusion	**2**
	(e)		Effervescence OR gets cold	**1**
	(f)		Brief description Diagram	**1** **2**
				Total [15]

JUNE 2004

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 60

SYLLABUS/COMPONENT: 0652/06

PHYSICAL SCIENCE
Alternative to Practical

1 **(a)** 2.6 cm, 5.8 cm correctly entered in **Fig. 1.2** (no tolerance)

(b) displacement increases as load increases OWTTE **[1]**

(c) repeat experiment (and average)/use a ruler marked in millimetres **[1]**

(d) **(i)** thicker beam gives smaller displacement OWTTE **[1]**

(ii) shorter beam gives smaller displacement OWTTE **[1]**

(e) hang object on beam [1]
read displacement [1]
compare result with data from the experiment [1]
by plotting a graph of the data [1] **[4]**

Total [10]

2 **(a)** 1.8V [1], 150mA
2.4V [1], 250mA (1 mark for both current readings)
+/- 0.1V, +/- 10mA **[3]**

(b) 2 points correctly plotted [2]
line drawn (can be straight or curved) [1] **[3]**

(c) **(i)** the bulb becomes brighter as resistance decreases **[1]**

(ii) the filament of the bulb melted OWTTE **[1]**

(d) no, since it is not a straight line/V and I are not proportional
OR
yes, graph is a straight line/(they are proportional) **[1]**

Total [9]

3 **(a)** **(i)** 53.4g, 60.0g (must say 60.0), no tolerance [2] **[3]**

(ii) 6.6g (ecf) [1]

(b) blue litmus (U.I) paper turns red in the gas (reject add indicator) **[1]**

(c) **(i)** 56.8g (no tolerance) **[1]**

(ii) 3.2g (ecf) (both correct for 1 mark)

(d) evaporate to remove some water [1]
leave the solution to cool [1]
OR
evaporate solution [1]
over a boiling water bath [1] **[2]**

(e) **(i)** 62.9g, (no tolerance) [1]

(ii) 9.5g (ecf) [1]

(f) some copper nitrate left in the solution during crystallisation/water of crystallisation was lost/copper nitrate decomposed/other suitable answer based on experimental details **[1]**

Total [10]

4 **(a)** gas C: 8s
gas D: 3s
gas E: 12s. (no tolerance) **[3]**

(b) gas C because it took the least time to fall OWTTE **[1]**

(c) heavier (denser) gases fall, lighter (less dense) gases rise [1]
gases less dense (lighter) than air rise [1]
gases more dense (heavier) than air fall [1] **[2]**

(d) to keep the experiment fair/so that the results are accurate **[1]**

(e) **(i)** gas A rose more quickly/it has the least density **[1]**

(ii) test with a lighted spill/burn in air [1]
gas explodes (pop!) [1] **[2]**

Total [10]

5 **(a)** box 1 colourless (clear) to cloudy/milky [1]
carbon dioxide/carbonate [1]
box 2(a) carbon dioxide (suspected)/gas will not support combustion/no oxygen/may be nitrogen [1]
box 2(b) carbon dioxide confirmed [1]
box 3 turned from green [1] to red [1]
box 4 turned yellow/orange (reject orange) [1] **[7]**

(b) reaction vessel with delivery tube [1]
gas collected over water or in a syringe [1]
means of measuring gas volume/graduations shown [1] **[3]**

Total [10]

6 **(a)** **(i)** use a pipette/dropper/burette **[1]**

(ii) 103 (no tolerance) [1]
147 (ecf) [1] **[2]**

(b) 28mm, 14mm (+/- 1mm) **[2]**

(c) **(i)** axes labelled and scale correctly shown [1]
all points from **Fig. 6.3** plotted correctly [1]
straight line drawn extended to cut horizontal axis [1]

(ii) from candidates' own graph (approx 147) **[1]**

(iii) it will sink OWTTE **[1]**

(d) yes/comparison of **(a)** and **(c)(ii)** shows that mass in cup is numerically similar to (or greater than) its volume **[1]**
OR
no/cup sank before its mass (g) exceeded the volume (cm^3)
(depends on candidate's graph)
(mark for explanation)

Total [11]