CAMBRIDGE
INTERNATIONAL EXAMINATIONS

NOVEMBER 2002

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK : 80

SYLLABUS/COMPONENT : 0652/3

PHYSICAL SCIENCE
(EXTENDED)

UNIVERSITY *of* CAMBRIDGE
Local Examinations Syndicate

1   **(a)**   5.8-9.7   **1**

                        metallic   **1**

                        acid   **1**

         (b)   idea that mp depends on structure **and** idea that   **(1)**
there are different structures

                        gases (simple) molecular **and** metal giant
(accept metallic)   **(1)**

                        gases weakly bound **and** metals strongly bound
or gases weak force **and** metals strong forces   **(1)**

                        idea of strength of metallic bond decreasing as
the size of the ion increases => weaker
electrostatic attraction   **(1+1)**

> max two
> marks
> here

                                                                               5

2   **(a)**   moment = force x (perpendicular) distance
(accept F x d but **not** F x a)   **1**

                        80 x 30 or 80 x 0.3   **1**

                        2400 Ncm or 24 Nm (**not** N/cm etc. unit
penalty)   **1**

         (b)   **(i)**   rate of doing work / rate of transfer of energy /
work over time or equivalent (not symbols   **1**
unless defined)

               (ii)   moment changes   **1**

                        distance changes   **1**   **max**
                                                                                2

                        forces changes   **1**

                                                                               6

3 **(a)** **(i)** -2 or 2-   **1**

      (ii) +3 or 3 +   **1**

      (iii) $FeCl_3$ **1**

      (iv) add (aqueous) ammonia or ammonium hydroxide   **1**   mandatory

         green precipitate   **1**

         orange/red/brown precipitate   **1**

   (b) $Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$
        or
        $2Fe_2O_3 + 3C \rightarrow 4Fe + 3CO_2$

> formulae correct **1**
>
> correctly balanced **1**

        $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

   (c) **(i)** limestone /calcium carbonate   **1**

      (ii) to remove impurities from ore   **1**

                                          10

4 **(a)** **(i)** evidence of g$\rightarrow$kg   **1**

         1.2×10^{-2} N or 0.012 N*
         (12 N scores 1)   **1**

      (ii) as (a)(i)   **1**

      (iii) ½ mv²   **1**

         evidence of 0.2 squared   **1**

         2.4×10^{-5} J*   **1**

   (b) **(i)** *mgh*   **1**

         3.6×10^{-3} J*   **1**
         ecf for mass from (a)(iii)
         allow 3.6 J if mass penalised in (a)(iii)

(ii) line of negative slope (curved or straight)   **1**

passing through (0,**(b)(i)** value)   **1**
and (1.5 s, 0)

(iii) gravitational potential energy ➜ heat   **1**
(ignore mention of k.e.)

of air or fruit or explanation that k.e. not   **1**
gained because constant speed

                                                    12

***one unit penalty only for all the parts
in this question**

5 (a) to remove excess oxide or MgO   **1**
not "to remove solid or residue"

(b) (i) calcium sulphate is insoluble / not possible to
separate (from oxide) by filtering   **1**

(ii) add calcium nitrate (solution) **to** sulphuric acid   **1**

filter   **1**

dry residue by warming   **1**

(c) (i) 40 (ignore unit)   **1**

(ii) 0.2 (ignore unit)   **1**

(iii) 0.2 mol H_2SO_4 needed / ratio 1:1   **1**

2 mol in 1000 cm^3 / vol = no of   **1**
moles/concentration

100 cm^3 or 0.1 dm^3 (unit penalty)   **1**

                                                    10

6	**(a)**	mention of light	1
		wave behaves as lenses /refraction of light rays etc	1
	(b)	use set up shown / project light on to screen	
		measure distance between 2 light or dark bands	
		use of ruler / mention of middle or edges of bands	
		improved by using several bands	**4**
		idea of need to work out scaling	**max**
		freezing using strobe	
	(c)	$v = f\lambda$	1
		0.60 (or 0.5952) or 2.5/4.2	1
		multiplication by 60	1
		36 (35.7) no unit penalty	1
			10

7	**(a)**	**(i)**	CH_3OH	1 mandatory
		(ii)	any shared pairs seen	1
			all shells filled (each H – 2, C and O – 8)	1
		(iii)	same functional group (OH) / same general formula ($C_nH_{2n+2}O$) / undergo similar reactions/ all alcohols/ similar chemical properties	1

(b) **(i)** $C_2H_4 + H_2O \rightarrow C_2H_5OH$ | formulae correct **1** correctly balanced **1** | **1+1**

(ii) high temperature not "heat"

catalyst

high pressure not "pressure" **2**

(c) (catalytic) cracking of alkanes **1**

9

8 $\dfrac{1}{R_p} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$ or $R_p = \dfrac{R_1 R_2}{R_1 + R_2}$ **1**

$R_p = 4\ \Omega$ **1**

$R_t = 12\ \Omega$ (or $8\ \Omega + R_p$ value) ecf wrong R_p **1**

$V = IR$ (or arrangement) **1**

$I = 0.5$ (A) ecf **1**

$V = 2$ (V) ecf **1**

6

or any equivalent method with including 2 marks for relevant equations - answers alone gain two marks

9	(a)		oxide forms layer which bonds to aluminium (or layer is tough and impermeable)	1
			rust (iron oxide) flakes of leaving another exposed surface/ rust traps water and air(O_2) in contact with iron	1
	(b)		amphoteric oxides dissolve in alkalis	1
			NaOH removes(dissolves) oxide (layer) / Al reacts with NaOH	1
	(c)	(i)	bauxite	1
		(ii)	Al too (allow "very") reactive / bond with oxide too strong / too much energy is needed / carbon is not reactive enough to reduce aluminium oxide **not** "it is more reactive"	1

6

10	(a)	induction	1
		changing	1
		primary	1
		voltage	1
	(b)	$N_s/N_p = V_s/V_p$ or equivalent	1
		25 (ignore any unit)	1

6

**Total
80**