

**NOVEMBER 2002**

**INTERNATIONAL GCSE**

<b>MARK SCHEME</b>
<b>MAXIMUM MARK : 80</b>
<b>SYLLABUS/COMPONENT : 0652/3</b> <b>PHYSICAL SCIENCE</b> <b>(EXTENDED)</b>



1	(a)	5.8-9.7	1	
		metallic	1	
		acid	1	
	(b)	idea that mp depends on structure <b>and</b> idea that there are different structures	(1)	max two marks here
		gases (simple) molecular <b>and</b> metal giant (accept metallic)	(1)	
		gases weakly bound <b>and</b> metals strongly bound or gases weak force <b>and</b> metals strong forces	(1)	
		idea of strength of metallic bond decreasing as the size of the ion increases => weaker electrostatic attraction	(1+1)	
				5
2	(a)	moment = force x (perpendicular) distance (accept $F \times d$ but <b>not</b> $F \times a$ )	1	
		$80 \times 30$ or $80 \times 0.3$	1	
		2400 Ncm or 24 Nm ( <b>not</b> N/cm etc. unit penalty)	1	
	(b)	(i)		
		rate of doing work / rate of transfer of energy / work over time or equivalent (not symbols unless defined)	1	
		(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<sub>3</sub> 1
- (iv) add (aqueous) ammonia or ammonium hydroxide 1 mandatory
- green precipitate 1
- orange/red/brown precipitate 1
- (b) Fe<sub>2</sub>O<sub>3</sub> + 3C → 2Fe + 3CO  
or  
2Fe<sub>2</sub>O<sub>3</sub> + 3C → 4Fe + 3CO<sub>2</sub> formulae correct 1  
correctly balanced 1
- Fe<sub>2</sub>O<sub>3</sub> + 3CO → 2Fe + 3CO<sub>2</sub>
- (c) (i) limestone /calcium carbonate 1
- (ii) to remove impurities from ore 1
- 10
- 4 (a) (i) evidence of g → kg 1
- 1.2 x 10<sup>-2</sup> N or 0.012 N\*  
(12 N scores 1) 1
- (ii) as (a)(i) 1
- (iii) ½ mv<sup>2</sup> 1
- evidence of 0.2 squared 1
- 2.4 x 10<sup>-5</sup> J\* 1
- (b) (i) mgh 1
- 3.6 x 10<sup>-3</sup> 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 1  
 separate (from oxide) by filtering
- (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<sub>2</sub>SO<sub>4</sub> needed / ratio 1:1 1  
 2 mol in 1000 cm<sup>3</sup> / vol = no of 1  
 moles/concentration  
 100 cm<sup>3</sup> or 0.1 dm<sup>3</sup> (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 <sub>3</sub> OH	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 <sub>n</sub> H <sub>2n+2</sub> 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  $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$  or  $R_p = \frac{R_1 R_2}{R_1 + R_2}$  **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<sub>2</sub>) 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**