UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2009 question paper for the guidance of teachers

0652 PHYSICAL SCIENCE

0652/03 Paper 3 (Extended), maximum raw mark 80

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UNIVERSITY of CAMBRIDGE
International Examinations

1 (a) (i) Use of clockwise moment (= 250 × 0.6 (= 150)) (1)
anticlockwise moment (= f × 2.4) (1)
150 = f × 2.4 (or 250 × 0.6 = f × 2.4, or attempt to equate) (1)
f = 63 (62.5) N (1) [4]
(note the first 3 marks can be scored in a single line)
(if no other mark is scored a clear attempt to calculate a moment OR
an attempt to equate clockwise and anticlockwise moments award 1 mark)

(b) (i) horizontal line at 2.5 m/s, starting at t = 0, ignore length (1)
diagonal line to time axis covering 8 s (1) [2]

(ii) attempt to calculate gradient or 2.5 m/s / 8 s (accept ecf) (1)
= 0.31 m/s^2 (accept m/s/s) (ignore minus signs) (1) [2]

(iii) attempt to find area under the graph or (2.5 × 12) + (½ × 2.5 × 8)
OR use of $s = ut + ½at^2$ (allow ecf) (1)
= 40 m (1) [2]

[Total: 10]

2 (a) (i) mention of fizzing/effervescence/hydrogen given off (1)
mention of movement across the water or forming a hydroxide (1)
increased fizzing/movement down the group/reactivity increases (1) [3]

(ii) $2Li + 2H_2O \rightarrow 2LiOH + H_2$
ALL formulae correct (do not allow wrong case for first mark but allow it to
qualify for the second mark) (1)
one mark for balancing (1) [2]
($Li + H_2O \rightarrow LiOH + H$ give 1 mark)

(b) (i) mention of outer shell (1)
each has two electrons/same number of electrons (1) [2]
(number of electrons/atomic number goes up by 8 each time, 1 mark)

(ii) mention of density (1)
decreases as atomic number increases/down the group (1) [2]

(iii) $MgCl_2$ (1) [1]

(iv) metals have lattice of positive ions (1)
in a sea of electrons (1)
electrons move to carry current (1) [3]
(first 2 marks can be scored from a labelled diagram)

[Total: 13]

3	**(a)**	**(i)**	radiation or infra-red/light/electromagnetic waves	(1)	[1]
		(ii)	black is a good absorber of radiation/energy, etc. (allow, 'to absorb energy'/radiation, etc.)	(1)	[1]
		(iii)	ray correctly drawn	(1)	[1]
	(b)	**(i)**	conduction	(1)	[1]
		(ii)	hot water less dense than cold/water expands (not molecules) therefore floats/rises to the top (do NOT allow heat rising) (allow 1 mark for mention of convection)	(1) (1)	[2]
	(c)	**(i)**	slip ring (**not** split rings)	(1)	[1]
		(ii)	(carbon) brush	(1)	[1]
		(iii)	(soft) iron (if more than one answer given – zero, except treat cobalt/ nickel/steel as neutral) increases magnetic field strength/easily magnetised/demagnetised/ acts as an electromagnet	(1) (1)	[2]
	(d)	**(i)**	distillation (accept evaporation then condensation)	(1)	[1]
		(ii)	idea that waste energy from turbine is used	(1)	[1]

[Total: 12]

4 **(a)** **(i)** cracking (1) [1]

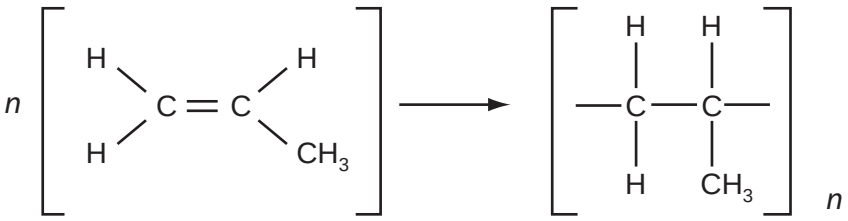
(ii) catalyst OR heat/high temperature (1)
increase rate of reaction OR provide energy to break bonds (1) [2]
(do NOT allow pick and mix, do not allow 'break chains', as in question stem)

(b) **(i)** $C_{15}H_{32} \rightarrow C_8H_{18} + C_3H_6 + 2C_2H_4$ (1) [1]

(ii) add bromine (water); (1)
no (colour) change; (+1)
(orange/red colour) changes to colourless/decolourises (+1) [3]

(iii) (addition) polymerisation [1]

(iv)



one mark lost for each error [2]

[Total: 10]

5 **(a)** use of R = V/I (= 6.0/2.4) (1)
= 2.5 Ω (1) [2]

(b) use of power = V × I (= 6 × 2.4) (1)
= 14.4 W (1) [2]

(c) **(i)** 3 × 2.5 or answer to **(a)** = 7.5 Ω (1) [1]

(ii) attempted calculation of power either by V^2 / R or other means (1)
= 4.8 W (1)
power less with higher resistor or correct conclusion from their figures (1) [3]

[Total: 8]

6 **(a)** from light/ultra-violet/Sun/sunlight/solar energy (1) [1]

(b) **(i)** $C_6H_{12}O_6$ RAM = 180 and/or H_2O RAM = 18 (1)
180 g glucose from 108 g water or 108/180 (= 0.6) (1)
20 g glucose from 108 × 20 / 180 = 12 g water (1) [3]

(ii) when 180 g glucose is made 6 × 24000 = 14 4000 cm^3 oxygen is produced (1)
20 g glucose made with 144000 × 20 / 180 = 16000 (1)
cm^3 (accept work in dm^3) (1) [3]

[Total: 7]

7 **(a)** **(i)** smooth curve going within 1 square of all points (1) [1]

(ii) clear working or 12.5 ± 1.0 s (1)
12.5 ± 0.5 s (1) [2]
(when marking final answer, if 12.5 ± 0.5 give 2 marks, 12.5 ± 1.0 for 1 mark)

(b) **(i)** **x** is 34 (1) [1]

(ii) **y** is 16 (1) [1]

[Total: 5]

8 **(a)** **(i)** diamond melting point higher than graphite (1)
all diamond atoms held by strong (covalent) bonds (1)
graphite has fewer bonds to break/weak bonds <u>between layers</u> (1) [3]

(ii) diamond does not conduct electricity or graphite does (1)
<u>electrons</u> not mobile in diamond (1)
graphite has mobile <u>electrons</u> (between layers) (1) [3]

(b) **(i)** covalent [1]

(ii) two oxygen atoms each overlapping/'attached' to one carbon atom (1)
two pairs of electrons in each overlap (1)
correct numbers of electrons on both oxygen and the carbon atoms (1) [3]

[Total: 10]

9 **(a)** The joining of two (light) <u>nuclei</u> (do **not** accept atoms) (1)
with release of energy/exothermic reaction (1) [2]

(b) <u>Use of</u> $E = mc^2$ (1)
$= 3.84 \times 10^{-29} \times (3 \times 10^8)^2$ (1)
$= 3.46 \times 10^{-12}$ J (1) [3]

[Total: 5]