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

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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1 (a) (i) Use of clockwise moment (= 250 × 0.6 (= 150))
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) [3]
(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 $s = ut + \frac{1}{2}at^2$ (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

(ii) black is a good absorber of radiation/energy, etc. (1)
(allow, 'to absorb energy'/radiation, etc.)

(iii) ray correctly drawn (1) [1]

(b) (i) conduction (1) [1]

(ii) hot water less dense than cold/water expands (not molecules) (1)
therefore floats/rises to the top (1) [2]
(do NOT allow heat rising)
(allow 1 mark for mention of convection)

(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) (1)
increases magnetic field strength/easily magnetised/demagnetised/acts as an electromagnet (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

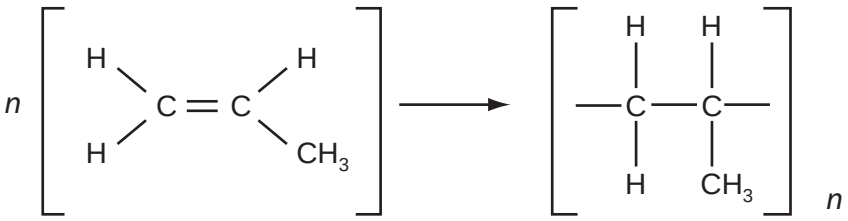
(ii) catalyst OR heat/high temperature (1)
increase rate of reaction OR provide energy to break bonds (1)
(do NOT allow pick and mix, do not allow 'break chains', as in question stem)

(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

(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]