CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

0652 PHYSICAL SCIENCE

0652/32 Paper 3 (Extended Theory), maximum raw mark 80

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1 **(a)** one extra electron added for each successive element / same number in outer
shell as group number ; [1]

(b) *metals*: Na, Mg, A*l* **and** *non-metals*: Si, P, S, C*l* ; [1]

(c) **(i)** CaC*l*$_2$; [1]

(ii) electrons transferred ;
two (electrons transferred) ;
from (outer shell) of calcium atom, one to each (outer shell) of two chlorine
atoms ; [3]

(d) six electrons in all three outer shells ;
totals of eight electrons in outer shell of sulfur ;
eight electrons in both oxygen outer shells after bonding ; [3]

[Total: 9]

2 **(a)** the point at which the whole mass of a body may be considered to act ;; [2]
(max 1 mark for use of weight **OR** stating the mass is concentrated at point)

(b) **(i)** use of mg Δh (= 75 × 10 × (2.3 – 1.1)) ;
= 900 J ; [2]

(ii) 900 J ; [1]

(c) use of E_k = ½ mv^2 (750 = 0.5 × 75 × v^2) ;
v^2 = 2 x 900 / 75 (= 20) ;
= 45 m / s ; [3]

(d) (work done against) friction / has KE in horizontal direction as well ; [1]

[Total: 9]

3 **(a)** add excess magnesium oxide to sulfuric acid ;
(warm mixture then) filter off excess magnesium oxide ;
evaporate solution to small volume ;
leave to crystallise then filter off crystals and dry ; [4]

(b) MgO(s) + H$_2$SO$_4$(aq) ⟶ MgSO$_4$(aq) + H$_2$O(l)
one mark each for: formulae ; balance ; state symbols ; [3]

(c) relative formula mass $Mg(OH)_2$ = 58 ;
$MgSO_4$ = 120 ;
mass magnesium sulfate = 120 × 5 ÷ 58 (= 10.3 g) ;   [3]

[Total: 10]

4 **(a)** kinetic energy ;
of the air molecules ;   [2]

(b) 30% of the input energy / power ;
is converted to useful energy output ;   [2]

(c) use of power = VI (4.5 × 103 = 230 I) ;
I = 19.6 A ;   [2]

[Total: 6]

5 **(a)** **(i)**   37 (± 1) seconds ;   [1]

(ii)   all magnesium reacted ;   [1]

(b) steeper gradient ;
ending at same final volume ;   [2]

(c) 24 000 cm^3 hydrogen evolved from 24 g magnesium ;
78 cm^3 hydrogen evolved ;
mass magnesium = 24 × 78 ÷ 24 000 ;
= 0.078 (g) ;   [4]

[Total: 8]

6 **(a)** **(i)**   rays refracted towards axis ;
all (minimum 2) rays go through **F** ;
rays continue after **F** ;   [3]

(ii)   line from **F** to centre of lens ;   [1]

(b) ray through optical centre ;
ray initially parallel to the axis passing through principal focus ;
rays traced back to form the image ;   [3]

(c) virtual, upright, enlarged ;;   [2]
(all 3 correct = 2 marks; 2 correct = 1 mark)

[Total: 9]

7 (a) metal has lattice of positive ions in sea of electrons ;
in pure metal layers of atoms can slide over each other easily ;
in alloy different size atoms prevent easy sliding of layers ;   [3]

(b) (i) steel coated with layer of zinc ;   [1]

(ii) does not rust even when scratched ;   [1]

(iii) zinc is more reactive than iron / steel ;
reacts in preference to iron / steel / idea of sacrificial corrosion ;   [2]

(c) good conductor of heat ;   [1]

[Total: 8]

8 (a) (i) vary the resistance of **X** ;   [1]

(ii) use of gradient (= $(0.36 - 0) \div (4.0 - 0)$) **or** identifying specific points ;
$R = 1 / $gradient **or** use of points ;
$= 11\,\Omega$;   [3]

(b) evidence that half diameter increases resistance ;
$R = 44\,\Omega$;   [2]

[Total: 6]

9 (a) has carbon to carbon double bond(s) ;   [1]

(b) cracking ;
of alkanes ;   [2]

(c) **n** $H_2C = CH_2$ on left ;
one mark for **n** ;   [2]
(1 mark for an correct representation of one ethene molecule)

[Total: 5]

10 (a) (i) generation of an emf / current ;
conductor in a changing magnetic field / moving through a magnetic field ;   [2]

(ii) input current produces the magnetic field ;
a.c. produces changing field ;   [2]

(iii) (soft) iron ;   [1]

(iv) easily magnetised and demagnetised ;
increases the field strength / channels the field through the secondary coil ;   [2]

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(b) 230 : 115 (= 2 : 1) ; [1]

(c) amplitude ≈ 1 division ;
frequency same as input ; [2]

[Total: 10]