UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2008 question paper

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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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1 **(a)** **(i)** use of weight = mass x *g* ; 1
= 2.0 N ; 1

    (ii) 2.0 N OR same as **(i)** ; 1

(b) arrow vertically upwards ; (allow without label if clear) 1 1

(c) marked clearly between 5.0 & 5.5 N ; 1 1

(d) **(i)** 1.9 ± 0.1N ; 1 1

    (ii) use of force = mass x acceleration ; 1
= 9.5 m/s^2 ; 1 2

[Total: 8]

2 **(a)** **(i)** coating with zinc ; 1 1

    (ii) zinc is more reactive than iron ; 1
when both exposed to water and oxygen zinc corrodes/reacts ; 1
protecting the iron/sacrificial corrosion ; 1 3

    (iii) painting ; 1 1

    (iv) for paint/oil/grease etc: no, if scratched the iron rusts/
OR for stainless steel: yes, because protection is throughout the
      alloy not just on the surface 1 1

(b) aluminium has an oxide layer ; 1
which prevents contact between the metal and oxygen/air/water ; 1 2

(c) **(i)** makes it stronger ; 1 1

    (ii) atoms of second metal get between aluminium metals in lattice/atoms
      of the two metals are of a different size ; 1
making it more difficult for layers of atoms to slide ; 1 2

[Total: 11]

3 **(a)** the liquid moves up the capillary tube ;   1
       because it expands ;   1

   (b) **(i)** iron, copper, constantan **ANY TWO**   1 + 1   2

       (ii) temperature = 100 × 4.8/7.2 ;   1
             = 67 °C ;   1   2

       (ii) quick acting OR
           can measure higher temperatures OR
           can be remote … ;   1

           low thermal capacity or can follow changing temps OR
           metals used have Higher melting points than glass OR
           wires can be as long as required ;   1   2

                                              [Total: 8]

4 **(a)** 2,8,8,1 ;   1
       2,8,8 ;   1
       2,5 ;   1   3

   (b) number of electrons in outer shell ;   1
       same as Group number   1   2

   (c) **(i)** CaI_2 ;   1   1

       (ii) black (accept dark grey/blue) ;   1   1

   (d) **(i)** boiling point increases ;   1
           with increase in proton number/down Group ;   1   2

       (ii) helium is less dense than air so will float/carry balloon up ;   1
           argon and krypton are more dense than air so will not float/will sink ;   1
           neon only slightly less dense than air, will not give enough uplift/will
              not make balloon rise ;   1   3
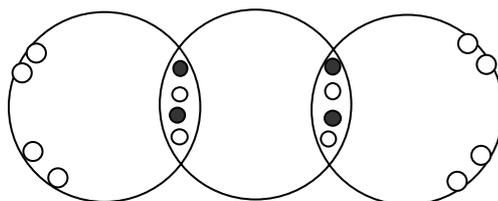
                                         [Total: 12]

5 **(a)** waves refracted on entering shallow water ;   1
refraction correct ;   1
wavelength in deep water constant AND in shallow water ;   1
(if only 3 wavefronts drawn max. 2, 2 drawn max 1)

    (b) **(i)** part circles centred gap ;   1
not reaching barrier ;   1
wavelength constant throughout ;   1   3
(if only 3 wavefronts drawn max. 2, 2 drawn max 1)

       (ii) diffraction ;   1   1

                                                                      [Total: 7]

6 **(a)** **(i)** causes acid rain/causes smog ;   1
damages buildings/trees/makes breathing difficult ;   1
(two answers must match, otherwise max 1)   any two   1 + 1   2

       (ii) speeds up reduction of nitrogen oxide ;   1
to form nitrogen ;   1   2

    (b) $C_3H_8 = (3 \times 12) + (8 \times 1) = 44$ and $CO_2 = 12 + (2 \times 16) = 44$;   1

44 kg propane produces $3 \times 44 = 132$ kg carbon dioxide ;   1
1.0 kg propane produces $132/44 = 3.0$ kg carbon dioxide ;   1

44 g carbon dioxide has volume 24 dm^3 ;   1
3.0 kg carbon dioxide has volume $1000 \times 3.0 \times 24/44 = 1636$ dm^3 ;   1   5

    (c)

one mark each for:
    a shared pair of electrons ;   1
    four shared pairs of electrons, **two** for each oxygen ;   1
    four other electrons on **each** oxygen ;   1   3

                                                                       [Total: 12]

7 **(a)** cracking ;   1
of an alkane/oil/petroleum ;   1

(b) $C_2H + H_2O \rightarrow C_2H_5OH$;;
one mark for each side   2   2

(c) a catalyst/named catalyst ;   1   1

[Total: 5]

8 **(a)** Use of power = VI   1
$I = 200\,000\,000/55\,000$ 1
= 3 600 A   1   3

(b) **(i)** less energy loss (in cables) ;   1
(same power transmitted) at lower current ;   1   2

(ii) transformer ;   1   1

(iii) use of $n_1/n_2 = V_1/V_2$;   1
= 220 : 1 ;   1   2

(d) energy input = energy output ;   1   1

[Total: 9]

9 **(a)** electron ;   1
fast/energetic/from the nucleus ;   1   2

(b) **(i)** nucleon numbers correct:131 0 ;   1
proton numbers correct: 54 −1 ;   1   2

(ii) xenon ;   1
noble gas ;   1   2

(c) shortish half life **OR** Xe unreactive
long enough to do tests etc. but not too long to harm patient
beta correct sort of penetration   **ANY TWO**   1 + 1   2

[Total: 8]