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

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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 = $100 \times 4.8/7.2$;   1
  $= 67\,^{\circ}C$;   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)
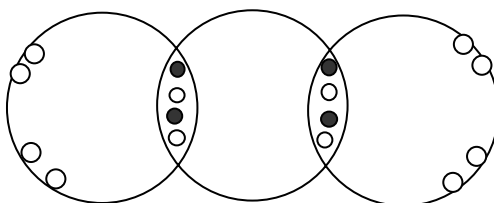
one mark each for:
a shared pair of electrons ;   1
four shared pairs of electrons, **two** for each oxygen ;   1
four other electrons on **each** oxygen ;   1   3

[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]