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.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.
1 (a) (i) Cs / Fr [1]
(ii) Br [1]
(iii) U / Pu / Th [1]
(iv) I or At [1]
(v) As [1]
(vi) He / Ne / Ar / Kr / Xe [1]

(b) (i) GeO₂ / GeO [1]
(ii) TeBr₂ / TeBr₄ [1]

(c) (i) Sr²⁺ [1]
(ii) F⁻ [1]

2 (a) (i) molecule / unit / simple compound / building block and used to make a polymer / big molecule / long chain / macromolecule [1]
formation of a polymer / big molecule / long chain / macromolecule or joining of monomers and elimination / removal / formation of a simple or small molecule / H₂O / HCl [1]
note: two points needed for 1 mark in both parts [1]
(ii) -O- linkage [1]
three correct monomer units [1]
continuation [1]

(b) (i) catalyst and from living organism [1]
accept: biological catalyst / protein catalyst [1]
(ii) enzyme denatured / destroyed [1]
(iii) chromatography [1]
locating agent / description of locating agent [1]
measure Rᵣ / compare with standards [1]
3 (a) sodium hydroxide solution
   warm
   (only) ammonium phosphate gives off ammonia / gas (which will turn red litmus paper blue)
   or:
   sodium hydroxide solution
   dissolve fertiliser in water
   Ca\(^{2+}\) gives (white) ppt
   or:
   flame test
   Ca\(^{2+}\) brick red / orange / orange-red
   NH\(_4^+\) no colour

(b) iron catalyst
   pressure 150–300 atmospheres
   temperature 370–470 °C
   \(\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3\)
   note: units required for temperature and pressure

(c) potassium / K

(d) (i) needs to be soluble / in solution (to be absorbed by plants)
   (ii) base
       proton acceptor

(e) plant growth depends on soil acidity or pH / plants have optimum pH (for growth)
    add Ca(OH)\(_2\) / CaO / CaCO\(_3\) / lime / slaked lime / quicklime / limestone

4 (a) (i) alloy / mixture
   iron and carbon / another metal or element etc.
   (ii) electron loss

(b) electrons move from / lost from Mg
    to steel / iron

(c) (i) \(2\text{H}^+ + 2e \rightarrow \text{H}_2\)
    not balanced = 1
(ii) sacrificial protection – is a cell
    cathodic protection – is electrolysis NOT electrical cell
    or:
    sacrificial protection – electrons from more reactive metal
    cathodic protection – electrons from battery etc.
    or:
    sacrificial protection – does not need or use power / battery / electricity / electrical cell
    cathodic protection – does
    or:
    sacrificial protection uses up / needs a sacrificial / more reactive metal
    cathodic protection doesn’t

5 (a) light / UV / sun / sunlight / solar energy
    starts / initiates / speeds up

(b) (i) 0.03% – 1(%) carbon dioxide
    accept: less than 1(%)
    20% – 21(%) oxygen

(ii) remove carbon dioxide from atmosphere
    produce oxygen
    any two from:
    photosynthesis
    chlorophyll / chloroplast
    light / sun / sunlight / UV / photochemical
    formed carbohydrates / glucose / sugar(s)

(c) reaction is photochemical / needs light
    (light) causes formation of silver / silver ions reduced
    (on formation of silver) goes black
    no light still silver(I) bromide / stays white / no reaction

6 (a) any three from:
    barium more reactive / forms ions more readily
    barium reacts with (cold) water, nickel does not
    barium more vigorous with acids
    nickel compounds coloured, barium compounds white
    nickel has more than one oxidation state, barium has one
    nickel / nickel compounds catalysts, barium / barium compounds not catalysts
    nickel forms complex ions, barium does not

(b) (i) forward reaction favoured by low temperatures / reverse reaction favoured by high temperatures / heat
    exothermic

(ii) products / RHS
    has fewer moles / molecules / smaller volume / ORA

(iii) do not react or left behind / left at 60 °C
(iv) electrolysis
   cathode (pure) nickel [1]
   anode impure nickel [1]
   electrolyte is a soluble nickel salt [1]

7 (a) correct method shown
   i.e. 126/14 (= 9) or 14x = 126 or x = 9 or (12 \times 9) + 18 = 126
   C_{9}H_{18}
   note: correct formula only = 1

(b) (i) all hydrogen atoms 1bp [1]
   C—C bond atoms 1bp [1]
   C=C 2 bp [1]

   (ii) correct repeat unit
        continuation [1]
        (iii) bonds broken
               H-H +436 (kJ/mol) C=C +610 = +1046 (kJ/mol) [1]
               bonds formed
               2C-H –415 \times 2 \text{kJ/mol} C-C –346 = –1176 (kJ/mol)
               –130 kJ/mol / more energy released than absorbed
               or:
               bonds broken
               3882 (kJ/mol)
               bonds formed
               4012 (kJ/mol)
               –130 kJ/mol / more energy released than absorbed
               allow: ecf for final mark as long as the answer is not positive
               note: units not necessary

(c) (i) butan-1-ol or butan-2-ol or butanol [1]

   (ii) CH_{3}-CH_{2}-CH(Br)-CH_{2}Br
        C_{4}H_{8}Br_{2} = 1
        note: any other dibromobutane = 0

   (iii) HI [1]