WJEC
CBAC

GCE MARKING SCHEME

CHEMISTRY
AS/Advanced

SUMMER 2012

CH1
Section A

1.

[1]

2. $1/12^{th}$ mass of one atom of carbon-12.   [1]

3.   C   [1]

4.   (a)

C	O	Cl	
$\dfrac{12.1}{12}$	$\dfrac{16.2}{16}$	$\dfrac{71.7}{35.5}$	(1)
1.01	1.01	2.02	
1	1	2	

Formula = $COCl_2$ (1)   [2]

(b) M_r / molecular mass / number of atoms of any element in compound   [1]

5.   (a)   **C   B   D   E   A**   [2]

(1 mark if one mistake e.g. **A** in wrong place)

(b)   **Z**   (1)

Si is in Group 4 therefore large jump in ionisation energy would be after the fourth ionisation, not before it / **W**, **X** and **Y** have a large jump before the fourth ionisation energy so cannot be in Group 4   (1)

[2]

Total [10]

Section B

6. (a) (i) 12 [1]

   (ii) 14 [1]

   (iii) Percentage / abundance / ratio / proportion of
        each isotope [1]

   (b) (i) 0.125 g [1]

   (ii) e.g. Cobalt-60 (1) in radiotherapy (1) / Carbon-14 (1) in
        radio carbon dating (1) / Iodine-131 (1) as a tracer in
        thyroid glands (1) [2]

   (c) (i) Atoms are hit by an electron beam / electrons fired from
        an electron gun (and lose electrons) [1]

   (ii) To be able to accelerate the ions (to high speed) / so that
        they can be deflected by a magnetic field
              - no credit for 'so that *atoms* can be deflected…'
        [1]

   (iii) They are deflected by a magnetic field / according to the
        m/z ratio [1]

   (d)

1s	2s	2p			3s	3p		
↓↑	↓↑	↓↑	↓↑	↓↑				

   [1]
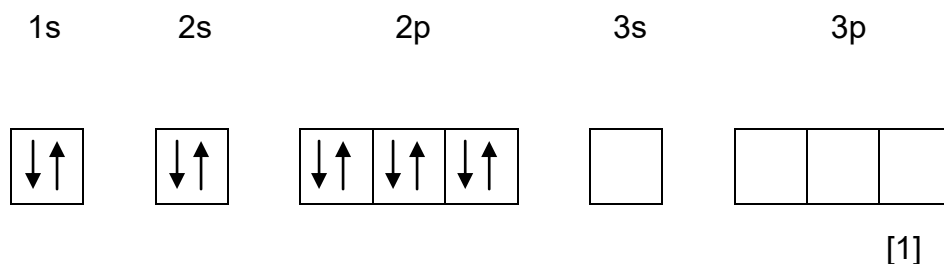
   (e) (i) Mg_3N_2 + **6**H_2O ⟶ **3**$Mg(OH)_2$ + **2**NH_3 [1]

   (ii) moles $Mg(OH)_2$ = 1.75/58.32 = 0.0300 (1)

        moles Mg_3N_2 = 0.0100 (1)

        mass Mg_3N_2 = 0.01 x 100.9 = 1.01 g (1) [3]

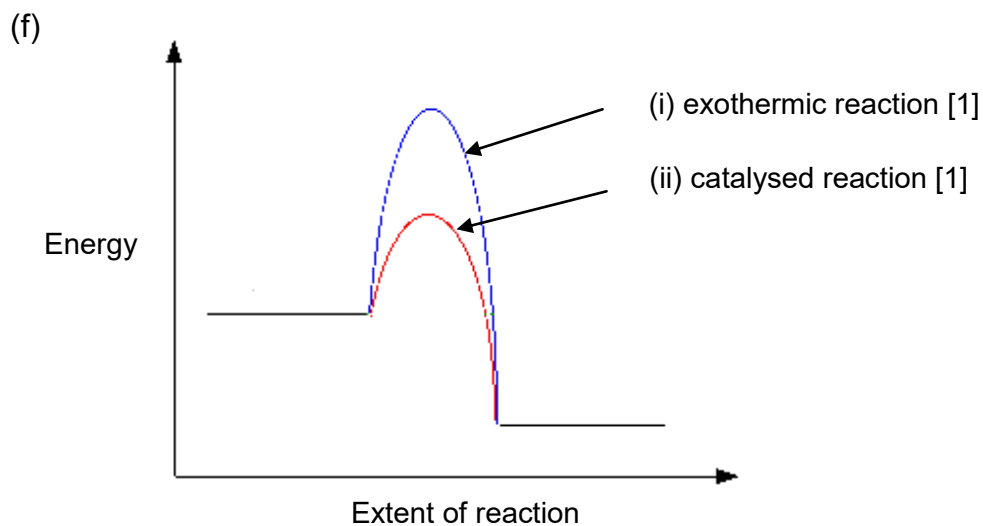   - must be **3 significant figures** to gain third mark

   Total [14]

7. (a) Plotting   (2)

        Best fit line   (1)   [3]

    (b) (i)   C   (1)

             Curve steeper   (1)   [2]

         (ii) Concentration of acid is greatest   [1]

    (c) 44 cm^3 ($\pm$1 cm^3)   [1]

    (d) Moles Mg = 0.101/24.3 = 0.00416   (1)

         Moles HCl = 2 x 0.02 = 0.04   (1)   [2]

    (e) (i)   Mg is not the limiting factor /

             Mg now in excess / HCl not in excess   [1]

         (ii) Moles acid = 0.5 x 0.04 = 0.02   (1)

             Volume H$_2$ = 0.01 x 24 = 0.24 dm^3

                  - correct unit needed   (1)   [2]

    (f) Lower the temperature of the acid   (1)

         Reactants collide with less energy   (1)

         Fewer molecules that have the required activation energy (1)[3]

    or   Use pieces of magnesium (1) less surface area (1) less chance
         of successful collisions (1)

    QWC Selection of a form and style of writing appropriate to purpose
    and to complexity of subject matter.   [1]

                                                      Total [16]

8. (a) Oil is non-renewable / will run out (1)

Contribution of CO_2 to global warming (1)

Oil has other important uses (1) [2]

(Maximum 2 marks)

(b) (i) Power stations / fossil fuels used to generate the electricity needed to make H_2 (1)

Resulting in CO_2 formation (global warming) / acid rain (1)

Manufacture of car produces pollution (1) [2]

(Maximum 2 marks)

QWC Legibility of text; accuracy of spelling, punctuation and grammar, clarity of meaning [1]

(ii) Disagree, no fuel is 100% safe /
petrol can burn explosively
(Accept agree if valid reason given e.g. in terms of lives being lost) [1]

(c) (i) Hydrogen since frequency is inversely proportional to wavelength / smaller wavelength [1]

(ii) Hydrogen since energy is proportional to frequency / greater frequency / E = hf [1]

(d) In Ne greater shielding of *outer* electron (1) outweighs larger nuclear charge (1) / He has greater effective nuclear charge (1) / He *outer* electron closer to nucleus (1)
- max 1 if no reference to *outer* electron [2]

(Maximum 2 marks)

(e) (i) ^{218}Po [1]

(ii) Since radon is a gas / inhaled, α particles will be given off in the lungs (which may cause cancer) [1]

Total [12]

9.   (a)   Low temperature   (1)
             As temperature is decreased equilibrium moves in exothermic
             direction.   (1)

             High pressure   (1)

             As pressure is increased equilibrium moves towards side with
             smaller number of gas moles   (1)   [4]

             QWC The information is organised clearly and coherently, using
             specialist vocabulary where appropriate   [1]

      (b)   ΔHreaction = ΔH$_f$ products – ΔH$_f$ reactants   (1)

             -46 = ΔH$_f$ ethanol – (52.3 – 242)

             ΔH$_f$ ethanol = -46 – 189.7   (1)

             ΔH$_f$ ethanol = -235.7 kJ mol^{-1} (1)   [3]

      (c)   Bonds broken = 1648 + 612 + 926 = 3186 kJ mol^{-1} (1)

             Bonds formed = 2060 + 348 + 360 + 463 = 3231 kJ mol^{-1} (1)

             ΔH reaction = 3186 – 3231 = -45 kJ mol^{-1} (1)
                                                                        [3]

      (d)   (i)   Average bond enthalpies used (not actual ones)   [1]

             (ii)   Yes, since answers are close to each other   [1]

      (e)   Catalyst is in different (physical) state to reactants   [1]

      (f)

             (i) exothermic reaction [1]

             (ii) catalysed reaction [1]

             Energy

             Extent of reaction

                                                           Total [16]

10. (a) Weighing bottle would not have been washed / difficult to dissolve solid in volumetric flask / final volume would not necessarily be 250 cm^3 [1]

(b) Pipette [1]

(c) To show the end point / when to stop adding acid / when it's neutralised [1]

(d) So that a certain volume of acid can be added quickly before adding drop by drop / to save time before doing accurate titrations / to give a rough idea of the end point [1]

(e) To obtain a more reliable value [1]

(f) (i) Moles = 0.730/36.5 = 0.0200 (1)

Concentration = 0.02/0.1 = 0.200 mol dm^{-3} (1) [2]

(ii) Moles = 0.2 x 0.0238 = 0.00476 [1]

(iii) 0.00476 [1]

(iv) 0.00476 x 10 = 0.0476 [1]

(v) M_r = 1.14/0.0476 = 23.95 [1]

(vi) Lithium [1]

- mark consequentially throughout (f)

Total [12]

Section B Total [70]