IGCSE Chemistry (4335) – Higher Tier

1. (a) (under)ground / mine / volcanoes **NOT** ores **(1)**
crude oil **(1)**

(b) air **NOT** oxygen **(1)**
water **(1)**

(c) (i) sulphur trioxide **(1)**
(ii) range or specific temperature within 350°C - 500°C / high temperature
range or specific pressure within 1 - 5 atm / slightly increased (**NOT** high) pressure
V_2O_5 / vanadium(V) oxide
any two **(2)**

Total 7 marks

2. (a) potassium manganate(VII) / manganese(IV) oxide **(1)**
purple / black (grey) **(1)**

(b) denser than air **(1)**

(c) green / yellow-green **(1)**

(d) (damp) litmus (paper) / starch iodide paper **(1)**
bleaches / white / black **(1)**

(e) (i) sodium chloride **(1)**
(ii) electrolysis **(1)**
(iii) bleach / treating **OR** sterilising water / manufacture of HCl **(1)**

Total 9 marks

3. (a) (i) only single bonds / no more atoms can be added **(1)**
(ii) (they contain) carbon and hydrogen only **(1)**

(b) (i) C_nH_{2n+2} **(1)**
(ii) alkanes **(1)**
(iii) similar chemical properties
gradation in physical properties
neighbouring members differ by CH_2
any two **(2)**

(c) (compounds with) the same molecular formula **(1)**
(but) different structures / structural formula **(1)**

Total 8 marks

4. (a) Na^+ **(1)**

(b) O^{2-} **(1)**

(c) Cl^- **(1)**

(d) Mg **(1)**

(e) Mg^{2+}, Na^+ and O^{2-} **(1)**

(f) MgO **(1)**
higher charges on the ions / ions have double charges **(1)**

Total 7 marks

5. (a) (i) enthalpy change / energy change / heat change **(1)**
(ii) reaction is exothermic / heat is given out **(1)**

(b) covalent **(1)**
two / pair of **(1)**
shared electrons **(1)**

(c) H × H **(1)**
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(d) forces between molecules (determine boiling point) **(1)**
(these are) weak **(1)**

(e) colourless **(1)**
colourless **(1)**

(f) (i) silver nitrate **(1)**
(ii) white precipitate **(1)**
(iii) $AgNO_3$ (on left) **(1)**
AgCl and HNO_3 (on right) **(1)**

Total 14 marks

6. (a) (i) solid **(1)**

(ii) 25 to 100 °C **(1)**

(b) (i) -1 **(1)**

(ii) each gain one electron **(1)**

to get full outer energy level / shell **(1)**

(c) fluorine **(1)**

(d) (i) $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

reagents and products **(1)**

balancing **(1)**

(ii) solution becomes red / orange / brown / yellow **(1)**

(e) K: $\frac{16.4}{39} = 0.421$; Cl: $\frac{30.0}{35.5} = 0.845$; I: $\frac{53.6}{127} = 0.422$ **(1)**

simplification of ratio / dividing all by 0.421 i.e. K =1; Cl = 2; I = 1 **(1)**

correct formula: KCl_2I **(1)**

Total 12 marks

7. (a) (i) needs lots of energy / container would melt **(1)**

(ii) cryolite has a lower melting point **(1)**

aluminium oxide dissolves in molten cryolite **(1)**

OR

mixture of aluminium oxide and cryolite **(1)**

has lower melting point **(1)**

(b) (i) $2O^{2-} \rightarrow O_2 + 4e^-$ (or halved) **(1)**

(ii) $Al^{3+} + 3e^- \rightarrow Al$

species correct **(1)**

balanced **(1)**

(c) O^{2-} / oxide **(1)**

lost electrons **(1)**

(d) carbon / graphite (electrode) **(1)**

reacts with oxygen formed **(1)**

makes carbon dioxide / carbon monoxide **(1)**

(e) (i) regular lattice/arrangement of positive ions **NOT** atoms **(1)**

delocalised/sea of electrons **(1)**

(ii) electrons mobile / free to move **(1)**

Total 14 marks

8. (a) weak acids do not dissociate/ionise fully
weak acids have higher pH / turn U.I. orange-yellow } *any two*
weak acids react more slowly **(2)**
ACCEPT reverse arguments for strong acids

(b) (i) 138 **(1)**
(ii) 2.76 ÷ 138 = 0.02 (moles) **(1)**
(iii) volume = 0.02 ÷ 0.2 (= 0.1dm^3) **(1)**
= 100 (cm^3) **(1)**
(iv) 44 **(1)**
(v) 44 x 0.02 = 0.88 (g) **(1)**
(vi) 0.02 x 24 = 0.48 (dm^3) **(1)**

(c) (i) flame test / description of flame test **(1)**
lilac **(1)**
(ii) add dilute hydrochloric acid **(1)**
test gas with acidified $K_2Cr_2O_7$ / (damp) blue litmus **(1)**
orange to green / goes red **(1)**
NB If no test, can score last mark by stating SO_2 produced
OR
add barium chloride **(1)**
followed by hydrochloric acid **(1)**
white precipitate which dissolves on adding hydrochloric acid **(1)**

Total 14 marks

9. (a) (refinery) gases **(1)**

(b) global warming **(1)**

(c) (i) high temperature / alumina catalyst **(1)**
(ii) fractional distillation of crude oil produces more long chain fractions than required **(1)**

(d) (i) 2640 (kJ/mol)
if incorrect, give 1 mark for 4 x 412 **OR** 2 x 496 **(2)**
(ii) 3338 (kJ/mol)
if incorrect give 1 mark for 2 x 743 **OR** 4 x 463 **(2)**
(iii) - 698 (kJ/mol) **cq on (i) and (ii)** **(1)**

(e) (i) $2CH_4 + 3O_2 \rightarrow 2CO + 4H_2O$ (accept equation to produce C)
all reagents and products correct = 1 **(1)**
balancing = 1 **(1)**
(ii) CO poisonous / toxic **(1)**
reduces ability of blood to carry oxygen / correct reference to haemoglobin **(1)**

Total 13 marks

10. (a) (i) natural gas / oil **NOT** methane **(1)**

(ii) $H_2O + CH_4 \rightarrow CO + 3H_2$

correct species **(1)**

balancing **(1)**

ALLOW correct equation producing hydrogen from cracking

(iii) iron **(1)**

(b) A: oxygen / O_2 **(1)**

B: water / H_2O **(1)**

(c) (i) reference to the arrow **(1)**

(ii) forward and reverse reactions take place **(1)**

same rate / concentrations do not change **(1)**

(iii) more / increases **(1)**

(iv) less / decreases **(1)**

(d) (i) acid rain **(1)**

(ii) kills trees
kills fish
damages buildings
} *any two* **(2)**

Total 14 marks

11. (a) Each C bonded to 4 others **(1)**

arranged tetrahedrally **(1)**

each C held rigidly in place/strong bonds need to be broken to deform structure **(1)**

(b) Each C bonded to 3 others **(1)**

arranged in layers of hexagons **(1)**

weak forces between layers/layers can slide over each other **(1)**

(c) strong (covalent) bonds (between atoms) **(1)**

need lots of energy to overcome/break **(1)**

Total 8 marks

PAPER TOTAL 120 MARKS