Paper 2H

1. (a)

Name of substance	Ionic bonding	Covalent bonding	Insoluble in water	Soluble in water
ammonia		✓		✓
methane		✓		
poly(ethene)			✓	
sodium chloride	✓			✓
sodium hydroxide				

All six correct – 4 marks
5 or 4 correct – 3 marks
3 correct – 2 marks
2 correct – 1 mark **4**

(b) (i) any suitable use e.g. making bags/food packaging… **1**
(ii) any two from: soap, paper, ceramics, bleach, detergents **2**

Total 7 marks

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

(b) damp litmus paper **1**
bleached **1**

(c) (i) iron(III) chloride **1**
(ii) brown solid / precipitate **1**

(d) (i) iodine **1**
(ii) chlorine is more reactive (than iodine) **1**

Total 7 marks

3. (a) a shared pair of electrons **1**

(b) simple **1**
weak **1**
molecules **1**
low **1**

(c) (i) hydrogen shown with 1 electron **1**
oxygen shown as 2,6 **1**
(ii) one oxygen atom with two hydrogens **1**
each has full outer shell of electrons **1**
(iii) bent / v-shaped **1**

Total 10 marks

4. (a) electrons from Mg to F **1**
Mg loses 2 electrons **1**
each of two F gains 1 electron **1**

(b) Mg **1**
it has lost electrons **1**

(c) (i) Na^+F^- **1**
(ii) NaF **1**

(d) orange / yellow **1**

Total 8 marks

5. (a) (i) 5 **1**
(ii) colourless **1**

(b) (i) $NH_3 + HCl \rightarrow NH_4Cl$ **OR** $NH_4OH + HCl \rightarrow NH_4Cl + H_2O$ **2**
reagents **(1)** products **(1)**; **(-1)** for incorrect balancing.
(ii) (heat with) sodium hydroxide solution **1**
ammonia /alkaline gas given off **1**
test gas with damp U I / litmus paper – turns blue **1**
(iii) mix together same volumes **1**
no indicator/partial evaporation - not to dryness **1**
crystallise solution **1**
(**OR** if use indicator: add charcoal
filter
evaporate/crystallise)

(c) (i) any soluble lead(II) salt **1**
any soluble chloride **1**
(ii) any equation that is cq on answer to c(i) **1**

Total 13 marks

6. (a) NaCl(s) If state symbols missing / incorrect, **1**
$H_2O(l)$ **(1)** for both formulae correct **1**

(b) (i) silver nitrate (solution) **1**
(dilute) nitric acid **1**
(ii) white precipitate **1**
(iii) diffusion **1**

(c) (i) all three pieces drawn in correct sequence **1**
condenser at correct angle and connected via sidearm to rb flask with bung in neck of flask **1**
(**ALLOW** bung + thermometer in top of flask)
labels for sea water, cooling water and drinking water **1**
(ii) distillation **NOT** fractional distillation **1**

Total 10 marks

7. (a) Giant structure of (positive/metal/copper) ions **1**
electrons **1**
delocalised / free / mobile **1**

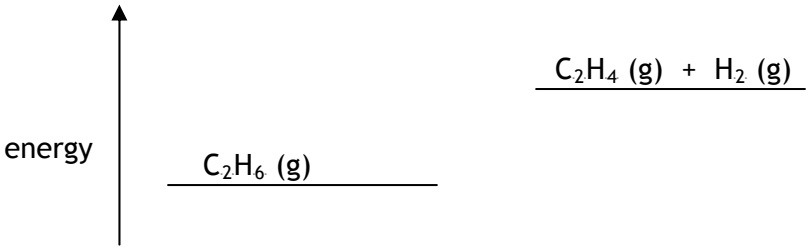
(b) (i) green **1**
black **1**
(ii) $CuCO_3 \rightarrow CuO + CO_2$ **1**
(iii) (bubble through) limewater **1**
turns milky/cloudy / white precipitate **1**
(iv) (dilute) nitric acid **1**
neutralisation **1**
(v) (pale) blue precipitate **1**
(vi) (dark) blue **1**
(vii) $[Cu(H_2O)_2(NH_3)_4]^{2+}$ **1**

(c) copper(I) oxide **1**
Cu_2O **1**

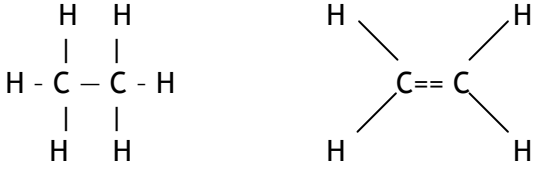
Total 15 marks

8. (a) (manufacture of) polymers / poly(ethene) / ethanol **1**
(manufacture of) ammonia / margarine / rocket fuel **1**

(b) **1**



(c) (i) **2**



(ii) bonds broken = 348 + (2×412) / 1172 **1**
bonds formed = 612 + 436 / 1048 **1**
energy change = 124 (kJ/mol) **1**

(d) increase in temperature
add catalyst
increase pressure
} any two for 1 each **2**

(e) (i) (⇌) reversible reaction **1**
(ii) (ΔH) enthalpy change / energy change / heat change **1**
increased **1**
decreased **1**

Total 14 marks

9. (a) fractional distillation **1**

(b) gasoline
kerosene
diesel
fuel oil
bitumen
} any two for 1 each **2**

(c) heat / high temperature / 200 – 400°C **1**
phosphoric acid **1**

(d) (i) sugar (cane) **1**
(ii) no crude oil **1**
plenty of land/suitable climate to grow sugar cane **1**

(e) (i) ethanol **1**
sulphuric/phosphoric/hydrochloric acid **1**
(ii) esters **1**

Total 11 marks

10. (a) effervescence / fizzing / bubbles
water goes cloudy / white precipitate
gets warmer
} any two for 1 each **2**
$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$ **1**

(b) zinc oxide **1**
$Zn + H_2O \rightarrow ZnO + H_2$ **1**

(c) (i) $Zn + Fe^{2+} \rightarrow Zn^{2+} + Fe$ **Ignore state symbols** **1**
(ii) displacement / redox **1**

(d) oxygen / air **1**

(e) (i) (coated with) zinc **1**
(ii) zinc more reactive than iron **1**
zinc reacts/corrodes instead of iron **1**

Total 11 marks

11. (a) 160 **1**

(b) (i) 320000 ÷ 160 **1**
= 2000 **1**
(ii) 2000 × 2 **1**
= 4000 **1**
(iii) 4000 × 56 **1**
= 224000 g = 224 (kg) **1**

(c) (i) it reduces the capacity of blood to carry oxygen / correct reference to haemoglobin **1**
(ii) 5000 × 24 = 120000 (dm^3) **1**

(d) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ **2**
All formulae correct = 1, correct balancing = 1

(e) (i) silica / silicon dioxide / sand **1**

(ii) $CaCO_3 \rightarrow CaO + CO_2$ **1**

$CaO + SiO_2 \rightarrow CaSiO_3$ **1**

Total 14 marks