

Paper 2H

1. (a) 1 1
2 1
- (b) (i) sodium + water \rightarrow sodium hydroxide + hydrogen 1
(ii) sodium moves around / floats
melts / becomes a ball / gets smaller / disappears
NOT dissolves
effervescence / fizzing / bubbles **NOT** 'gas made'
any two - max one from each line 2
- (c) indicator **NOT** 'universal indicator' 1
blue 1
- (d) (i) $\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgO} + \text{H}_2$ 1
(ii) white 1
- (e) potassium / K 1
magnesium / Mg 1

Total 11 marks

2. (a) X: hydrochloric acid / HCl 1
Y: / limestone / calcium carbonate / marble / chalk / CaCO_3 1
- (b) in a syringe / by downward delivery or recognisable diagram / by
upward displacement of air 1
- (c) (i) yellow / orange **NOT** red 1
(ii) carbonic (acid) 1
 H_2CO_3 1
(iii) proton/ H^+ donor/source **OR** provides/loses/gives protons 1
- (d) ionic 1
covalent 1
- (e) carbonating drinks / fizzy drinks / fire extinguishers / dry ice 1
- (f) amount/percentage too small (any stated % under 1%) 1

Total 11 marks

3. (a) carbon and hydrogen 1
- (b) (i) fractional distillation 1
(ii) (group of) compounds with same / similar boiling points 1
(iii) crude oil heated / boiled 1
(vapour) passed into column / tower 1
fractions collect at different heights 1
- (c) (i) gasoline 1
(ii) fuel oil 1
(iii) (refinery) gases **NOT** 'natural gas' 1
bitumen 1
naphtha
- (d) (i) carbon monoxide 1
(ii) poisonous / toxic / lethal / causes death 1
reduces capacity of blood to carry oxygen / combines with 1
haemoglobin

Total 13 marks

4. (a) acts as solvent
mixture melts at lower temperature / reduces operating temperature
/ allows lower temperature to be used
increases conductivity of mixture (Any two) 2
- (b) (i) carbon / graphite / C 1
(ii) oxygen 1
(iii) they burn/combine with oxygen/form carbon dioxide 1
- (c) (aluminium) more reactive than carbon / too reactive 1
- (d) electricity / replacing anodes 1
- (e) (aeroplanes) low density **NOT** light 1
(overhead power cables) (good) conductor of electricity 1
low density (if not scored above)
(pans for cooking food) (good) conductor of heat 1

(Accept resists corrosion once as alternative for any of the above)

Total 10 marks

5. (a) $\text{Mg(s)} + 2\text{HCl(aq)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$ 1
 all formulae correct 1
 state symbols correct 1
 balanced 1
- (b) (i) line steeper 1
 same final volume 1
 (ii) line not as steep 1
 produces half the final volume of gas 1
- (c) particles/ions move faster / have more energy 1
 more collisions per second / more frequent collisions / greater chance 1
 of collisions
 more successful/effective/fruitful collisions / idea of more collisions 1
 with E_A
- (d) add nitric acid 1
 and silver nitrate (solution) 1
 white ppt (**ONLY** if silver nitrate mark awarded) 1

Total 13 marks

6. (a) (i) titanium 1
 (ii) electrons 1
 (iii) Na^+ / sodium ions 1
 Cl^- / chloride ions 1
- (b) (i) uv light / sunlight / sun 1
 (ii) (goes red then) bleached / goes white / decolorised / colourless 1
 (iii) goes red / pink 1
- (c) (i) division of percentages by A_r values 1
 division of numbers of moles by the smallest 1
 CH_2Cl 1
 (ii) $\text{C}_2\text{H}_4\text{Cl}_2$ only 1

Total 11 marks

7. (a) Company A
- fermentation 1
 - (agricultural area so) grows sugar (cane) 1
- Company B
- reaction of ethene with steam 1
 - (crude) oil available / needs pure ethanol / ethene comes from oil 1
- (b) 1: conc sulphuric acid/conc phosphoric acid/aluminium oxide(+heat) / pumice / porous pot 1
- 2: acidified potassium dichromate(VI) / potassium manganate(VII) 1
- 3: sodium 1
- (c) (i) correct (ester) linkage between monomer units 1
- repeat unit correct (with continuation bonds) 1
-
- (ii) condensation / polyester 1

Total 10 marks

8. (a) $C + O_2 \rightarrow CO_2$ 1
- C / carbon reacted with oxygen 1
- equation correct 1
- (b) $ZnO + CO \rightarrow Zn + CO_2$ 1
- $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ 1
- all formulae correct 1
- balancing correct 1
- (c) limestone decomposes 1
- to make CaO 1
- or $CaCO_3 \rightarrow CaO + CO_2$ (2)**
- this reacts with silicon dioxide 1
- to form slag / calcium silicate 1
- or $CaO + SiO_2 \rightarrow CaSiO_3$ (2)**
- (d) zinc has lower boiling point than silicon dioxide 1
- evaporates / vaporises 1
- leaving impurities behind 1
- (last two points could be awarded by saying 'zinc distils off')*
- (e) prevents rusting 1
- zinc more reactive than iron 1
- oxidises /corrodes instead of iron 1

Total 15 marks

9. (a) $\text{Cu}_2\text{O} / \text{Cu}^+$ 1
 it gains an electron / loss of oxygen / causes (Mg) to lose electrons /
 oxidation number decreases 1
- (b) brown gas / fizzing / bubbling / effervescence 1
 blue / blue-green solution 1
- (c) $32 \times 300 \text{ seconds} = 9600 \text{ coulombs}$ 1
 $9600/96000 = 0.1 \text{ faradays}$ 1
 $0.1/2 = 0.05 \text{ moles of copper}$ 1
 $0.05 \times 63.5 = 3.175\text{g} / 3.2\text{g copper}$ 1
- (d) (i) atoms/particles/ions in layers 1
 slip / move / slide over each other (can get this from diagram) 1
 (ii) tin atoms/particles/ions large(r) 1
 prevents (layers) sliding / slipping / moving 1

Total 12 marks

10. (a) stoichiometric coefficients are: 2:3:2:2 1
- (b) (i) energy in = 2468 / correct working 1
 energy out = 2958 / or correct working 1
 energy change = - 490(kJ/mol) 1
 (ii) exo/endothemic diagram 1
 enthalpy change and vertical energy axis labelled 1
 reagents / products labelled (names or formulae) 1
- (c) (i) pipette to measure sulphuric acid 1
 sodium hydroxide in burette 1
 indicator used and colour change (**NOT** universal indicator) 1
 add sodium hydroxide gradually near end point (and swirl) 1
 (ii) 0.00167 (3 or 4 s.f.) 1
 (iii) (ii) $\div 2$ 1
 (iv) (iii) $\times 100 = 0.0835$ 1

Total 14 marks

PAPER TOTAL 120 MARKS