Mark schemes

1

(a) (zinc has) lost electron(s)

accept loss of electrons

1

(b) copper is the least reactive

1

because it gave the most negative voltage when it was metal 2
or
it gave the biggest voltage with chromium
or
it gave the most positive voltage when it was metal 1

1

(c) −0.7 V

1

The voltage with chromium and copper is 1.2

accept use of other cell pairings such as tin with copper and tin with iron

1

The voltage with chromium and iron is 0.5 and copper is less reactive (than iron)

1

(d) hydrogen + oxygen = water

1

(e) $H_2 \rightarrow 2H^+ + 2e^-$

1

$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$

1

[9]

2 (a) electrical

1

(b) using hydrogen saves petrol / diesel / *crude oil*

allow crude oil is non-renewable

ignore hydrogen is renewable

1

using hydrogen (in fuel cells) does not cause pollution

accept no carbon dioxide produced

allow less carbon dioxide produced

allow hydrogen produces <u>only</u> water

1

(c) (i) (–)486

*correct answer with or without working gains **3** marks*

if answer is incorrect:

*(2 × 436) + 498 **or** 1370 gains **1** mark*

*4 × 464 **or** 1856 gains **1** mark*

*correct subtraction of ecf gains **1** mark*

3

(ii) products lower than reactants

1

reaction curve correctly drawn

1

activation energy labelled

1

[9]

3 (a) Aluminium has a low density

1

Aluminium is resistant to corrosion

1

(b) (i) (an alloy) is a <u>mixture</u> of metals

*accept (an alloy) can be a metal <u>mixed</u> with another metal **or** iron <u>mixed</u> with carbon / a non-metal*

1

(ii) pure metals are soft

allow weak

or

alloys are hard

allow strong / keep their shape

ignore rust / corrosion

1

(c) (i) crude oil

1

(ii) hydrocarbons

1

(iii) oxygen

1

(d) (i) hydrogen

allow H_2 or H

1

(ii) only water is produced (from the fuel)

or

no carbon dioxide is produced (from the fuel)

*allow less carbon dioxide produced **or** less global warming*
allow carbon dioxide causes global warming

1

[9]