

QUESTIONSHEET 1

- (a) butane is easier to light 1
charcoal is less expensive/is easier to store 1
- (b) (i) random arrangement of molecules, quite close together 1
able to move freely in body of liquid 1
- (ii) widely spaced random arrangement 1
able to move freely in whole container 1
- (c) evaporation 1
- (d) (i)
- $$\begin{array}{cccccccc}
 & & \text{H} & & \text{H} & & \text{H} & & \text{H} & & \\
 & & | & & | & & | & & | & & \\
 \text{H} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{H} \\
 & & | & & | & & | & & | & & \\
 & & \text{H} & & \text{H} & & \text{H} & & \text{H} & &
 \end{array}$$
- 2
- (ii) separate molecules with low attraction 1
- (e) energy needed to start reaction 1
called activation energy 1

TOTAL 12**QUESTIONSHEET 2**

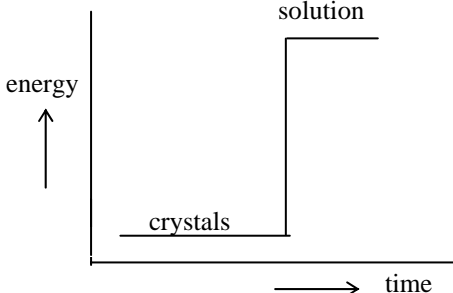
- (a) (i) to allow gases to pass through 1
(ii) as a conductor 1
- (b) produce electricity directly from fuel 1
- (c) $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ 2
(one for formulae, one for balancing)
- (d) do not run down as quickly 1
produce water for use by astronauts 1
- (e) solar cell 1

TOTAL 8

QUESTIONSHEET 3

- (a) (i) burns quicker/more completely 1
(ii) heat transferred to water more efficiently 1
- (b) (i) $6\text{H}_2\text{O}$ 1
+ 6CO_2 1
- (ii) $31\,200 \times 100/2$ 1
= $1\,560\,000\text{ J}$ or 1560 kJ 1

TOTAL 6**QUESTIONSHEET 4**

- (a) (i)  1
- energy taken in 1
from surroundings 1
- (ii) breaking bonds in ammonium nitrate takes in energy 1
making bonds between ions and water molecules gives out energy 1
former exceeds the latter 1
- (b) (i) $2\text{Al} + \text{Fe}_2\text{O}_3 \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$ 2
- (ii) match supplies activation energy 1
the reaction supplies it after that 1

TOTAL 10**QUESTIONSHEET 5**

- (a) treacle pudding contains carbohydrate for energy 1
sumo wrestler needs protein for muscle 1
- (b) sugar is a simple carbohydrate 1
may cause obesity 1

TOTAL 4

QUESTIONSHEET 6

- (a) Bond breaking = $436 + 151 = 587$ 1
 Bond making = $2 \times 298 = 596$ 1
 Difference = -9 kJ 1

- (b) Exothermic 1

**TOTAL 7****QUESTIONSHEET 7**

- (a) Heat energy = $4.2 \times 15 \times 20$ 1
 = 1260 J = 1.26 kJ 1

- (b) Moles = $\frac{10}{1000} \times 0.1 = 0.001$ 1
 = 1×10^{-3} 1

- (c) $\text{HCl(aq)} + \text{NaOH(aq)} \rightarrow \text{NaCl(aq)} + \text{H}_2\text{O(l)}$ 1

- (d) $1000 \times$ (a) 1
 = 1260 kJ 1

TOTAL 7**QUESTIONSHEET 8**

- (a) (i) $\text{Br-Br} + \text{H-H}/193 + 436$ 1
 = 629 1

- (ii) $2 \times \text{H-Br}/2 \times 366$ 1
 = 732 1

- (iii) overall energy change = energy in – energy out/ $629 - 732$ 1
 = -103 1
 (+ 103 scores 1 mark.)

- (b) exothermic/ energy given out/ energy supplied to surroundings 1
 (give follow through mark)

- (c) b 1

TOTAL 8

QUESTIONSHEET 9

- (a) (i) to find out how much fuel was used 1
- (ii) to ensure an even temperature 1
- (iii) the temperature of the water 1
- (iv) the volume of water 1
distance of burner from beaker 1
- (b) (i) 12°C/g 1
- (ii) propanol 1
propanol is bigger molecule 1
contains more carbon 1

TOTAL 9**QUESTIONSHEET 10**

- (a) bubbling/ fizzing/ slight movement of calcium 1
clouding of water 1
- (b) (i) energy produced = $4.2 \times 5 \times 50$ 1
=1050 J (or 1.050 kJ) 1
- (ii) Exothermic 1
- (c) $\text{Ca(s)} + 2\text{H}_2\text{O(l)} \rightarrow \text{Ca(OH)}_2\text{(aq)} + \text{H}_2\text{(g)}$ 2
Ignore state symbols

TOTAL 7**QUESTIONSHEET 11**

- (a) (i) open 1
- (ii) more oxygen mixes with the methane 1
- (b) (i) hydrogen 2
carbon
- (ii) carbon dioxide 2
water
- (c) (i) the minimum energy 2
for a reaction to happen
- (ii) lowers the activation energy 1

TOTAL 9

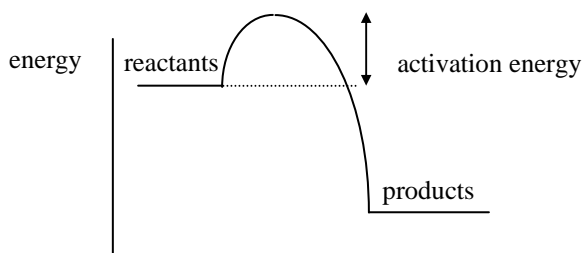
QUESTIONSHEET 12

(a)	(i)	exothermic heat is given out/ temperature rises	2
	(ii)	17°C	1
	(iii)	paraffin	1
	(iv)	to make the test fair/ so the results are comparable	1
(b)		oxygen	1
(c)		causes global warming/ greenhouse effect polar ice caps melt causing flooding	2
(d)		carbon monoxide	1
			TOTAL 9

QUESTIONSHEET 13

(a)	ethanol smallest temperature rises	1 1	
(b)	to make the test fair different amounts of water require different amounts of heat to raise temperature by 1°C	1 1	
(c)	$100 \times 4.2 \times 39$ = 16380 J for 1.0 g for 2.0 g: $16380 \times 2 = 32760$ J (=32.76 kJ)	1 1 1	
			TOTAL 7

QUESTIONSHEET 14



- (a) reactants and products labelled 1
- (b) activation energy labelled 1
- (c) (i) formula mass of MgO = 24 + 16 = 40 1
 40 g MgO produced from 24 g Mg 1
 100 g MgO produced from $(24 \times 100) / 40 = 60$ g Mg 1
- (ii) 32 g O₂ reacts with 48 g Mg 1
 8 g O₂ reacts with 12 g Mg 1
 8 g O₂ occupies 6 dm³ 1
- TOTAL 8**

QUESTIONSHEET 15

- (a) (i) exothermic 1
- (ii) they are being used up faster than they can be replaced
 so they will eventually run out 2
- (iii) wood/ paper/ peat/ biogas/ charcoal
 any two 2
- (b) (i) C-H
 O=O 2
- (ii) C=O
 H-O 2
- (iii) bonds broken = 4 C-H + 2 O=O bonds formed = C=O + 4 H-O 1
 energy in = $(4 \times 435) + (2 \times 497)$ energy out = $(2 \times 803) + (4 \times 464)$ 1
 energy change = 2734 – 3462 1
 energy change = -728 kJ 1

correct answers score 4 marks

TOTAL 13

QUESTIONSHEET 16

- (a) the reading would increase 1
- (b) (i) substance which speeds up/ increases the rate of a chemical reaction
is chemically unchanged/ remains the same 2
- (ii) reading goes up to the same point as before
reading goes up quicker 2

TOTAL 5**QUESTIONSHEET 17**

- (a) (i) thermometer 1
- (ii) $57 - 19 = 38$ 1
- (iii) any temperature at least 5 degrees above 38 1
- (b) exothermic 1
- (c) (i) any combustion, any displacement etc 1
- (ii) can be used to supply energy 1
- (iii) can be used to cool injuries etc. 1

TOTAL 7**QUESTIONSHEET 18**

- (a) Two from
state of health, age, type of job 2
- (b) $325 + 1430 + 660 + 200$
 $= 2615 \text{ J}$ 1
1
- (c) (i) man would be fatter 1
farmer more muscular 1
- (ii) he does not take in enough energy 1
- (iii) eat less 1
take exercise 1

TOTAL 9

QUESTIONSHEET 19

(a)	larger surface area of coal oxygen/air can mix with it more easily	2
(b)	less coal for amount of air/oxygen mixes better to burn more easily	2
(c)	oxygen needed for combustion air only contains 20% oxygen	2
(d)	carbon dioxide carbon monoxide	2
	TOTAL	8

QUESTIONSHEET 20

(a)	Three from lights easily, easy to store, safe to store, continues to burn, no pollution	3
(b)	(i) heat same mass of water with each fuel measure temperature rise weigh burners before and after experiment to calculate amount of fuel used	1 1 1 1
	(ii) coal does not light and continue to burn as easily	1
	(iii) difficult to measure amount of gas used	1
(c)	we don't know how much fuel was used	1
	TOTAL	10