Question 1

1(e)(i)	thermal energy is released (in the reaction) / (reaction that) transfers thermal energy / (reaction that) gives out heat	1
1(e)(ii)	the energy (level) of the reactants is higher than the energy (level) of the products / the energy (level) of the ethene is higher than the energy (level) of the poly(ethene) / the energy of the products is less than the energy of the reactants	1

Question 2

2(c)(i)	Mg + Cl_2 on line on left **AND** $MgCl_2$ on line on right	1
2(c)(ii)	the energy of the reactants is greater than the energy of the products / the energy of the products is less than the energy of the reactants	1

Question 3

3(c)(i)	S + O_2 on left horizontal line AND SO_2 on right horizontal line	1

3(c)(ii)	the energy of the reactants is greater than the energy of the product / the energy of S + O_2 is greater than the energy of SO_2	1
3(c)(iii)	surroundings	1

Question 4

4(c)(i)	2 (P) (1) 5 (Cl_2) (1)	2
4(c)(ii)	releases thermal energy / releases heat	1

Question 5

5(d)(i)	reaction which gives out thermal energy / reaction which releases heat	1
5(d)(ii)	The **energy** of the reactants is higher than the energy of the products / the **energy** of the products is lower than the energy of the reactants	1

Question 6

6(a)	coal / coke / wood	1
6(b)	L	1
6(c)	exothermic	1

Question 7

7(b)(i)	enthalpy change	1
7(b)(ii)	(the value of) ΔH is negative	1

Question 8

8(c)(ii)	M1 Bond energy in breaking bonds = [(4 × 410) + 610 + 240] = 2490 (kJ / mol) M2 Use of total E change to find bond energy of $C_2H_4Cl_2$ = M1 + 180 = 2490 + 180 = 2670 (kJ / mol) M3 Determination of total C–Cl bond energy = M2 – [(4 × 410) + 350] = 2670 – 1990 = 680 (kJ / mol) M4 Determination of each C–Cl bond energy = M3 / 2 = 680 / 2 = 340 (kJ / mol)	4

Question 9

9(e)	432(1) 436(1) – 4(1)	**3**

Question 10

10(d)(i)	**M1** horizontal line below energy level to right hand side of reactants line and labelled $C_2H_4Br_2$ (1) **M2** activation energy 'hump' with upward arrow **labelled A** from the reactants level (1) **M3** one downward arrow starting from the energy level of the reactants and finishing at the energy level of the products (1)	**3**
10(d)(ii)	**M1** energy needed to break bonds 4 × C–H + C=C + Br–Br = 4 × 410 + 610 + 190 = 2440 (kJ) (1) **M2** energy released in making bonds 4 × C–H + C–C + 2 × C–Br = 4 × 410 + 350 + 2 × 290 = 2570 (kJ) (1) **M3** energy change M1 – M2 = – 130 (kJ / mol) (1)	**3**