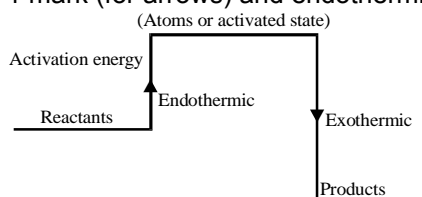


Calculating and explaining energy changes – Mark scheme

1. (a) chicken, cheese, salted allow 545, 548, 550 1
 (b) 546 1 [2]
2. (a) eg plastic (beaker) / insulation / lid / cover **or** any mention of enclosed
 any sensible modification to reduce heat loss
 ignore prevent draughts; ignore references to gas loss 1
- (b) all the substances react **or** all (the substances) react fully / completely
or heat evolved quickly **or** distribute heat 1
 accept to mix them; 'so they react' is insufficient for the mark
 accept increase chances of (successful) collisions / collision rate
 increase; do **not** accept rate of reaction increase / make reaction faster
- (c) experiment 2 **and** different / higher / initial / starting temperature 1
 accept experiment 2 **and** the room is hotter / at higher temperature
 do **not** accept temperature change / results higher
- (d) temperature change does not fit pattern 1
 accept anomalous / odd **or** it is the lowest **or** it is lower than the others
or it is different to the others; 'results are different' is insufficient
- (e) 7 / 7.0 1
- (f) $(100 \times 4.2 \times 7) = 2940$ ecf from (e) 1
- (g) diagram A **and** reaction exothermic / heat evolved / ΔH is negative /
 temperature rises 1
 accept energy is lost (to the surroundings)

[7]

3. (a) bonds broken bonds made 2
- | | | |
|-------|---------|--|
| C – C | 2 (4) | |
| C – H | 12 (10) | |
| O = O | 7 | |
| C = O | 8 | |
| H – O | 12 | |
- 1 mark for all bond
 breaking correct; 1 mark
 for all bond making correct
- (b) 1 mark for the three energy levels drawn 1
 1 mark is for products and reactants labelled, with products shown lower
 than reactants 1
 1 mark for activation energy in the correct position 1
 1 mark (for arrows) and endothermic exothermic labels 1



arrows not required

	lowers activation energy	1	
	more particles have the energy to react	1	
	<i>particles do not need as much energy to react</i>		[8]
4.	(a) (i) 4 E (H-O) = 4 × 464 = 1856 2 E (O-O) = 2 × 146 = 292 <i>gains 1 mark each</i>	2	
	but Total = 2148 kJ Deduct one mark for each mistake. Answer of 1074 kJ gains 1 mark. (Candidate has ignored the 2 in front of the brackets.) <i>gains 2 marks</i>		
	(ii) 4 E (H-O) = 4 × 464 = 1856 E (O=O) = 498 <i>gains 1 mark each</i>	2	
	but Total = 2354 kJ Deduct one mark for each mistake. Answer of 1426 kJ gains 1 mark. (Candidate has ignored the 2 in front of the brackets.) <i>gains 2 marks</i>		
	(iii) 2354 - 2148 = 206 kJ (Ignore any signs) Answer is consequential on their answers to (i) and (ii). <i>for 1 mark</i>	1	
	(iv) exothermic because (more) heat is given out (than put it) / or ΔH is negative / answer to (iii) is negative.). (If the candidate gives the answer 'endothermic because heat /energy is taken in' then look back to their answers to (i) and (ii). If (i) is greater than (ii) then accept this answer. <i>for 1 mark</i>	1	
	(b) (i) eg minimum energy for reaction energy needed to start a reaction; energy needed to break bonds; energy needed to make two substances react; (Energy linked to starting a reaction.) <i>for 1 mark</i>	1	
	(ii) B <i>for 1 mark</i>	1	
	(iii) lowers activation energy / needs less energy to start reaction / less energetic route <i>for 1 mark</i>	1	[9]
5.	exothermic does not gain any credit	1	
	reactants: bond breaking (436 + 242 =) 678 (kJ)	1	
	products: bond making (2 × 431 =) 862(kJ)		
	so overall 184 (kJ) <u>released</u> / -184(kJ)	1	[3]