Exothermic/Endothermic Changes and Basic Energy Profiles

Q1. (2018) – 1a, 1b, 1d (i, ii)

A)

Question Number	Answer	Mark
1(a)	R P S Q T R P S as first 3 (1) Q T as last 2 (1)	**(2)** AO 3 2a AO 3 2b

B)

Question Number	Answer	Mark
1(b)	**A** always higher **The only correct answer is A** ***B*** *is not correct because temperature rise* ***C*** *is not correct because temperature always rises* ***D*** *is not correct because temperature rises*	**(1)** AO 2 2

C)

Question Number	Answer	Additional guidance	Mark
1(d)(i)	An explanation including • the solid {dissolves/ reacts with the water} (1) • {takes in /absorbs} heat / is endothermic (1)	 Ignore just 'a (chemical) reaction occurs' etc allow energy for heat ignore reference to temperature change	**(2)** AO 2 1

D)

Question Number	Answer	Additional guidance	Mark
1(d)(ii)	(reaction) irreversible	allow **reaction** can only occur once allow reactants are used up / reaction is complete /the reaction has happened allow bag can only burst once/ cannot get water back into bag	**(1)** AO 3 1a

Q2. (2018)

A)

Question Number	Answer	Additional guidance	Mark
10(a)(i)	{heat/energy} is lost/escapes	Allow anywhere heat is transferred e.g. can absorb heat, heat lost to air etc.	**(1)** AO 3 2b

B)

Question Number	Answer	Additional guidance	Mark
10(a)(ii)	An explanation including: • add a lid/ use of draught shield (1) • so more {heat/energy} goes to water/ less {heat/energy} escapes (1) MP2 dependent on MP1	Ignore altering distance between flame and can Allow any suitable insulating material Ignore burning more fuel/ less water	**(2)** AO 3 3b

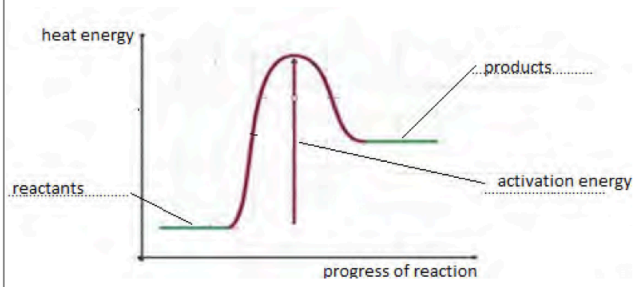
Q3. (2019) – 4b

Question number	Answer	Additional guidance	Mark
4(b)	An explanation linking • temperature rises / increases (by 11 °C) (1) • exothermic process (1)	allow gets hotter / water heats up {temperature / it} goes up Ignore heat increasing for MP1 allow heat / energy {given out / released to surroundings} reject endothermic for MP2	**(2)**

Q4. (2019) – 4d

Question number	Answer	Additional guidance	Mark
4(d)	put a lid on / put cover on top / lag beaker / use insulation / use polystyrene cup (1)	allow any material around the beaker that prevents heat loss eg cotton wool /(aluminium) foil	**(1)**

Q5. (2020) – 3b (iv)

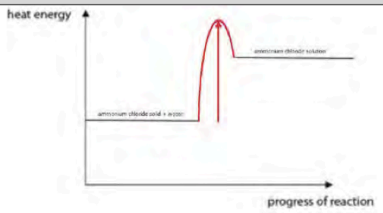
Question number	Answer	Mark
3(b) (iv)	• any one label correct (1) • all three labels correct (1) 	**(2)**

Q6. (2021) – 8b

A)

Question number	Answer	Additional guidance	Mark
8(b)(i)	an explanation linking two of: • {ammonium chloride solution/product} has more energy than {ammonium chloride solid and water/reactant} / ORA (1) • heat (energy) has increased / energy change is positive (1) • (therefore) heat energy has been {absorbed/taken in} (1)	ignore arguments about bond making / bond breaking	**(2)** **AO3**

B)

Question number	Answer	Additional guidance	Mark
8(b)(ii)	 (2)	curve from reactants to products with peak higher than product energy (1) arrow labelled activation energy on correct curve (1)	**(2)** **AO2**

Q7. (2022)

Question number	Answer	Mark
4(a)(i)	**A** Heat energy is the only correct answer. **B**, **C** and **D** are incorrect as all exothermic reactions give out heat	**(1)** **AO1 1**

Q8. (2022) – 4b (iv)

Question number	Answer	Additional guidance	Mark
4(b)(iv)	-2.5℃ scores 3 with or without working 16.1 – 18.6 (1) = -2.5 (1) ℃ (1)	2.5℃ scores 2 with or without working 2.5 scores 1 with or without working MP3 standalone mark ignore 'C' / 'o' alone ignore 'deg C'	**(3)** **AO2 1**

Q9. (2023) – 2b

A)

Question number	Answer	Additional guidance	Mark
2(b)(i)	**+** (1) 8.7 (1) (°C) sign (1) value (1)	Allow answer to be shown on the table mark independently	**(2)** **AO2-2**

B)

Question number	Answer	Additional guidance	Mark
2(b)(ii)	An explanation linking • salt with larger positive temperature rise in part (i) (1) • shows the {largest/highest} temperature rise (1)	allow ecf from Q02b(i) +8.7 °C in part(i) gives salt C in Q02b(ii) MP2 depends on MP1 allow gives out most heat / loses most energy /heats up the most / biggest temperature change ignore just quoting numbers ignore biggest exothermic change / because it's getting hotter reject B for both marking points	**(2)** **AO2-1**

Q10. (2024)

Question number	Answer	Mark
4(a)	**B** endothermic is the only correct answer. **A**, **C** and **D** are incorrect as all endothermic reactions absorb heat.	**(1)** **AO1 1**

Q11. (2024) – 4b (iv)

Question number	Answer	Additional guidance	Mark
4(b)(iv)	salt R: (+) 3(.0) (1) salt S: **-**1.5 (2) salt with most negative value **only** ticked (1)	reject -3(.0) for MP1 (+)1.5 scores 1	**(4)** **AO2 2**

Q12. (2024) – 5c

Question number	Answer	Additional guidance	Mark
5(c)	an explanation of the reaction between solution W and sodium hydroxide solution linking: • (temperature increases because) it is exothermic (1) and any two from: • the pH goes down (towards 7) (1) • (because) {the sulfur dioxide (solution)/(solution) **W**} {is an acid / has a low pH / has a pH <7} (1) • which leads to a neutralisation reaction / reacts with sodium hydroxide solution (1)	{heat / thermal energy} released allow pH becomes more acidic allow goes towards {neutral /pH7} 'neutralisation is exothermic' scores for MP1 and	**(3)** **AO2 1**
		MP4	