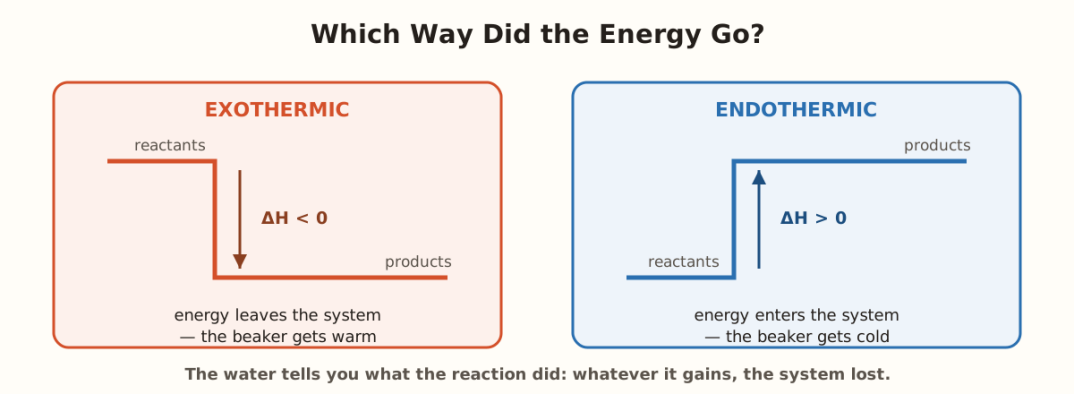
Enthalpy Worksheet

Grade 11 Chemistry · q = mcΔT, molar enthalpy and signs

Name: Date: Score: / 19



Before you start: use c = 4.18 J/g·K for water. Work out what the water gained first, then give the system the opposite sign. A solution that warms up means the reaction released energy, so ΔH is negative.

Part A · exothermic or endothermic, and what is the sign of ΔH?

#	Situation	Type	Sign of ΔH
1	A hand warmer becomes hot when shaken.		
2	An instant cold pack drops to 5 °C.		
3	Methane burns in a gas hob.		
4	Photosynthesis stores energy from sunlight.		
5	Concentrated sulfuric acid is added to water.		
6	Ammonium nitrate dissolves and the beaker cools.		

Part B · how much heat did the water absorb? (q in J)

#	Measurement	q (J, 3 s.f.)
7	100.0 g of water warms by 6.50 K	
8	250.0 g of water warms by 4.20 K	
9	50.0 g of water warms by 12.0 K	
10	200.0 g of water warms by 8.75 K	
11	150.0 g of water warms by 3.60 K	
12	500.0 g of water warms by 2.40 K	

Part C · molar enthalpy, with the correct sign

#	Measurement	ΔH (kJ/mol)	Type
13	100.0 g water, ΔT = +8.40 K, 0.0250 mol NaOH dissolved		
14	200.0 g water, ΔT = +5.60 K, 0.0400 mol KOH dissolved		
15	150.0 g water, ΔT = +11.2 K, 0.0500 mol LiCl dissolved		
16	250.0 g water, ΔT = +3.75 K, 0.0200 mol NH_4NO_3 dissolved		

Part D · scale it to the amount reacting

#	Reaction	Amount	Energy (kJ)
17	$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ ΔH = -890.0 kJ per mole of reaction	2.00 mol of reaction	
18	$2H_2 + O_2 \rightarrow 2H_2O$ ΔH = -572.0 kJ per mole of reaction	0.500 mol of reaction	
19	$N_2 + 3H_2 \rightarrow 2NH_3$ ΔH = -92.4 kJ per mole of reaction	4.00 mol of reaction	

Answer Key

Enthalpy · Grade 11 Chemistry

Part A

#	Situation	Type	ΔH
1	A hand warmer becomes hot when shaken.	**exothermic**	**negative**
2	An instant cold pack drops to 5 °C.	**endothermic**	**positive**
3	Methane burns in a gas hob.	**exothermic**	**negative**
4	Photosynthesis stores energy from sunlight.	**endothermic**	**positive**
5	Concentrated sulfuric acid is added to water.	**exothermic**	**negative**
6	Ammonium nitrate dissolves and the beaker cools.	**endothermic**	**positive**

Part B

#	Working	q
7	q = 100.0 × 4.18 × 6.50	**2720 J**
8	q = 250.0 × 4.18 × 4.20	**4390 J**
9	q = 50.0 × 4.18 × 12.0	**2510 J**
10	q = 200.0 × 4.18 × 8.75	**7320 J**
11	q = 150.0 × 4.18 × 3.60	**2260 J**
12	q = 500.0 × 4.18 × 2.40	**5020 J**

Part C

#	Working	ΔH
13	q = 100.0 × 4.18 × 8.40 = 3510 J; ΔH = −(3.51 kJ) ÷ 0.0250 mol	**-140 kJ/mol** — exothermic
14	q = 200.0 × 4.18 × 5.60 = 4680 J; ΔH = −(4.68 kJ) ÷ 0.0400 mol	**-117 kJ/mol** — exothermic
15	q = 150.0 × 4.18 × 11.2 = 7020 J; ΔH = −(7.02 kJ) ÷ 0.0500 mol	**-140 kJ/mol** — exothermic
16	q = 250.0 × 4.18 × 3.75 = 3920 J; ΔH = −(3.92 kJ) ÷ 0.0200 mol	**-196 kJ/mol** — exothermic

Part D

#	Working	Energy
17	-890.0 kJ/mol × 2.00 mol	**-1780 kJ** — exothermic
18	-572.0 kJ/mol × 0.500 mol	**-286 kJ** — exothermic

#	Working	Energy
19	-92.4 kJ/mol × 4.00 mol	**-370 kJ** — exothermic