

Energy Changes

energy profile diagram: energy against progress of reaction **not time!!**

if the question asks for calculation on energy absorbed/released: dont make it + or -

calculating energy change

- enthalpy change: energy absorbed for bond breaking (+) + energy released for bond breaking (-)

no need memorise, is given if needed

Bond	Energy (kJ/mol)	Bond	Energy (kJ/mol)	Bond	Energy (kJ/mol)	Bond	Energy (kJ/mol)
H - H	436	I - I	151	C - C	350	C = O	740
O = O	496	H - F	562	C = C	610	N - H	390
N $\equiv$ N	994	H - Cl	431	C $\equiv$ C	840	N - N	160
F - F	158	H - Br	366	C - H	410	N = N	410
Cl - Cl	244	H - I	299	C - Cl	340	O - H	460
Br - Br	193			C - O	360	O - O	150

1. write balanced chemical equation
 2. draw the bonding for each part of element
 3. add up positive energy for bond breaking
 4. add up negative energy for bond forming
- tada!! energy change for whole reaction is in kJ/mol, must have + or -
 - UNLESS u have the kJ/mol but they ask you to tweak it for some specific number of mol, then just use kJ

TLDR

	Exothermic	Endothermic
Definition	energy released = negative change temperature of surroundings increase	energy absorbed = positive change temperature of surroundings decrease
How yk?	Total energy absorbed to break the bonds in A moles of HZ and B moles of XY is less than the total energy released to form bonds in C moles of ZY. Hence energy is released to surroundings	Total energy absorbed to break the bonds in A moles of HZ and B moles of XY is more than the total energy released to form bonds in C moles of ZY. Hence energy is absorbed from surroundings
Energy profile diagram		
Energy level diagram (NO CURVE)		

Chemical processes (WHEN IN DOUBT ...CALCULATE IT OUT??) think about is there any energy being used? need fire for reaction?	Chemical energy -> heat 1. Combustion (substance reacts w O₂ to form CO₂ and H₂O) 2. Respiration (opposite of photosynthesis) 3. Neutralisation (acid/base + smt = water + salt) 4. Displacement of metals 5. Acid + metal 6. Adding water to concentrated H₂SO₄ 7. Group 1 + water 8. Reducing iron (III) oxide with CO (extract iron) 9. Haber process (producing ammonia) 10. Adding water to anhydrous substances Chemical energy -> electrical energy 1. Electric/Simple cell 2. Fuel cell Chemical energy -> Nuclear energy 1. Fission of Uranium atoms (splits into 2)	Heat -> Chemical energy 1. Addition of water to substances like NH₄Cl. Ca(NO₃)₂, KNO₃ 2. Thermal decomposition of metal carbonates Light energy -> Chemical energy 1. Photosynthesis (CO₂ + H₂O = C₆H₁₂O₆ + O₂) 2. Photochemical reaction Electrical energy -> Chemical energy 1. Electrolysis of molten lead (II) bromide, aqueous sulfuric acid, aqueous sodium chloride, aqueous copper (II) sulfate (opposite of simple cells)
Physical processes	Condensation, Freezing - Heat released to strengthen attractive forces between particles (rmb forming bonds is - change!)	Melting, Boiling - Heat absorbed to weaken attractive forces between particles (rmb breaking bonds is + change!)