



# A2 Physical Chemistry

## Lattice Enthalpy of NaCl

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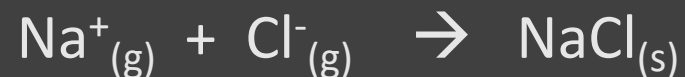
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It is the enthalpy change when one mole of an ionic solid is formed from gaseous ions under standard conditions.

The equation for sodium chloride is



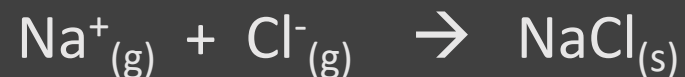
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Lattice enthalpy is always negative (exothermic).

A stronger lattice has a more exothermic lattice enthalpy.

# Calculating the Lattice Enthalpy of Sodium Chloride

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The Lattice enthalpy may be calculated using a Born-Haber cycle using the following enthalpy data

**Standard enthalpy change of atomisation** of Na

**Standard enthalpy change of atomisation** of  $0.5\text{Cl}_2$

First ionization energy of Na(g)

First electron affinity of Cl(g)

**Standard Enthalpy change of formation** of formation of NaCl(s)

# Important definitions

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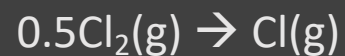
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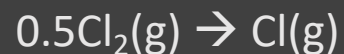
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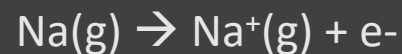
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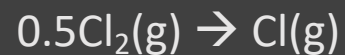
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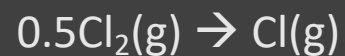
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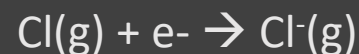
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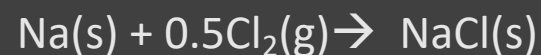
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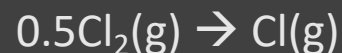
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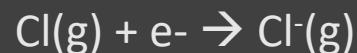
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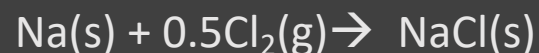
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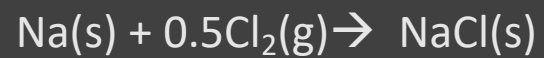
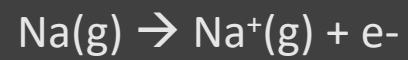
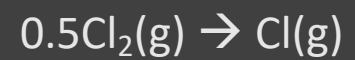
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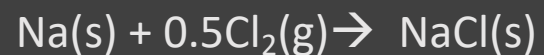
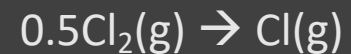


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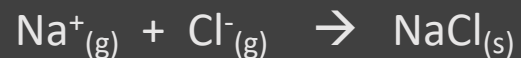
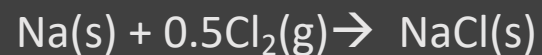
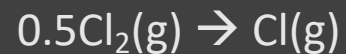
Lattice Enthalpy of NaCl





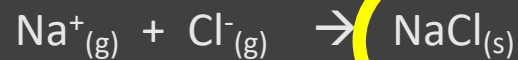
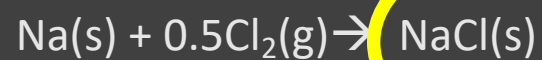
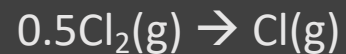


We need to develop an extended Hess Cycle

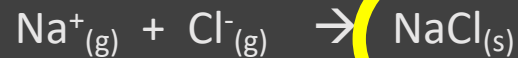
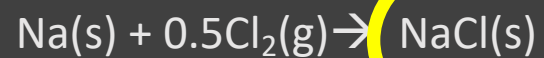
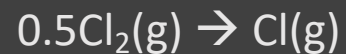


Let's find a product that appear in two equations



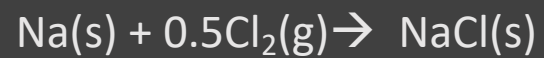
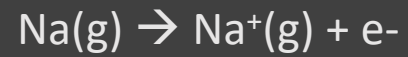
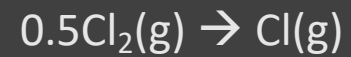


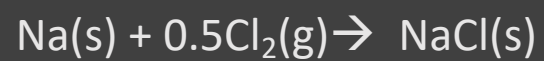
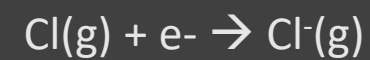
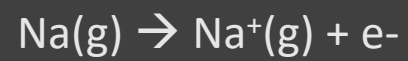
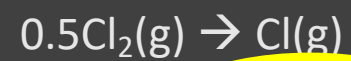
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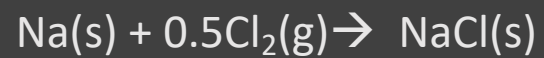
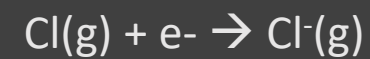
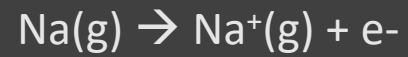
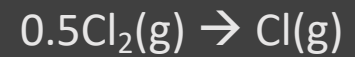


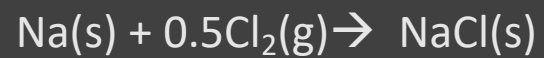
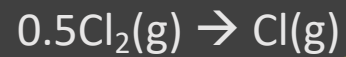
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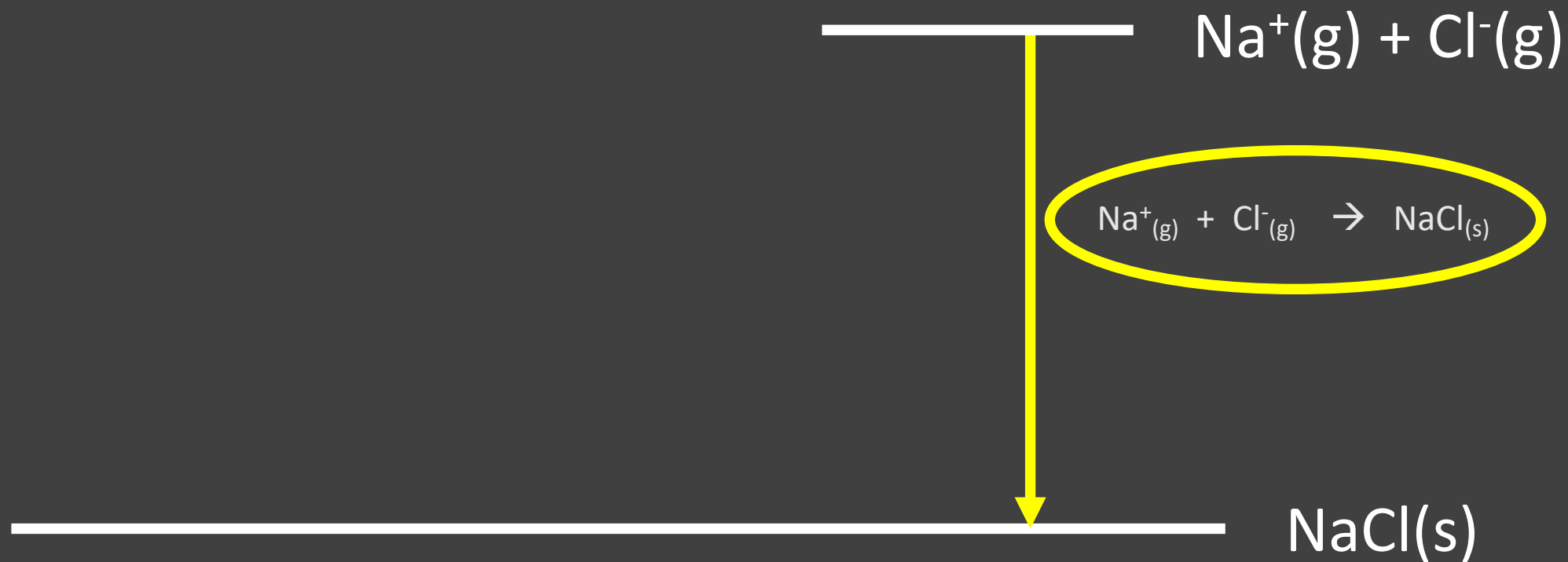
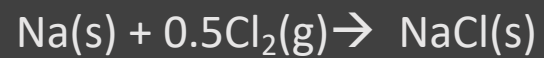
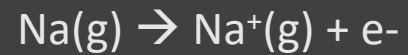
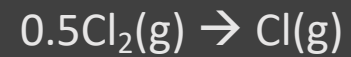


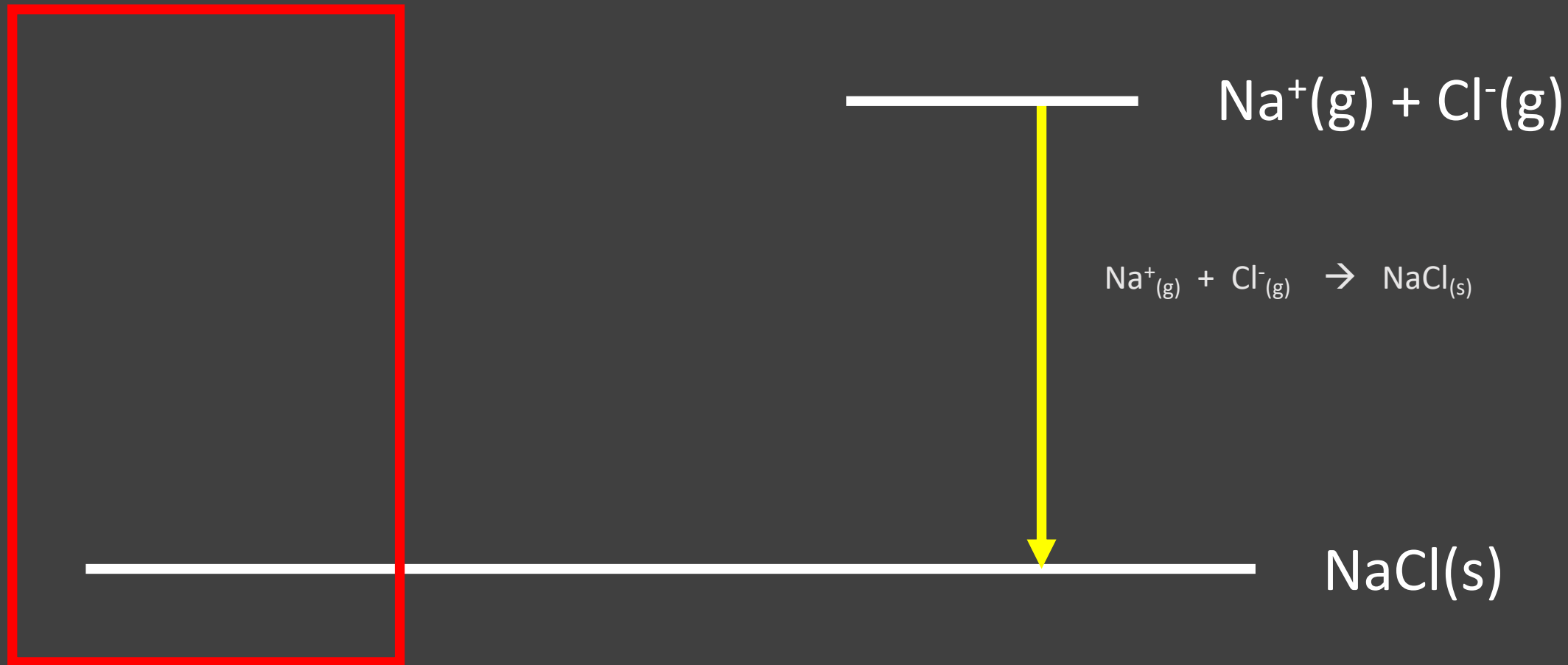
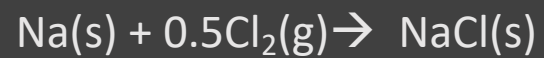
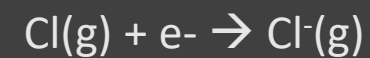
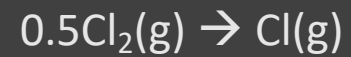




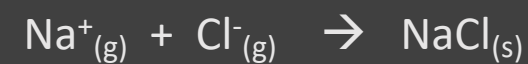
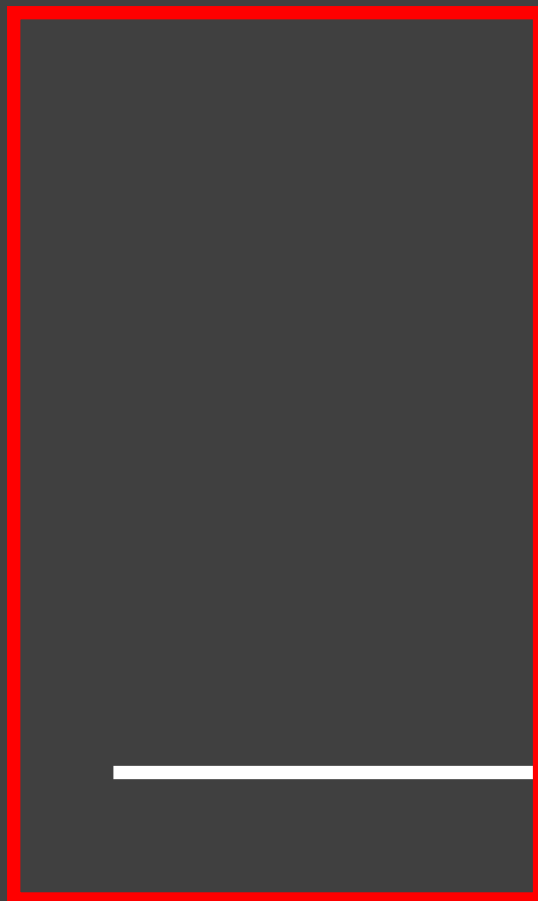
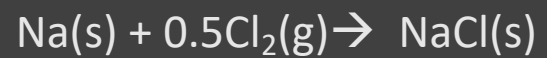
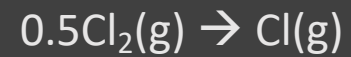


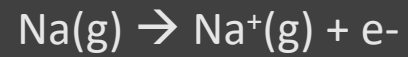
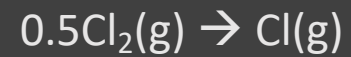


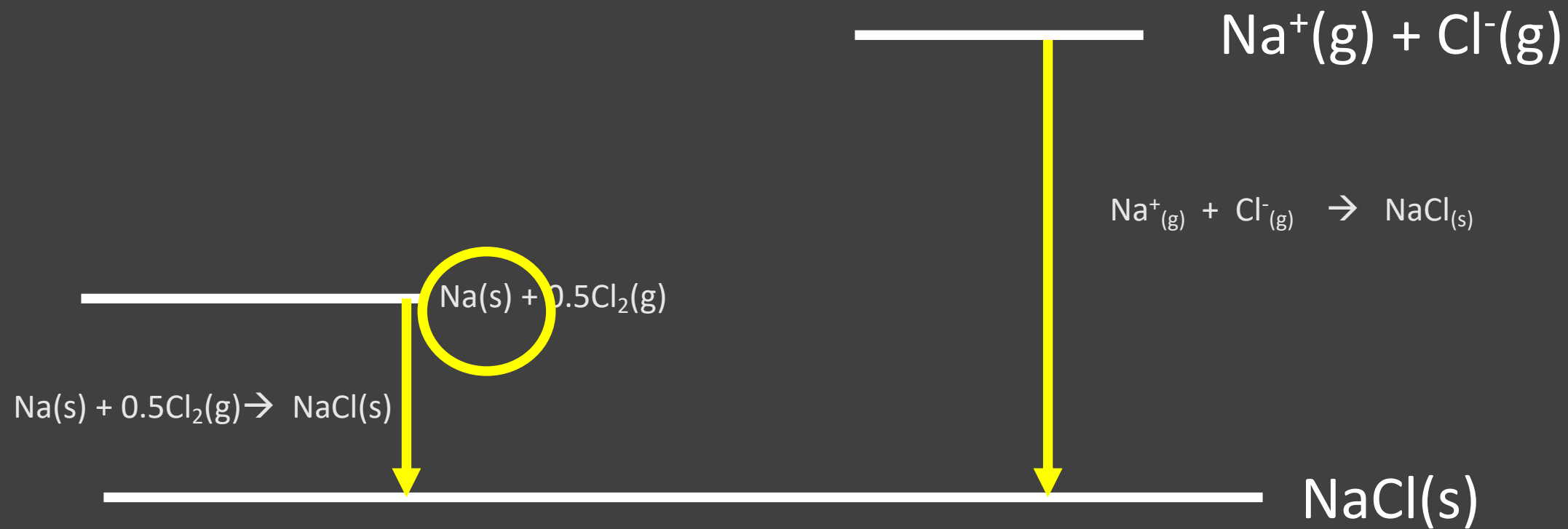
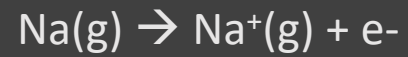
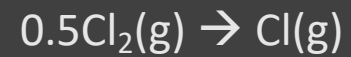


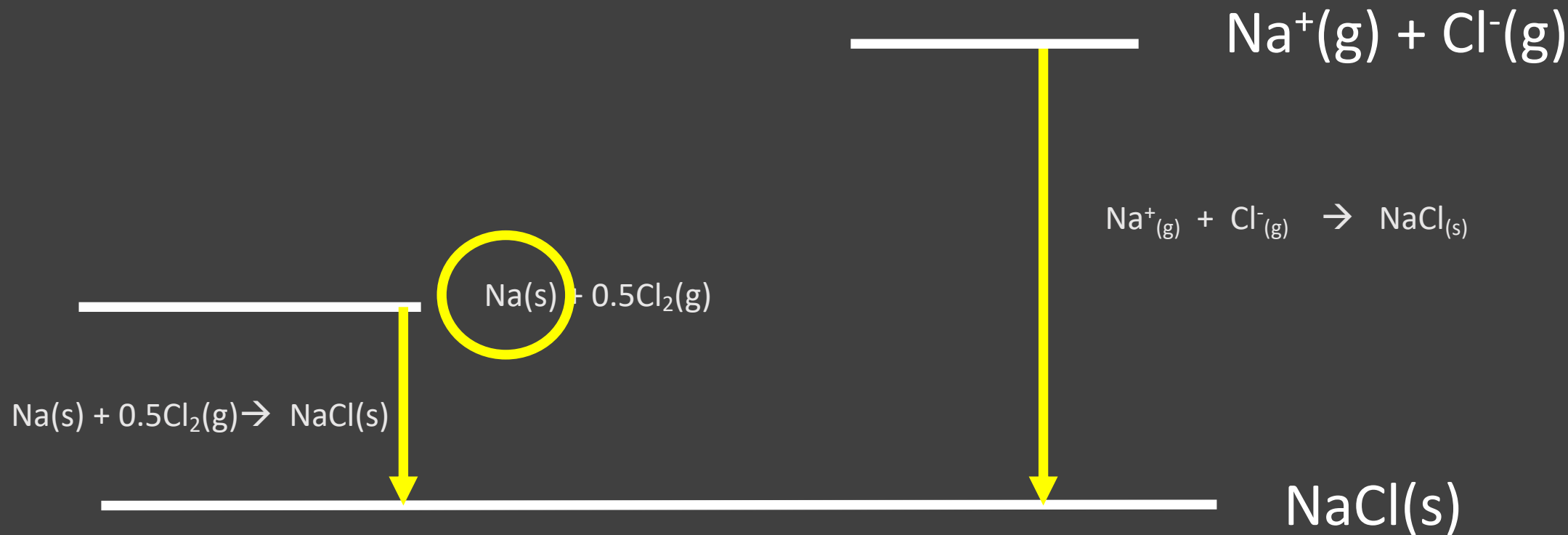
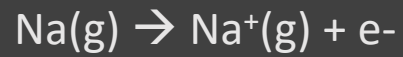
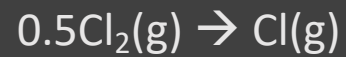
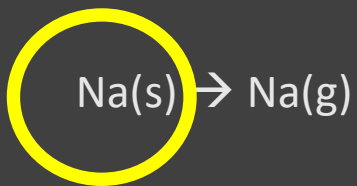


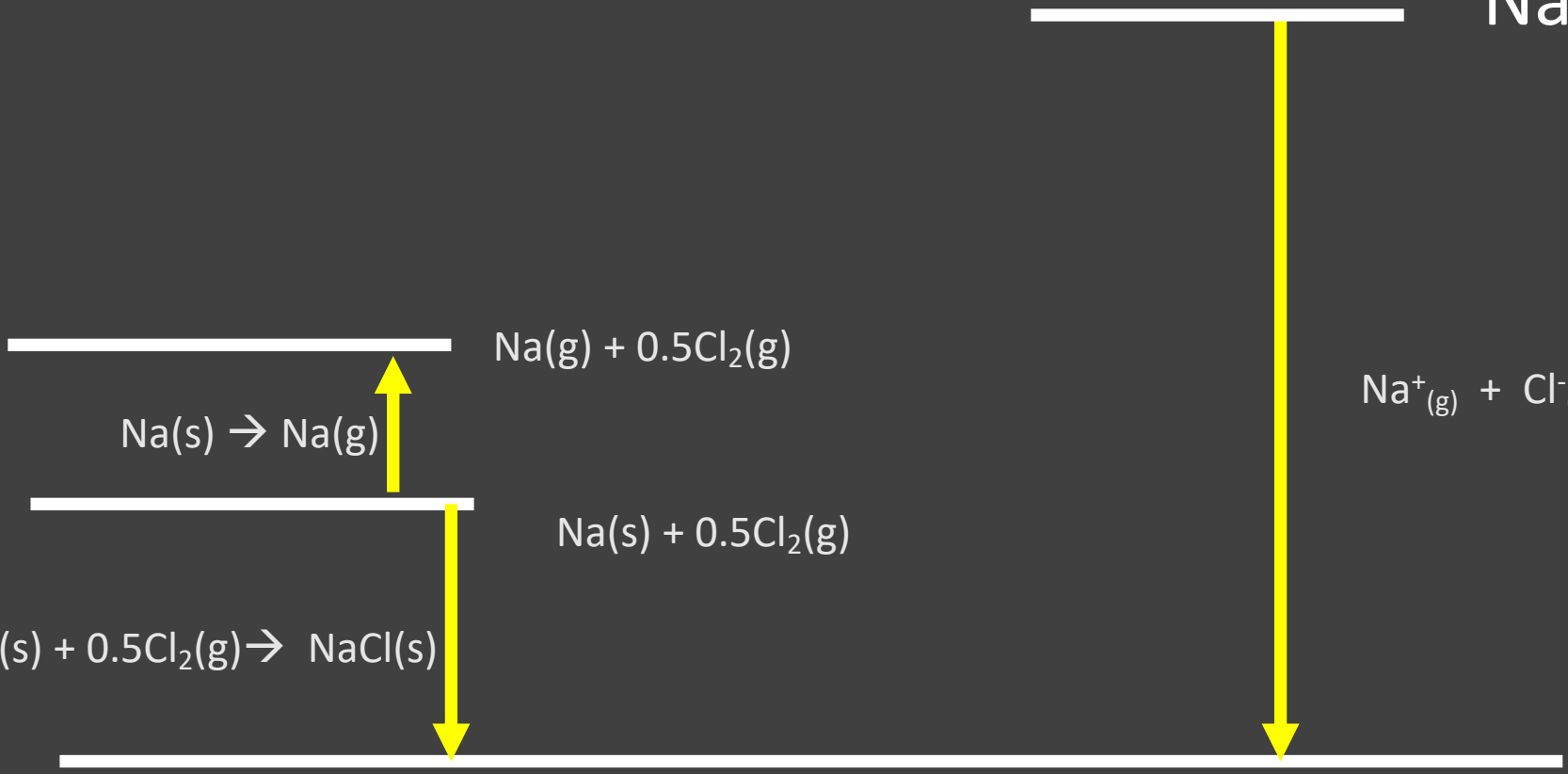
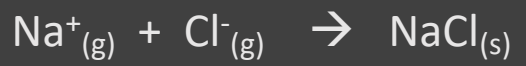
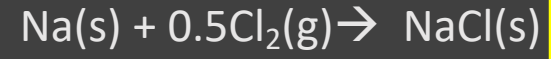
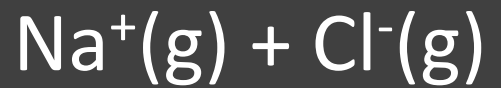
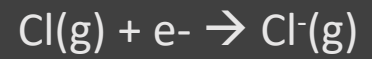
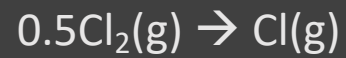


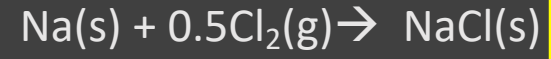
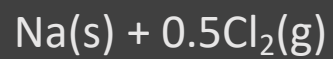
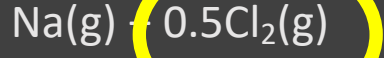
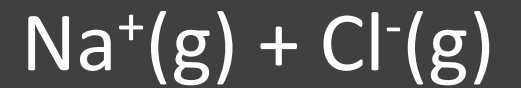
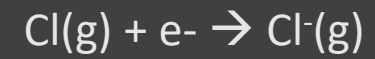
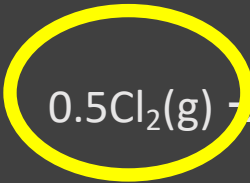


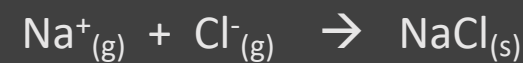
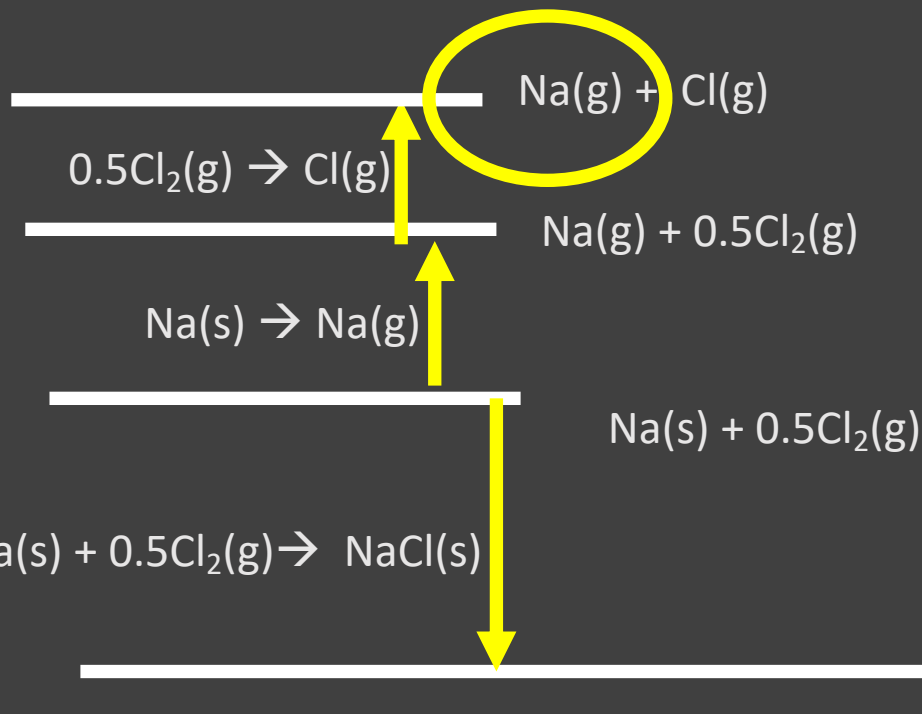
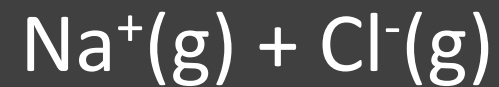
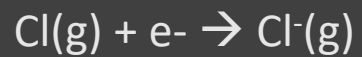


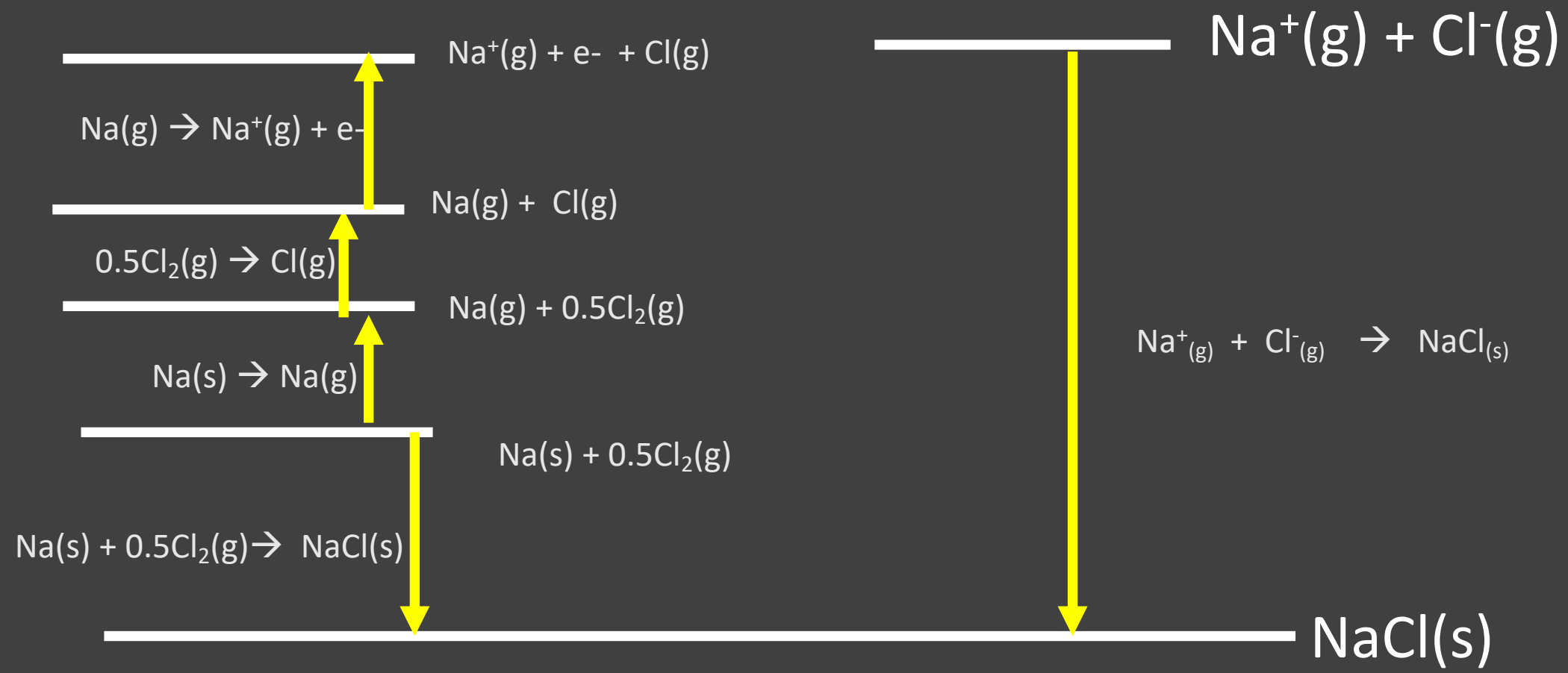
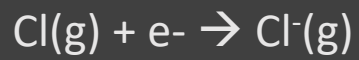




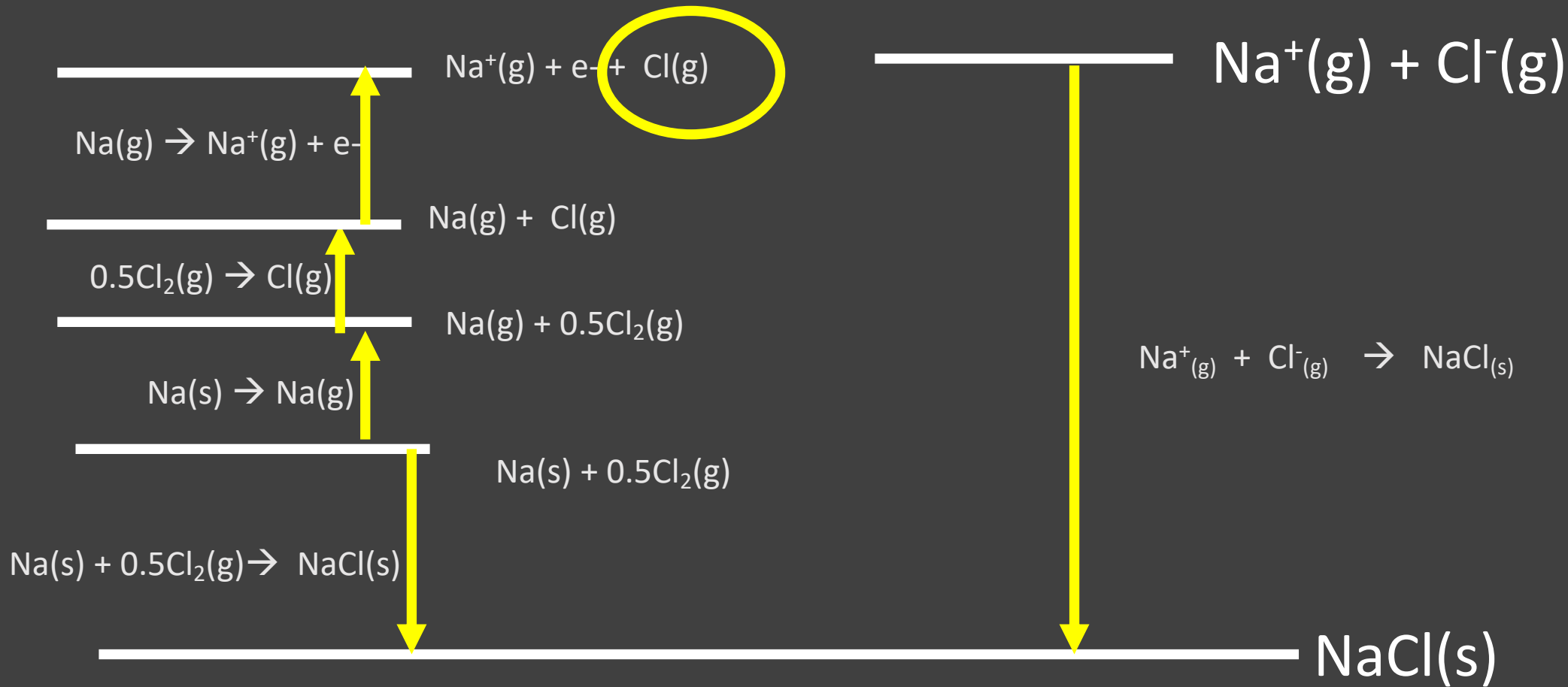


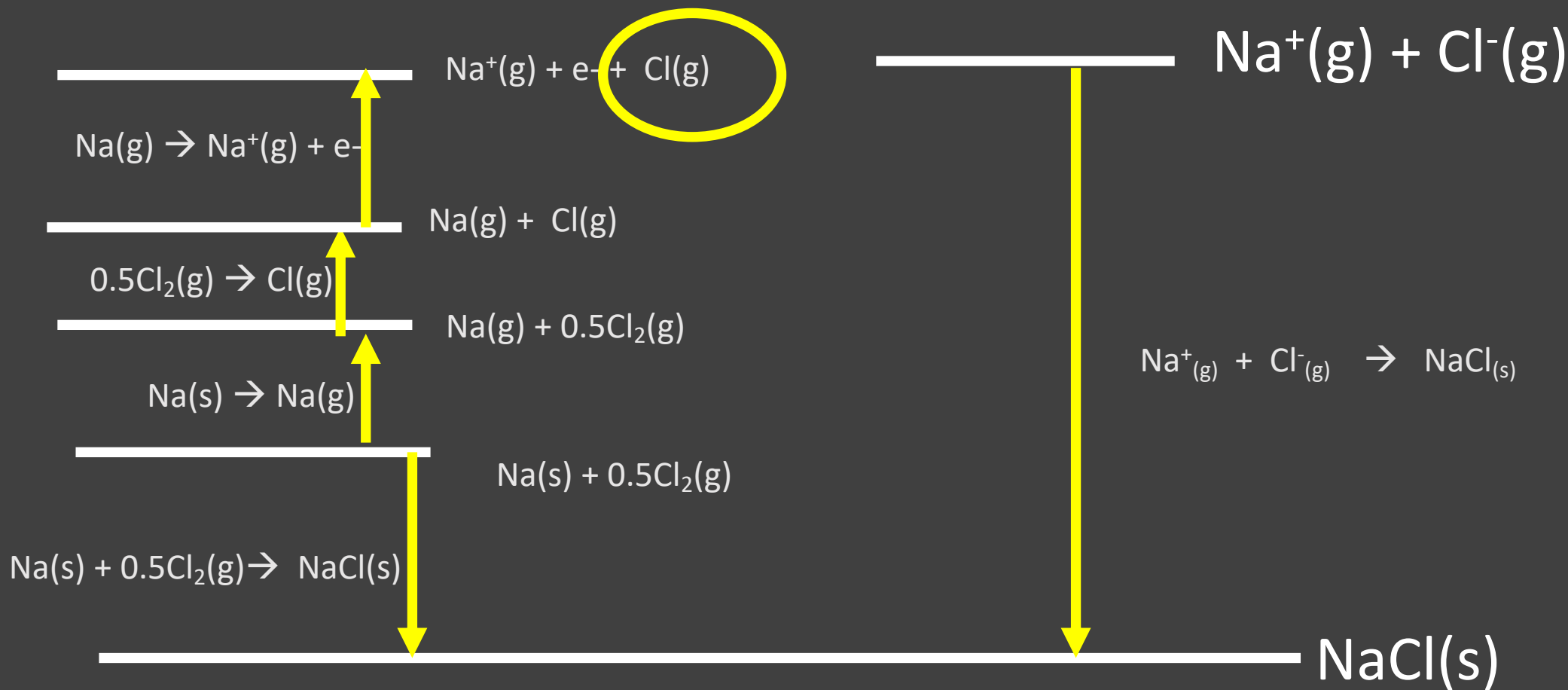


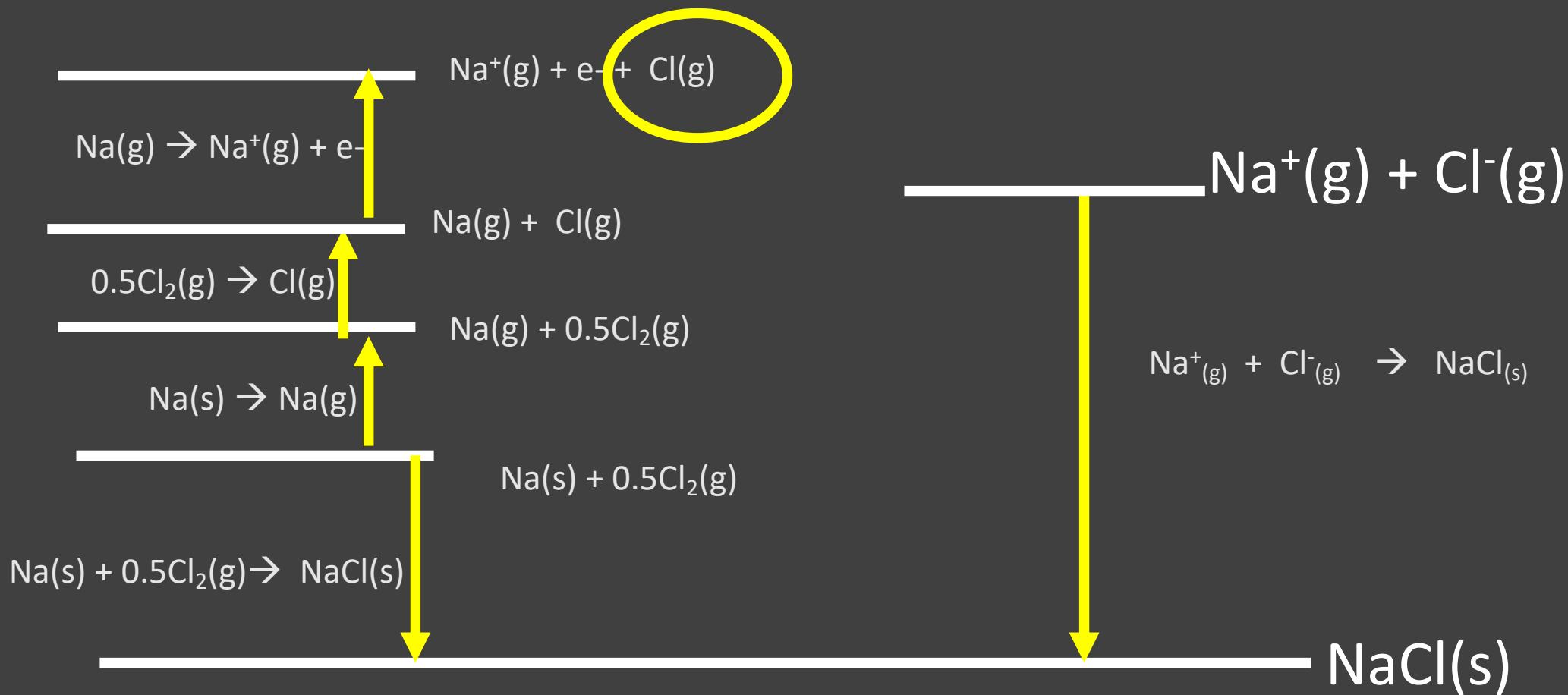


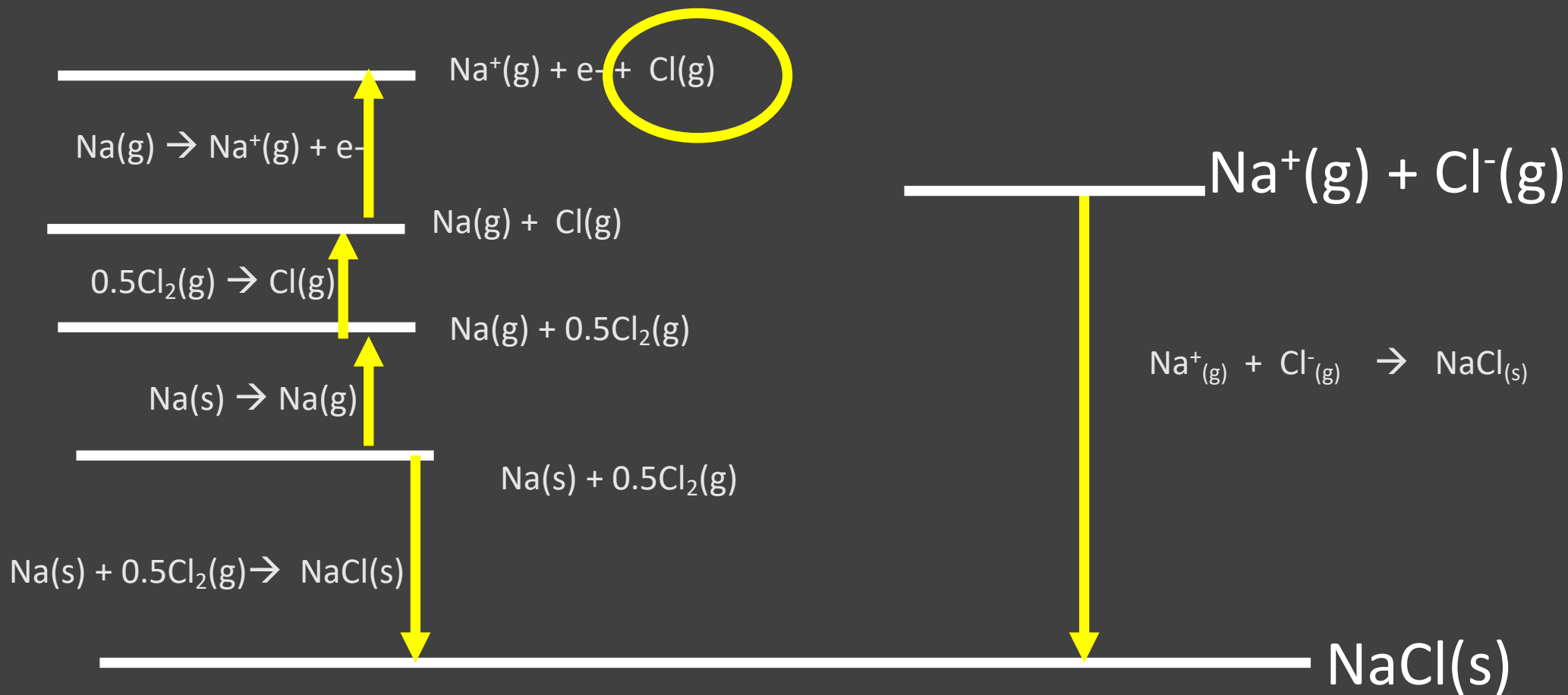


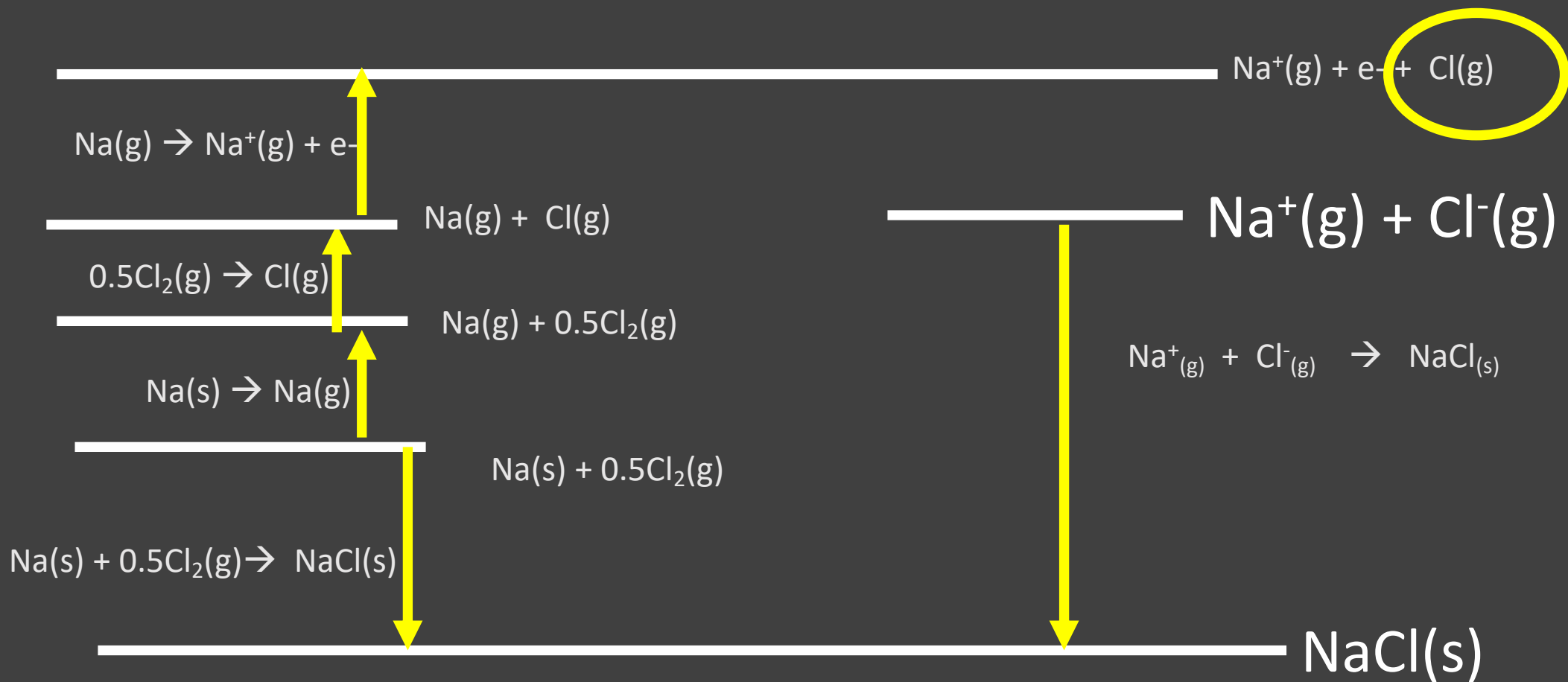


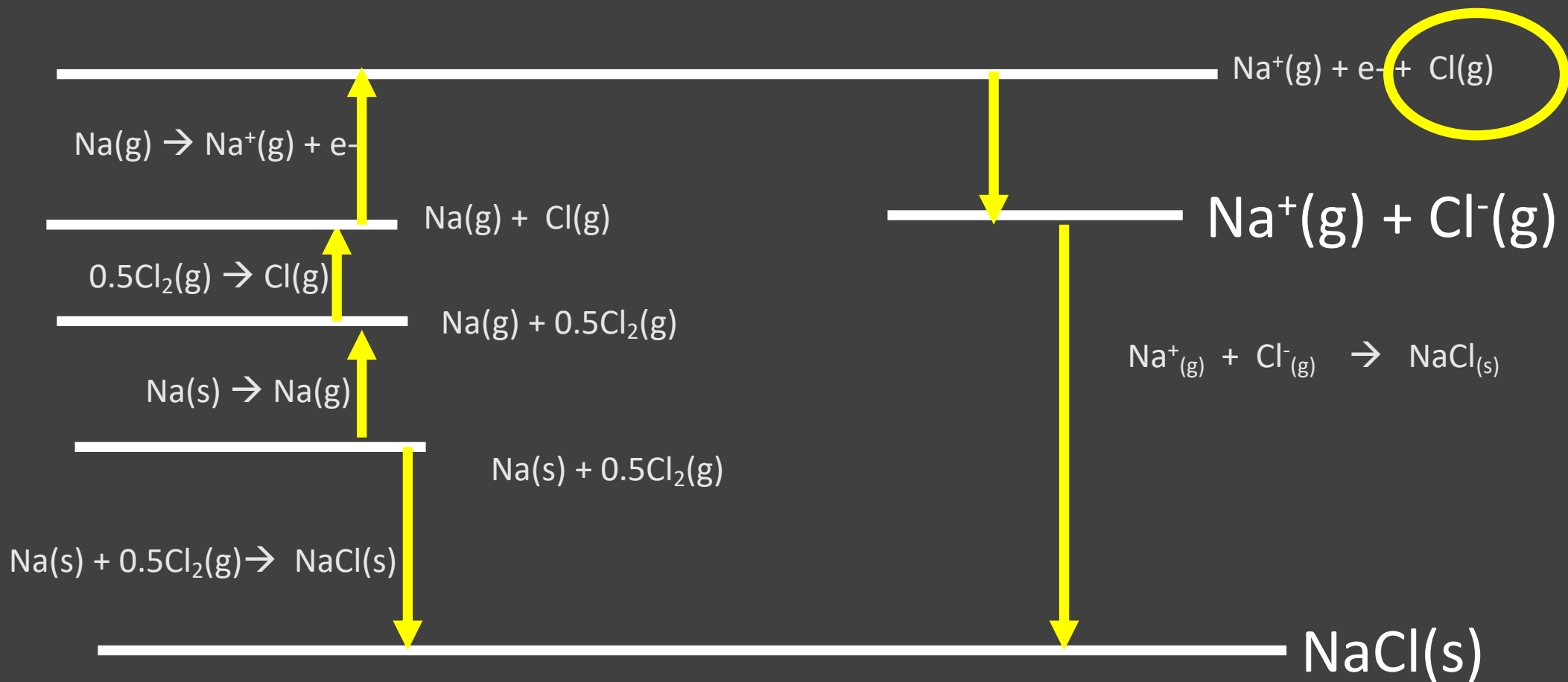


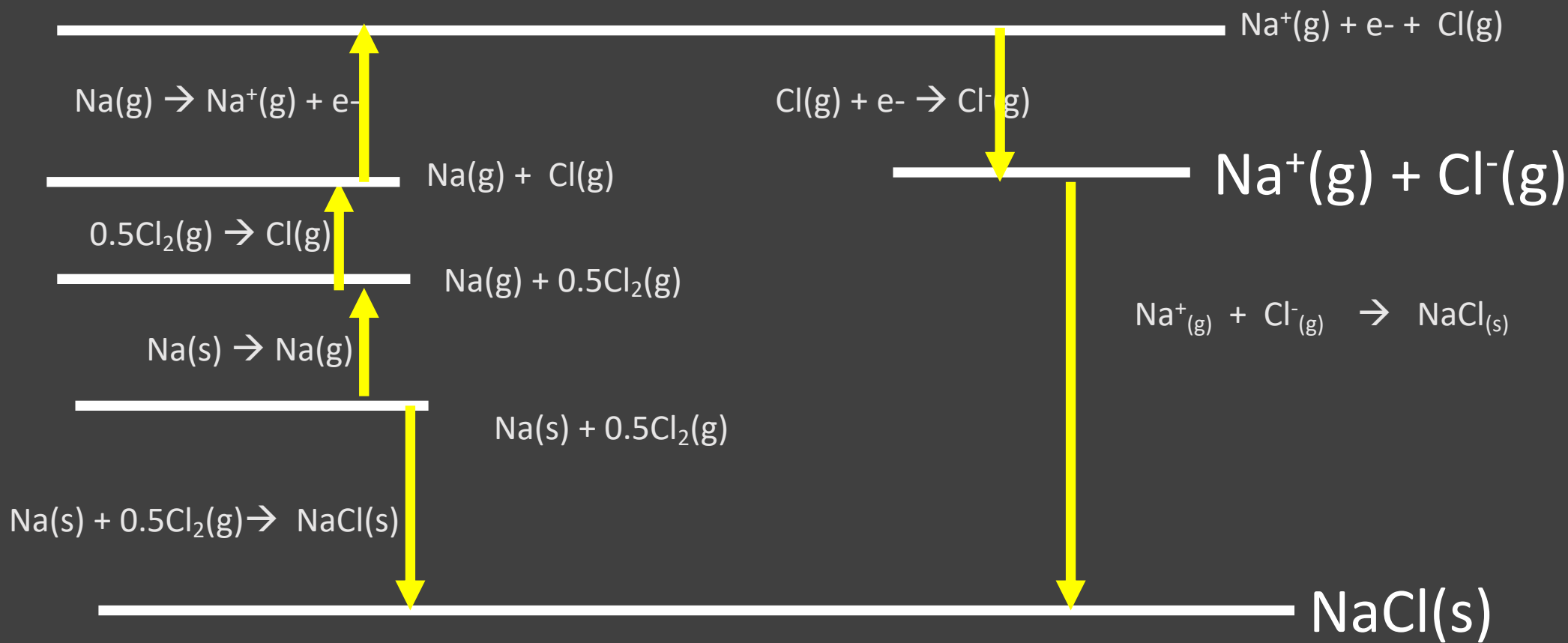


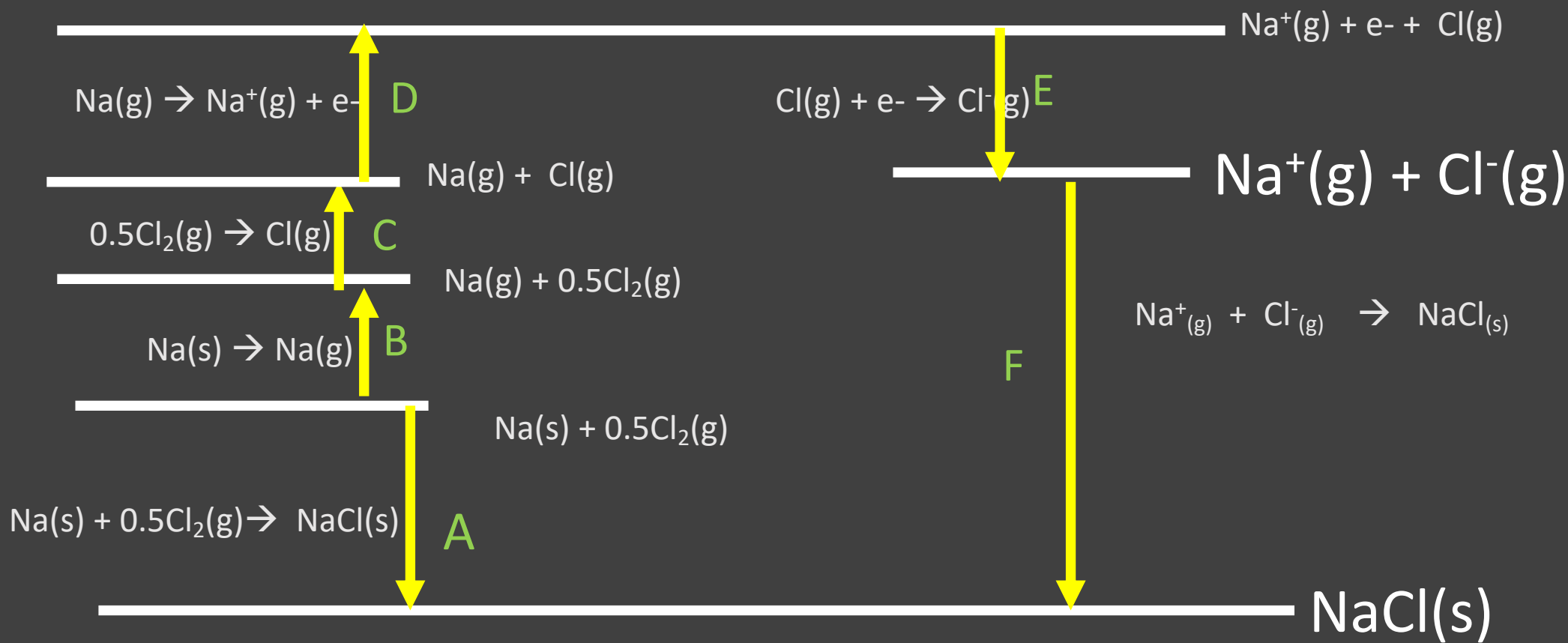




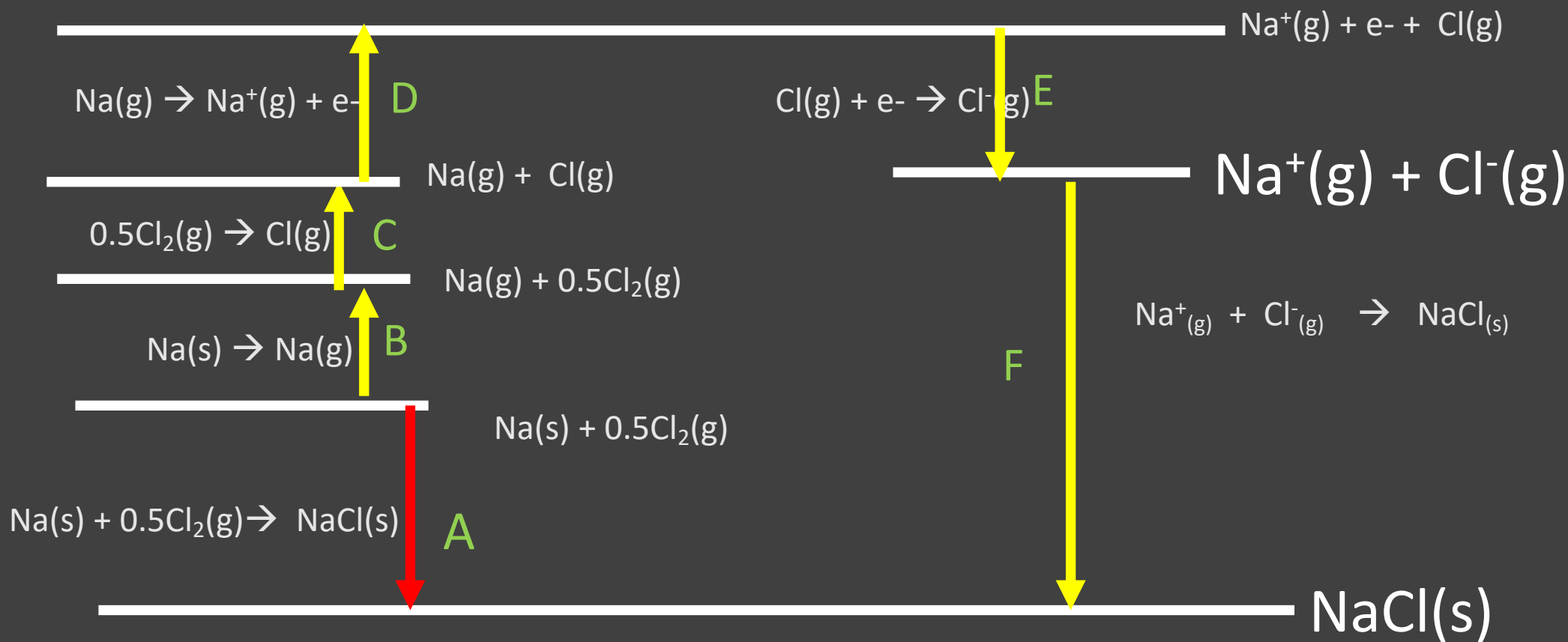




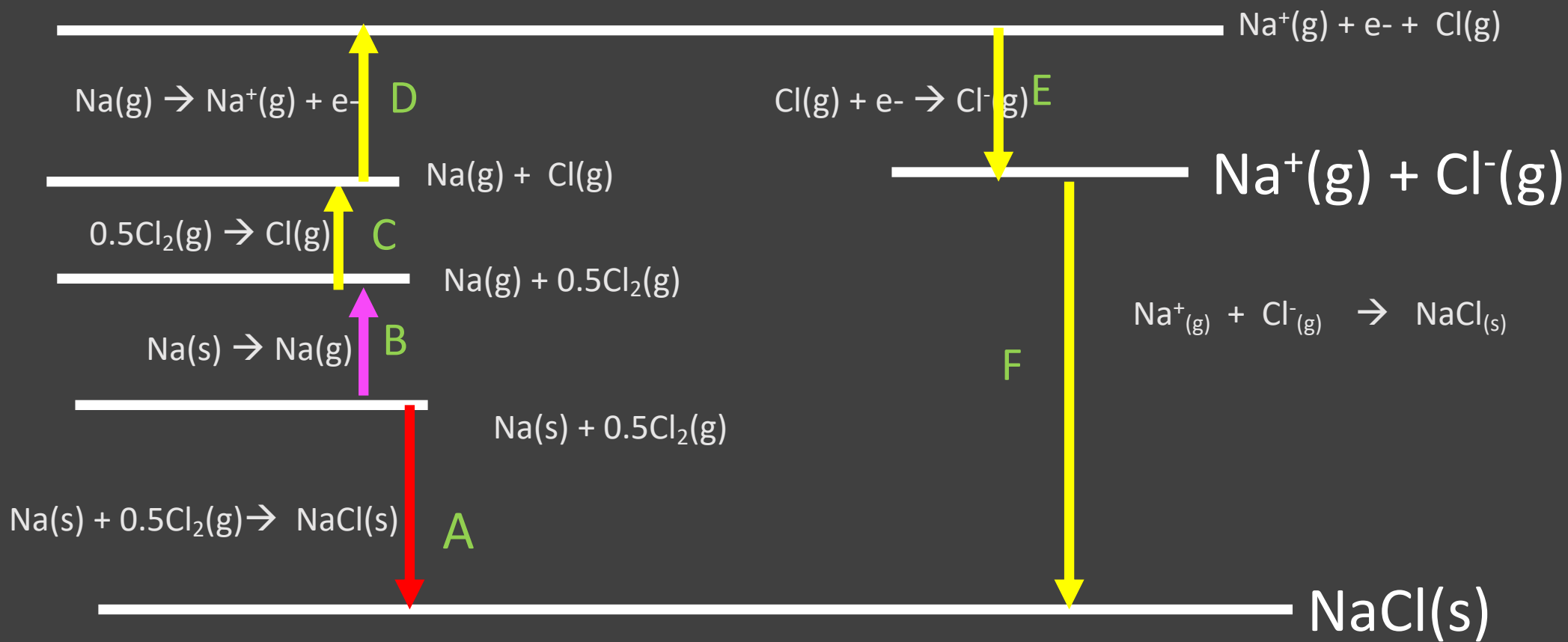




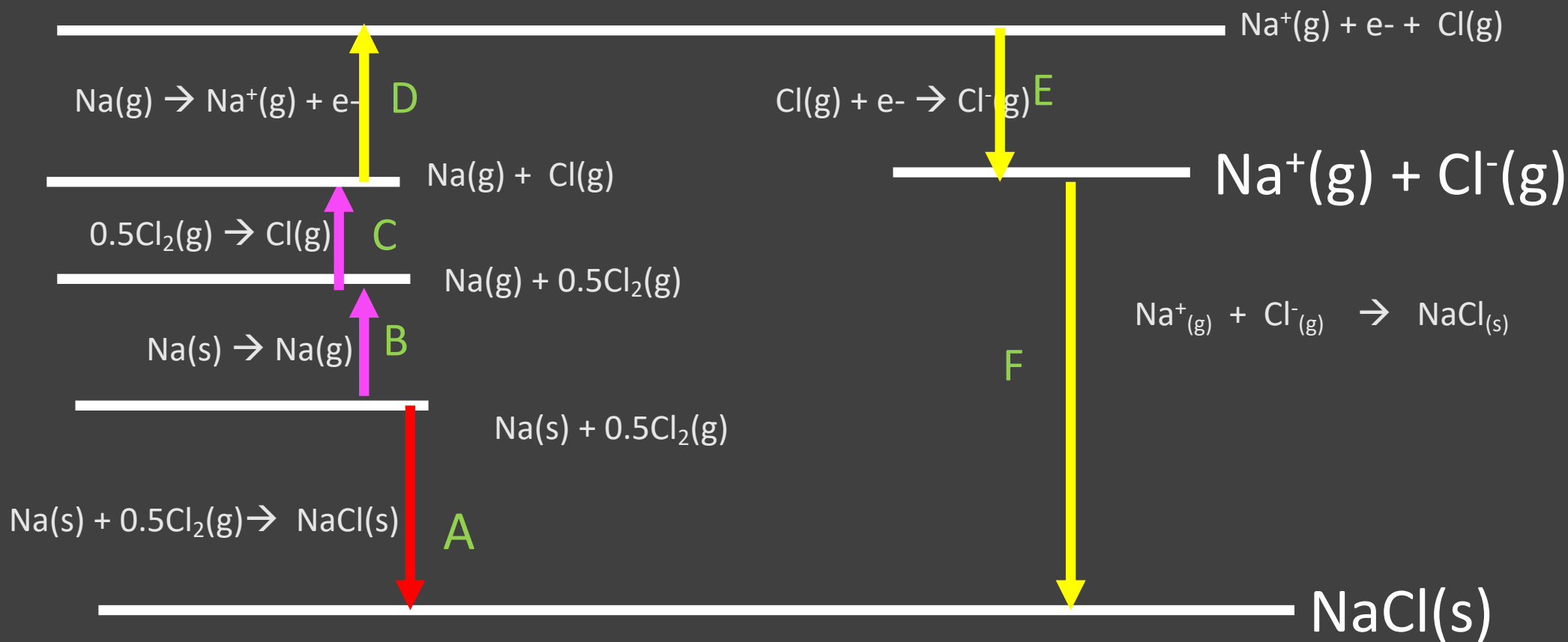




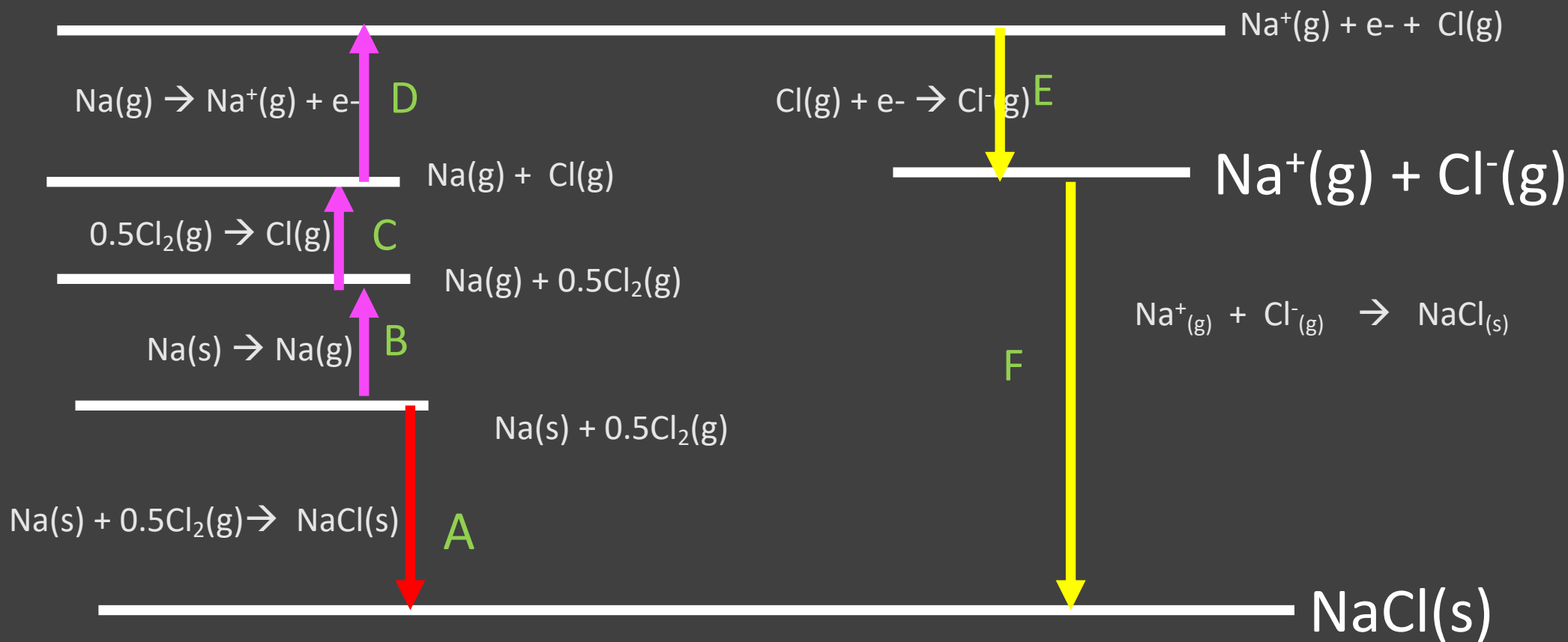
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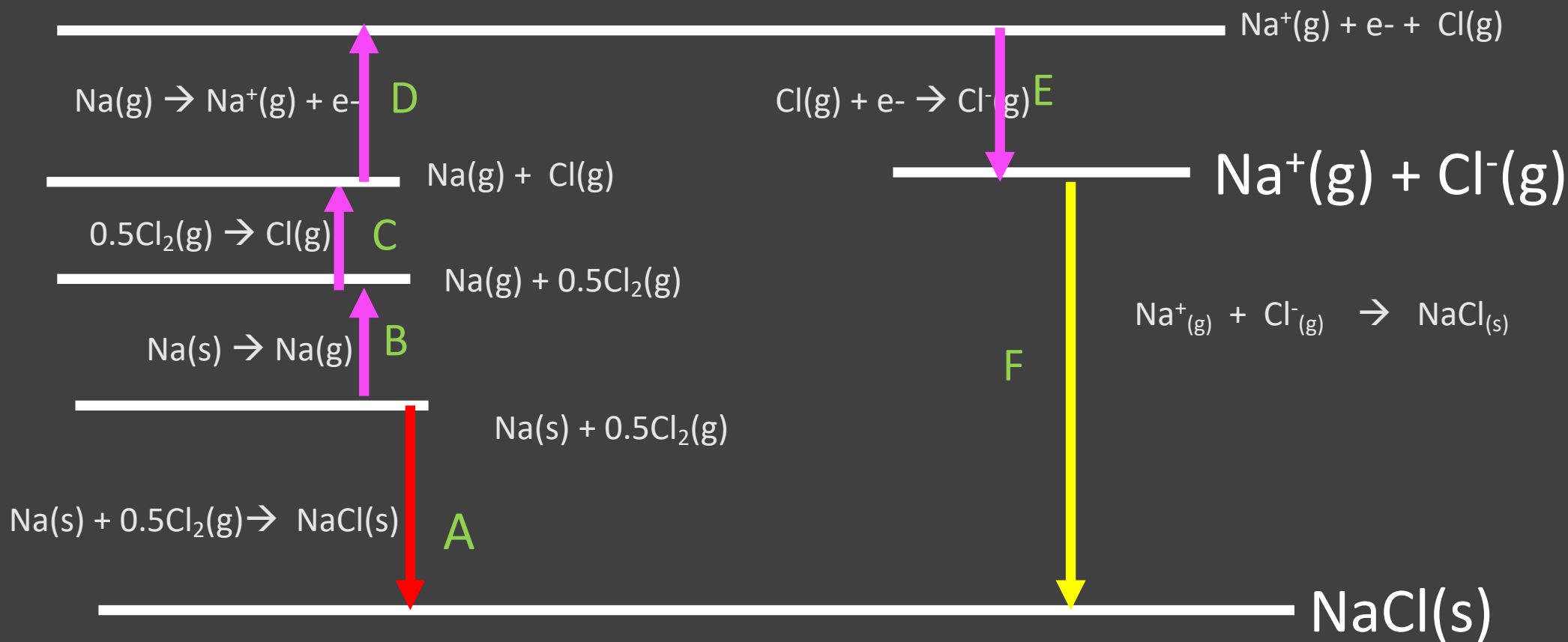
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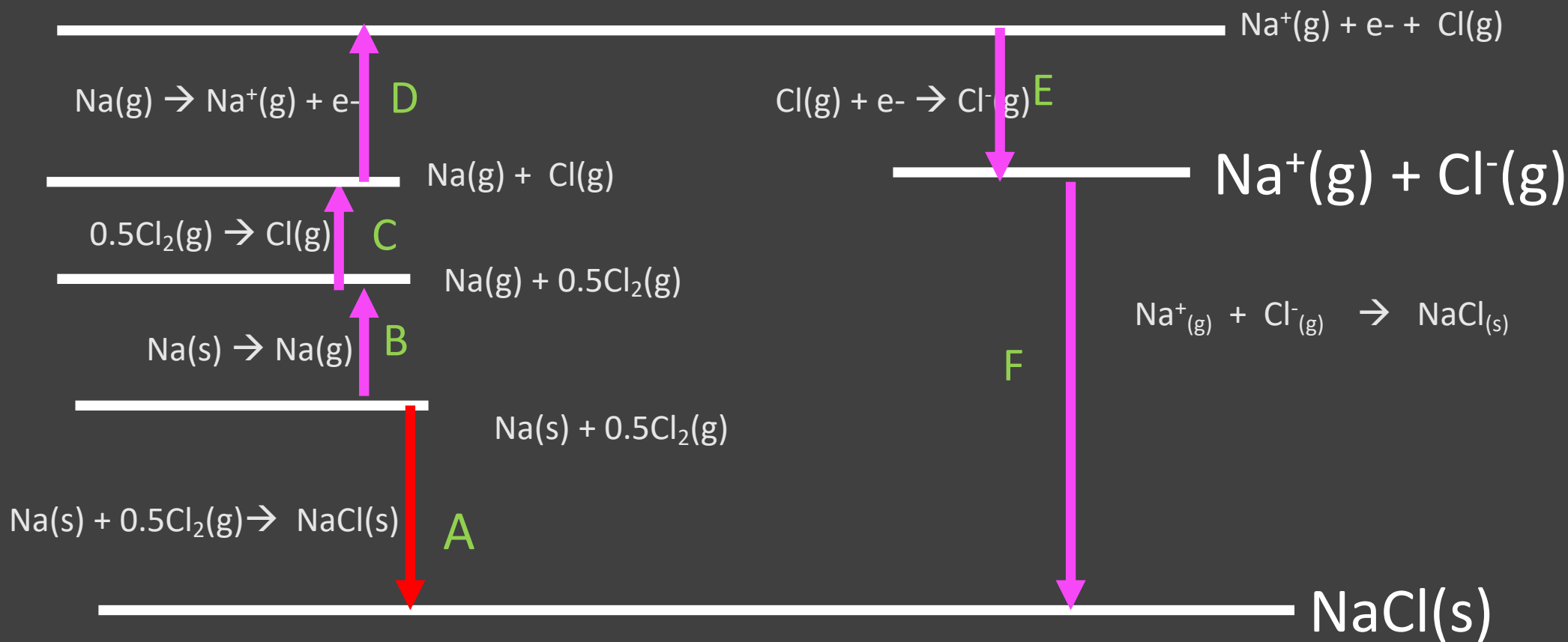
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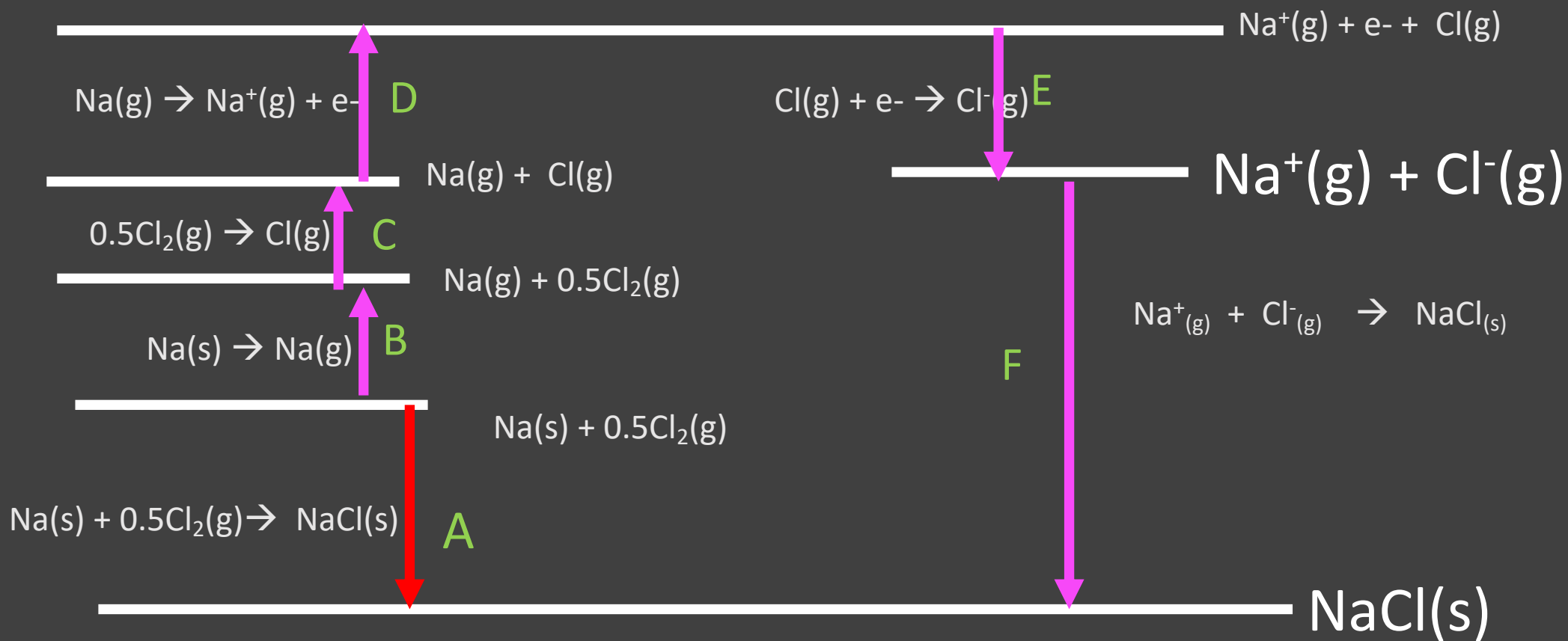


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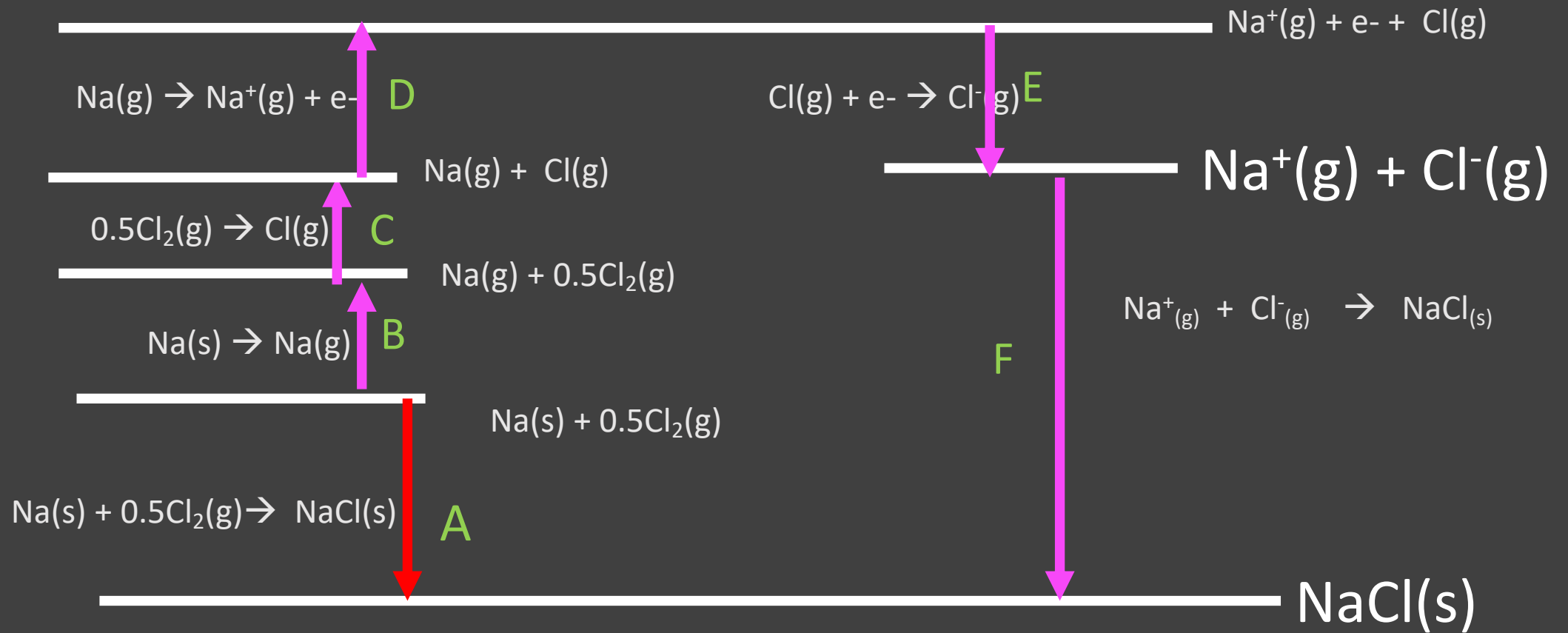


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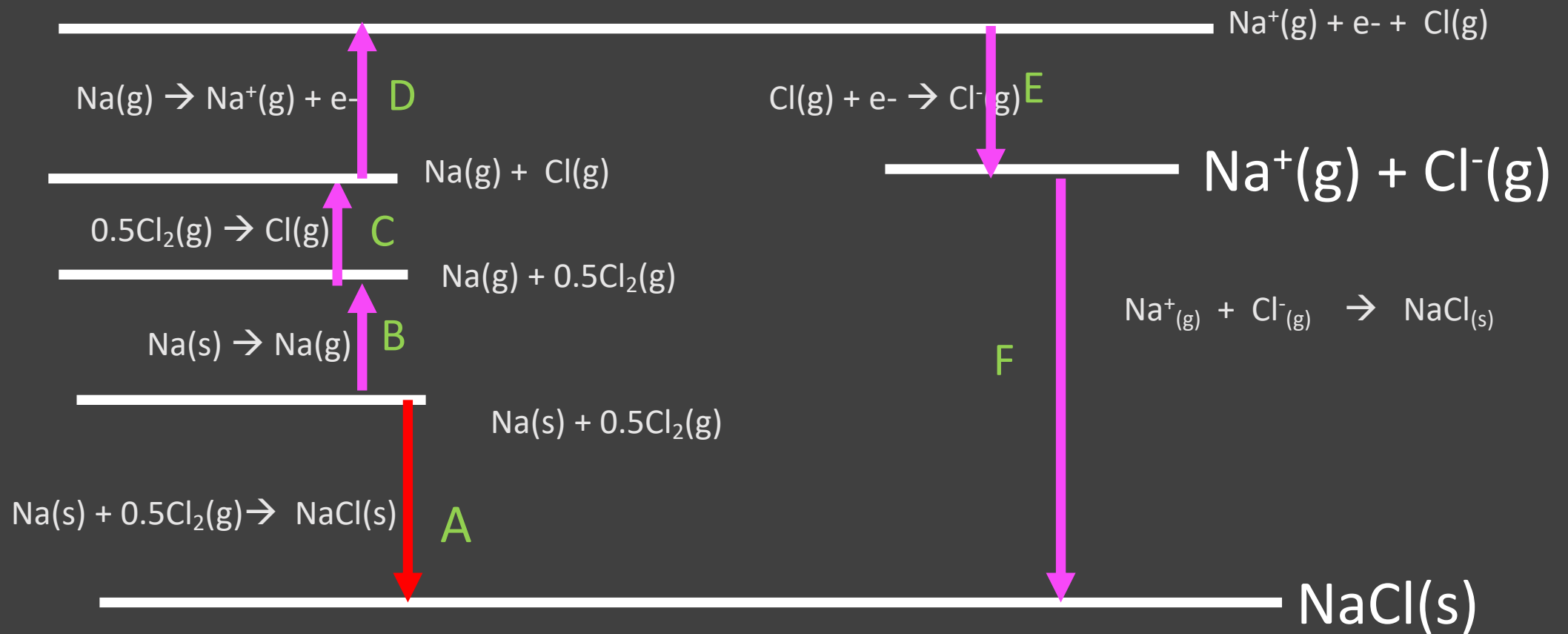


$$F = A - (B + C + D + E)$$

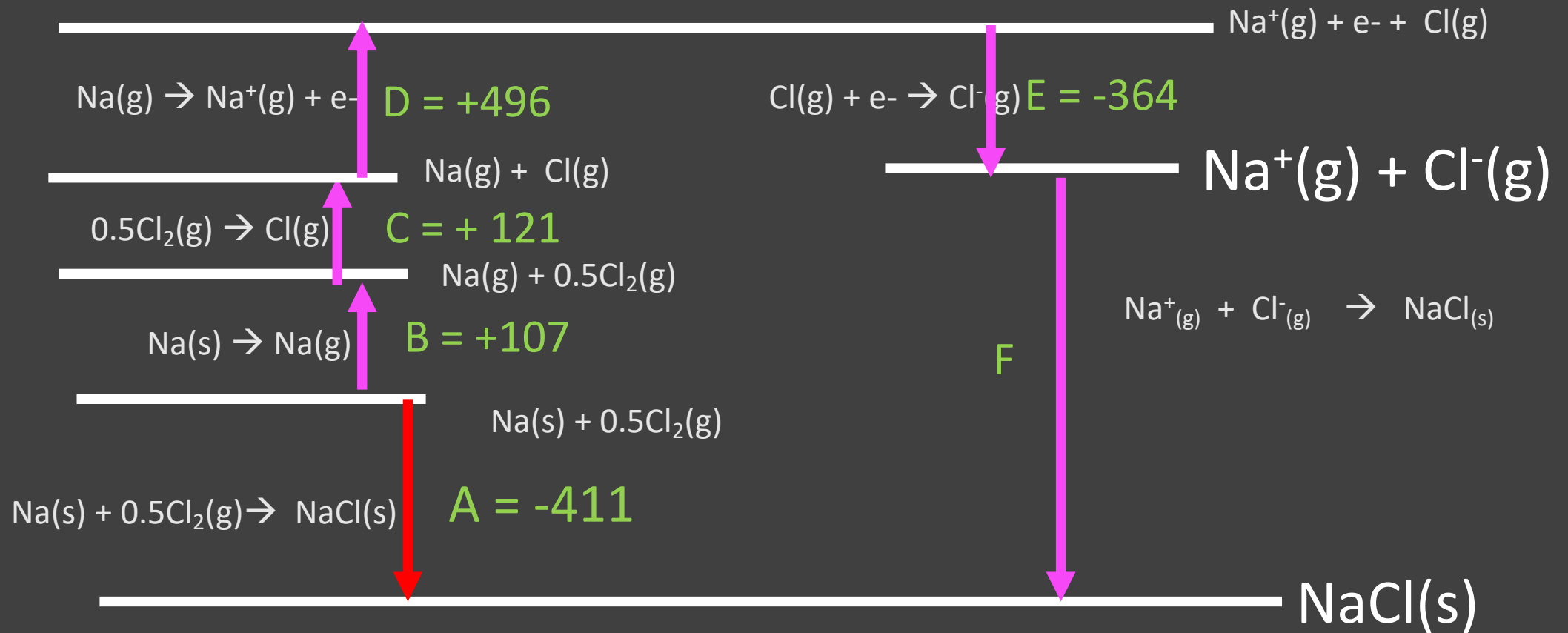




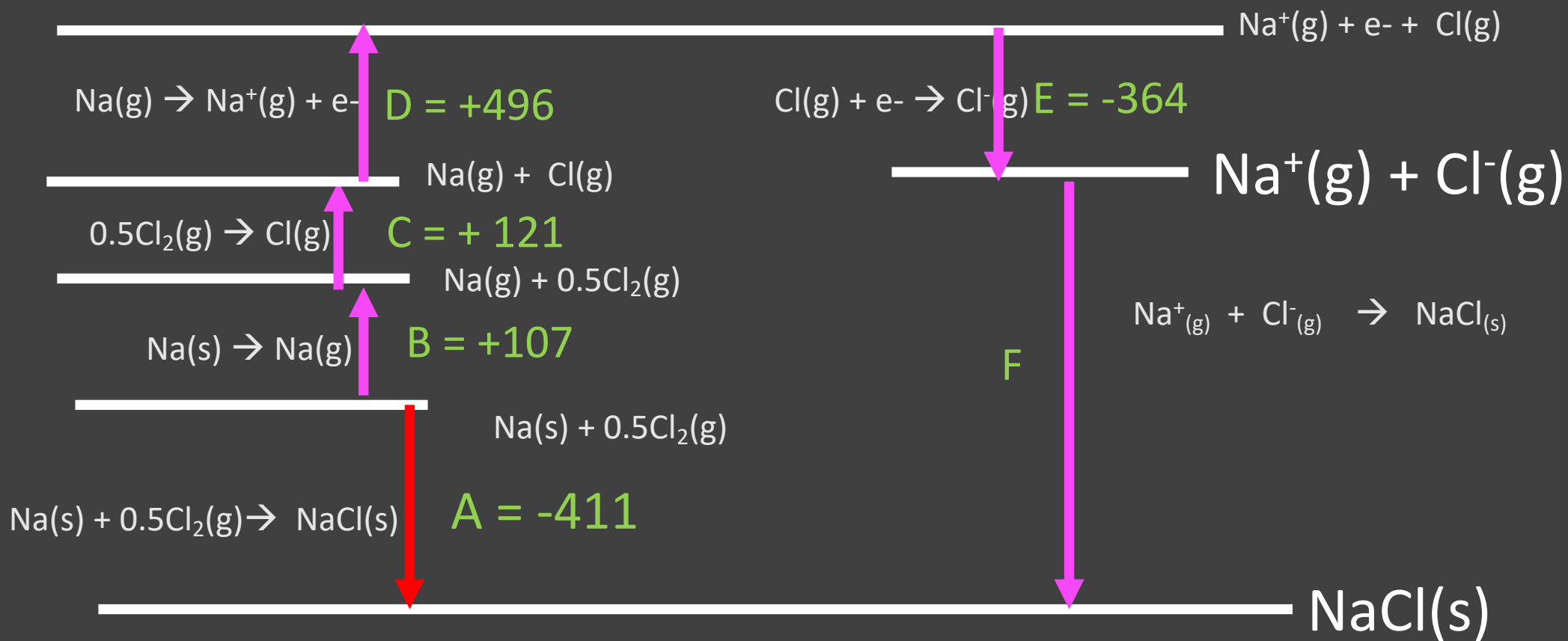
$$\text{Lattice enthalpy} = A - (B + C + D + E)$$



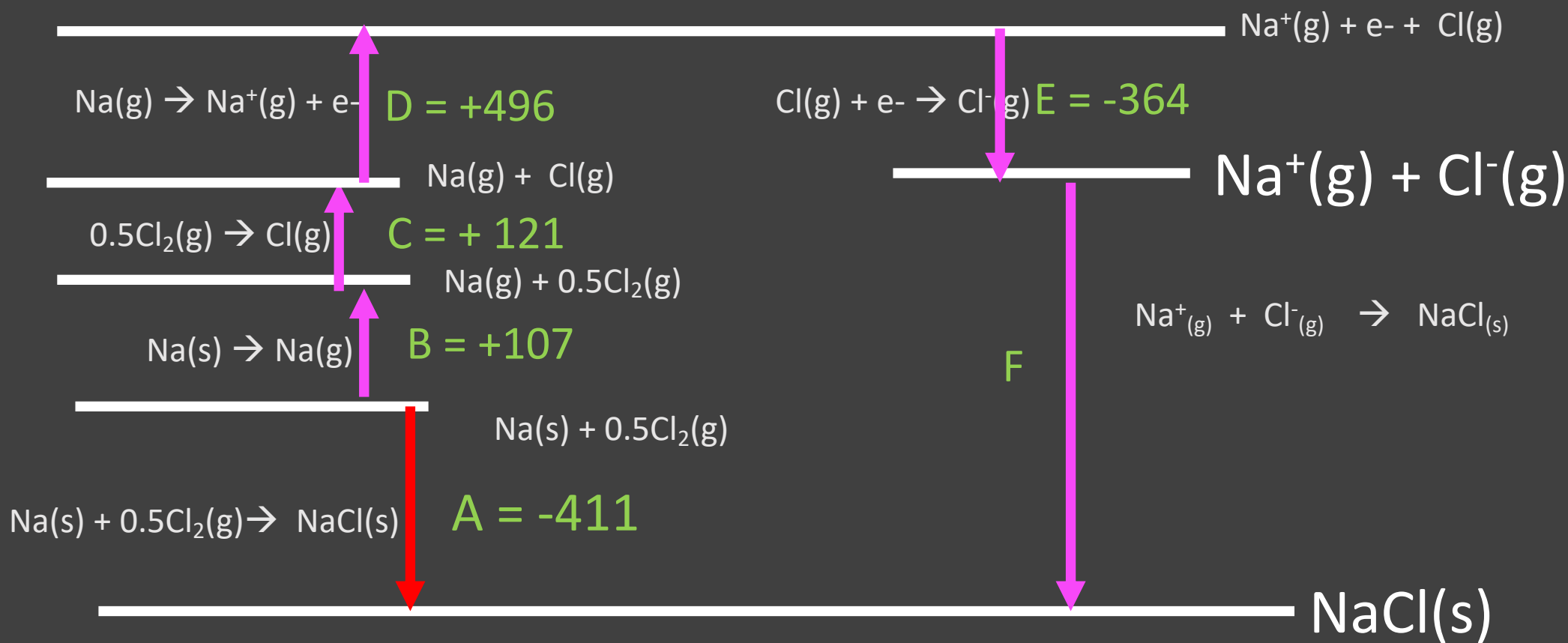
$$\text{Lattice enthalpy} = A - (B + C + D + E)$$



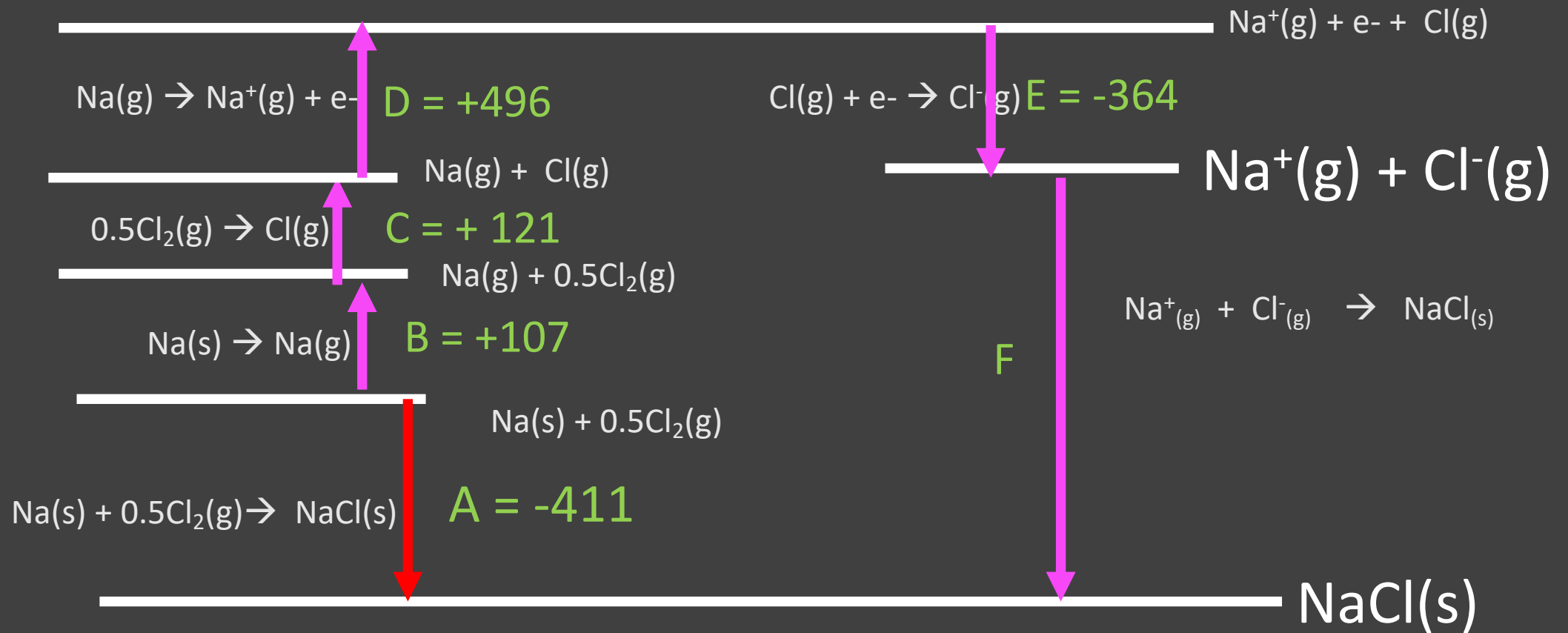
$$\text{Lattice enthalpy} = -411 - (107 + 121 + 496 - 364)$$



$$\text{Lattice enthalpy} = -411 - (360)$$



# Lattice enthalpy = $-771 \text{ kJ mol}^{-1}$



# Online Teaching and Learning Resources for Chemistry Students

[ChemistryTuition.Net](https://www.chemistrytuition.net)

