

# 23 Born-Haber cycles – Part 2

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

## Vocabulary

Write each word three times.

### English

Write it 3 times (English)

Born–Haber cycle

smaller ionic radius

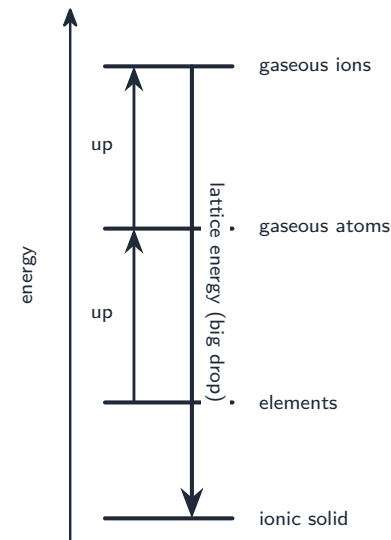
## Recall

A **Born–Haber cycle** links these enthalpy changes so you can find any unknown one.

## New ideas

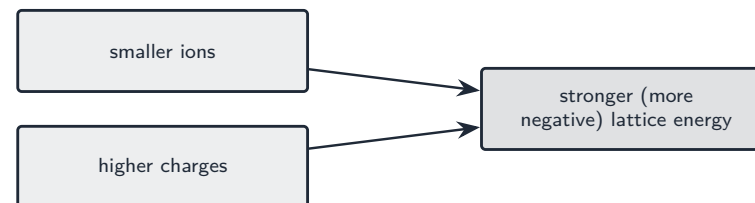
Read these first, then do the Practice.

### ■ 1 The cycle



Going *up* costs energy (atomisation, ionisation); coming *down* releases it (electron affinity, and the large lattice energy). Using Hess's law, you go round the cycle to find any one unknown step.

### ■ 2 What controls lattice energy



The lattice energy is more negative (stronger) for ions with a **smaller ionic radius** and a higher charge – they attract more strongly.

**Watch out:** you go round the Born–Haber cycle using Hess's law – the two routes from the elements to the ionic solid give the same total. Lattice energy is stronger (more negative) for *smaller* ions and *higher* charges.

## Practice

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Try these in order.

**23.6** What does a *Born–Haber cycle* let you find? [1]

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**23.7** Name one step that goes *up* (costs energy). [1]

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**23.8** Which step is the big drop down? [1]

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**23.9** What law do you use to go round the cycle? [1]

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**23.10** Do *smaller* ions give a stronger or weaker lattice energy? [1]

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**23.11 Challenge.** Lithium fluoride has a more negative lattice energy than potassium iodide, even though both are made of  $1+$  and  $1-$  ions. Explain why. [2]

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