# Equilibrium Constant Kp Map

AQA A-level Chemistry · 3.1.10 Equilibrium constant Kp for homogeneous systems

## 1 Partial pressures

3.1.10

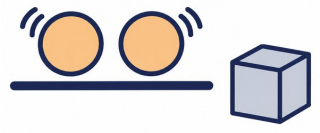
- x = **moles ÷ total moles**
- p = **x × P**
- Mole fractions add to 1
- Partial pressures add to P



## 2 Writing Kp

3.1.10

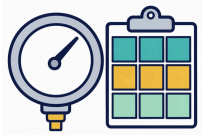
- **Homogeneous**: every substance a gas
- Powers = **balancing numbers**
- p( ), never [ ]
- Units from kPa: **cancel**

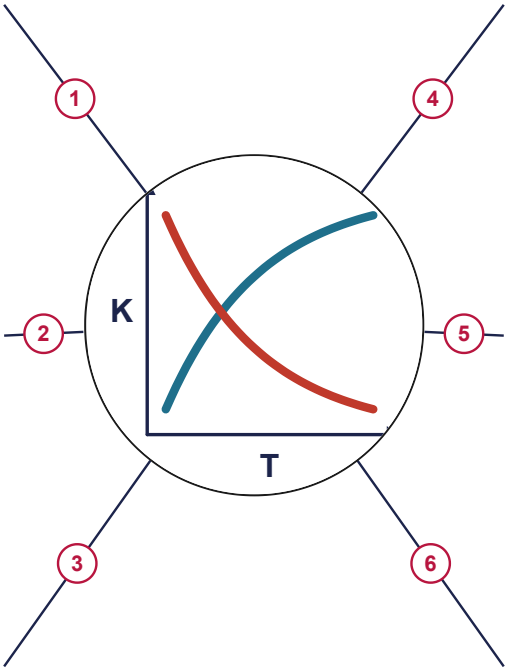


## 3 Calculating Kp

3.1.10

- Amounts in **moles**
- New **total** amount
- x, then p, then **Kp**
- % dissociated changes the total






## 4 Only T changes Kp

3.1.10

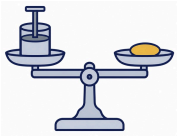
- Exothermic: Kp **falls** as T rises
- Endothermic: Kp **rises**
- New Kp: **position moves**
- Pressure: Kp unchanged



## 5 Ratio against Kp

3.1.10

- More pressure: **Kp unchanged**
- Ratio ≠ Kp: system **shifts**
- Catalyst: Kp the same, **sooner**
- Ratio > Kp: moves left



## 6 Working back

3.1.10

- Write Kp first
- **Rearrange** for the unknown
- **Square root** if squared
- Then add for the total



## What changes Kp and the position

for an exothermic forward reaction with fewer gas molecules on the right

| Change | Effect on Kp | Ratio just after | Position |
|---|---|---|---|
| Raise the temperature | falls | larger than Kp | left |
| Raise the pressure | none | smaller than Kp | right |
| Add a reactant | none | smaller than Kp | right |
| Remove a product | none | smaller than Kp | right |
| Add a catalyst | none | equal to Kp | no change |

## Worked examples

### Kp from moles

- 0.80 $NO_2$, 0.60 $N_2O_4$ mol
- p = 114, 85.7 kPa
- **Kp = 6.6 × $10^{-3}$ $kPa^{-1}$**

### Kp from a percentage

- $PCl_5$ 50% dissociated
- total 1.50 mol at 150 kPa
- **Kp = 50 kPa**

### Working back

- Kp = 18 kPa for $PCl_5$
- $p(PCl_3) = p(Cl_2)$ = 60 kPa
- **$p(PCl_5)$ = 200 kPa**

Kc and Le Chatelier (3.1.6) come first; Ka and Kw (3.1.12) are equilibrium constants too.

**Online Learning System** · onlinelearningsystem.net · © 2026 Online Learning System. All rights reserved. Not for redistribution.