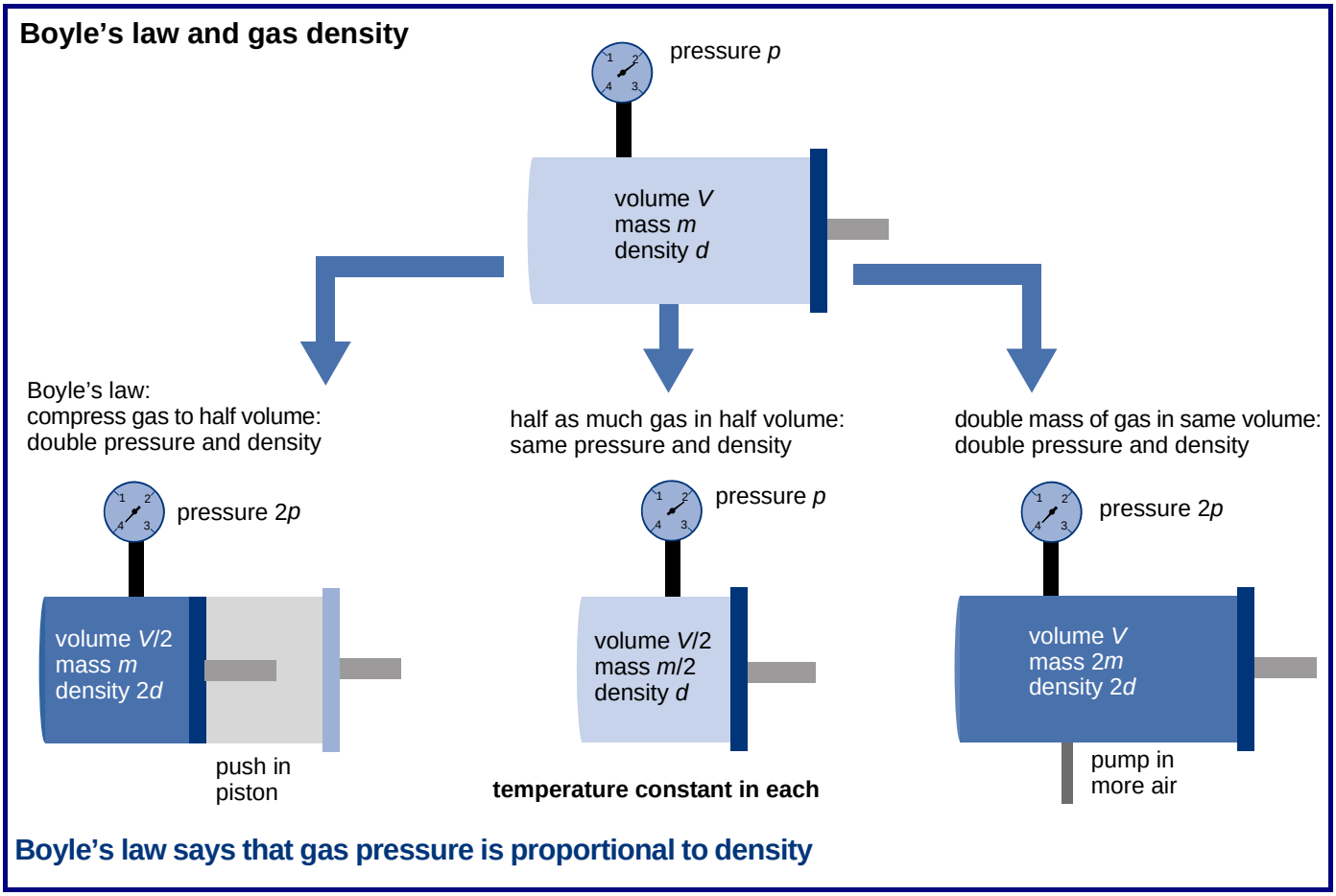
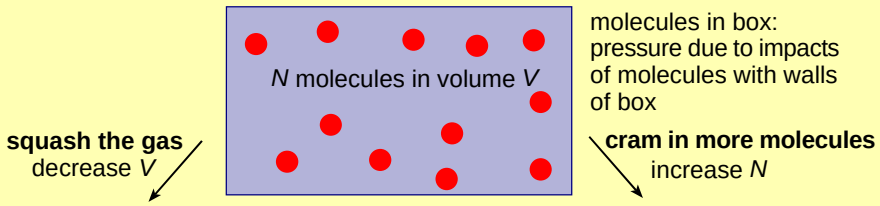
TAP 601-7: Boyle’s law, density and number of molecules



This diagram shows how pressure and density are connected, providing a basis for understanding where Boyle’s law comes from.

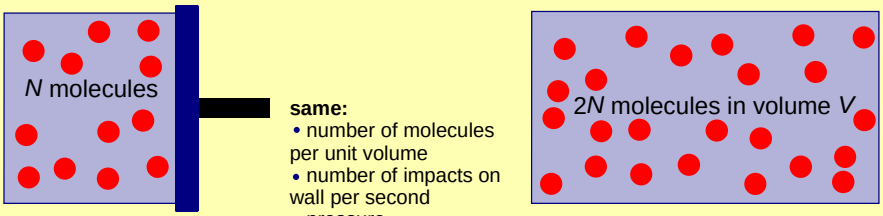
Boyle's law and number of molecules

Two ways to double gas pressure



piston squashes up same molecules into half the volume, so doubles the number per unit volume

add extra molecules to double the number, so double the number per unit volume



pressure proportional to 1/volume
$p \propto 1/V$

pressure proportional to number of molecules
$p \propto N$

If.... pressure is proportional to number of impacts on wall per second

and if.... number of impacts on wall per second is proportional to number of molecules per unit volume

Then.... pressure is proportional to number of molecules per unit volume

p = constant × N/V

Boyle's law in two forms

pV = constant × N $\quad p$ = constant × N/V

Boyle's law says that pressure is proportional to crowding of molecules

This diagram shows how pressure and number of molecules are connected, providing a basis for understanding where Boyle's law comes from.

Practical advice

These diagrams are reproduced here so that you can discuss them with your class.

External reference

This activity is taken from Advancing Physics chapter 13, 10O