

Compressed Gases

11 elements are gases at STP:

hydrogen,
nitrogen, oxygen,
helium, neon, argon, xenon, krypton, radon,
fluorine, chlorine.

In addition there are many **compounds**:

carbon dioxide, propane, butane

Types of Gases

- “Liquefiable” gases
- Non-liquefiable gases (cryogenic gases)

“Non-liquefiable” (cryogenic) gases

Liquefy at temperatures -273 to -150 C
(i.e. 0 – 120 K)

- Oxygen (liquefies at 90 K)
- Nitrogen (liquefies at 77 K)

Approaching Zero Kelvin

- 1877 Louis-Paul Cailletet liquefies oxygen (90 K) and nitrogen (77 K)
- 1898 Dewar liquefies hydrogen at 23 K
- 1908 Kamerlingh Onnes liquefies helium at below 5 K.
- 1926 William Francis Giauque / Peter Debye
Adiabatic demagnetization 0.25 K
- 1950 Pomeranchuk Refrigerator
Adiabatic *compression* 1 milliKelvin
- 1995 Bose-Einstein Condensation 0.17 microKelvin
- 1999 Slowing the speed of light to 60 km/hr
0.05 microKelvin

“Liquefiable” gases

Liquefy easily

- at temperatures > 90 C
- at pressures from 25 – 2500 psig
- Can become solid at cryogenic temperatures (e.g. carbon dioxide)

Two main issues with compressing gases

- Must be done safely
- It costs energy (and money)

Therefore going from a liquid fuel to a gaseous one (“the hydrogen economy”) must deal with these two issues.

Compressed Gases in the lab

- Gas tank
- “House Air”

For both kinds of systems, the pressure supplied is usually much higher than what is needed. So one must regulate this pressure.

Pressure Regulators

One-Stage Regulators



(www.migtigarc.co.uk)

Two-Stage Regulators



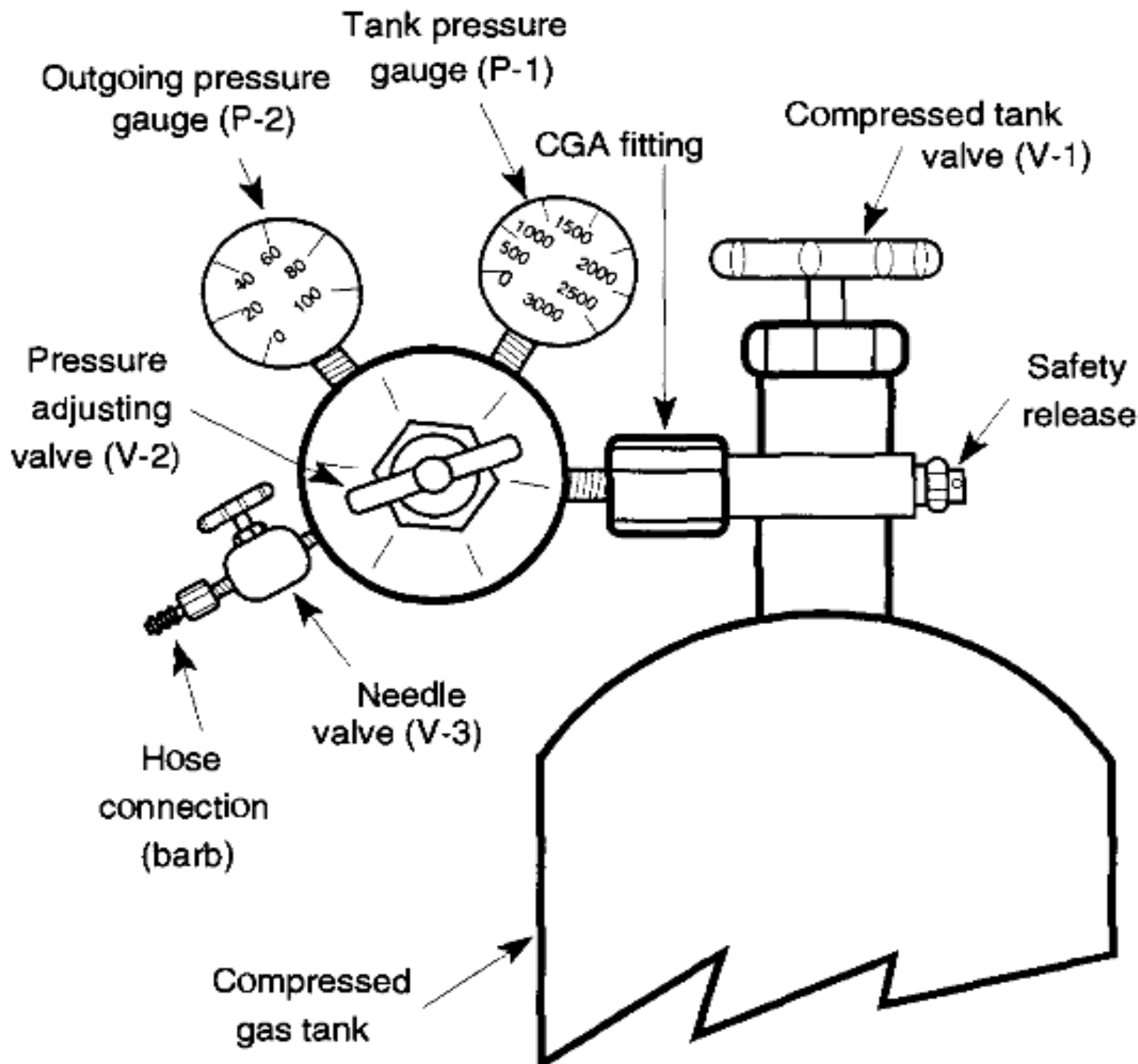
(www.coleparmer.com)

Maximum Inlet Pressure: 3000psig
Maximum Outlet Pressure: 50psig

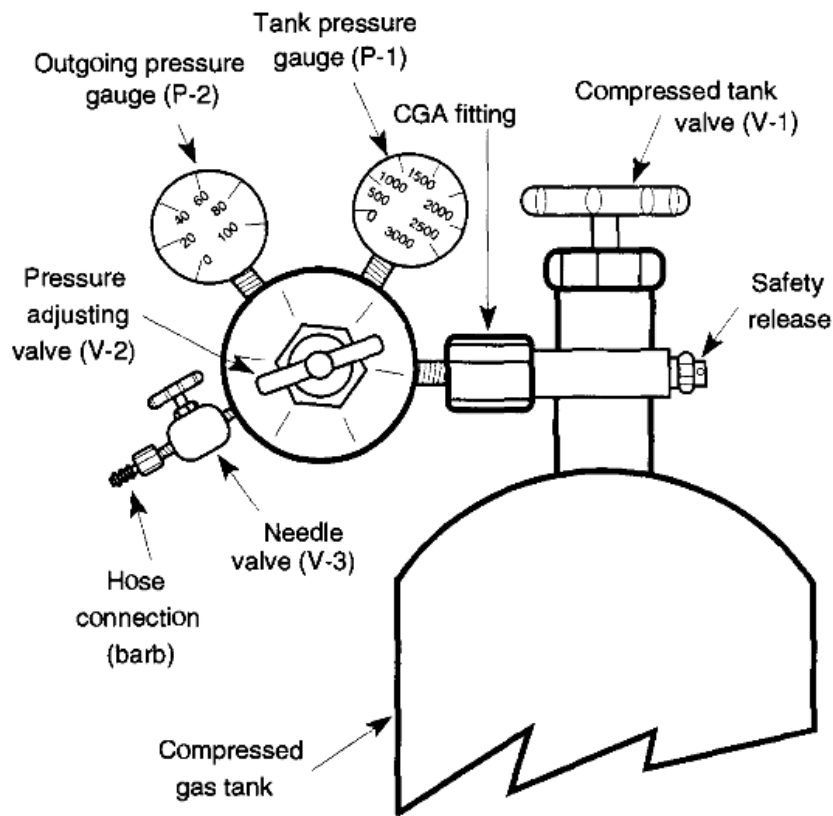


(www.fishersci.ca)

REGULATOR



Parts of the regulator



- V-1: The Compressed Tank Valve or Main Valve
- P-1: The Tank Pressure Gauge
- V-2: The Pressure Adjusting Valve
- P-2: Outgoing Pressure Gauge
- V-3: The Needle Valve
- The Hose Connection

NMR Samples

Example of Solvent:
Deuterated chloroform (CDCl_3)

Example of material to get spectrum of
available in a lab near you:
menthol, simple alkane (like n-decane), ethylene glycol (antifreeze), toluene
available at home or the store:
margarine, olive oil, wine, aspirin

NMR plan: Oct 27, 29

Mon 9-10: Ahmad, Ramesh menthol, n-decane

Mon 10-11: Suliman, Nasir olive oil, margarine

Wed 9-10: Lance, Hanieh aspirin, tylenol

Wed 10-11: Martin, Mahbub caffeine, alcohol

Samples must be prepared by Friday. We will discuss this on Wednesday.