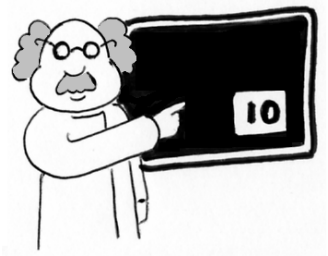


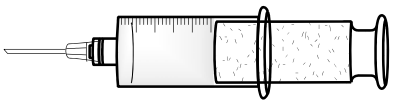
STARTER FOR 10...

1.3. Molar gas volume

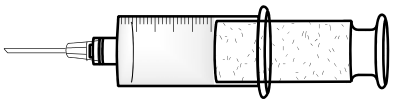
According to Avogadro's Law, as long as the pressure and temperature are kept the same, equal volumes of gases contain equal numbers of moles of gas. Under **standard temperature and pressure** (273 K and 101,325 Pa) **1 mole of any gas has a volume of 22.4 dm^3**.

Use Avogradro's law to find out which gas syringes contain identical numbers of moles of gas.

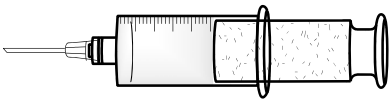
(1 mark for each correct pairing, 1 mark for correct number of moles of gas)



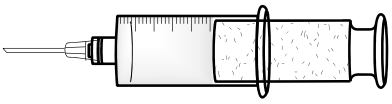
Syringe A contains 105 cm^3 of gas



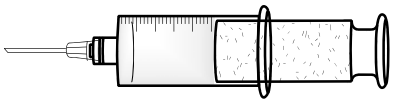
Syringe F contains 48 mg of ammonia



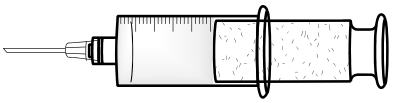
Syringe B contains 5.6 dm^3 of gas



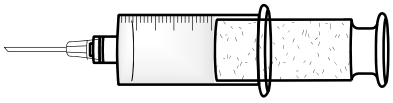
Syringe G contains 0.61 g of bromine



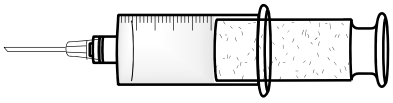
Syringe C contains 63 cm^3 of gas



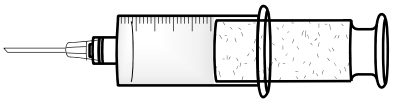
Syringe H contains 0.27 g of butane (C_4H_{10})



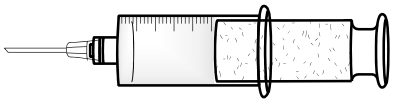
Syringe D contains 0.085 dm^3 of gas



Syringe I contains 7 g of nitrogen



Syringe E contains 1.24 × 10^{-4} m^3 of gas



Syringe J contains 0.16 g of air

1.1.4. Moles summary

1. (a) 1 mole × (correct answer, 0.5 moles)

(b) 1 mole ✓

2. (a) $K + 2 H_2O \rightarrow K(OH)_2 + H_2$ × (correct answer; $2 K + 2 H_2O \rightarrow 2 KOH + H_2$)

(b) 0.075 moles ✓

3. (a) 22.5 g ✓

(b) 249.6 g × (correct answer; 49.9 g)

4. (a) 0.5 moles ✓

(b) 64 g × (correct answer; 128 g)

5. (a) 5×10^{-3} moles ✓

(b) 93.8 cm^3 ✓

1.2 The ideal gas equation

Hydrogen; 5 moles, 54 K

Methane; 0.625 moles, 0.025 m^3

Helium; 2.5 moles, 3,745 kPa

Carbon dioxide; 0.227 moles, 4.27×10^{-3} m^3

Chlorine; 0.141 moles, 2387 °C

1.3 Molar gas volume

Syringe A links with **syringe H**; no. of moles = 4.7×10^{-3} moles

Syringe B links with **syringe I**; no. of moles = 0.25 moles

Syringe C links with **syringe F**; no. of moles = 2.8×10^{-3} moles

Syringe D links with **syringe G**; no. of moles = 3.8×10^{-3} moles

Syringe E links with **syringe J**; no. of moles = 5.5×10^{-3} moles

1.4 Empirical and molecular formulae

Amino acid A has an empirical formula of $C_5H_{10}N_2O_3$ and is therefore **glutamic acid**

Amino acid B has an empirical formula of C_3H_7NO and is therefore **lysine**

Amino acid C has an empirical formula of $C_4H_8N_2O_3$ and is therefore **aspartic acid**

Amino acid D has an empirical formula of $C_4H_9NO_3$ and is therefore **threonine**

Amino acid E has an empirical formula of $C_3H_7NO_2$ and is therefore **alanine**