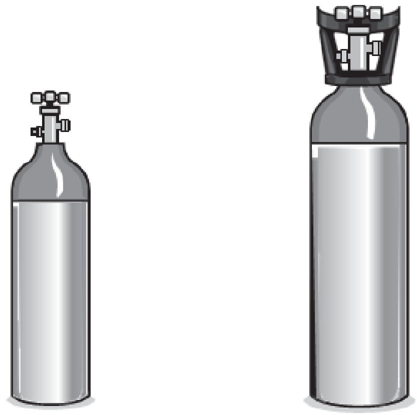
GCSE Physics B (Twenty First Century Science)

J259/01 Breadth in Physics (Foundation Tier)

Question Set 19

1 Hospitals store oxygen at high pressure in metal cylinders.
The pictures show two cylinders, **A** and **B**. Both cylinders contain the same mass of gas and have the same temperature.



(a) Cylinder **A** contains oxygen at a pressure of 23 000 kPa.

The area of the base of cylinder **A** is 0.030 m^2.

Calculate the force exerted by the gas on the base of cylinder **A**.

Use the equation: force normal to a surface = pressure × area of that surface

F = 23,000,000 × 0·03
= 690,000 N

Force = ...690,000..........N **[3]**

(b) Cylinder **B** has a larger volume than cylinder **A**.

The pressure in cylinder **B** is smaller than the pressure in cylinder **A**.

(i) Explain, using ideas about **particles**, why storing the same mass of gas in a larger volume produces a smaller pressure.

Larger volume means fewer and less frequent collisions of particles so smaller pressure **[2]**

(ii) Both cylinders contain the same mass of gas and are at the same temperature.

	Pressure (kPa)	Volume (dm^3)
Cylinder A	23 000	15
Cylinder B	10 000	

Calculate the volume of gas in cylinder **B**.

Use the equation: pressure × volume = constant

23000 × 15 = 10000 × V so V = $\frac{345000}{10000}$
V = 34·5 dm^3

Volume of gas = ...34·5..........dm^3 **[2]**

Total Marks for Question Set 19: 7

Resource Materials

Question Set No: 19

Equations in Physics

change in internal energy = mass × specific heat capacity × change in temperature

energy to cause a change in state = mass × specific latent heat

for gases: pressure × volume = constant
(for a given mass of gas and at a constant temperature)

(final speed)^2 – (initial speed)^2 = 2 × acceleration × distance

energy stored in a stretched spring = ½ × spring constant × (extension)^2

potential difference across primary coil × current in primary coil =
potential difference across secondary coil × current in secondary coil