AQA Physics A-level
RP08 - Boyle's and Charles' Laws

Practical Flashcards

State Boyle's Law.

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When kept at a constant temperature, the pressure and volume of an ideal gas are inversely proportional.

pV = Constant

State Charles' Law.

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When kept at a constant pressure, the absolute temperature and volume of a gas are directly proportional.

V/T = Constant

How would you go about measuring the cross-sectional area of the inside of a syringe?

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Remove the plunger and then, using a micrometer, measure the diameter of the seal. This value can then be substituted into the circular area equation.

Why should the clip used to seal the tubing, coming from the syringe, be as close to the syringe tip as possible?

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The volume of air trapped in the tubing should be as small as possible so that it is negligible in comparison to the volume in the syringe.

Suggest how a mass hanger could be attached to the plunger of the syringe.

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A small piece of string can be tied to the plunger to form a loop. The hanger can then hook onto this loop.

Why should the syringe be clamped above the region of the plunger's motion?

Why should the syringe be clamped above the region of the plunger's motion?

Clamping the syringe can distort the barrel and hinder the motion of the plunger. By clamping above the region in which the plunger moves, this problem is avoided. It also ensures that the scale on the syringe isn't covered by the clamp.

Why should the syringe be clamped at a relatively high position?

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The syringe should be clamped at a height so that the plunger has space to move downwards as masses are added.

How can the force exerted by the masses be calculated?

$$F = mg$$

$$\text{Force} = \text{Mass} \times \text{Gravitational Field Strength}$$

How can the pressure exerted by the masses on the air sample be calculated?

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Pressure = Force / Cross-Sectional Area of Plunger

This pressure should then be subtracted from the standard atmospheric pressure.

State the value of standard atmospheric pressure.

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101 kPa

Describe the relationship that should be found when a graph of 1/V against P is plotted.

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Pressure and volume are inversely proportional so the graph of 1/V against P should be a straight line that passes through the origin.

Suggest why a straight line may not be produced when plotting a graph of 1/V against P.

Suggest why a straight line may not be produced when plotting a graph of 1/V against P.

The plunger may have experienced some resistance to its motion as masses were added. This sticking of the plunger, would create error that may result in an inaccurate measured change in volume.

What safety precautions should be taken when using concentrated sulfuric acid?

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Safety goggles should be worn to ensure no acid enters your eyes. Gloves could also be worn to ensure there is no contact between the acid and your skin.

What safety precautions should be taken when working with a hot beaker of water?

What safety precautions should be taken when working with a hot beaker of water?

Avoid touching the hot beaker with bare hands, and ensure it is handled with care to avoid spillages. A heatproof mat should be used to protect the bench.

What should you do before recording each measurement of water temperature?

What should you do before recording each measurement of water temperature?

You should always stir the water before taking a temperature measurement so that the reading is an appropriate and accurate reflection of the average temperature of the water in the beaker.

Explain how an estimate of absolute zero can be obtained from a graph of length of air sample against temperature.

Explain how an estimate of absolute zero can be obtained from a graph of length of air sample against temperature.

The graph will be of the form:

$$L = m\theta + c$$

Substitute values from the graph to obtain c and then rearrange for θ when L=0 to obtain a value for absolute zero.