GAS Laws PAG Covers 8.1 and 8.2 SA 3rd Nov 2016

Eye protection should be worn whilst carrying out practical work with gases under pressure, heated glassware or with mercury.

1. Use the PhET Gas Properties applet to collect data to establish relationships between P,V,T and N.

Record data in suitable tables and plot graphs (in excel) to establish the relationships between:

1. P and V at constant T and N
2. P and T at constant V and N
3. T and V at constant P and N
4. P and N at constant T and V

Use the relationships shown by the graphs to write mathematical expressions linking the parameters.

1. Use the Boyles Law apparatus to make measurement of how the volume of a gas depends on its pressure. Record your experimental data in suitable tables and plot a graph to show the relationship between P and V.
2. Use the Charles’ Law apparatus to make a set of measurements of how the volume of a gas varies with temperature. A mercury spillage kit is available. You must notify your teacher immediately if there is a spillage of mercury. Plot a graph of volume against temperature and extrapolate a line of best fit to zero volume to establish a value for absolute zero.
3. Use the pressure Law apparatus to make measurements of how the pressure of a gas at constant volume varies with temperature. Record your results in a suitable table. Plot a graph of pressure against temperature and extrapolate a line of best fit to zero pressure to establish a value for absolute zero.

For the experimental work record the ambient temperature and pressure. (Smart phones often have pressure sensors.) You may also use additional data from other groups to reduce the uncertainty in your findings.

Does your experimental data and the PhET simulation show the same relationships?

Does your experimental data and your values for absolute zero agree with established theory?

Practical Skills Assessed in this PAG

1.2.1 Practical skills

(a) apply investigative approaches and methods to practical work

(b) safely and correctly use a range of practical equipment and materials

(c) follow written instructions

(d) make and record observations/measurements

(e) keep appropriate records of experimental activities

(f) present information and data in a scientific way

(g) use appropriate software and tools to process data, carry out research and report findings

(j) use a wide range of experimental and practical instruments, equipment and techniques appropriate to the knowledge

 and understanding included in the specification.

1.2.2 Use of apparatus and techniques

(a) use of appropriate analogue apparatus to record a range of measurements (to include length/ distance, temperature, pressure, force, angles and volume) and to interpolate between scale markings

(b) use of appropriate digital instruments, including electrical multimeters, to obtain a range of measurements (to include time, current, voltage, resistance and mass)

(c) use of methods to increase accuracy of measurements, such as timing over multiple oscillations, or use of fiduciary marker, set square or plumb line

(k) use of ICT such as computer modelling or data logger with a variety of sensors to collect data, or use of sofware to process data

Common Practical Assessment Criteria, CPAC

(1) Follows written procedures

(2) Applies investigative approaches and methods when using instruments and equipment

(3) Safely uses a range of practical equipment and materials

(4) Makes and records observations