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| **Lesson Number – 20.1a** |
| **Lesson Title – Investigation of Boyle’s Law (constant temperature) and Charles’s Law (constant pressure) for a gas (Required practical #8)** |
| **Specification Reference** | **3.6.2.2** |
| **Learning Objectives** |
| Required practical criteria (a) |
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| **Opportunities for Assessment** |
| Assessing the practical aspect of the lesson**Skills Assessment (Required practical 8)**AT (a) |
| **Starter:** | Recap lesson 20.1 (Gas laws) and the outcomes / targets of this lesson |
| **Main:** | This is a required practical lesson so students need to work independently to perform the experiment |
| **Plenary:** | Write-up the experiment |
| **Homework:** | Complete write-up of required practical |
| **Differentiation / Extension / S&C** |
| Assistance / guidance on the planning of the experiment can be altered for group’s ability |
| **Numeracy / Literacy** | **SMSC / Fundamental British Values** |
| Use of the SHM formulae for both springs and pendulums | Team work / Planning |

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| **RESOURCES:****Boyle’s Law experiment**Class sets of:* Stand and clamp
* 10ml syringe with 0.5ml divisions
* 5cm length of thin-walled rubber or silicone tubing to fit nozzle of syringe
* Pinch clip
* 2kg mass
* Loop of string
* 9 x 100g masses on a 100g mass holder
* Micrometer

**Charles’s Law experiment**Class sets of:* 25cm length of glass capillary tubing
* 5cm length of thin-walled rubber tubing to fit over the end of the capillary tubing
* Contact adhesive
* Concentrated sulphuric acid
* 30cm ruler
* 2 elastic bands
* Thermometer (e.g. -10 to 110 oC)
* 2 litre beaker
* 250ml glass beaker
* Paper towels
* Kettle
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| **Risk Assessment** e.g. CLEAPSS card reference |
| Sulphuric acid – this kit should be prepared by a technician in advance – breakages should be dealt with by adding water to dilute the acid before glassware is touchedBe aware that the 2kg mass can drop / string can break etc. so it must be placed over a desk with a bag or soft surface to catch it.Broken glass – dust pan and brush used and correct glass wastage disposalKettle – hot water, do not pour into glassware that is being held, keep to centre of desk |
| **Working Scientifically (HSW)** |
| Assessed practical assessment criteria linked to the practical |