Lesson 2: Gathering and Measuring Particulates

This lesson is designed to last 1 hour and will enable students to learn about particulates and their role in air pollution.

Air Quality Wigan Borough

As a result of participating in this session, students will be able to:

- **RECALL** what particulates are.
- **UNDERSTAND** how particulates affect the human body.
- **GATHER** evidence of particulates in the locality.

Curriculum Links

Science Programme of Study for Key Stage 3

- Interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions.
- Present reasoned explanations, including explaining data in relation to predictions and hypotheses.
- The role of diffusion in the movement of materials in and between cells.
- The mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases, including simple measurements of lung volume.

Lesson Resources:

- A decision needs to be made at the planning stage as to whether to take students outdoors to gather evidence or to gather the evidence as part of the preparation. If the former, they will need to be the assessment of risk and compliance with school policies on out of classroom activities.
- Airborne Particulates Size Chart

5 mins	**Introduction/Do Now Task:** Ask students to work in pairs and sort out these units in terms of decreasing size (i.e. largest first) • Microns, or micrometres • Centimetres • Nanometres • Metres • Millimetres (Correct answer: metres, centimetres, millimetres, microns (micrometres),nanometres)
15 mins	**Starter Task:** Introduce the poster and say that it relates to air pollution. Ask students to work in small groups, either with a printed copy of the poster or with sight of one on a screen, and to study it to explain what it shows. Allow students a few minutes to examine the poster, deal with any questions with individual groups and then take feedback, with each group contributing, as far as possible, a different point. Draw out key points such as: • Not all atmospheric pollutants are gases • Pollutants come from a variety of sources • Some pollutants are referred to as particulates • Different particulates have different sizes Explain that in this lesson they are going to be studying particulates

25 mins	**Main Task 1:** Gathering particulates – procedure 1 This activity can either by done in advance, or students can be involved in gathering the evidence. In either case it is a good idea to test the area to be used in advance, to make sure it will yield evidence that can be analysed. Cotton wool swabs need to be used to wipe surfaces on which particulates are likely to have settled. Suitable surfaces include lampposts and railings near to roads. Swabs should be used in a consistent way (i.e. similar pressure and over a similar distance on the surface). It is a good idea to have swabs from several surfaces that vary in position. For example: • At a number of points different distances away from a busy road. • At a number of different heights above the ground. In each case this factor should be measured and recorded. The swabs can then be compared. A good way of doing this is to fix the swabs to a chart that displays the other variable and display this so that students can study it. Ask students to look at the swabs and: • Suggest conclusions that can be drawn. • Suggest the advantages and limitations of this technique. • Suggest further evidence that could be gathered.
10 mins	**Main Task 2:** Gathering particulates – procedure 2 Explain that another way of gathering particulates is to use adhesive pads which can be hung up in various areas and left for several days. Particulates in the air become attached to the pads. The pads are then removed and examined using a microscope to explore the level of particulate pollution in that location. Ask students to: • Consider whether this technique would produce useful data. • Compare this technique with the swab tests. • Suggest why researchers might want to use both procedures.
5 mins	**Plenary:** Ask students to suggest three things they've learned in this lesson about particulates and air pollution. Take a sample of responses.

Thank you for incorporating our resources into your teaching. Your feedback is valuable to us as we strive to improve and enhance our materials. We kindly ask that you take a few moments to complete the online feedback questionnaire. Your insights and suggestions will help us better support you and your students in the future.

Air
Quality
Wigan
Borough