

Clean air for better breathing

Resource Kit for
Middle/Secondary Levels

ACTIVITY SHEETS



ACTIVITY SHEET 1

PART 1: STUDENT SURVEY

How much do you know about air pollution? The following survey may help you to find out. This is not a test so if you don't know the answer, please select this option. Some questions seek your opinion, so answer them honestly and do not select the response you think we want to hear.

	Statement	Circle one answer		
1	I think air pollution is getting worse in our state.	True	False	Don't know
2	Photochemical smog occurs when there is lots of sunlight and high temperatures.	True	False	Don't know
3	The main component of smog is ozone.	True	False	Don't know
4	Jogging on high smog days harms your health.	True	False	Don't know
5	Haze is the same as smog.	True	False	Don't know
6	Burning your wood heater incorrectly can be bad because it adds more fine particles into the air.	True	False	Don't know
7	Air quality in cities could be improved if more people used public transport.	True	False	Don't know
8	I'd be willing to ride a bicycle or catch public transport in order to reduce air pollution in our area, even if it was inconvenient.	True	False	Don't know
9	At home, we are encouraged to walk or ride a bike rather than use the car.	True	False	Don't know
10	I try not to cause air pollution in our area.	True	False	Don't know

ACTIVITY SHEET 1

PART 2: OUR VIEWS

If you live in a city or large town it is not possible to have a completely unpolluted atmosphere.

1) Look around your local area and list possible sources of pollution around you.

2) If you live in Adelaide, or a big regional centre, list other sources which may not be in your area, but may still contribute pollutants to your air. Next to each describe how they contribute to air pollution.

3) Describe what qualities you would like for the air that you use.

4) If you were told that the brown haze sometimes seen in the sky was not particularly harmful, would you be prepared for your air to look that way all the time? Explain.

5) If you were told that the brown haze was harmful to your health, tick which action you would be prepared to undertake:

- Stop using your wood heater
- Talk to your local member of parliament
- Participate in an action group
- Write to the newspaper

A collaborative project between the Environment Protection Authority and the Asthma Foundation of South Australia



ACTIVITY SHEET 1

PART 2: OUR VIEWS

6) Is clean air worth it? Explain.

7) What would be a good way for the people in your city or local area to ensure clean air now and for the future?

A collaborative project between the Environment Protection Authority and the Asthma Foundation of South Australia



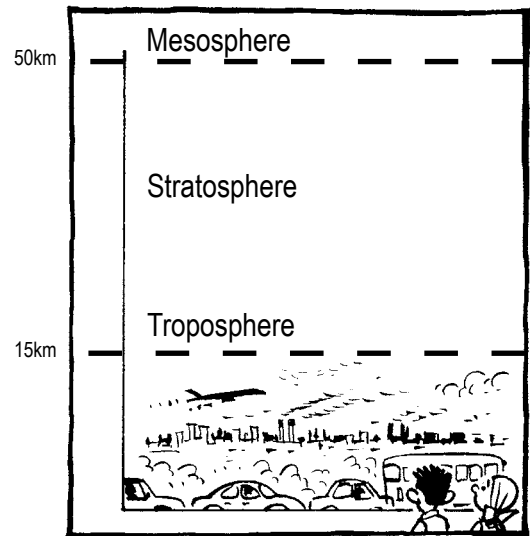
ACTIVITY SHEET 2

ABOUT AIR POLLUTION

The atmosphere

The Earth's atmosphere has 3 layers. They are:

- Troposphere
- Stratosphere
- Mesosphere



The level of gases such as sulphur dioxide, oxides of nitrogen, carbon monoxide, ozone, dust particles, smoke, lead and odours are indicators of air quality in the troposphere. These levels are important to people's health and have social and economic implications for our society.

Other pollutants are greenhouse gases and ozone depleting gases which have the potential to affect the upper atmosphere (the stratosphere). These are of great concern as they affect the global climate and potentially the well being of all who live on this planet.

Air pollution can be broken into two kinds of sources:

- Point sources** – where pollutants come directly from one identifiable place, such as a chimney stack.
- Non-point/diffuse sources** – where the pollutants are emitted from over a wide area, such as emissions from cars in the metropolitan area.

Constituents of air

The components of dry air near the earth's surface:

Gas percentage by volume:

Nitrogen	78.0
Oxygen	21.0
Argon	0.93
Carbon dioxide	0.0035
Neon	0.0018
Helium	0.00052
Water vapour	Varies in the air

ACTIVITY SHEET 2

ABOUT AIR POLLUTION

QUESTIONS

1) Which layer of the atmosphere is affected by greenhouse and ozone depleting gases?

2) Which layer of the atmosphere is affected by pollutant such as carbon monoxide and particles?

3) Which layer of the atmosphere most affects the activities of people?

4) How does this level of the atmosphere help us to survive?

5) The upper layer (stratosphere) of the atmosphere contains ozone. What is the function of this gas in this layer?

6) The amount of water vapour varies greatly in the atmosphere. Why is that?

7) List 5 sources of pollution that you know about.



ACTIVITY SHEET 3

THE HUMAN RESPIRATORY SYSTEM

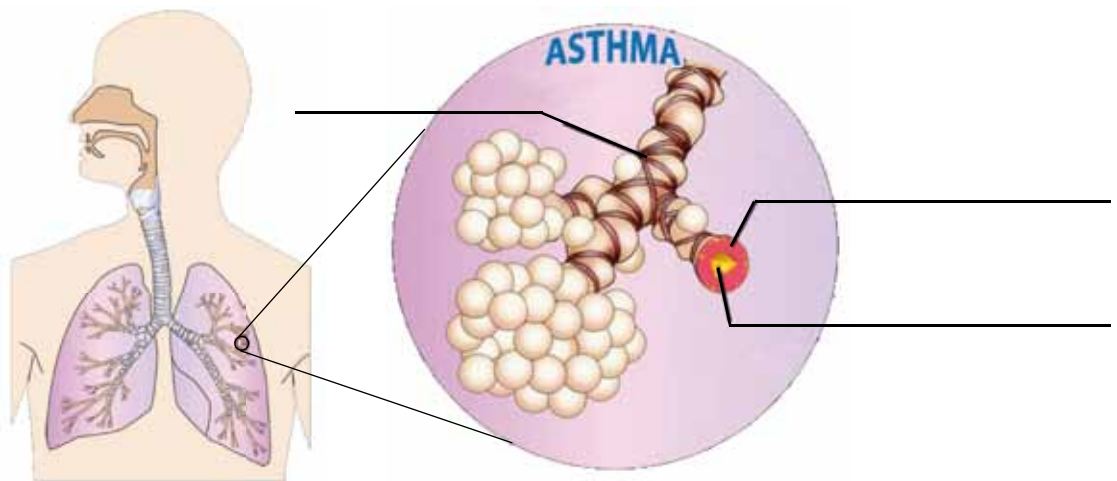
When we breathe, air enters the respiratory system through the nose, where it is filtered, heated and moistened. Hairs in the nose trap any large inhaled particles.

The air moves from the nasal cavity into the throat or pharynx, which branches into the oesophagus and the airways.

The larynx opens into the trachea, which then branches into two smaller bronchi, each entering a lung. The bronchi branch into smaller, narrower airways called bronchioles, which eventually lead into tiny air sacs called alveoli. The alveoli are surrounded by tiny blood filled capillaries, where oxygen and carbon dioxide are exchanged. This is how we get the air we need to survive.

ACTIVITY

Using the information above and reference materials, label the parts of the respiratory system.



Describe the function of the following:

Larynx:

Trachea:

Bronchi:

Bronchiole:

Alveoli:

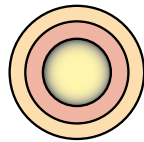


ACTIVITY SHEET 4

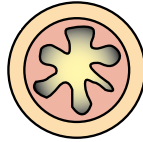
AIR POLLUTION AND RESPIRATION

When particles, such as those from wood heaters and cars, are breathed in, they can cause health problems, especially for the very young, the elderly or people with lung or heart disease. Particles can also make health problems like bronchitis, emphysema and asthma worse and can cause premature death.

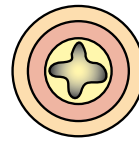
The respiratory system works in several ways to trap particles and remove them from your airways. The nose contains large hairs that trap large particles inhaled. The nasal cavity has a sticky mucous lining with surface hairs called cilia that trap and move the particles towards the nose to be sneezed out.



Normal airway



Red and swollen



Extra mucus



Muscle spasm

Smaller particles that are inhaled bypass the nose and nasal cavity and enter the trachea or further into the bronchioles. These structures also have a mucus and cilia lining and the smaller particles are trapped in these and are moved up towards the mouth, where they are either expelled or swallowed.

If very small particles (smaller than 2.5 micrometres in diameter) are inhaled and reach the alveoli, they can embed themselves into the walls, causing irritation and scarring. This causes the mucous glands to enlarge and excess mucus can result in breathing difficulties. If carcinogens form part of the particles breathed in, the result can be abnormal growth of cells, leading in some cases to cancer developing.

ACTIVITY SHEET 4

AIR POLLUTION AND RESPIRATION (continued)

QUESTIONS

1) Where do most of the particulates in the air originate from?

2) Describe some of the effects of particulates on the respiratory system.

3) Which individuals are most at risk from air pollution?

4) Using your library, find out more information on at least two of the conditions you listed in question 2.

5) How many students in your class have asthma? Show diagrammatically how the airways are affected in asthma?



ACTIVITY SHEET 5

AIR POLLUTANTS and THEIR SOURCES

When particulate matter (tiny specks of solids) or toxic gases in the air exceed certain levels, the air is polluted. Use the resources of the library or internet to complete the following summary sheet on air pollutants.

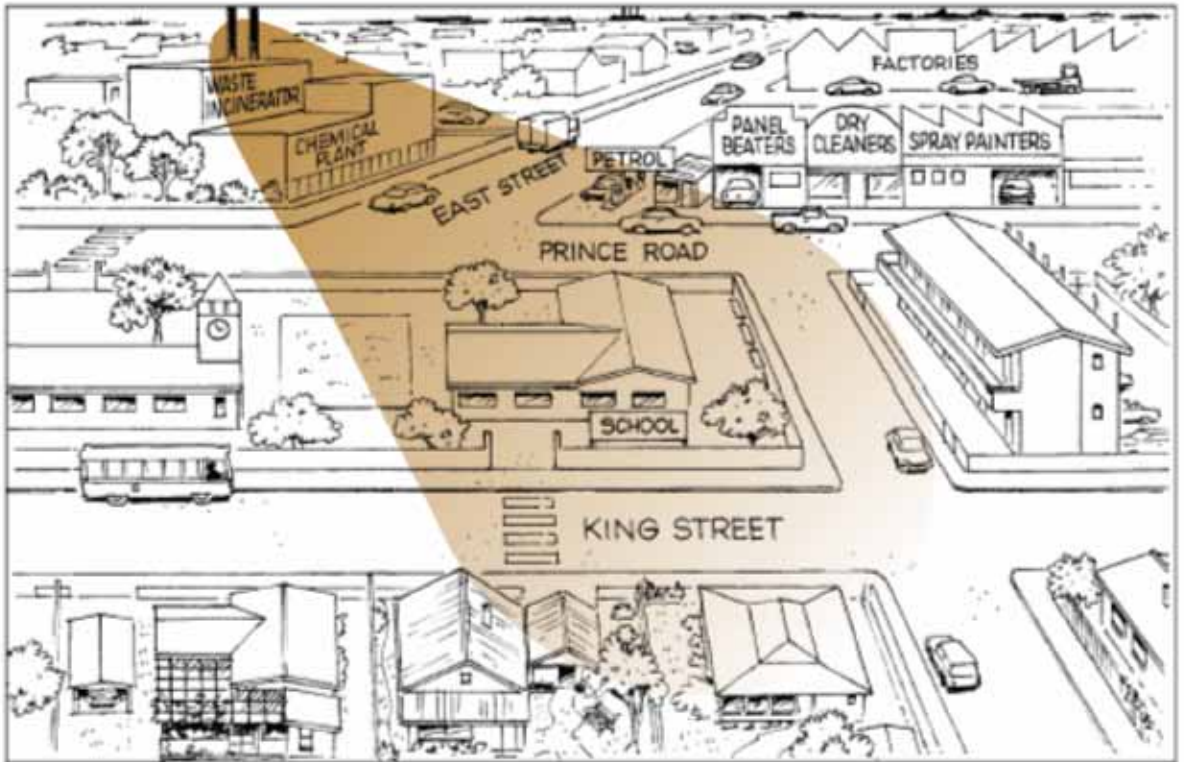
POLLUTANT	DESCRIPTION	SOURCES	HEALTH EFFECTS
Particulates (PM)			
Carbon Monoxide (CO)			
Nitrogen Dioxide (NO ₂)			
Ground Level Ozone (O ₃)			
Sulphur Dioxide (SO ₂)			
Volatile Organic Compounds (VOCs) eg. Benzene			
Hazardous air pollutants eg. lead, asbestos			



ACTIVITY SHEET 6

SOURCES OF POLLUTION

A collaborative project between the Environment Protection Authority and the Asthma Foundation of South Australia



Using the diagram above, identify the air pollutants being produced in this area. Determine whether they are point sources or diffuse sources. Note that shading shown provides an example of a point source.

POLLUTANT	SOURCE	DIFFUSE/POINT SOURCE

ACTIVITY SHEET 7

MAKING A PARTICLE COLLECTOR

One very easily visible air pollutant is particulate matter (PM). PM is made up of tiny particles of solid or droplets of liquid.

The natural sources of particulate matter are such things as pollen and dust. Man-made particles come from coal and oil burnt in power plants, fuel burning in cars and trucks, wood fires, slow combustion heaters and of course, industry. Particles can be harmful to our health, affect plant and animal life and affect buildings and other structures. To get an idea of what the particulates are like around your area, you can try this simple way of collecting them.

Equipment (per group)

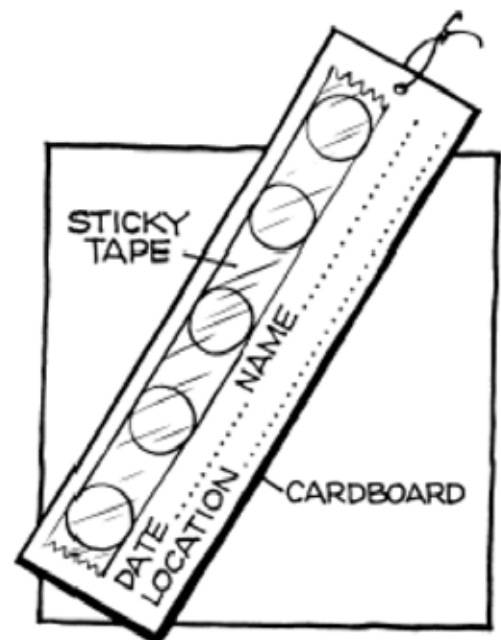
Ruler, compass, cardboard, scalpel, sticky tape, string, marker pen, plastic bag.

Steps to making your particle collector:

- 1) Using a ruler to measure, cut a strip of posterboard or cardboard that is 5cm wide and 25cm long.
- 2) Cut 5 holes, each about 2cm in diameter, in the strip. Use a round object of the right diameter or use a compass to draw the circles.
- 3) Use a hole punch to put a small hole in one end of the strip. Tie a string through the hole; the string will be used to hang the strip at a selected site.
- 4) Put a long piece of clear tape over one side of the strip. Be sure to completely cover all 5 holes. (Depending upon the width of the tape, you may need two or more pieces). The sticky side of the tape will collect the particles from the air. Make sure you do not touch the sticky side of the tape over the holes.

Siting your particle collector

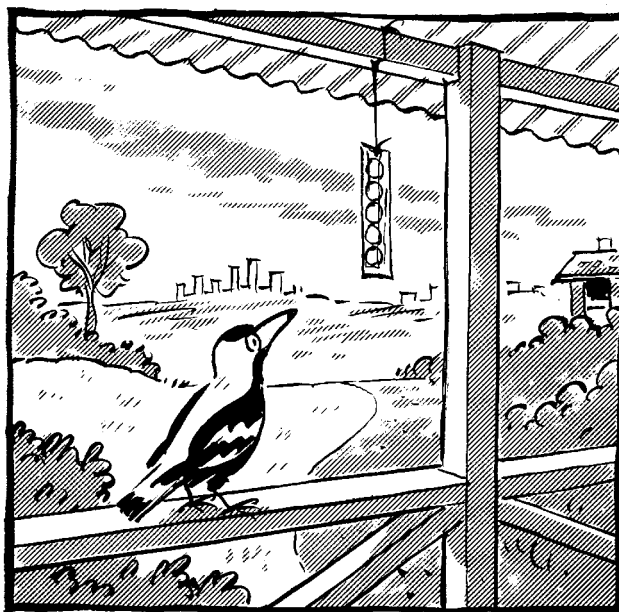
- 1) Choose three locations and site testers at these locations around your school or neighbourhood for 24 hours. Write on your tester/s the date, your name and the location.
- 2) Keep one tester in a clean plastic bag as your control.



ACTIVITY SHEET 7

MAKING A PARTICLE COLLECTOR (continued)

- 3) Design a results sheet with the date, the place you hung your particle collector, wind strength, wind direction, cloud cover, temperature and tester description. (Visit the Bureau of Meteorology website www.bom.gov.au to find the wind information for the last 24 hour period)
- 4) Remove the testers after 24 hours and record the information in your results sheet. (If you store five collectors in a plastic bag and place a new one out each day, you could compare the results on each particle collector to determine which days were high pollution days).

**ANALYSIS**

Compare all your particle collectors in the plastic bag:

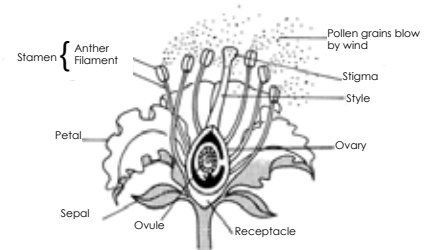
- 1) What conclusions can you make about the particulate air pollutants in the test areas?
- 2) Is there a difference in the amount of particles based on where the air strips were placed?
- 3) Can any of your observations be explained using your weather information?

ACTIVITY SHEET 8

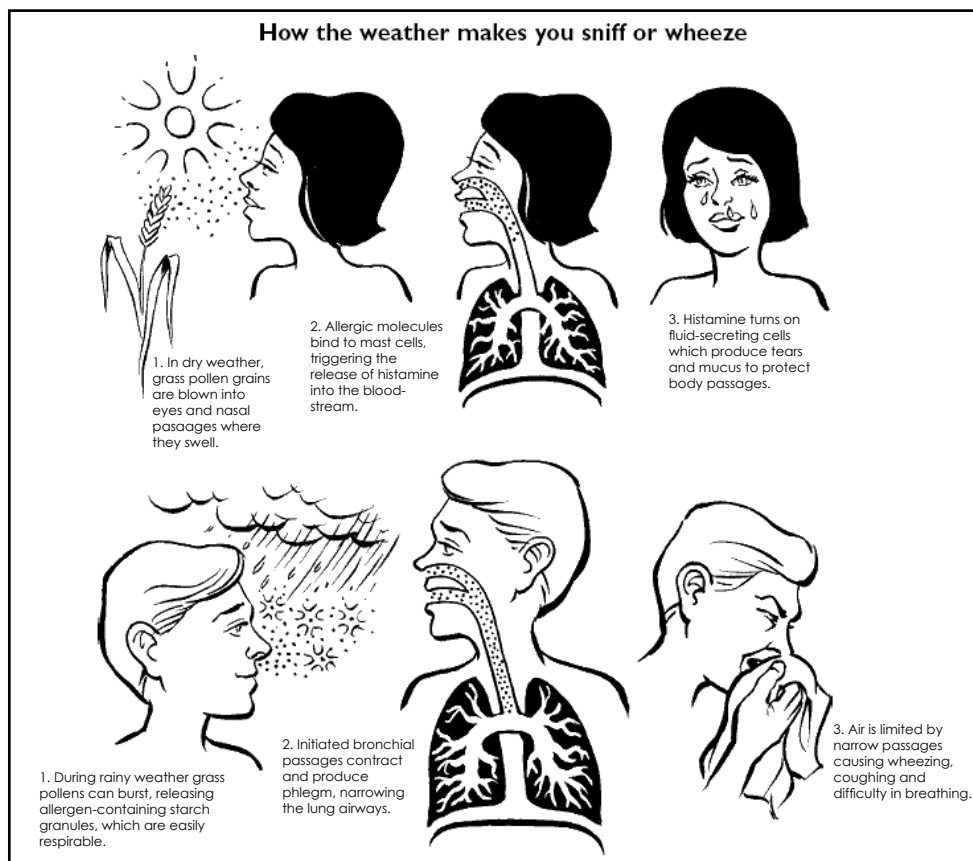
PEOPLE AND POLLEN

Flowering plants are divided into 'wind' pollinating and 'insect' pollinating. This project is concerned with wind pollinating plant types.

During the flowering season numerous pollen grains are released from the flower and blown around in the air. During dry weather pollen is easily blown into eyes and nasal passages, causing hayfever in sensitive people.



During and after rain (often thunderstorms) some grains of pollen burst, releasing the allergen-containing starch granules. These starch granules are small enough to be breathed in and can enter the bronchi (tubes to the lungs), where they may trigger allergic asthma.



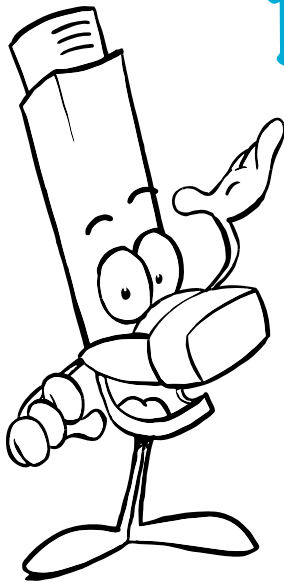
QUESTIONS

Use the diagram above to answer the following questions.

- 1) What enters the nasal passages to produce hayfever symptoms?
- 2) How is the hayfever trigger different to the asthma trigger?
- 3) What chemical does the body release in the hayfever response?
- 4) What effect does this chemical have on the human body?
- 5) Describe what occurs with the asthma responses.

ACTIVITY SHEET 9

Trigger Cards



Teachers, duplicate and cut up this sheet so that each student has a trigger card.

A collaborative project between the Environment Protection Authority and the Asthma Foundation of South Australia

Cigarette smoke	Running	Dogs
Panic	Pollen from flowers	Colds
Paint fumes	Football	Cats
Laughter	Dust	Flu
Dust mites	Netball	Rabbits
Excitement	Mould spores	Viruses
Petrol fumes	Soccer	Birds
Stress	Grasses	Infection (chest)
Spray deodorant	Air pollution	Perfume
Exhaust fumes from cars	Cleaning product fumes	





A collaborative project between the Environment Protection Authority
and the Asthma Foundation of South Australia

2010