




Components

	NAME	DESCRIPTION	AUDIENCE
	<i>Photochemical smog</i> teacher guide	The guide shows how a video may be used to engage students' interest in rates of reaction, by examining photochemical smog and associated reactions.	teachers
	<i>Photochemical smog</i> video	This introduces the concept of reaction rates by looking at the environmental problem of photochemical smog, and how factors affecting reactions involved are an issue in Perth.	students
	<i>Atmospheric chemistry</i> background sheet	This background sheet for teachers supports the video.	teachers

Purpose

To **Engage** students' interest in reaction rates by examining photochemical smog, and show how climate is a main cause of a pollution problem in Perth.

Outcomes

Students:

- identify some factors that cause an increase in photochemical smog reactions,
- link chemical reactions to applications in the real world, and
- formulate their own explanation about why photochemical smog is a problem in Perth.

Activity summary

ACTIVITY	POSSIBLE STRATEGY
Show the video, <i>Photochemical smog</i> .	class
Students complete focus questions.	students view the video
Class engages in follow-up discussion, as suggested in the teacher notes.	in groups or individually

Using the video

Play the video *Photochemical smog* and discuss it with students. Suitable discussion questions include:

- What features are common to cities where photochemical smog is a problem?
- What factors influence the development of photochemical smog?
- Primary pollutants are emitted into the air directly. What are the primary pollutants causing photochemical smog?
- Secondary pollutants form in the air when primary pollutants react. What are some of the secondary pollutants that are found in photochemical smog?
- A complex series of reactions takes place in photochemical smog. The secondary pollutants produced depend on how quickly chemical reactions are happening. Which chemical reactions are fastest during the morning, during the afternoon and during the evening?
- Why is Perth susceptible to photochemical smog?
- What measures can cities take to try to reduce photochemical smog?

Teachers may like to share with the class other interesting facts about photochemical smog and air pollution:

- Lichens can be used to provide an effective way of measuring air pollution in an area because they are sensitive to air pollutants.
- 20% of rush hour traffic is related to students being driven to and from school.
- Children are particularly vulnerable to air pollution as they breathe faster than adults and inhale more air per kilogram of body weight.
- Between 1998 and 2006, Perth exceeded the National Environmental Protection Measure (NEPM) for ozone levels, 13 times. Each of these times occurred during the months of January and February. The number of times ozone has exceeded NEPM levels is low, however the background ozone level in Perth has risen steadily over this time. Only a small rise of ozone is now needed to exceed NEPM levels.
- Photochemical smog causes a visible brown/white haze over Perth during summer months.

Technical requirements

A modern browser (eg Internet Explorer 9 or later, Google Chrome, Safari 5.0+, Opera or Firefox) is required to view the video. A high quality MP4 version of the video is available by download from the SPICE website.

The guide and background sheet require Adobe Reader (version 5 or later), which is a free download from adobe.com.

Image credits

Photochemical smog (teacher guide)

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Photochemical smog (video)

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Atmospheric chemistry (background sheet)

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Associated SPICE resources

Reaction rates 1: Photochemical smog may be used with related SPICE resources to address the broader topic of reaction rates.

DESCRIPTION	LEARNING PURPOSE
<i>Reaction rates (overview)</i> This learning pathway shows how a number of SPICE resources can be combined to teach the topic of reaction rates.	
<i>Reaction rates 1: Photochemical smog</i> A video shows how environmental factors can increase chemical reactions that occur in the atmosphere, to produce photochemical smog.	Engage
<i>Reaction rates 2: Investigating reaction rates</i> Students investigate how they can change the rate of a real-life chemical reaction in the laboratory.	Explore
<i>Reaction rates 3: Controlling reactions</i> An interactive learning object explains relationships between reaction rates, collision theory, energy profile diagrams and kinetic energy distribution graphs.	Explain
<i>Reaction rates 4: Enzymes</i> Students extend their knowledge of catalysts by studying how enzymes work.	Elaborate