Common ideas and the evidence.

Name: Class: Date:

Use these pages as you work through the ten screens. On each of screens 1 to 9, vote on the common idea before you read on, and vote again at the end of the screen.

SCREENS 1 TO 9 My votes

Tick one box for your first vote and one for your second vote. Then write what the evidence says about the idea: wrong, or half right.

SCREEN	COMMON IDEA	FIRST VOTE			SECOND VOTE			THE EVIDENCE SAYS
		Agree	Not sure	Disagree	Agree	Not sure	Disagree	
1	**All air pollution warms the planet.**	☐	☐	☐	☐	☐	☐	
2	**Particles from a chimney stay in the air as long as its carbon dioxide does.**	☐	☐	☐	☐	☐	☐	
3	**Smoke and soot trap heat like a blanket.**	☐	☐	☐	☐	☐	☐	
4	**Particles only change the climate where you can see the haze.**	☐	☐	☐	☐	☐	☐	
5	**Cleaning up air pollution will cool the planet.**	☐	☐	☐	☐	☐	☐	
6	**Clearing land changes the climate only through the carbon dioxide it releases.**	☐	☐	☐	☐	☐	☐	
7	**Particles only change the weather near where they are made.**	☐	☐	☐	☐	☐	☐	
8	**More carbon dioxide and a warmer climate will just make crops grow better.**	☐	☐	☐	☐	☐	☐	
9	**Antarctica now gets more snow in places, so its ice sheet must be growing.**	☐	☐	☐	☐	☐	☐	

SCREEN 1 Two kinds of pollution

Set the model to each of these, and write down the warming it shows.

SETTING	GREENHOUSE GASES	PARTICLES	WARMING SINCE 1850–1900
Today	100%	100%	
Gases only	100%	0%	
Particles only	0%	100%	

A coal power station gives out both carbon dioxide and sulfur dioxide. What does each do to the Earth's temperature?

SCREEN 2 How long do they last?

Move the time on the two tanks, and write down how much is left.

AFTER THE CHIMNEY STOPS	1 WEEK	1 YEAR	100 YEARS	1,000 YEARS
Particles left				
Carbon dioxide left				

Suppose a power station gives out 4 million tonnes of carbon dioxide in a year. About a quarter of it will still be in the air in 1,000 years. How many million tonnes is that?

Answer: _____ million tonnes

SCREEN 3 Bright and dark particles

Add the IPCC's best estimates for sulfate (−0.9 W/m²), organic carbon (−0.2 W/m²) and black carbon (+0.1 W/m²). What do the three come to?

Answer: _____ W/m²

Smoke and soot are often said to trap heat like a blanket. What does black carbon actually do?

_____

_____

SCREEN 4 Brighter clouds

Choose each kind of air in the cloud model, and write down what you see.

AIR	DROPLETS PER CM³	DROPLET RADIUS	BRIGHTNESS (ALBEDO)	DRIZZLE
Clean ocean air	50			
Polluted air	400			

In the model, the cloud keeps the same water. If it has 8 times as many droplets, how many times smaller is the radius of each droplet?

Answer: _____ times smaller

SCREEN 5 The hidden warming

Use the middles of the IPCC's ranges: greenhouse gases warmed the planet by 1.5 °C, and particles cooled it by 0.4 °C. What is the total warming in the model?

Answer: _____ °C

A country fits scrubbers that take the sulfur out of its power stations' smoke. What happens to the warming over the next few years?

_____

_____

_____

SCREEN 6 Clearing the land

A farmer burns a heap of cleared timber on a paddock with only 20% ground cover, and a strong wind blows the next day. What could go into the air?

Along the vermin fence, where do cumulus clouds form more often? Circle one for each season.

SEASON	WEST: FARMLAND	EAST: NATIVE VEGETATION
Winter	◯	◯
Summer	◯	◯

SCREEN 7 Moving the rain

In the late 20th century, sulfate pollution cooled the Northern Hemisphere. Why did the Sahel, far from most of the factories, get less rain?

SCREEN 8 Wheat in the Wheatbelt

Merredin's average April to October rainfall is 244 mm. Use French and Schultz's rule, 20 × (rainfall − 110), to find the water-limited yield.

Answer: _____ kg/ha

With 16% less growing-season rain, Merredin would get about 205 mm. What is the water-limited yield now?

Answer: _____ kg/ha

A 16% cut in the rain cut the water-limited yield by about what percentage?

Answer: _____ %

SCREEN 9 Ice sheets

Fresh snow has an albedo of about 0.9, so it soaks up about 0.1 of the sunlight. Dirty snow has an albedo of about 0.2. How many times as much sunlight does dirty snow soak up?

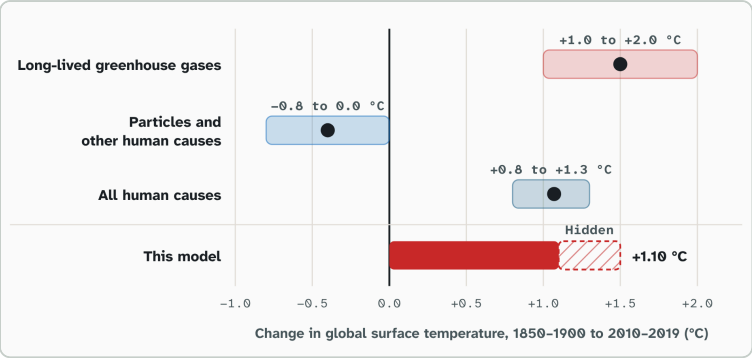
Answer: _____ times

Snowfall at Law Dome has risen by about 10% since the late 1960s. Why doesn't that show the Antarctic ice sheet is growing?

SCREENS 5, 8 AND 9

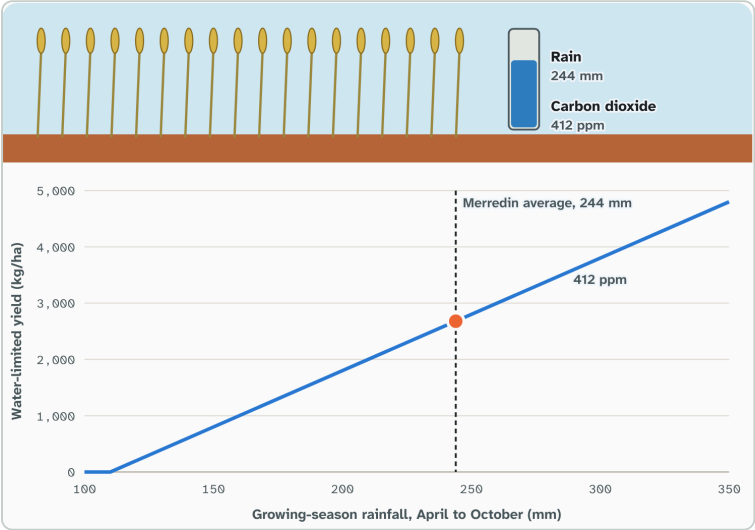
Reading the evidence

These charts come from the models on screens 5, 8 and 9.



The IPCC's warming budget, with the model at today's particles (screen 5)

The IPCC's range for the cooling from particles runs from 0.0 to 0.8 °C. Why does a range this wide matter for a country that is about to clean up its air?



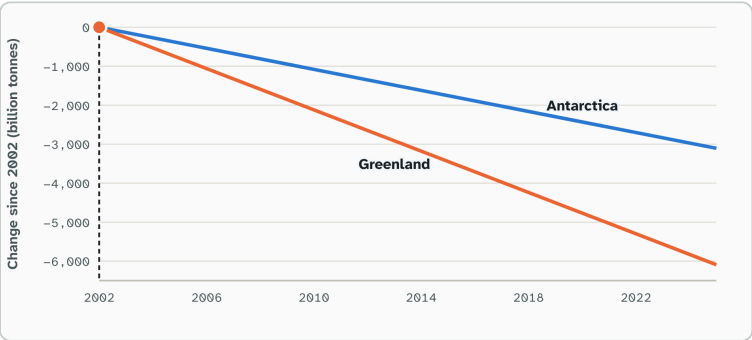
French and Schultz's rule for wheat, at 412 ppm of carbon dioxide (screen 8)

Read the water-limited yield at 150 mm and at 300 mm of growing-season rain. How many times as much grain can 300 mm grow?

150 mm: _____ kg/ha

300 mm: _____ kg/ha

_____ times as much



The ice lost from Antarctica and Greenland since 2002, at NASA's average rates (screen 9)

Use the lines to estimate how much ice each ice sheet had lost by 2012.

Antarctica: _____ billion tonnes

Greenland: _____ billion tonnes

SCREEN 10

My refutation

Write your refutation for the newsletter's Myth or fact? column. Use the four steps, in this order.

The common idea I chose, and the screen it is on:

Headline. A question works well.

1. The fact. State the truth in one or two sentences.

2. The common idea. Name it once, and say whether it is wrong or only half right.

3. Why it doesn't hold. Explain what the idea misses, with evidence from the lesson and where the evidence came from.

4. The fact again. Finish with the fact, and say what it means for your readers.

Check your refutation

- [ ] My first sentence states the fact, not the common idea.
- [ ] I name the common idea only once.
- [ ] My explanation uses at least one piece of evidence, and says where it came from.
- [ ] I finish with the fact.
- [ ] A Year 9 student could follow it.

Looking back. Which of your votes changed most, and what changed your mind? Which idea did you find hardest to give up?