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FRQ Practice 7.1

SUGGESTED SKILL

 *Scientific Experiments*

4.E

Explain modifications to an experimental procedure that will alter results.

EPA scientists performed an experiment where coal was burned in different chambers at varying temperatures to see how temperature impacts the amount of NO_x produced by coal combustion.

Explain how the results of the study would be expected to change if the same experiment were repeated with natural gas. (1 pt.)

Explain (1 pt.)

- The same trend in NO_x formation (increasing NO_x formation with increasing temperature) would be observed, but the amount of NO_x formed at any given temperature would be lower as natural gas emits far less NO_x than coal when combusted

FRQ Practice 7.2

Explain the relationship between NO₂ concentration and ozone concentration represented in this graph. **Describe** how the time of day impacts ozone formation. (2 pts.)

Explain (1 pt.)

- Ozone concentration peaks several hours after NO₂ concentration because NO₂ is a precursor to ozone; NO₂ is broken down into NO and a free oxygen atom by the sun's rays, leading to ozone formation when this free oxygen atom combines with molecular oxygen/ O₂ in the atmosphere

Describe (1 pt.)

- Ozone formation is driven by the photochemical/sunlight breakdown of NO₂, so formation is greatest during the afternoon when the sun's rays are strongest

SUGGESTED SKILL

 Data Analysis

5.B

Describe relationships among variables in data represented.


FRQ Practice 7.3

Explain what the arrows in each diagram illustrate about the impacts of a temperature inversion on air pollutants such as smog. (1 pt.)

Explain (1 pt.)

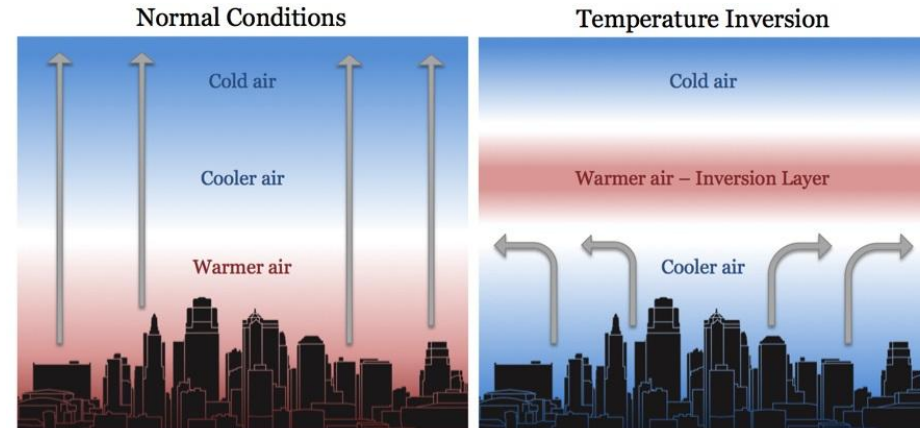
- Under normal conditions, the layer of air closest to earth's surface is the warmest, causing air to continually rise and expand, carrying air pollutants away from earth's surface; in a temperature inversion, there is a layer of cooler air trapped beneath a warmer air layer, preventing the cool air mass from rising which keeps air pollutants trapped close to earth's surface

SUGGESTED SKILL

 *Visual Representations*

2.C

Explain how environmental concepts and processes represented visually relate to broader environmental issues.



FRQ Practice 7.4

SUGGESTED SKILL

 Scientific Experiments

4.C

Describe an aspect of a research method, design, and/or measure used.

Students want to conduct an experiment to determine how road construction impacts the amount of PM in the air. They spread vaseline onto the bottom of six petri dishes and placed them at various distances from a road construction site and an existing road. The first three dishes were placed 50, 100, and 200 yards from the road construction site. The second group of dishes were placed 50, 100, and 200 yards from an active road (not under construction). (2 pts.)

Identify the control group used in this experiment.

Identify the likely dependent variable the students are measuring and **describe** how they could measure this variable.

Identify (1 pt.)

- The control group consists of the three dishes placed at various distances from the active road

Identify and Describe (1 pt.)

- The dependent variable is the amount of particulate matter collected on each dish. This could be measured by placing each dish under a microscope or magnifying glass and counting the number of particles observed.

FRQ Practice 7.5

SUGGESTED SKILL
Data Analysis

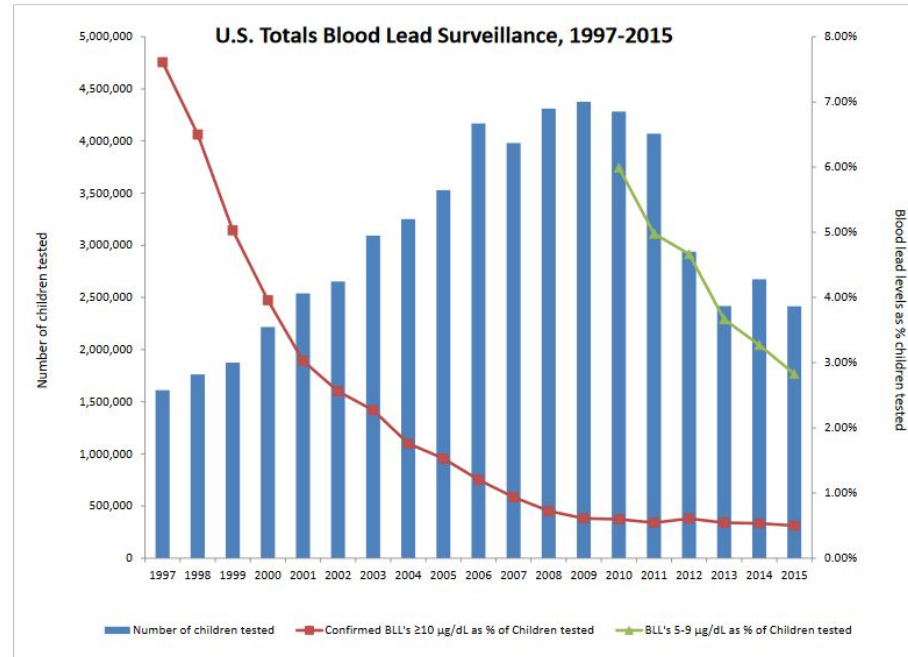
5.C

Explain patterns and trends in data to draw conclusions.

Explain a cause for the trend in the confirmed BLLs (blood lead levels) above 10 micrograms/dL as a % of children tested from 1997 to 2015.


Explain (1 pt.)

- The percentage of children with blood lead levels above 10 micrograms/dl has dropped dramatically from 1997 to 2015. Since the EPA banned lead in gasoline and paint in the 1970's, children born further and further from this time are likely to be exposed to lower levels of lead in their homes and environments.
- As the EPA/other health-related groups have raised awareness about the danger of lead-based paint, removal of lead-based paint in homes has led to the decline in blood lead levels in children from 1997 to 2015.



FRQ Practice 7.6

SUGGESTED SKILL

 Environmental Solutions

Make a claim about the effectiveness of the Obama CAFE standards as an effort to reduce the levels of NO_x in urban areas. **Justify** your claim with data from figure 1.

7.D

Use data and evidence to support a potential solution.

Make a claim (1 pt.)

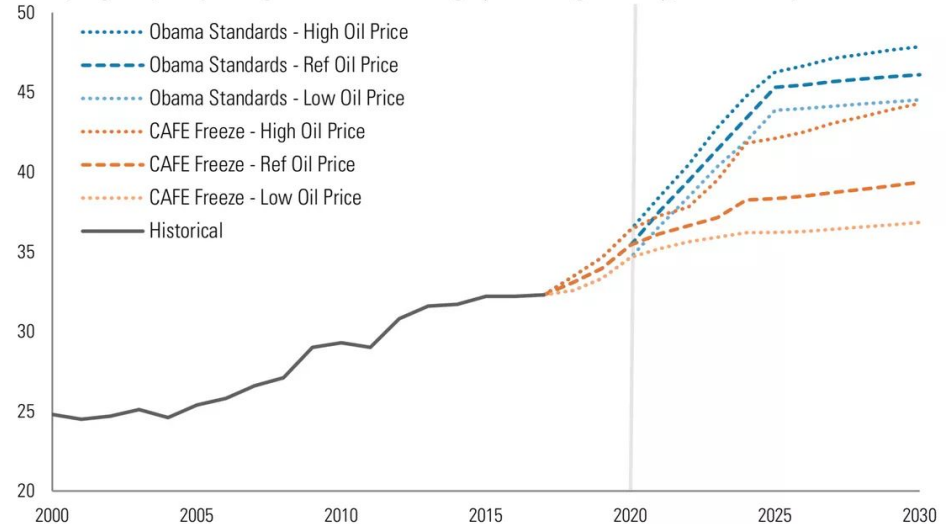
- The Obama CAFE standards raise the average fuel efficiency of new passenger vehicles, which makes them an effective way to reduce the levels of NO_x in urban areas

Justify (1 pt.)

- Data in figure 1 indicate that the Obama CAFE standards would raise fuel efficiency standards significantly compared to historical standards. When vehicles have higher fuel efficiency, they burn less gasoline and release less NO_x per mile traveled

Figure 1: Impact of CAFE rollbacks on fleetwide fuel economy

Miles per gallon, new passenger vehicle fleet average (cars and light trucks), AEO2018 oil price scenarios



Source: EIA, NHTSA, Rhodium US Climate Service

FRQ Practice 7.7

Scientists want to examine how acid deposition impacts crustacean organisms, such as isopods (rolly pollies) in the soil of temperate forests. To explore this question, they collect rainwater with different pH values and mist the different rainwater samples onto pots of soil taken from a temperate forest.

Throughout the experiment, the scientists record the number of living and dead crustaceans found in each pot of soil.

- Identify** a likely hypothesis for this experiment.
- Identify** the independent variable for this experiment.
- Explain** how the results of this experiment would change if crushed limestone were added to each soil pot.

Identify hypothesis(1 pt.)

- As the pH of rainwater decreases, the number of dead crustaceans found in a pot of soil will increase

Identify independent variable

- The pH of the rainwater

Explain (1 pt.)

- If crushed limestone were added to each pot of soil, fewer dead crustaceans would be found in pots of soil receiving highly acidic rainwater; this is because limestone would buffer the pH of the soil receiving the acidic rainwater, shifting pH back into the range of tolerance for crustaceans or preventing their shells from being dissolved by the acidic conditions

SUGGESTED SKILL

 *Scientific Experiments*

4.B

Identify a research method, design, and/or measure used.

FRQ Practice 7.8

Read the [passage](#) from NAMEPA (North American Marine Environment Protection Association)

Describe the reasoning behind the author's claim that whales may be able to adapt to the increased levels of aquatic noise pollution. (1pt.)

Describe (1 pt.)

- The author claims that whales may be able to adapt to increased levels of aquatic noise pollution because both wild and captive whales have shown behavioral adaptations to increased noise levels in the water, such as increasing the volume of their calls or distancing themselves from the source of noise.

SUGGESTED SKILL

 *Text Analysis*

3.C

Describe the author's reasoning (use of evidence to support a claim).