

## Selected Properties Of Earth Atmosphere

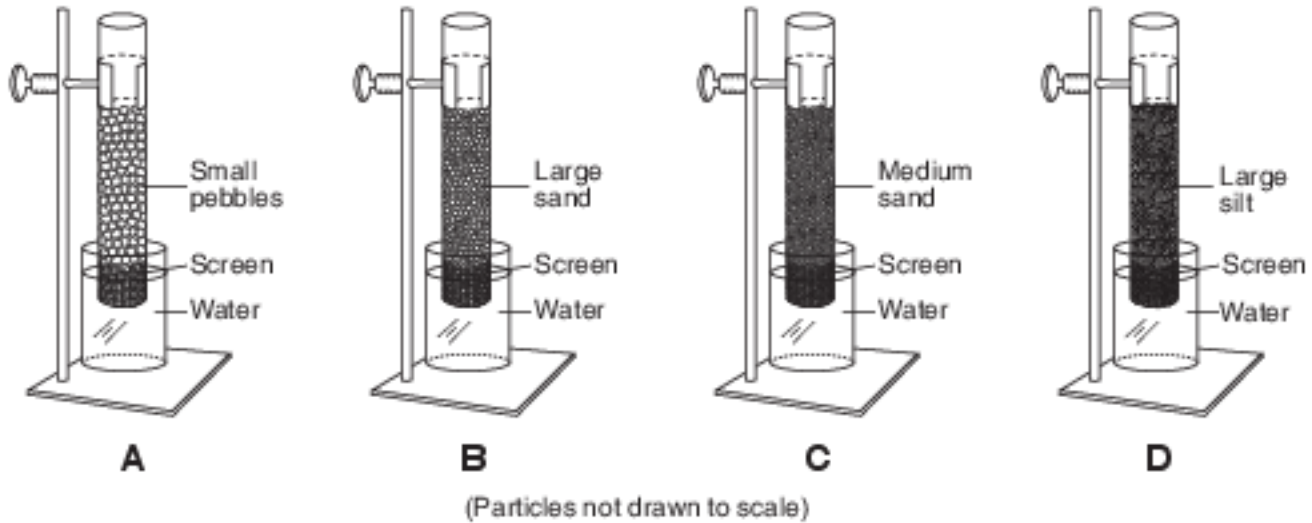
1 In which atmospheric temperature zone does most precipitation occur?

- (1) thermosphere                      (3) stratosphere  
 (2) mesosphere                        (4) troposphere

2 Which changes in air temperature and atmospheric pressure will normally be recorded by a weather balloon when it is released at Earth's surface and rises through the troposphere?

- (1) a decrease in both air temperature and atmospheric pressure  
 (2) a decrease in air temperature and an increase in atmospheric pressure  
 (3) an increase in both air temperature and atmospheric pressure  
 (4) an increase in air temperature and a decrease in atmospheric pressure

Base your answers to questions 3 on the diagrams below and on your knowledge of Earth science. The diagrams represent four columns, labeled A, B, C, and D, that are partially filled with equal volumes of dry, sorted sediments. A fine wire mesh screen covers the bottom of each column to prevent the sediment from falling out. The lower part of each column has been placed in a beaker of water.



3 Capillarity will cause water to rise highest in column

- (1) A    (3) C  
 (2) B    (4) D

4 Most of Earth's weather events take place in the

- (1) thermosphere                              (3) stratosphere  
 (2) mesosphere                                (4) troposphere

5 The ozone layer protects life on Earth by absorbing harmful ultraviolet radiation. The ozone layer is located between 17 kilometers and 35 kilometers above Earth's surface in which atmospheric temperature zone?

- (1) troposphere
- (2) stratosphere
- (3) mesosphere
- (4) thermosphere

6 Most of the hurricanes that affect the east coast of the United States originally form over the

- (1) warm waters of the Atlantic Ocean in summer
- (2) warm land of the southeastern United States in summer
- (3) cool waters of the Atlantic Ocean in spring
- (4) cool land of the southeastern United States in spring

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Base your answers to questions 7 on the map below, which shows the position of the jet stream relative to two air masses and a low-pressure center (L) over the United States.



7 In which layer of the atmosphere is this jet stream located?

- (1) thermosphere
- (2) mesosphere
- (3) stratosphere
- (4) troposphere

8 As altitude increases in the troposphere and stratosphere, the air temperature

- (1) decreases in the troposphere and increases in the stratosphere
- (2) decreases in both the troposphere and stratosphere
- (3) increases in the troposphere and decreases in the stratosphere
- (4) increases in both the troposphere and stratosphere

Base your answers to questions 9 on the passage below and on your knowledge of Earth science.

Comets and Asteroids

Since comets and asteroids orbit the Sun, both are part of our solar system. Asteroids are rocky objects that vary greatly in size. Most asteroids follow orbits between 300 and 600 million kilometers from the Sun, but several have been pulled from this region by

the gravitational attraction of nearby planets. Many of these dislodged asteroids have struck both Earth and the Moon, causing the large impact craters that are visible on the surfaces of both bodies.

Comets have often been described as “dirty snowballs” and occupy highly eccentric orbits, traveling from near the Sun to far beyond the orbits of the outer planets. As they move through space, comets leave a debris trail of mostly dust-sized particles. When Earth passes through this debris, a meteor shower occurs, often filling the night sky with “shooting star” trails as they burn up in the atmosphere 50 to 80 kilometers above Earth’s surface.

9 In which temperature zone of Earth’s atmosphere will most meteors burn up?

- (1) troposphere
- (2) stratosphere
- (3) mesosphere
- (4) thermosphere

10 At what approximate altitude in the atmosphere can stratospheric ozone be found?

- (1) 10 km
- (2) 30 km
- (3) 70 km
- (4) 100 km

Base your answers to questions 11 on the data table below and on your knowledge of Earth science. The data table shows how the destruction of the ozone layer in Earth’s atmosphere has affected the amount of ultraviolet radiation reaching Earth’s surface beneath the areas of ozone destruction.

**Ozone Loss and Ultraviolet Radiation**

Ozone Destruction (%)	Average Increase in Ultraviolet Radiation Reaching Earth’s Surface (%)
0	0
5	5
10	12
15	20
20	28
25	36
30	47
35	60
40	76

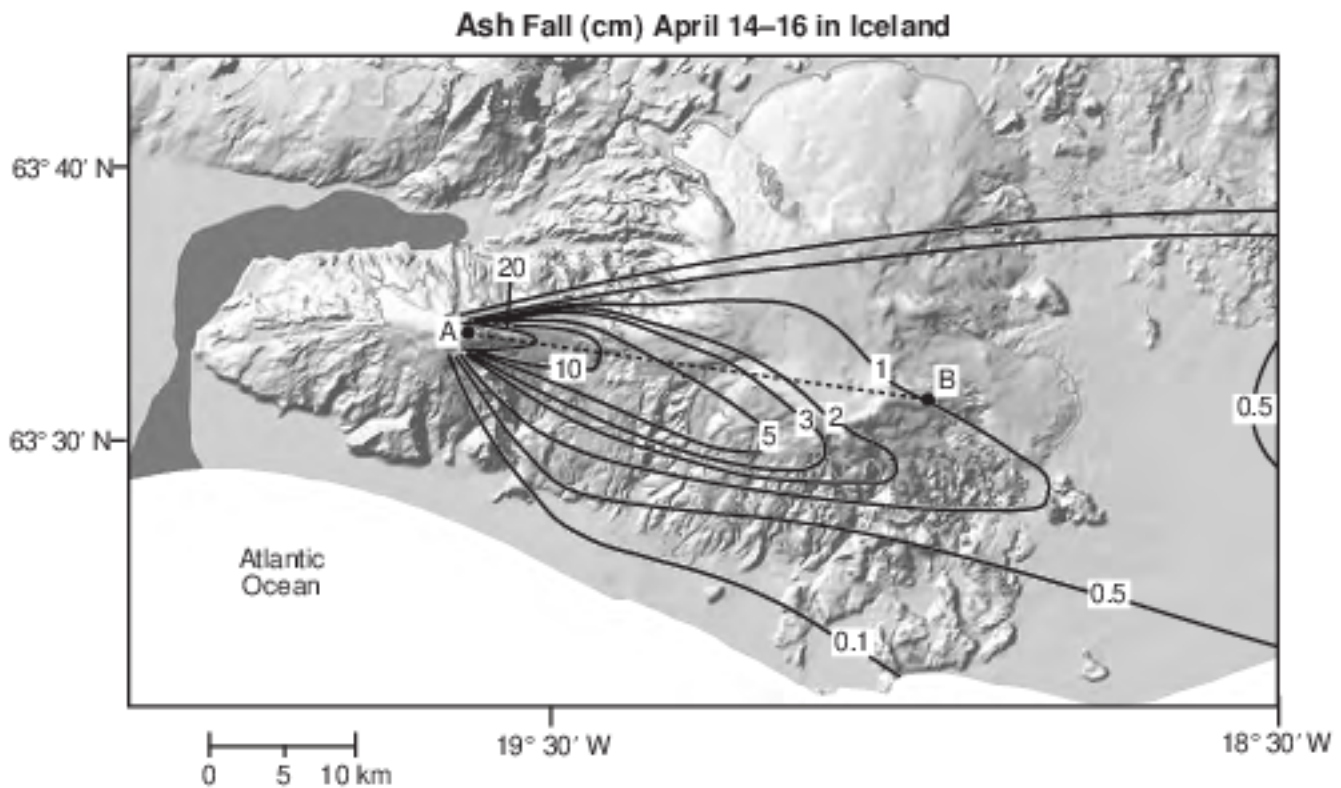
11 The ozone layer is mostly concentrated between 20 and 25 kilometers above Earth’s surface. State the name of the atmospheric temperature zone layer where this ozone concentration can be found. [1]

Base your answers to questions 12 on the reading passage and map below and on your knowledge of Earth science. The passage provides information regarding the eruption of a volcano in Iceland. The map shows the thickness of ash deposits, in centimeters (cm), during the first three days of the eruption. Point A, representing the volcano's location, and point B, representing a location on Earth's surface, are connected with a reference line.

### Iceland Volcano Eruption Spreads Ash Cloud over Europe

On April 14, 2010, Eyjafjallajökull volcano, located in southern Iceland, explosively erupted, sending large volumes of volcanic ash high into the atmosphere. Much of the ash fell quickly to Earth, as seen in the map, but large quantities remained airborne and spread over Europe. Most of the ash was transported within the atmosphere below 10 kilometers. Air traffic across the Atlantic and throughout Europe was severely

disrupted, as airlines were forced to keep jet aircraft on the ground.



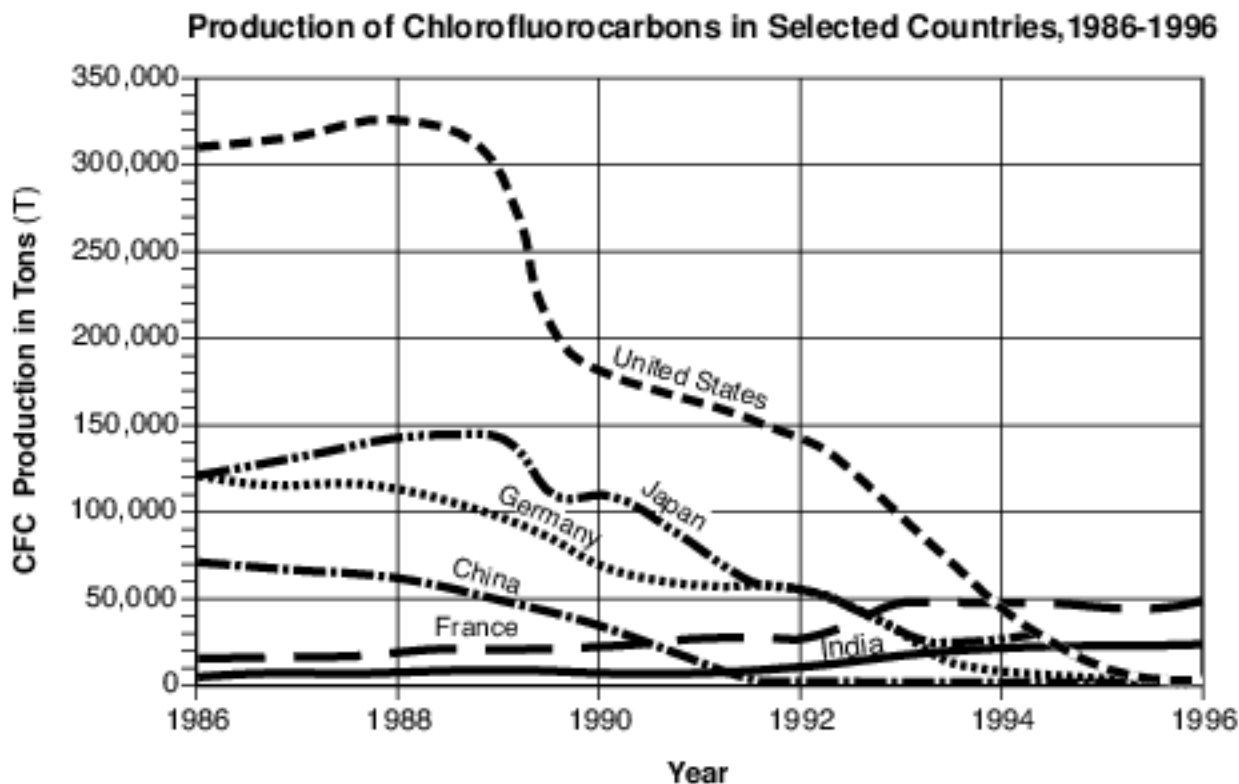
Source: Ash generation and distribution from the April-May 2010 eruption of Eyjafjallajökull, Iceland, Gudmundsson et al., *Scientific Reports*, August 14, 2012 (adapted)

12 Identify the atmospheric layer within which most of the volcanic ash was transported. [1]

Base your answers to questions 13 on the passage and graph below and on your knowledge of Earth science. The graph shows changes in the amount of chlorofluorocarbon production, in tons per year (T/y), by some countries over a 10-year period.

CFCs and Ozone

CFCs (chlorofluorocarbons) are chemicals that threaten to destroy stratospheric ozone. CFCs were first manufactured in 1928 to be used as chilling agents in refrigerators. In later years, they were used for cleaning electrical circuit boards and to make foam for insulation. Unfortunately, scientists found that these chemicals escaped into the atmosphere and rose to the stratosphere. In the stratosphere, intense ultraviolet (UV) radiation broke the CFCs down, producing chlorine, a gas that reacts with and destroys ozone. In 1974, two scientists identified the depletion of stratospheric ozone from the release of CFCs. After this discovery, 27 countries agreed to reduce production of CFCs, because ozone in the stratosphere protects all life from the Sun's most damaging UV rays.



Adapted from: Gore, Al. *An Inconvenient Truth*

- 13 Identify the name of the atmospheric temperature zones directly below and directly above the atmospheric layer in which intense UV radiation breaks down CFCs. [1]  
 \_\_\_\_\_ and \_\_\_\_\_

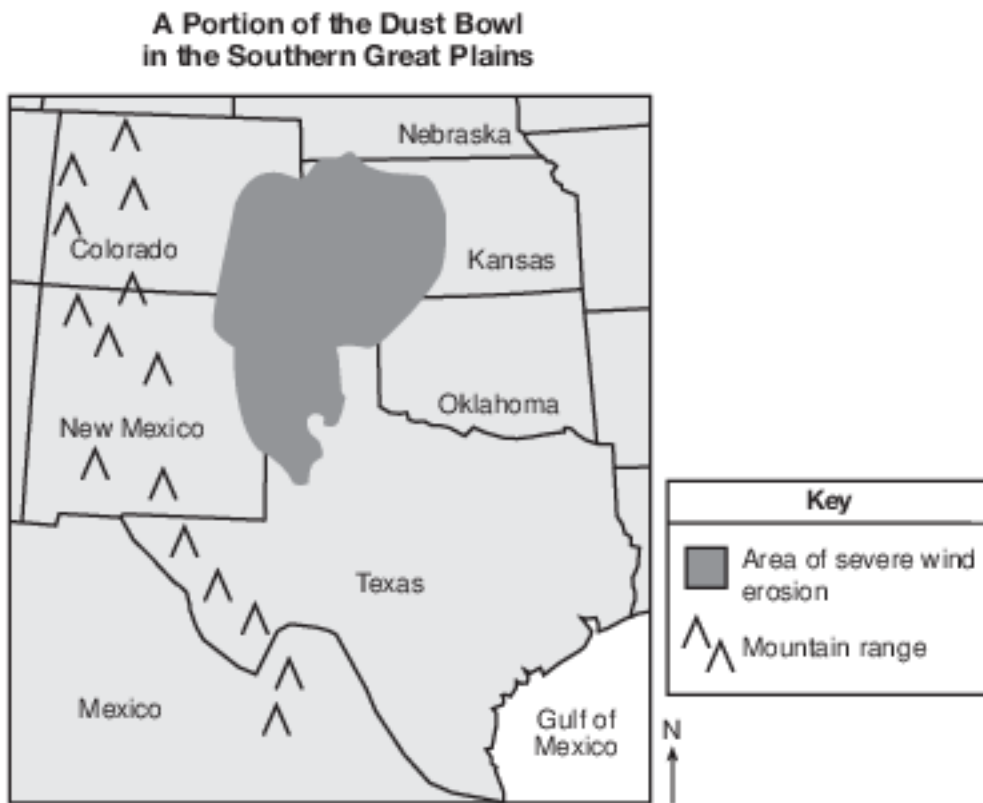
Base your answers to questions 14 on the passage and map below and on your knowledge of Earth science. The map shows a portion of the Dust Bowl in the southern Great Plains.

### The Dust Bowl

In the 1930s, several years of drought affected over 100 million acres in the Great Plains from North Dakota to Texas. For several decades before this drought, farmers had plowed the prairie and loosened the soil. When the soil became extremely dry from lack of rain, strong prairie winds easily removed huge amounts of soil from the farms, forming dust storms. This region was called the Dust Bowl.

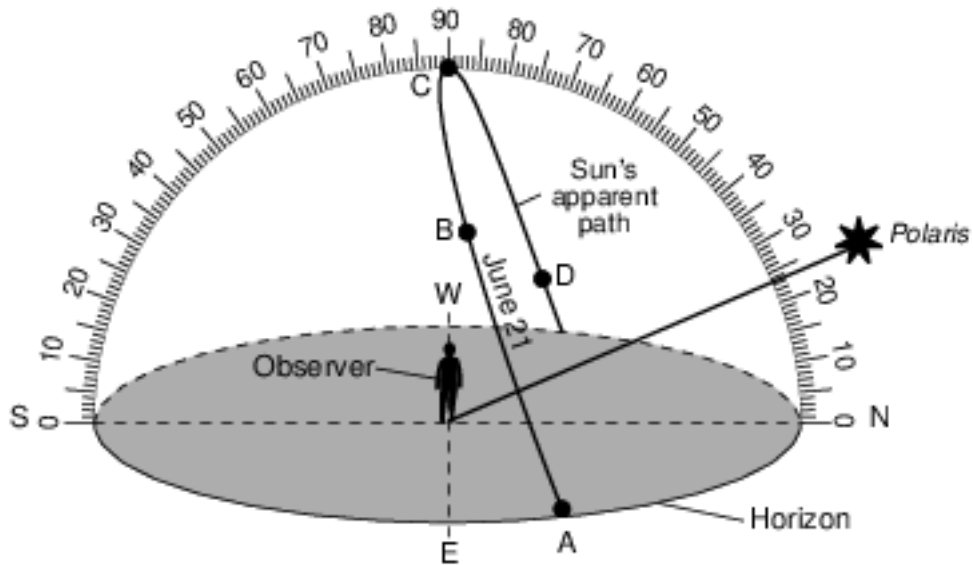
In the spring of 1934, a windstorm lasting a day and a half created a dust cloud nearly 2000 kilometers long and caused “muddy rains” in New York State and “black snow” in Vermont. Months later, a Colorado storm carried dust approximately 3 kilometers up into the atmosphere and transported it 3000 kilometers, creating

twilight conditions at midday in New York State.



- 14 Identify the name of the layer of the atmosphere in which the dust particles were transported by the Colorado storm to New York State. [1]

Base your answers to questions 15 on the diagram below and on your knowledge of Earth science. The diagram represents the apparent path of the Sun across the sky as seen by an observer on Earth's surface on June 21. Points A, B, C, and D represent positions of the Sun at different times of the day. The angle of Polaris above the horizon as seen in the nighttime sky is indicated.



- 15 Describe one piece of evidence from the diagram that supports the inference that the observer is located at the Tropic of Cancer. [1]

## Answer Keys

1 4

2 1

3 4

4 4

5 2

6 1

7 4

8 1

9 3

10 2

11 Allow 1 credit for stratosphere.

12 Allow 1 credit for troposphere.

13 Allow 1 credit for troposphere and mesosphere.

14 Allow 1 credit for troposphere.

15 Allow 1 credit. Acceptable responses include, but are not limited to:

- — The altitude of Polaris is at  $23.5^\circ$  or  $23\frac{1}{2}^\circ$ .
- — The noon Sun for June 21 is directly overhead.
- — The highest Sun position is at  $90^\circ$  (zenith) on June 21.
- — the angle/altitude of Polaris
- Note: Do not allow credit for  $23\frac{1}{2}^\circ$  N or  $23.5^\circ$  North, because a compass direction should not be included with an altitude value.