Science Conflicting Viewpoints Questions: Strategies and Sample Questions

- Understand the topic and basic premise of each viewpoint, theory, or hypothesis.
- Identify the reasoning involved in the viewpoints and extend that reasoning to other logical conclusions based on it.
- Be aware of what might strengthen or weaken a viewpoint.
- Analyze the specifics of each viewpoint and the argument supporting it.
- Mark the differences and similarities in the viewpoints.
- Look for what might be suggested or implied by an argument.
- Reason from new information.

Sample passage:

Various theories have arisen to explain why the earth's protective ozone layer has been depleted. Following are just three such theories that might explain the phenomenon.

Theory 1

The overall global warming of our planet is primarily responsible for the dissipation of the protective ozone layer in our upper atmosphere. The huge amounts of air pollutants, such as nitrous oxide and sulfur oxide gases, from factories and automobiles have caused the greenhouse effect, which causes a general global warming. Ozone (O_3), which normally resides in an upper atmospheric layer, is heated by this greenhouse effect. In turn, it rises, thinning out as it does so because it has a greater and greater surface area to cover as it moves farther from the earth. The phenomenon is similar to the thinning out of a balloon's surface material as it is inflated. The natural mechanism for replenishing this layer does not keep up with this thinning effect, as surface area is proportional to the square of the radius, so the layer appears thin and depleted.

Theory 2

The thinning of our planet's protective ozone layer is just another natural occurrence, resulting from the periodic reversal of the magnetic poles of our planet. From the geologic record, it is known that the earth's magnetic field has reversed itself at least 150 times in its history. The core of the earth, which contains a large amount of molten iron, is in constant flux, which causes the ongoing changes in the earth's planetary magnetic field. This ongoing, natural planetary magnetic field change, in turn, results in dramatic weather pattern variance, including wide swings in lightning frequency and strength. Lightning, of course, is directly responsible for the natural production of ozone. Lightning is known to strike diatomic oxygen molecules, breaking them into single oxygen atoms, called radicals, which quickly bond to other diatomic oxygen molecules to form triatomic ozone, O_3.

Theory 3

The relatively thin ozone layer in our upper atmosphere, which protects us from harmful ultraviolet radiation of the sun, is being depleted because human-produced chemicals interfere with the natural production cycle of ozone. Chlorofluorocarbons, or CFCs, found in many aerosol propellants and refrigerants introduce chlorine radicals into our upper atmosphere. These chlorine radicals bond with lone oxygen atoms, atoms produced by the action of lightning on oxygen molecules, atoms naturally destined to join with diatomic oxygen to form ozone, in our atmosphere. Thus our ozone layer is not replenished at an adequate rate, and the observed thinning results.

Understand the topic and basic premise of each viewpoint, theory, or hypothesis. As you read each viewpoint, theory, or hypothesis, focus on "what point the scientist is trying to make."

Sample:

1. The argument made in Theory 2 is based on all of the following EXCEPT:

F. the earth's magnetic field is dynamic.
G. lightning is responsible for splitting up oxygen molecules.
H. ozone, O_3, is formed when O_2 joins with a lone oxygen radical.
J. the changing frequency and strength of lightning is determined by the protective ozone layer.

First focus on Theory 2 and underline or circle the words *argument, based,* and *EXCEPT.* Choices **F, G,** and **H** are known facts and are stated as such in the passage. According to the passage, however, it is the changes in the magnetic field, not the ozone layer, that determine the frequency of lightning, so **J** is the correct answer.

Identify the reasoning involved in the viewpoints and extend that reasoning to other logical conclusions based on it. Understanding the main point and the line of reasoning is key to drawing a logical conclusion.

Sample:

2. A logical conclusion that can be drawn from Theory 3 is that:

A. ultraviolet rays continue to bombard us from the sun.
B. decreasing the use of CFCs would help stabilize the ozone layer.
C. ozone is a very stable material.
D. chlorine gas, Cl, is as harmful to the ozone layer as are lone chlorine radicals.

Always circle or underline the main point of each theory, viewpoint, or hypothesis. The main point of Theory 3 is that CFCs are the cause of the ozone layer's depletion. Therefore, the logical conclusion would be that decreasing the use of CFCs would help stabilize the ozone layer, choice **B.**

Be aware of what might strengthen or weaken a viewpoint. You'll need to recognize what points could logically support an argument and those that could logically call it into question or that could be a valid criticism of it.

Sample:

3. All of the following, if true, would weaken the argument presented in Theory 1 EXCEPT:

F. the temperature at the altitude of the ozone layer causes thermal expansion.

G. the ozone layer does not thin out as it expands; all gases thicken and cool as they expand.

H. ozone is a denser gas than the atmospheric oxygen and would tend to fall closer to the earth under the pull of the earth's gravity.

J. the ultraviolet shielding that the ozone layer is responsible for contributes to the greenhouse effect.

First, circle or underline the words *weaken* and *EXCEPT.* Next, focus on Theory 1. Choices **G, H,** and **J** would weaken the argument because they contradict the assumptions made in Theory 1. The correct answer is choice **F** because it is the only point that would support the argument, by reinforcing the expansion theory.

Analyze the specifics of each viewpoint and the argument supporting it. As you analyze, try to look at each of the pieces of the argument and how they fit together.

Sample:

4. To test the hypothesis put forth in Theory 1, useful experiments would examine all of the following EXCEPT:

A. the effects of nitrous oxide and sulfur oxide gases on the greenhouse effect.
B. the effect of temperature on the formation of ozone.
C. the density of the ozone at varying altitudes.
D. whether ozone contributes to the greenhouse effect.

To know what "useful experiments would examine," you need to carefully analyze Theory 1. Again, note the word *EXCEPT.* From the information and argument made in Theory 1, choices **A, B,** and **C** are all relevant subjects for experiments. But ozone is *affected by* the greenhouse effect, not the other way around, so an experiment concerning ozone's contribution *to* the greenhouse effect would not be useful. Choice **D** is the correct answer.

Mark the differences and similarities in the viewpoints. Notice the conflicts and contradictions. As you read each viewpoint, focus on what points make it different from the others and what points make it the same as the others.

Sample:

5. Theories 1 and 3 are similar in that they both:

F. blame the depletion of the ozone layer on chlorofluorocarbons.
G. base their arguments on human interference.
H. rely on the greenhouse effect as an explanation for the depletion of the ozone layer.
J. discuss the effect of lightning on the ozone layer.

Theories 1 and 3 both base their arguments on human interference, choice **G.** Theory 1 concerns huge amounts of pollutants, and Theory 3 concerns human-produced chemicals.

Look for what might be suggested or implied by an argument. Even though something isn't directly stated, you may arrive at it by reasoning or "reading between the lines."

Sample:

6. Which of the theories imply that the depletion of the earth's protecting ozone layer CANNOT be stopped?

I. Theory 1
II. Theory 2
III. Theory 3

A. I only
B. II only
C. III only
D. I, II, and III

Since Theories 1 and 3 blame the ozone depletion on human interference, it is reasonable to assume then that humans should be able to stop this interference. But Theory 2 is based on a natural, repeating occurrence that is seemingly impossible for humans to intervene in. Therefore, Theory 2 implies that ozone depletion cannot be stopped, and choice **B** is the correct answer.

Reason from new information. Sometimes new information, information not included in the passage, is introduced in a question. You'll need to apply this information and reason from it.

Sample:

7. If lightning is directly responsible for action on the oxygen molecules, as mentioned in Theories 2 and 3, and if the frequency and strength of the lightning is weakened, which of the following must also be true if Theory 3 is true?

F. The greenhouse effect would be an even more plausible explanation for ozone depletion.
G. Human-produced chemicals could not be responsible for the ozone depletion.
H. The ozone layer would be depleted at an even faster rate.
J. The surface area of the ozone layer would be proportional to the cube of its radius.

If the frequency and strength of lightning is weakened, less ozone is produced. If Theory 3 is true, less ozone is produced. If both are true, then the ozone layer would be depleted at an even faster rate, choice **H.**