



Survey Instrument: Student Perception Towards Responsible Chemical Use

Likert-type scale

Each of the statements below expresses a feeling toward chemical use in consumer products. Please rate each statement on the extent to which you agree by checking the appropriate box. For each, you may:

A	B	C	D	E
Strongly agree	Agree	Undecided	Disagree	Strongly Disagree

	A	B	C	D	E
1. Chemical use in consumer products is appropriate.					
2. I don't like chemical use in consumer products.					
3. I think a lot about chemical use in consumer products.					
4. I regularly check product labels for certain chemicals before purchasing the product.					
5. It is important to know what chemicals are in the products we buy.					
6. I can make a impact on environmental chemical pollution through my purchasing decisions.					
7. The government does a good job of keeping us safe from chemical hazards in consumer goods.					
8. My actions are an important part of responsible chemical use.					
9. I am nervous about the safety of certain products that I buy.					
10. I don't need to know what chemicals are in the things I buy; I feel that they're safe.					
11. Chemical safety refers only to hazards to human health.					
12. I am nervous about the impact my actions might have on the environment.					
13. Chemicals are mostly bad.					
14. Knowing more about chemical use in consumer products influences my behavior.					

Semantic differential scale

Below are some scales on which we would like you to rate your feelings toward chemical use. On each scale, you can rate your feelings toward chemical use as an A, B, C, D, or E. There are no correct answers. Also, some of the scales seem to make more sense than others. Don't worry about it. Just rate your feelings toward biology on these scales as best you can. Please don't leave any scales blank.

Chemical Use Is:

15.	Good	A	B	C	D	E	Bad
16.	Clean	A	B	C	D	E	Dirty
17.	Worthless	A	B	C	D	E	Valuable
18.	Cruel	A	B	C	D	E	Kind
19.	Pleasant	A	B	C	D	E	Unpleasant
20.	Safe	A	B	C	D	E	Unsafe
21.	Necessary	A	B	C	D	E	Unnecessary
22.	Fair	A	B	C	D	E	Unfair

Survey adapted from: http://www.flaguide.org/tools/attitude/biology_attitude_scale.php

Russell, J. & Hollander, S. (1975). A biology attitude scale. *The American Biology Teacher*, 37 (5), 270-273.



Assessment Instrument: Student Understanding of Associated State

Instructor version: Instructor should select questions that seem more relevant to their students and incorporate on an exam - correct answers are marked in red

HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Sample Question 1: Bloom's Level 1

Pick the answer below that most correctly describes a common way that Triclosan makes its way into the environment:

- A. Triclosan made in soil bacteria -> environment
- B. Triclosan sprayed on fruit -> groundwater -> environment
- C. Triclosan from chemical companies -> environment
- D. Triclosan from toothpaste and hand soap into the sink -> water treatment plants -> environment**
- E. Triclosan from hospital bedsheets -> water treatment plants -> environment

Sample Question 2: Bloom's Level 4

Triclosan is an environmental toxin found in many consumer products. It finds its way into the environment largely from our sinks and landfills. Examine and evaluate the following 3 proposed plans for reducing the impact of

Proposed solution #1: Build a series of very large water treatment plants, pump environmental groundwater into them, and clean out the Triclosan

Proposed solution #2: Educate the public on the potential hazards associated with Triclosan release into the environment and build and sell Triclosan filters that consumers could install into their sinks

Proposed solution #3: Educate the public on the potential hazards associated with Triclosan release into the environment and create enforceable legislation to govern its use

Rank the plans in order of most to least likely to be successful long-term at reducing Triclosan's environmental footprint:

- A. 3, 2, 1**
- B. 3, 1, 2
- C. 2, 1, 3
- D. 1, 2, 3
- E. 1, 3, 2

HS-LS1-1 & AP Biology Learning Objectives 4.1.7; 4.B.1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

Sample Question 1: Bloom's Level 1

Pick the answer below that correctly describes one relationship between DNA, proteins, and their chemical components:

- A. DNA encodes RNA encodes protein
- B. proteins encode DNA encode RNA
- C. amino acids in DNA are responsible for its distinctive structure
- D. RNA encodes DNA encodes proteins
- E. the nucleic acids in proteins encode their three dimensional structures

Sample Question 2: Bloom's Level 4

An enzyme based-biosensor was developed to measure the levels of the chemical Triclosan. Triclosan binds to the enzyme and inhibits its ability to convert the compound NADH to the compound NAD⁺. A student working on this project noticed that the last batch of enzyme that was purified from the bacteria that produced it still converted NADP to NAD⁺ at rates comparable to previous batches but no longer seemed to be sensitive to Triclosan.

Pick the answer choice that provides the most reasonable hypothesis for why the enzyme is no longer sensitive to

- A. the new batch of enzyme is working too fast to detect its activity
- B. the DNA encoding the new enzyme could have mutated
- C. the student added too little of the new enzyme to the reactions
- D. there was too much Triclosan added to the assay of the new enzyme
- E. the protein encoding the gene for the enzyme mutated