

Background Information: For thousands of years, clams have been dug up along the beaches of California for food, first by Native Americans, and these days often by tourists. Today, the clam population is at an all-time low, and many scientists agree that several species of clams will inevitably become extinct in California. Dr. Kim, a marine biologist, believes that DDT (a pesticide) dumped into the ocean during the 1950's and 60's could be another factor in the dramatic decrease in the clam population.

- A) Define the “**Tragedy of the Commons**” and identify the person who coined the term.
- B) Write an argument to explain **why** the decline in the clam population could be considered an example of a **tragedy of the commons**.
- C) Identify and describe **two strategies** that could be employed to prevent any decline in the clam population due to a tragedy of the commons.
- D) **Design a controlled experiment** to support or refute the claim by Dr. Kim that DDT is playing a role in the clam's demise. Include a detailed description of the experiment that includes the hypothesis being tested, a description of the data being collected, and identification of the dependent and independent

variables in the experiment.

2. After reading the following editorial from *The Fremont Daily*, answer the questions that follow.

IS RECYCLING SMART ECONOMICS?

Debates about recycling often become highly charged and passionate. Over the past decade some headlines have heralded that "trash is treasure" while others have proclaimed that "recycling is garbage."

The antagonists in these debates are disagreeing over public policy and its role in shaping decisions about resource use. Both sides in these debates frequently have broad policy agendas that go far beyond choosing the most efficient way to manage solid waste. Both sides also promote their political agendas with unsupported assertions and incomplete information. Determining what amount of recycling will result in efficient resource use requires systematic analysis.

Proponents of recycling argue that recycling saves resources. For example, most manufacturers of aluminum cans currently depend on recycled aluminum for more than 50% of their needs. This recycled input reduces the economic and environmental costs associated with mining and landfills.

A common argument for the antirecycling side is that recycling wastes resources. It takes resources to recycle. For example, it takes human effort to sort aluminum cans from other trash and energy to move aluminum cans from the consumer back to the manufacturer.

It may not make economic sense to recycle all materials or all of any single material, but numerous studies have shown that there are net benefits to society at low or modest levels of recycling most materials. The question is, Which has the higher environmental cost: using recovered materials or using virgin materials? Do recovered or virgin materials cost more in resources? The answer is complex and changing.

Your next environmental decision is fast approaching. Should you put this copy of *The Fremont Daily* in the recycling bin or should you put it in the trash?

- (a) Consider the arguments regarding aluminum presented in the editorial, then make
 - (i) a similar argument in favor of recycling the newspaper, and
 - (ii) a similar argument against recycling the newspaper.
- (b) For each of the following, describe two pieces of scientific information that would be needed to evaluate
 - (i) the environmental benefits of recycling the newspaper, and
 - (ii) the environmental costs of recycling the newspaper.
- (c) If a community can afford to begin a recycling program for either aluminum or newspaper, but not both, which one would you recommend to be recycled? Provide two reasons why your recommendation is better than the alternative.
- (d) Discuss two difficulties that the community might face in implementing the recycling program in part (c).