The following is a generalized rubric for scoring student responses to the *Whale Meat Assessment* questions.

SCORING GUIDE FOR EVALUATION OF STUDENT RESPONSES	
SCORE	DESCRIPTION
Level 4	Student responses are clear, well-written, and include all the components of a complete answer.
Level 3	Student responses are clear, well-written, and include most of the components of a complete answer.
Level 2	Student responses show some understanding of the concepts involved.
Level 1	Student responses show little understanding of the concepts involved.
Level 0	Responses are irrelevant or nonexistent.

A Level four response should also include essential knowledge components for each question. For each of the questions, these components are listed below:

Question 1: Lesson Components

❑ Which whales are endangered or threatened
❑ Populations vary genetically
❑ Genetic variations can be detected by RFLP Analysis

Question 2: Lesson Components

❑ The use of restriction enzymes as a molecular tool
❑ Recognition sites are used to cut DNA into different size fragments
❑ Different size fragments appear on the gel
❑ Different populations will have characteristic banding patterns
❑ Comparison of known and unknown samples containing DNA using banding patterns

Question 3: Lesson components

❑ Restriction enzymes work as a molecular tool
❑ The sequence and structure of DNA can vary between populations (repeats, deletions, substitutions)
❑ Populations can be separated by fragment lengths and banding patterns
❑ Application of this knowledge to whale populations

Question 4: Lesson components

❑ Set up an appropriate experiment including standards and controls
❑ Establish a data base
❑ Compare patterns to draw inferences

Question 5: Lesson Components
- ❑ Detect differences in banding patterns
- ❑ The movement of fragments relates to their base pair size
- ❑ The number of bands relates to the restriction enzyme recognition sites
- ❑ Color intensity (band width) relates to the number of fragments

Question 6: Lesson components
- ❑ Make a hypothesis based on known information
- ❑ Detect differences in banding patterns by sketching a gel
- ❑ Properly label scientific data

Question 7: Lesson components
- ❑ Understand the term stakeholder
- ❑ Relate stakeholder viewpoint to a value
- ❑ Understand points of view from other perspectives

Question 8: Lesson components
- ❑ Relate to interconnectedness of living organisms
- ❑ Understand the consequences of losing a species
- ❑ Examine their own value systems

INTERNET RESEARCH ON ENDANGERED WHALE MEAT

You (or your students) may wish to find additional information about the sale of endangered whale meat.

Two recent articles of interest can be found at:

http://www.hsus.org/ace/14157

Evidence of Endangered Whale Meat In Japan Underscores Need for Commercial Whaling Moratorium. May 20, 2002

http://www.nature.com/nsu/nsu_pf/000706/000706-5.html

Slipping the net. *Protected whales could be threatened with extinction because the legal trade in meat and blubber masks their deaths, David Adam reports.* 4 July 2000

Every time New Zealand scientist Dr. Gina Lento enters Japan, her stomach knots up as she waits for a tap on the shoulder from a Customs officer. A close inspection of her luggage will reveal a mini-laboratory used to try to detect what is believed to be the illegal sale of whale meat on Asian markets."

Meat advertised as kujira (whale) can be sold in Japan only if it comes from legally caught minke whales. Japanese whalers can catch minke whales legally for research purposes and then the meat can later be sold on the commercial market. Commercial whaling and the international commercial trade of whales have both been subject to a moratorium since 1986, due to worldwide concern about several species of endangered whales. The International Whaling Commission and CITES are responsible for monitoring and enforcing the moratorium around the world.

Dr. Lento buys several samples of kujira from markets in Japan. Her next task is to identify the samples and determine whether they are from species of endangered whales or not.

QUESTIONS

1. What does Dr. Lento need to know in order to identify if the whale meat is from an endangered species?

2. What are RFLPs, and how could they be used by Dr. Lento to identify the origin of the whale meat?

3. How could Dr. Lento use restriction enzymes in her work to identify the origin of the whale meat?

4. Design an experiment (the basic steps) that Dr. Lento could perform in order to identify the whale meat. Be sure to include an enzyme digest, and a lane for a ladder.

5. What are two bits of information that you can use to tell samples apart on a gel? How could you determine the size of each of the fragments in each lane?

6. What would you expect the results of your experiment to look like if two or more of the samples were <u>not</u> from a minke whale. Sketch what the gel would look like and be sure to label it clearly.

7. Name four stakeholders involved with the whale issue, and explain what each of their viewpoints might be.

8. Why should Dr. Lento, or anyone else care about saving endangered whales? Or any other species?