Chapter 6 Problem Wrap-Up

Student Text Page
393

Suggested Timing
80–160 min

Tools
- computers with Internet access
- graphing calculators

Related Resources
BLM 6-20 Chapter 6 Problem Wrap-Up Rubric

Teaching Suggestions

- Have students read the Chapter Problem Wrap-Up and ensure they understand what they are being asked to do. Relate the Chapter Problem revisits to the Chapter Problem Wrap-Up scenario. You may wish to assign a topic rather than have students choose their own, to simplify your evaluation.
- Students could brainstorm in groups the strategies involved in completing the problem. Discuss, as a class, the strategies, and review necessary skills and concepts for completing the Problem.
- Students will need computers with Internet access for their research.
- Circulate as students complete the problem and assist them as necessary. Students can give more polished solutions if they have additional time.
- If you assigned the Chapter Problem revisits section by section, the Chapter Problem Wrap-Up can be used as part of a summative assessment.
- If you are assigning the Chapter Problem as a whole at the end of the chapter, you can use it as part of a summative assessment or as a formative assessment prior to a Chapter Test or Task.

Level 3 Sample Response

How Radiation is Used in Medicine

Nuclear medicine is the branch of medicine dedicated to diagnosing and treating illnesses through the use of radioactive isotopes.

Using radioactive isotopes to diagnose problems or illnesses is a complicated chemical process. First, doctors must determine what they are looking for in the body. Then, they need to get a chemical that will be attracted to that problem, such as a chemical that the body would use in bone repair when searching for a small bone fracture. This chemical, called a tracer, is attached to a radioactive isotope before being injected in the patient. After a while, the body will move most of the chemical to wherever it is needed. Doctors then use special instruments that detect radiation to locate the problem and determine how to heal the patient.

The majority of the world's medical isotopes are produced in Ontario at the Chalk River Laboratories. Two of the isotopes they produce are fluorine-18, which has a half-life of 110 min, and technetium-99m, which has a half-life of approximately 6 h.

Problems

1. A hospital in Vancouver requires 3 mg of fluorine-18 for diagnostic tests. If it takes 11 h to transport the isotope from Chalk River, how much fluorine-18 should be sent?

Solution

Since 11 h is 660 min, the isotope will be halved six times before it reaches the hospital.
$3 \times 2^6 = 192$
So, they need to send 192 mg of fluorine-18.

2. When molybdenum-99 decays, it turns into technetium-99m. Since molybdenum-99 has a half-life of 2.7 days, it is more useful to send it to hospitals so they can generate their own technetium-99m. Approximately how much of a 10 mg sample of technetium-99m would be lost in 2.7 days?

Solution

The half-life of technetium-99m is 6 h or 0.25 days. Determine the number of times is would be halved.
$2.7 \div 0.25 = 10.8$
It would be halved 10.8 times in 2.7 days.

$10 \times 0.5^{10.8} = 0.0056$
There would be 0.0056 mg remaining in 2.7 days.

Level 3 Notes

Look for the following:

- report is well organised
- chosen topic is described in detail
- report includes two relevant problems involving algebraic modelling, with solutions

What Distinguishes Level 2

Look for the following:

- report is somewhat organised
- chosen topic is described in minimal detail
- report includes two somewhat relevant problems with solutions that might contain errors

What Distinguishes Level 4

Look for the following:

- report is exceptionally well organised
- chosen topic is described in great detail
- report includes two complex and relevant problems involving algebraic modelling, with complete solutions

Summative Assessment

- Use **BLM 6-20 Chapter 6 Problem Wrap-Up Rubric** to assess student achievement.