UNIT C

Review

Radioactivity

Unit Summary

In this unit, you have learned about radiation, how it is produced, and how it is used. You have also looked at nuclear equations for nuclear fission and fusion reactions. Beginning with the word "radiation," add words and arrows to make a concept map that shows your understanding of radiation.

Many of these questions are in the style of the Science 10 Provincial Exam. The following icons indicate an exam-style question and its cognitive level.

K Knowledge U Understanding and Application HMP Higher Mental Processes

Review Key Ideas and Vocabulary

K **1.** What is the definition of atomic number?

A. the number of protons found in the nucleus of an atom
B. the number of neutrons found in the nucleus of an atom
C. the number of electrons found in the nucleus of an atom
D. the number of protons plus neutrons found in the nucleus of an atom

2. Which is most similar to an X-ray: an alpha particle, a beta particle, or a gamma ray? Why?

K **3.** How many neutrons and protons are in the isotope $^{14}_{6}C$?

	Neutrons	Protons
A.	6	8
B.	6	14
C.	8	6
D.	14	6

K **4.** Which of the following isotopes is represented by $^{27}_{11}Na$?

A. sodium-11
B. sodium-16
C. sodium-27
D. sodium-38

5. Fill in the missing particle or nucleus in the following nuclear decay equations.

(a) $^{210}_{84}Po \rightarrow ^{206}_{82}Pb + ?$

(b) $^{60}_{27}Co \rightarrow ^{60}_{28}Ni + ?$

(c) $^{60}_{27}Co^{*} \rightarrow ^{?}_{?}? + ^{0}_{0}\gamma$

(d) $^{12}_{7}N \rightarrow ^{12}_{6}C + ?$

(e) $^{236}_{88}Ra \rightarrow ^{?}_{?}? + ^{4}_{2}He$

6. Copy Table 1 into your notebook, complete the nuclear equation, and identify the type of nuclear decay.

Table 1

Nuclear equation	Decay type
$^{66}_{29}Cu \rightarrow ^{66}_{30}Zn + ?$	
$^{121}_{50}Sn \rightarrow ? + ^{0}_{-1}e$	
$^{140}_{62}Sm \rightarrow ? + ^{4}_{2}He$	
$^{3}_{1}H \rightarrow ^{3}_{2}? + ?$	
$^{148}_{64}Gd \rightarrow ^{144}_{62}Sm + ?$	
$? \rightarrow ^{65}_{29}Cu + ^{0}_{-1}e$	
$^{189}_{78}? \rightarrow ? + ^{0}_{-1}?$	

K **7.** Which of the following is not a source of natural background radiation?

A. soil
B. water
C. dental X-rays
D. human bodies

8. Tin-124 decays by emitting a beta particle with a half-life of almost 10 min.
   (a) Complete the nuclear equation
   $$^{124}_{50}Sn \rightarrow ? + ^{0}_{-1}e$$
   (b) A sample originally contained one million tin-124 atoms. Copy Table 2 into your notebook and complete the table.

Table 2

Time (min)	Expected number of tin-124 atoms	Expected number of decays	Activity (Bq)
0			
10			
20			
30			
40			
50			
60			

   (c) Draw a graph of the expected number of tin-124 atoms versus time, and a graph of the activity versus time.

Use What You've Learned

U 9. A sample of a material contained 4000 radioactive atoms of a particular isotope. How many atoms of the isotope would be left after four half-lives?
   A. 0
   B. 250
   C. 500
   D. 1000

10. Carbon-14 has a half-life of 5730 years. A skeleton was found that had only $\frac{1}{8}$ the amount of carbon-14 present compared with present-day bones. How old was the skeleton?

11. Complete the following nuclear equations:
   (a) $^{1}_{0}n + ^{239}_{94}Pu \rightarrow ^{141}_{54}Xe + ^{97}_{40}Zr + ?$
   (b) $^{2}_{1}H + ^{2}_{1}H \rightarrow ^{4}_{2}He + ?$

U 12. The isotope nickel-63 has a half-life of 100 years. If a sample contained 12 million atoms of nickel-63, how many atoms would have decayed after 400 years?
   A. 375 000
   B. 750 000
   C. 10 500 000
   D. 11 250 000

HMP 13. A nuclear fusion reactor does not produce radioactive waste. However, a hydrogen bomb produces radioactive fallout in the atmosphere. Which of the following explains this fact?
   A. The hydrogen bomb uses an atomic bomb to start the reaction.
   B. The fusion reactor consumes its own radioactive waste products.
   C. The fusion process in a bomb is different from the fusion process in a reactor.
   D. The hydrogen bomb explodes in the atmosphere, which introduces contamination to the process.

Think Critically

14. When you get an X-ray at the dentist's office, you are given a lead apron to wear.
   (a) Where is the lead apron placed on you?
   (b) Why is the lead apron used?

15. Research the impact or contributions that Canada has made toward the development of nuclear physics.

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Reflect on Your Learning

16. In this unit, you have learned how nuclear physics and radioactivity have been applied to areas such as medicine, research, energy, and weapons. Choose one area and explain how your understanding of this area changed as a result of studying this unit?

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