

Science 10

Worksheet 7-1

Effects and Applications of Radiation

10

Due Date _____

Correct & Hand In by _____

Name _____

Read pages 145-151 in Science Probe 10 to help you with the following questions:

1. Name 3 sources of **background** radiation.

2. Harmful radiation that comes from **radioactive isotopes** are _____, _____ and _____ radiation. Two types of *electromagnetic* radiation that are harmful are _____ and _____.

3. **Ionizing radiation** knocks _____ off of atoms, making them into _____.

4. Rapidly dividing cells in the _____ and the _____ _____ are affected by large doses of ionizing radiation and can cause _____ sickness.

5. Out of control cell division is called _____. What are **mutations**? _____

6. A unit called the **Sievert** (Sv) measures the effect of a dose of radiation on _____

7. A unit called the _____ () measures the energy transferred to a material by a dose of ionizing radiation.

8. Fill in the following table:

| | Less than 0.25 Sv | Above 1 Sv | Above 5 Sv |
|------------------|-------------------|------------|------------|
| Effect on Humans | | | |

9. In Canada the maximum recommended radiation dosage per year is _____ Sv. A

dental or chest X-ray gives us about _____ μ Sv or _____ Sv.

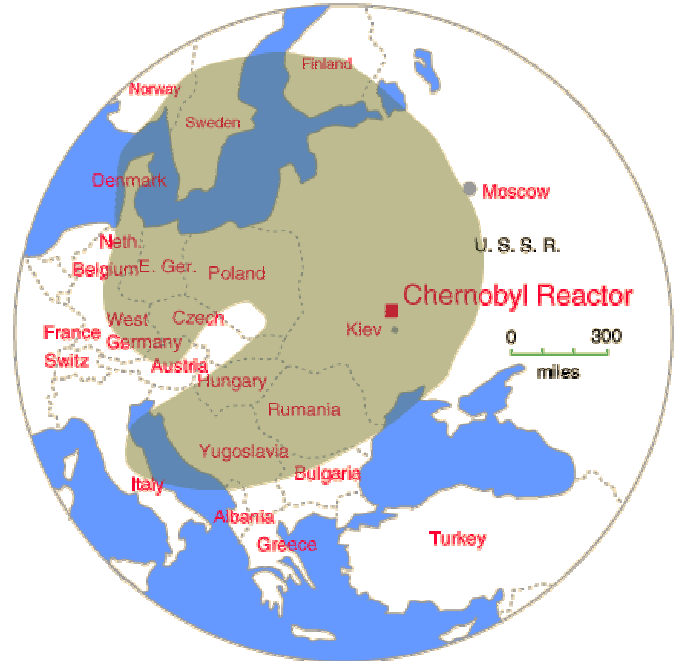
10. What are three ways in which we can **limit** our exposure to radiation:

1. _____
2. _____
3. _____

11. Radioactive isotopes with a (short/long) _____ **half-life** will quickly become less harmful over time.

12. The following is from an internet site: <http://hyperphysics.phy-astr.gsu.edu/Hbase/nucene/chno.html>

On April 26, 1986, the Chernobyl Nuclear Power Plant in the Ukraine region of the USSR had a major accident, which released a cloud of radioactive material over a large area of the USSR and Europe. Detectable radiation eventually spread throughout the world.



13. **Iodine-131** is a highly radioactive isotope of iodine. It is produced in a nuclear reactor.

It has a half-life of 8 days, which means it decays quite (slowly/quickly) _____
 Iodine is used by the _____ gland to produce thyroxin. Iodine-131 will quickly get absorbed by the _____ gland and **concentrate** there.

14. The country of Belarus (in the former USSR) is just north of the **Chernobyl Reactor**.



Look at the following data:

(Obtained from the internet site: <http://www.nea.fr/html/rp/chernobyl/welcome.html>)

Table 13. **Number of cases of thyroid cancers in children under 15 years old at diagnosis and cancer incidence rates number of cases per 100 000 children**

| Year | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 |
|--------------------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|------------|-----------|
| Belarus | 3 0.2 | 4 0.3 | 6 0.4 | 5 0.3 | 31 1.9 | 62 3.9 | 62 3.9 | 87 5.5 | 77 5.1 | 82 5.6 | 67 4.8 | 73 5.6 | 48 3.9 |
| Russian Federation | – | 1 0.3 | – | – | 1 0.3 | 1 0.3 | 3 0.9 | 1 0.3 | 6 2.8 | 7 2.5 | 2 0.6 | 5 2.2 | – |
| Ukraine | 8 0.2 | 7 0.1 | 8 0.1 | 11 0.1 | 26 0.2 | 22 0.2 | 49 0.5 | 44 0.4 | 44 0.4 | 47 0.5 | 56 0.6 | 36 0.4 | 44 0.5 |
| Total | 11 | 12 | 14 | 16 | 58 | 85 | 114 | 132 | 127 | 136 | 125 | 114 | 92 |

a) Propose a *hypothesis* (tentative explanation) for this data. _____

b) Does the data prove, support, refute or have no effect on your hypothesis?

_____ Explain _____

15. Suggest why radioactive iodine might have a greater effect on thyroid cancers in **children** than in **adults**. _____

16. How can we shield ourselves from **ultraviolet radiation**? _____

17. People who routinely work with ionizing radiation use shields made out of _____

18. Explain how **distance** from a source and **time** of exposure affect the amount of harm radiation does to us. _____

19. In **X-ray radiography**, do X-rays pass right through a person? _____
 X-rays are absorbed (more/less) _____ by bones than by soft tissue.

20. What three main things are X-rays used for in medicine?
 1. _____
 2. _____
 3. _____

21. Explain how technetium-99 is used in **nuclear medicine** to test a patient's blood flow.

22. Would you expect the radioisotopes injected into people in nuclear medicine to have **long** half-lives or **short** half-lives? _____ Explain your answer

23. Look at the bone scan on the bottom of page 149 of Science Probe. Phosphorus is absorbed by bones as they are growing. A _____ isotope is attached to a phosphorus containing molecule. Where the bone is growing abnormally rapidly there is a high concentration of phosphorus and a high level of radiation from the isotope attached to it, so the area is very red. What is wrong with the bone cells at this location? _____

24. Large amounts of iodine-131 are thought to cause _____ of the thyroid gland, but small doses are actually used in the treatment of a hyperactive thyroid. Explain how the treatment works. (See top of page 151.) _____

25. Why does the isotope strontium-89 go to areas of rapid bone growth? _____

What does the radiation from Strontium-89 do to cancer cells? _____

Does radiation from radioactive isotopes affect normal cells? _____.

26. In other types of radiation therapy, ____-rays or _____ rays are aimed at cancerous tumors in order to kill the cancer cells. What are some of the serious side effects of radiation therapy? _____

