Name _____
Period _____


**Topic 1 Practice Test: Nuclear Radiation**

1. The type(s) of radiation that is not detected by the Geiger counter? (circle all that apply)
    a. ionizing
    b. nonionizing
    c. microwaves
    d. light

2. What type of radiation below is considered to be ionizing? (circle all that apply)
    a. alpha particles
    b. beta particles
    c. gamma rays
    d. microwaves

3. What is the term for the ionizing radiation that is made of a high speed electron?
    a. alpha particles
    b. beta particles
    c. gamma rays
    d. X-rays

4. Which type(s) of ionizing radiation is not a particles, just a high energy wave of energy?
    a. X-Rays
    b. alpha
    c. beta
    d. gamma

5. Which type of radiation is the easiest to stop with blocking materials like cardboard, copper and lead?
    a. alpha
    b. beta
    c. gamma
    d. visible light

6. Which of these activities would expose you to the least ionizing radiation?
    a. Visiting the radioactive clothes left by the dead firefighters at Chernobyl
    b. Smoking
    c. Standing outside a running nuclear power plant

7. A fiestaware plate radiates 0.99 mrem/hr of radiation. How many days of being exposed to the fiestaware plate would it take for mutations to occur? **(Remember to use mutation calculation)**

8. A student wanted to see if they could protect themselves from radiation by using a glass of water. They did the experiment by changing the type of radioactive source (alpha, beta, gamma), and then measured the amount of radiation that got through the water in millirems/hour.

   What is the **independent variable** in the experiment?



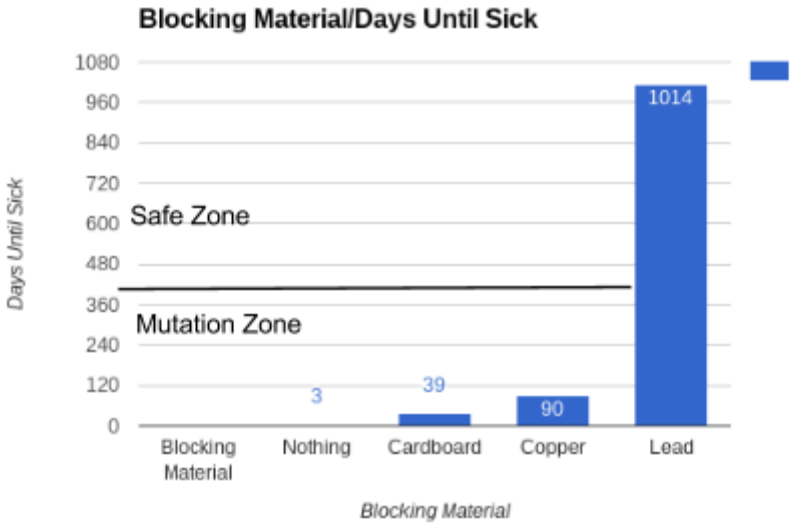
   a. alpha, beta, gamma radiation
   b. The type of blocking material
   c. Amount of radiation

9. A student collected the following data. Which value below is the **median value?**
   a. Reading 1: **0.031 mRem/hour**
   b. Reading 2: **0.065 mRem/hour**
   c. Reading 3: **0.059 mRem/hour**

10. How many days could you be safely exposed to a radioactive source if the geiger counter read 0.111 mRem/hour?

11. Based on the bar graph to the right, which material(s) should not be used to protect radiation workers from being exposed to radiation at their jobs?
   a. nothing
   b. cardboard
   c. copper
   d. lead

12. Based on the bar graph to the right, was the radioactive source alpha, beta or gamma?
   a. alpha
   b. beta
   c. gamma

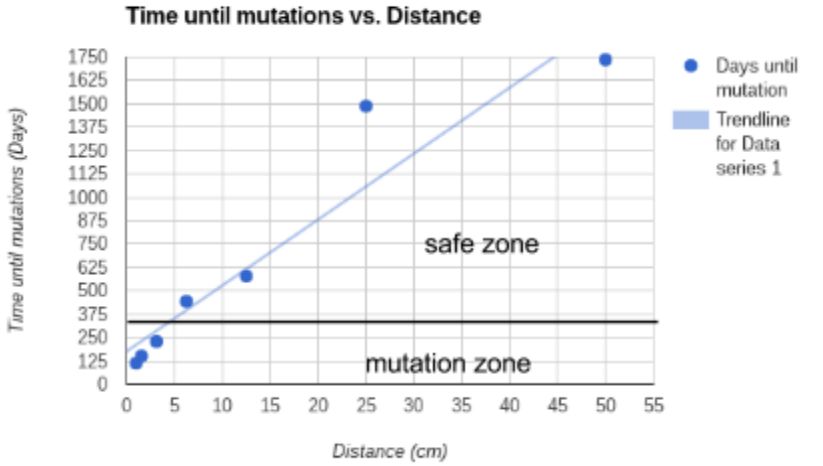


13. Based on the graph to the right, how many days could you safely be near the radioactive source if you were 18 cm away?

    a. 0 days
    b. 1400 days
    c. 1800 days
    d. 2100 days

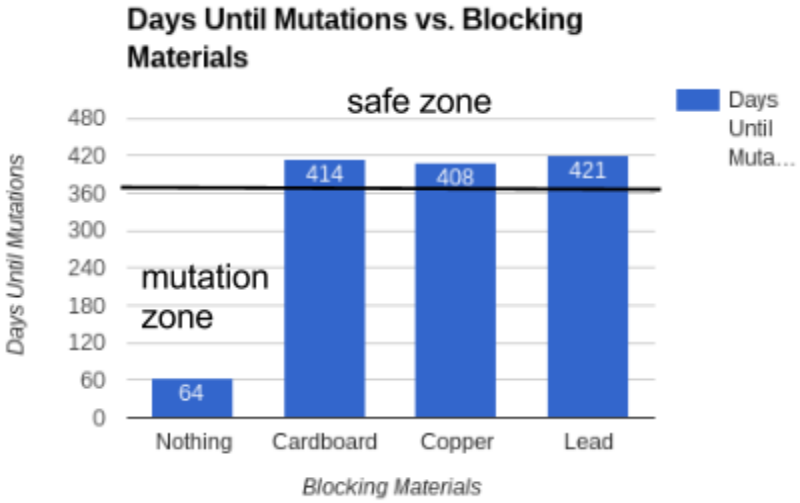

14. Based on the graph to the right, at 40 cm from the radiation source would a person be in danger of mutating?

    a. yes
    b. no
    c. impossible to determine

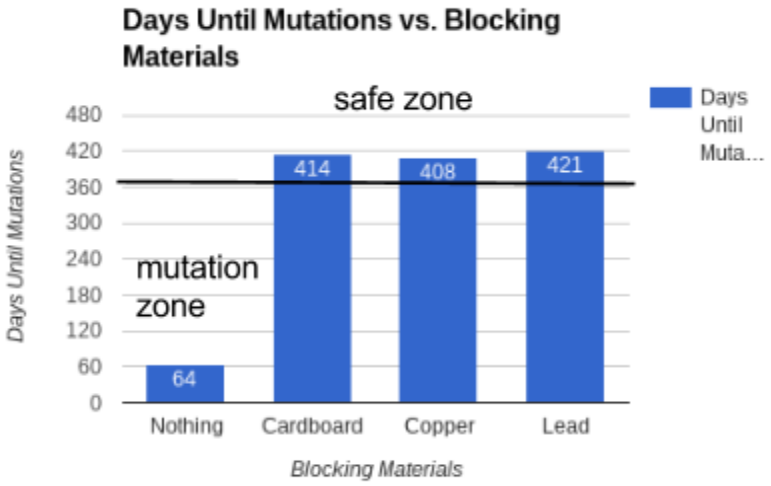



15. Based on the bar graph to the right, what type of radiation they were trying to block?

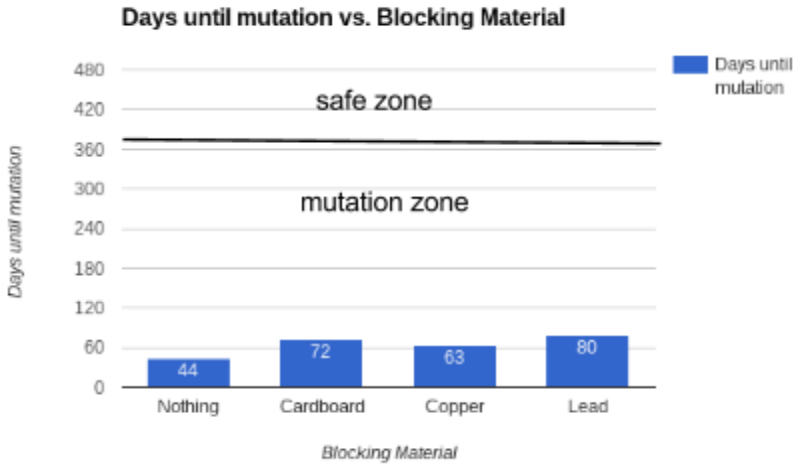
    a. alpha
    b. beta
    c. gamma



16. Based on the radiation bar graph to the right, which material(s) would protect a person from radiation so that they would be in the safe zone?
    a. cardboard
    b. copper
    c. lead




17. Based on the gamma radiation bar graph to the right, would any of the materials protect you from the radioactive source? Explain why or why not.

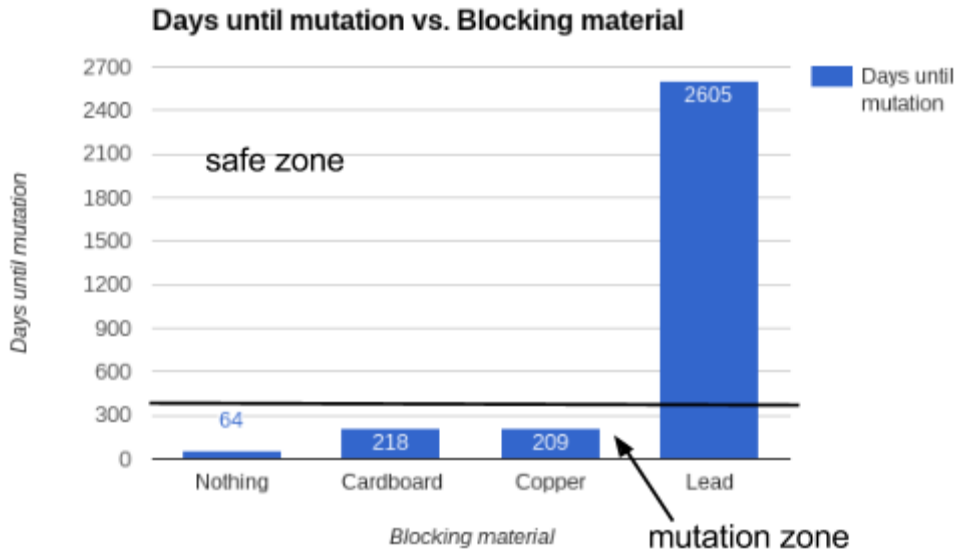



18. What happens to the amount of radiation you receive as you get closer to a radioactive source?
    a. the amount of radiation increases
    b. the amount of radiation decreases
    c. the amount of radiation stays the same

19. When a person is near to an alpha source of radiation, shielding material
    a. will always help to protect the person from radiation
    b. never help to protect the person from radiation because all types of radiation are deadly and should be avoided at all cost.

20. The constant clicking of the Geiger counter when it is just sitting in the room is a result of
    a. cell phones
    b. dirty shoes
    c. chromebooks
    d. background radiation

21. Based on the bar graph on the to the right what type of radiation is being blocked?
    a. alpha
    b. beta
    c. gamma




22. Based on the radiation bar graph above, what is the dependent variable in the experiment?
    a. Days until mutation
    b. The type of radiation (alpha, beta, gamma)
    c. The type of blocking material used
    d. The safe zone or the mutation zone

**23. Use the chart below to determine the Estimated Annual Radiation Dose for a person with the following profile:**

- lives in Denver, CO (5500 feet above sea level in a brick house)
- Does not live within 50 miles of a nuclear power plant or a coal fired power plant
- Smokes
- Took 2 airplane rides in the past year
- watches TV
- Got 4 X-rays on a broken arm

| **Your Yearly Ionizing Radiation Dose** | |
|---|---|
| Common Sources of Radiation | Yearly Dose |
| **Part 1. Where You Live**<br>a. Cosmic Radiation (from outer space)<br>Your exposure depends on elevation. These are annual doses.<br>● 0–1000 ft = 28 mrem<br>● 1000–5000 ft = 31 mrem<br>● 5000–8000 ft = 66 mrem<br>b. Terrestrial Radiation (from the ground) 46 mrem unless...<br>● If you live in a state bordering Gulf or Atlantic coasts = 23 mrem<br>● If you live in AZ, CO, NM, or UT = 63 mrem<br>c. House Construction<br>● If you live in a stone, adobe, brick, or concrete building = 7 mrem<br>d. Power Plants<br>● If you live within 50 miles of a nuclear power plant = 0.009 mrem<br>● If you live within 50 miles of a coal-fired power plant = 0.03 mrem | _____ mrem<br><br>_____ mrem<br><br>_____ mrem<br><br>_____ mrem |
| **Part 2. Food, Water, Air**<br>Internal Radiation (based on average values)<br>● a. from food (C-14, K-40) and water (radon) = 40 mrem<br>● b. from air (radon) = 200 mrem | __40__ mrem<br><br>__200__ mrem |
| **Part 3: How You Live**<br>● Smoking cigarettes (1 pack / day) = 15 mrem<br>● Travel by jet aircraft = avg 1 mrem per flight<br>● If you watch TV = 1 mrem | _____ mrem |
| **Part 4: Medical Uses (radiation dose per procedure)**<br>● X-ray: Extremity (arm, hand, foot, or leg) 1 mrem<br>● X-ray Dental 9 mrem<br>● X-ray Upper GI 245 mrem | _____ mrem |
| Your Estimated Annual Radiation Dose | _____ mrem |

**Alpha Decay Problems:** For each isotope, calculate the number of protons left after the decay. Use the number of protons to write the atomic number and name of the element.

| **Alpha Emitting Isotopes** | **Atomic #** |
|---|---|
| **Francium-211** | |
| **Gold-185** | |

24**.** What is the mass of the Francium isotope in the table above?

25. What is the atomic number of the Gold-185 isotope?

26. How many protons would remain after the Francium-211 goes through an alpha decay?

27. What element would remain after the Gold-185 goes through an alpha decay?

**Beta Decay Problems:** For each isotope, calculate the number of protons left after the decay. Use the number of protons to write the atomic number and name of the element.

| **Beta Emitting Isotope** | **Atomic #** |
|---|---|
| **Iodine-131** | |
| **Iron-52** | |

28. What is the mass of the Iodine isotope in the table above?

29. What is the atomic number of the Iron-52 isotope?

30. How many protons would remain after the Iodine-131 goes through a beta decay?

31. What element would remain after the Iron-52 goes through a beta decay?