Shedding Light on Nuclear Radiation Episode 1: Atomic Structure Name: _____

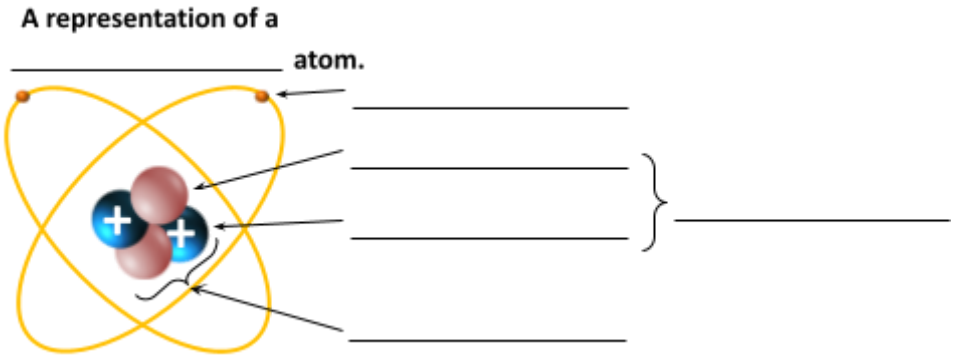
Part A:

1. The three most common forms of naturally occurring radiation on Earth are _____, _____, and _____ radiation.

2. What is a Geiger counter?

Part B:

3. Label the diagram (by dragging and dropping the words on the right).



neutron

proton

electrons

nucleus of atom

nucleons

Helium

4. Protons have a _____ charge and electrons have a _____ charge.

5. How does the mass of a proton compare to the mass of an electron?

6. How does the mass of a proton compare to the mass of a neutron?

7. How does the size of a whole atom compare to the size of the atom's nucleus?

8. Aluminium has an atomic number of _____, which means that it has _____ protons in its nucleus.
9. Fill in the table. You will need a Periodic Table.

Element	Symbol	Number of Protons	Number of Electrons
Uranium			
	Fe		
		27	

Part C:

10. There are _____ naturally occurring isotopes of lithium on Earth. One isotope has _____ protons and _____ neutrons in its nucleus while the other isotope has _____ protons and _____ neutrons in its nucleus. The abundance of each isotope is _____% and _____% respectively.

11. What can be said about the way that the two isotopes of lithium chemically react?

12. The vast majority of carbon atoms on earth have _____ protons and _____ neutrons in their nucleus, which makes for a total of _____ nucleons.

13. Different isotopes of a particular element can be expressed in "atomic notation".

$${}^{A}_{Z}\mathrm{X}$$ (X is the symbol for the element)

Z (atomic number) = no. of _____ in the nucleus.

A (mass number) = no. of _____ + no. of _____ in the nucleus (or, other words, the number of _____ in the nucleus).

14. How many protons, neutrons, and electrons make up the following atoms?

(a) ${}^{9}_{4}\mathrm{Be}$

(b) ${}^{63}_{29}\mathrm{Cu}$

(c) ${}^{65}_{29}\mathrm{Cu}$

(d) lithium-7

(e) iodine-131

15. A particular isotope of iron has 30 neutrons. Write its atomic notation.

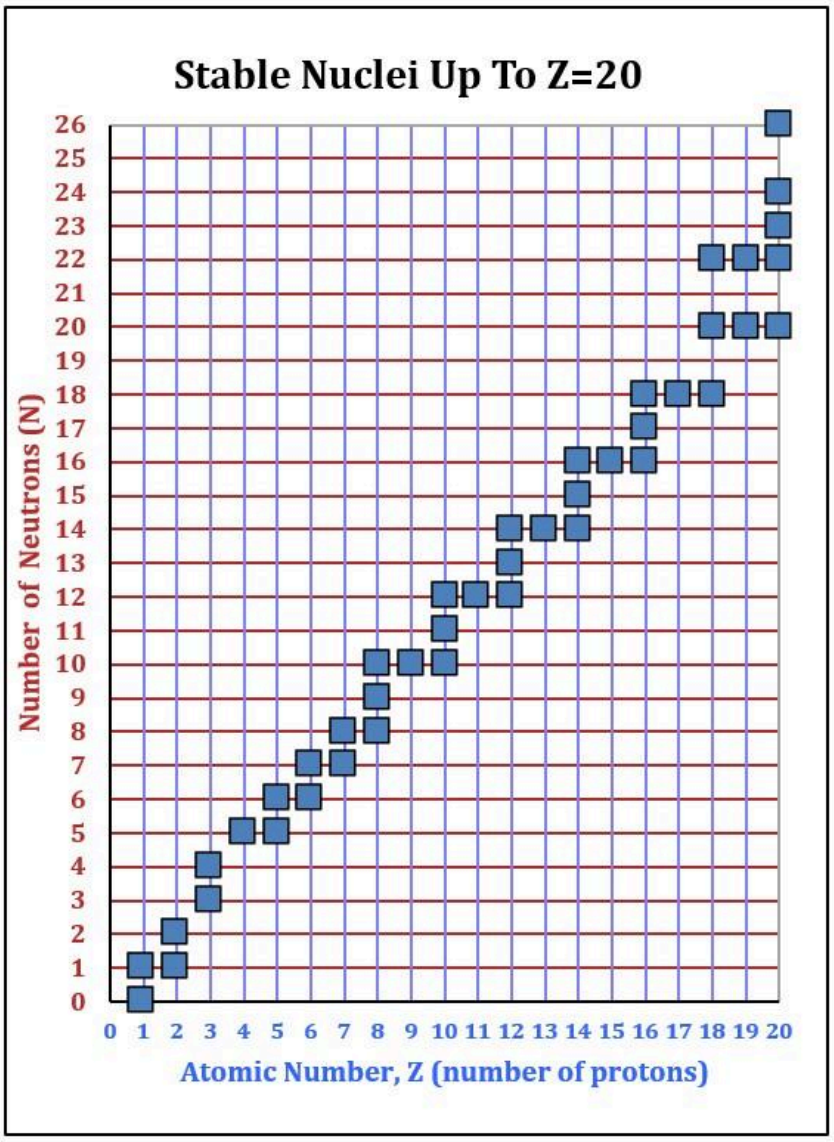
$${}^{?}_{?}?$$

16. Fill in the table below.

Element	Isotope	Atomic Notation ${}^{A}_{Z}X$	Number of protons (Atomic Number, Z)	Number of nucleons (Mass Number, A)	Number of neutrons (N)	Number of electrons
lithium	lithium-7	${}^{7}_{3}\mathrm{Li}$				
	lithium-6	${}^{6}_{3}\mathrm{Li}$				
cobalt		${}^{?}_{?}?$	27		32	
	cobalt-60	${}^{?}_{?}?$				
fluorine		${}^{?}_{?}?$		18		
		${}^{?}_{?}?$	9	19		

17. Atoms that are lighter than calcium-40 atoms have approximately equal numbers of protons and neutrons in their nuclei. <u>All</u> stable atoms that are heavier than calcium-40 atoms have _____ neutrons in their nuclei than protons.

18. The chart below shows all the stable isotopes of all elements up to Z=20 (calcium). The y-axis shows the number of neutrons (NOT the mass number).



(a) Circle the three isotopes of magnesium (using the oval on the left).

(b) Beryllium has only one stable isotope. What is its atomic notation? (Hint: the number 5 does not feature in the answer.)

?
?

(c) The element with an atomic number of 17 also has only one stable isotope. What is its atomic notation?

?
?

(d) Hydrogen has two stable isotopes. List the number of protons and neutrons that each isotope has.

Hydrogen-1:

Hydrogen-2:

(e) Oxygen has 3 stable isotopes. One of them is oxygen-16. What are the other two?

(f) How many stable isotopes of calcium are there? Which is the lightest?

(g) Only two naturally occurring nuclides have more protons than neutrons. What are they?