ESS 200 (Stapleton) Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Rock Dating Terminology and Background Information

Definitions to know and questions to answer:

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2. Sedimentary Rock

3. Metamorphic Rock

4. Relative Dating

5. Absolute Dating

6. Principle of Superposition

7. Principle of Cross-Cutting Relationships

8. Principle of Faunal Succession

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15. Radiometric dating

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17. Why can’t sedimentary rock layers be dated using radiometric dating?

18. Half-Life

19. How do scientists decide which isotopes to use when they date rocks?

Definitions and Answers:

1. **Igneous Rock:** A rock that was formed by fully melting and then recrystallizing (solidifying).

2. **Sedimentary Rock:** A rock that formed from a layer of sediment that compacted and became solid over time. Sedimentary rocks may be made from small or large grains of other types of rocks – or of other crushed up sedimentary rocks – or even from sediment made of formerly living material.

3. **Metamorphic Rock:** A rock that was formed when an existing rock changed in some way by being squeezed and/or heated (but not completely melted).

4. **Relative Dating**: Comparing or ranking rocks or rock layers by age – without determining their actual ages.

5. **Absolute Dating:** Determining the age of a rock in years.

6. **Principle of Superposition:** The relative dating principle which says that younger rock layers are closer to the Earth’s surface.

7. **Principle of Cross-Cutting Relationships:** The relative dating principle which says that, if some object or event cuts or passes through another object, the object that gets cut is older than whatever did the cutting. [In short, the thing that gets cut is older.]

8. **Principle of Faunal Succession:** The relative dating principle which states that the fossils of extinct organisms (plants or animals) can be used to determine the ages of the rocks in which they are embedded. In short, rock layers containing similar fossils are likely to be of similar ages.

9. **Isotopes:** Two atoms are isotopes of one another if they are atoms of the same element, but they have different masses.

10. **Radioactive Isotope:** An isotope of an element that is unstable, so that it breaks down over time, turning into a different type of element that is more stable. In the process, the radioactive isotope releases energy in the form of radiation. [This is fission (breaking apart of atoms), which is different from the fusion (joining) of atoms that takes place in the Sun.]

11. **Radioactive decay:** The process of a radioactive atom turning into another smaller atom and releasing radiation in the process.

12. **Why does radioactive decay release radiation energy?** When a radioactive parent atom decays into a daughter atom, the daughter atom has less mass. The mass that is lost gets turned to energy according to the equation E=mc2.

13. **Parent atom:** A radioactive isotope. Over time, the parent atom turns into a smaller daughter atom.

14. **Daughter Atom:** what a radioactive isotope turns into when it decays

15. **Radiometric dating:** a method of absolute dating that uses the half-lives of radioactive isotopes in rocks to determine the ages of rocks.

16. **Why can only igneous rock be dated using radiometric dating?**  Melting and recrystallizing (solidifying) “resets” the clock by removing the daughter atoms from the parents. In essence, melting and solidifying increases the parent atom percentage back to 100%. Only igneous rock formation can be dated, because only igneous rocks are formed by melting and recrystallizing.

17. **Why can’t sedimentary rock layers be dated using radiometric dating?** The age of a rock is the amount of time since it solidified after melting. If we dated a rock sample in a layer of sedimentary rock, we would find the amount of time since the grains of sediment were melted and solidified. In other words, we would be finding the age of the igneous rock that got crushed up to form the sediment, rather than the age of the sedimentary layer itself.

18. **Half-Life:** The amount of time it takes for half of a mass of some radioactive isotope to decay into daughter atoms.

19. **How do scientists decide which isotopes to use when they date rocks?** For example, why would scientists use C-14 to date one thing and U-238 to date another? For very old rocks, scientists use isotopes with very long half-lives (like U-238). For dating younger things, scientists use isotopes with shorter half-lives.