

Nuclear Science Merit Badge Homework

Georgia Tech American Nuclear Society

Name: _____

Troop Number: _____

Section 1: People in Nuclear Science

In the boxes below, please write the name of 5 individuals who were important to the field of atomic energy and nuclear science followed by an explanation of the individual's contribution.

Person 1: _____

Contribution: _____

Person 2: _____

Contribution: _____

Person 3: _____

Contribution: _____

Person 4: _____

Contribution: _____

Person 5: _____

Contribution: _____

Section 2: Understanding Nuclear Science Terms

1. An atom is
 - A) the smallest piece of an element that has properties of that element.
 - B) a positive or negative particle that is located in a nucleus.
 - C) a structure made of several elements bonded together.
 - D) a form of ionizing radiation made of two protons and two neutrons.

2. Isotopes of an atom
 - A) contain the same number of neutrons but a different number of protons.
 - B) contain the same number of protons but a different number of neutrons.
 - C) has too many electrons.
 - D) has too few electrons.

3. A neutron is
 - A) a subatomic particle with a negative charge.
 - B) a subatomic particle with a positive charge.
 - C) a subatomic particle with no electric charge.
 - D) the dense region at the center of an atom which consists of nucleons.

4. Quarks are
 - A) unstable fluctuations in a nuclear power plant.
 - B) ionizing events in an atom.
 - C) elementary particles which make up protons and neutrons.
 - D) radioactive isotopes.

5. Ionization is
 - A) the process by which an atom either gains or loses a charged particle such that it becomes electrically neutral.
 - B) the process by which an atom either gains or loses a charged particle such that it becomes electrically charged.
 - C) the splitting of an atom which results in the release of energy.
 - D) the combining of two atoms which results in the release of energy.

6. Alpha particles are a form of ionizing radiation consisting of (choose all that apply)
 - A) two protons
 - B) an electron
 - C) two neutrons
 - D) an electromagnetic wave

7. Beta particles are a form of ionizing radiation consisting of (choose all that apply)
 - A) two protons
 - B) an electron
 - C) two neutrons
 - D) an electromagnetic wave

8. Gamma rays are a form of ionizing radiation consisting of
- A) two protons
 - B) an electron
 - C) two neutrons
 - D) an electromagnetic wave
9. The difference between X-rays and gamma rays is that
- A) x-rays are created by neutrons; gamma rays are created by protons.
 - B) x-rays are created by protons; gamma rays are created by neutrons.
 - C) x-rays are created in the nucleus; gamma rays are created in the electron cloud.
 - D) x-rays are created in the electron cloud; gamma rays are created in the nucleus.
10. Background radiation is
- A) radiation that comes from medical devices, such as x-ray machines.
 - B) radiation that comes from natural sources in the environment.
 - C) radiation that comes from nuclear power plants.
 - D) radiation that comes from spent nuclear fuel.
11. Curies and Becquerel are
- A) units of radiation dose equivalence that take into account the type of radiation and the location of the body where the radiation is absorbed.
 - B) units of absorbed radiation dose that is only a measure of energy deposited per unit mass.
 - C) units of radioactivity.
12. Rads and Grays are
- A) units of radiation dose equivalence that take into account the type of radiation and the location of the body where the radiation is absorbed.
 - B) units of absorbed radiation dose that is only a measure of energy deposited per unit mass.
 - C) units of radioactivity.
13. Rem and Sieverts are
- A) units of radiation dose equivalence that take into account the type of radiation and the location of the body where the radiation is absorbed.
 - B) units of absorbed radiation dose that is only a measure of energy deposited per unit mass.
 - C) units of radioactivity.
14. Radiation is
- A) the process in which energy is released from an atom through disintegration or decay.
 - B) a naturally occurring radioactive element which is also a noble gas.
 - C) emitted moving subatomic particles or electromagnetic waves from an atom.
15. Radioactivity is
- A) the process in which energy is released from an atom through disintegration or decay.
 - B) a naturally occurring radioactive element which is also a noble gas.
 - C) emitted moving subatomic particles or electromagnetic waves from an atom.

16. Radon is
- A) the process in which energy is released from an atom through disintegration or decay.
 - B) a naturally occurring radioactive element which is also a noble gas.
 - C) emitted moving subatomic particles or electromagnetic waves from an atom.
17. Contamination is
- A) the steam produced from cooling towers.
 - B) spent nuclear fuel rods.
 - C) an MRI machine.
 - D) trace amounts of radioactive material on some object.
18. ALARA stands for
- A) As Long As Radiation Allows.
 - B) As Late As Reasonably Achievable.
 - C) As Low As Reasonably Achievable.
 - D) Always Learn About Radiation Awareness.
19. Nuclear energy is
- A) energy released through the splitting, combining, or the decay of atoms.
 - B) energy released through chemical reactions.
 - C) energy released through biological processes.
20. A nuclear reactor generates heat by
- A) accelerating particles to high speeds using electromagnetic fields
 - B) including a chemical reaction between various subatomic particles.
 - C) controlling and utilizing a fission chain reaction.
 - D) burning fossil fuels.
21. A particle accelerator is a device used for research that
- A) accelerates electromagnetic rays to high speeds.
 - B) accelerates charged particles to high speeds.
 - C) accelerates neutral particles to high speeds.
 - D) accelerates polymers to high speeds.
22. An unknown substances X has a half-life of 10 days. If you start with 100 atoms of the substances, how many particles of substance X would be left after 20 days?
- A) 100
 - B) 98
 - C) 50
 - D) 25

Section 3: Nuclear Power in the United States

The following questions relate to the electricity market in the United States and where nuclear power fits into that market. Please fill in the boxes according to each question.

1. How many commercial nuclear power reactors are operation in the United States?

2. What is the closest nuclear power plant to your home?

3. What percentage of the electricity in the United States comes from nuclear power?

4. What percentage of the electricity in the United States comes from coal?

5. What percentage of the electricity in the United States comes from natural gas?

Photo Release Form

(Leave this attached to the homework)

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Signature: _____ Date: 11-14-2015

Print above name: _____