

## Period 10 Exercise Answers

**E.1** Alpha particle radiation is

- a) emission of electrons from radioactive material.
- b) high energy photons from outer space.
- c) made up of neutrinos and antineutrinos.
- d) emission of helium nuclei from radioactive material.
- e) made up of two protons and four neutrons.

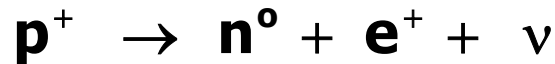
**E.1 = d**

**E.2** In a nuclear reaction, which of the following quantities are conserved?

- a) neutron number, charge, and energy
- b) proton number, charge, and energy
- c) nucleon number, energy, and leptons
- d) energy, charge, leptons, and nucleon number
- e) energy, entropy, and charge

**E.2 = d**

**E.3** Is the reaction shown below correct in terms of conservation of quarks and conservation of leptons?



- a) No, because there are three particles on the right side of the equation, but only one particle on the left side.
- b) No, because there are leptons and antileptons on the right side of the equation, but no leptons on the left side.
- c) No, because the number of quarks in the positive proton on the left side of the equation is not the same as the number of quarks in the neutral neutron on the right side.
- d) Yes, because the reaction is the result of the strong force.
- e) Yes, because the reaction has 3 quarks on each side and each side has zero net leptons.

**E.3 = e**

**E.4** What are the values of Z and A for the isotope X produced in the decay of plutonium-234 shown below? Which type of ionizing radiation is given off?



- a) **A = 232, Z = 90;  $\beta^-$**
- b) **A = 234; Z = 90;  $\alpha$**
- c) **A = 234; Z = 92;  $\beta^+$**
- d) **A = 234; Z = 92;  $\alpha$**
- e) **NONE of the answers is correct.**

**E.4 = e**

**The correct answer is  $A = 234 - 4 = 230$ ,  
 $Z = 94 - 2 = 92$ .  $\alpha$  is given off**

**E.5** The isotopes listed below are unstable. For each isotope, indicate whether you would expect the isotope to decay by  $\alpha$ ,  $\beta^-$ , or  $\beta^+$ .

a)  ${}^{14}_8\text{O}$  (Oxygen-14) is unstable because it has more protons (8) than neutrons (6). It will emit an antielectron ( $\beta^+$ ) in order to turn a proton into a neutron. A neutrino ( $\nu$ ) is also emitted

b)  ${}^{238}_{92}\text{U}$  (Uranium-238) is unstable because it is a large nucleus with more than 83 protons. It will reduce the size of its nucleus by emitting a helium nuclei ( $\alpha$ )

c)  ${}^{23}_{10}\text{Ne}$  (Neon-23) is unstable because it has more neutrons (13) than protons (10). It will emit an electron ( $\beta^-$ ) in order to turn a neutron into a proton. An antineutrino ( $\bar{\nu}$ ) is also emitted

## Period 10 Answers

**E.1 = d**

**E.2 = d**

**E.3 = e**

**E.4 = e**

**E.5 a)**  ${}^{14}_8\text{O}$  (**Oxygen-14**) emits a  $\beta^+$

**b)**  ${}^{238}_{92}\text{U}$  (**Uranium-238**) emits an  $\alpha$

**c)**  ${}^{23}_{10}\text{Ne}$  (**Neon-23**) emits a  $\beta^-$