

## Period 9 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** Comparing alpha and beta radiation of the same energy,

- a) alpha is more ionizing and more penetrating.
- b) alpha is more ionizing and less penetrating.
- c) alpha is less ionizing and more penetrating.
- d) alpha is less ionizing and less penetrating.
- e) alpha and beta have the same ionizing and penetrating ability.

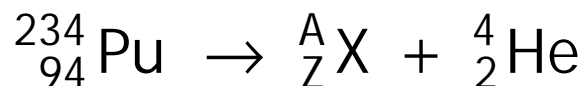
**E.2 = b**

**E.3** In a nuclear reaction, which of the following quantities are conserved?

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

**E.3 = d**

**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 82 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 9 Answers

E.1 = d

E.2 = b

E.3 = d

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  $\beta^{-}$

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