**Beta Decay**

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

In beta-minus decay, a neutron in the nucleus changes into a proton and a beta-minus particle is emitted. For A and Z balances, use A = 0 and Z = −1 for the emitted particle.

**1** How do the parent nucleus's mass number and atomic number change after one beta-minus emission?

(1) Mass number stays the same and atomic number increases by 1.

(2) Mass number increases by 1 and atomic number stays the same.

(3) Mass number decreases by 1 and atomic number decreases by 1.

(4) Both numbers decrease by 1.

**2** Explain why the daughter nucleus has one fewer neutron even though its mass number stays the same. [1]

Answer and work

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**3** A parent nucleus has A = 24 and Z = 11. Find A and Z for the daughter after one beta-minus decay. Show the balances. [1]

Answer and work

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**4** Why does beta-minus decay change the identity of the element?

(1) The number of protons changes.

(2) The number of electrons in the first shell decreases.

(3) The mass number doubles.

(4) The daughter always gains an electron from the surroundings.

**Identifying Daughter Nuclei**

Use the information below to answer the questions.

A model catalog shows three beta-minus decays. The periodic table identifies the element for each atomic number.

| Record | Parent (A, Z) | Daughter (A, Z) |
|---|---|---|
| P | (24, 11) | (24, 12) |
| Q | (90, 38) | (90, 39) |
| R | (40, 19) | (40, 20) |

**5** Which record produces a magnesium nucleus?

(1) P

(2) Q

(3) R

(4) All three

**6** Use record Q to write separate equations that balance A and Z, including the emitted beta-minus particle. [1]

Answer and work

**7** What is conserved in the parent-to-daughter transformation shown in record R?

(1) The atomic number of the nucleus

(2) The number of neutrons in the nucleus

(3) The number of protons in the nucleus

(4) The mass number of the nucleus

**8** A student compares the event in P to a sodium atom becoming $Na^{+}$ by losing an outer electron. Explain how the nuclei differ in these two processes. [1]

Answer and work