Quiz E23.1

Nuclear physics

1. How many protons and how many neutrons are there in the nuclide $^{36}_{16}S$?

	Number of protons	Number of neutrons
A	16	36
B	16	20
C	20	36
D	20	20

2. A nucleus has mass 3×10^4 Mev c^{-2}. What is the mass in u and what is the energy equivalent to this mass, in MeV?

	Mass/u	Energy/MeV
A	3	$3\times10^4 \times c^2$
B	3	3×10^4
C	30	$3\times10^4 \times c^2$
D	30	3×10^4

3. What is the energy equivalent to a mass of 1 kg?

A About 930 MeV
B About 930 J
C About 9×10^{16} MeV
D About 9×10^{16} J

4. The binding energy per nucleon for ^3_2He is about 2.5 MeV. How much energy must be supplied to this nucleus in order to separate all the nucleons?

A 2.5 MeV **B** 5.0 MeV **C** 7.5 MeV **D** 12.5 MeV

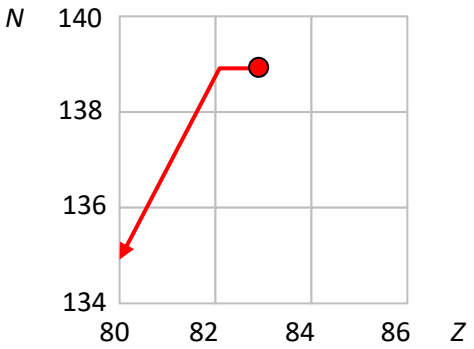
5. What sequence of decays results in the formation of an isotope of the parent nucleus?

A α, β^-, β^-
B α, β^+, β^-
C α, α, β^-
D γ, β^-, β^-

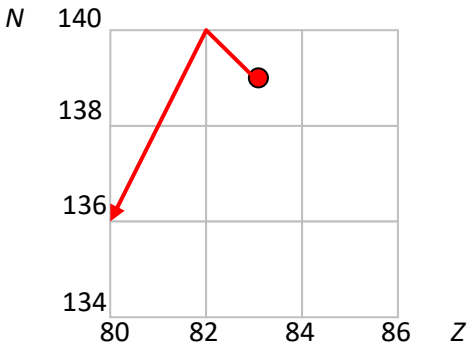
6. What particles are produced in beta minus decay in addition to the daughter nucleus?

A An electron and a neutrino
B An electron and an antineutrino
C A positron and a neutrino
D A positron and an antineutrino

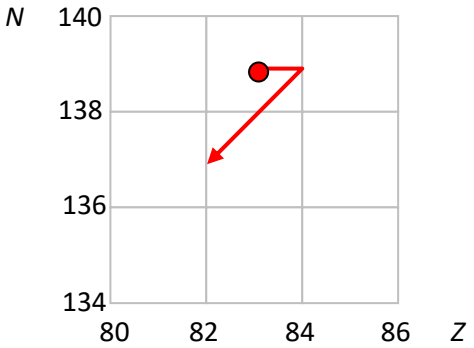
7. The diagrams show plots of neutron number *N* versus proton number *Z*. Which diagram represents the decay of a nucleus by beta plus decay followed by an alpha decay?



A



B



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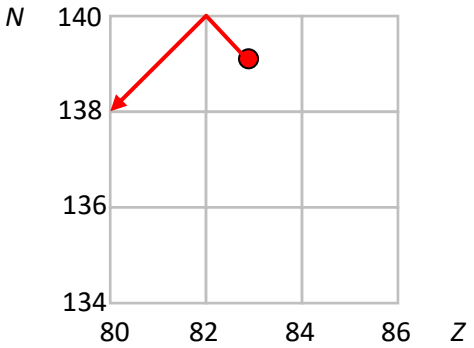

D

8. A pure sample of a radioactive isotope has mass 64 mg. The half-life of the isotope is 6.0 minutes. What mass of the isotope remains after 18 minutes?

A 32 mg **B** 16 mg **C** 8.0 mg **D** 4.0 mg

9. A pure sample of a radioactive isotope X decays into the stable isotope Y. What is the ratio $\frac{\text{number of Y nuclei}}{\text{number of X nuclei}}$ after three half-lives?

A 3 **B** 5 **C** 7 **D** 9

10. The graph shows the count rate (in counts per minute) of a sample containing a radioactive isotope of half-life 4.0 minutes.

What is the background count rate and what is the count rate after two half-lives?

	Background count rate	Count rate
A	12 min^{-1}	21 min^{-1}
B	12 min^{-1}	12 min^{-1}
C	21 min^{-1}	21 min^{-1}
D	21 min^{-1}	12 min^{-1}

Quiz E23.1 Answers	
1	B
2	D
3	D
4	C
5	A
6	B
7	D
8	C
9	C
10	A