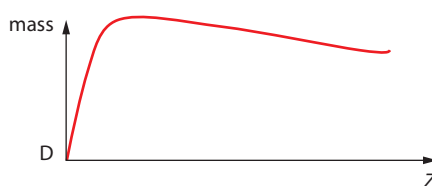
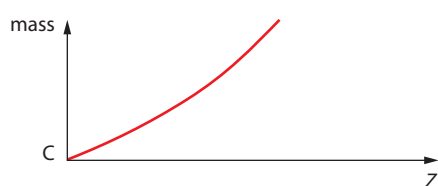
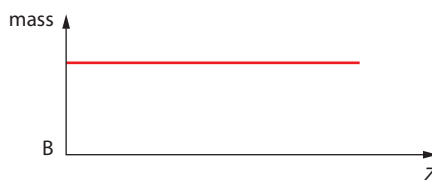
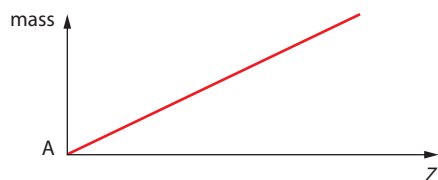


# Self-test questions

## Topic 7

- 1 Two elements with atomic (proton) numbers  $Z_1$  and  $Z_2$  and neutron numbers  $N_1$  and  $N_2$  are isotopes if which of the following conditions applies?
- A  $Z_1 = Z_2$  and  $N_1 = N_2$
  - B  $Z_1 = Z_2$  and  $N_1 \neq N_2$
  - C  $Z_1 \neq Z_2$  and  $N_1 = N_2$
  - D  $Z_1 \neq Z_2$  and  $N_1 \neq N_2$
- 2 Which of the following is a correct about radioactive decay?
- A it is random and spontaneous
  - B the half-lives of unstable elements depend on temperature
  - C unstable elements with roughly the same nucleon number have roughly the same half-lives
  - D activity is proportional to nucleon number
- 3 The half life of a radioactive sample is 8.0 minutes. Which of the following is a correct statement of the radioactive decay of the sample?
- A in 16 minutes the activity will drop to zero
  - B in 16 minutes the mass of the sample will be reduced by a factor of 2
  - C a particular nucleus will decay with probability 0.50 in an interval of 8.0 minutes
  - D a randomly chosen nucleus will decay with probability 0.50 in an 8.0 minute interval
- 4 Which of the following graphs best represents the variation with atomic number of the atomic mass of stable nuclei?



- A
- B
- C
- D

- 5 For the decay  $X \rightarrow Y + Z$  the following data on binding energies (BE) are available:

BE of X = 10 MeV

BE of Y = 7 MeV

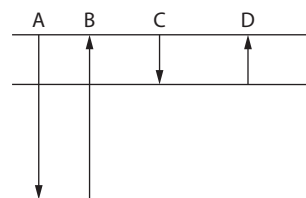
What is the minimum binding energy of Z for the decay to be possible?

- A 0 MeV
- B 3 MeV
- C 17 MeV
- D there is no minimum value; the decay is impossible

6 What are the two missing particles in the beta decay  ${}_{11}^{22}\text{Na} \rightarrow {}_{10}^{22}\text{Ne} + \_ + \_$ ?

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

7 The energy level diagram shows four possible transitions in a hypothetical atom. In which one is a photon of the longest wavelength emitted?

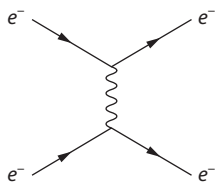


- A
- B
- C
- D

8 The reaction  $e^- \rightarrow \bar{\mu} + \gamma$  does not occur because if it did it would violate the law of conservation of

- A baryon number
- B momentum
- C charge
- D energy

9 The figure shows a Feynman diagram for the reaction  $e^- + e^- \rightarrow e^- + e^-$ .



The wavy line could represent

- A a photon
- B a meson
- C a baryon
- D a quark

10 The strong nuclear force acts on:

- A quarks
- B leptons
- C all charged particles
- D all particles with mass