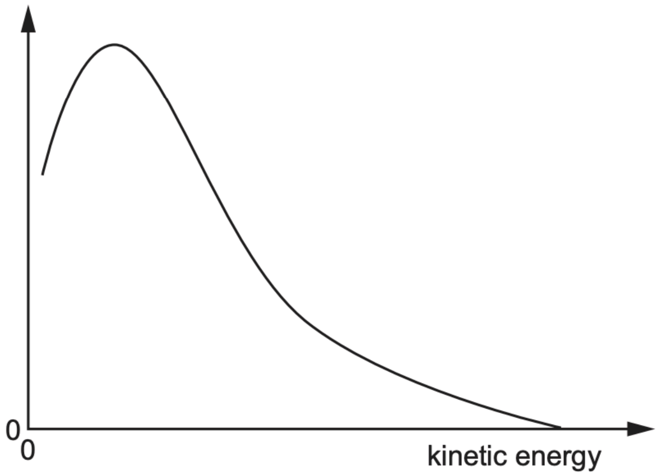
1. An isolated stationary nucleus X decays by emitting an α-particle to form a nucleus Y. Nucleus Y and nucleus Z are isotopes of the same element. Use the principle of conservation of momentum to explain why nucleus Y cannot be stationary immediately after the decay of nucleus X.
   - total momentum before decay is zero OR X has zero / no momentum
   - total momentum after decay must be zero so Y must have equal (and opposite) momentum to α-particle (so cannot be stationary / must have speed/velocity)

2.

The energy spectrum of the β^- radiation emitted by a sample of this isotope is shown in Fig. 7.1.



Use Fig. 7.1 to explain why other particles apart from the β– particles must be emitted during this decay.
   - the energy of the decay is fixed / constant
   - the energies of the beta particles have a continuous range of values / varies / not constant
   - another particle (antineutrino) must possess the extra / remaining energy

3. State the name of the other particle emitted during β– decay.
   - Electron antineutrino

4. Copper isotope ^{66}Cu decays to an isotope of Zn. Give the radioactive decay equation for this decay. Include the nucleon and proton numbers of all the particles involved.

$$^{66}_{29}Cu \rightarrow {}^{66}_{30}Zn + {}^{0}_{-1}\beta + {}^{0}_{0}\overline{\upsilon}_e$$

NOTE: when asked to quantitatively state the change in charge, say 0 if no change, +1 if increase by 1, –1 if decrease by one, etc.

5. A particle P is composed of an up quark and a down antiquark. Particle P belongs to two classes (groups) of particles. State the names of these two classes.
   - hadron(s)
   - meson(s)

6. Compare an α-particle with a β+ particle in terms of their masses and charges.
   - mass of α-particle is <u>much</u> greater than β+ particle
   - both particles are positively charged
   - magnitude of charge on α-particle is twice the charge on β+ particle

7. State what is meant by a fundamental particle
   - particle with no internal structure / particle which cannot be broken down into anything smaller