7 **(a)** State what is meant by the *activity* of a radioactive sample.

……..……

……... [1]

(b) Radon ($^{222}_{86}Rn$) can decay into polonium ($^{218}_{84}Po$) by emitting an alpha radiation as shown.

$$^{222}_{86}Rn \rightarrow {}^{218}_{84}Po + {}^{4}_{2}He$$

The half-life of radon is 3.8 days.

In a 1.0 g sample of radon, determine

(i) the number of radioactive nuclei,

number of radioactive nuclei = …… [1]

(ii) its initial activity,

activity = …… decay s^{-1} [2]

(iii) the time taken for its activity to decline to 1.0% of its initial level, and

time = …… s [2]

(iv) the energy that will be released when all the radon has decayed.

Fig. 7.1 shows the masses of the particles.

particle	mass / u
helium	4.002602
polonium	218.008966
radon	222.017576

Fig. 7.1

energy = …… MeV [3]

(c) A Geiger–Müller tube attached to a counter is placed near the sample at the start of the decay. The count rate measured is far lower than that calculated in **(b)(ii)**.

Suggest a possible reason for this.

……

……

…… [1]

[Total: 10]