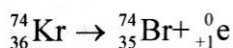
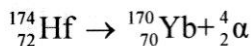


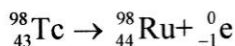
17.12 (a) ${}^{74}_{36}\text{Kr} \rightarrow ? + {}^0_{+1}\text{e}$



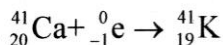
(b) ${}^{174}_{72}\text{Hf} \rightarrow ? + {}^4_2\alpha$



(c) ${}^{98}_{43}\text{Tc} \rightarrow ? + {}^0_{-1}\text{e}$

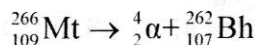


(d) ${}^{41}_{20}\text{Ca} + {}^0_{-1}\text{e} \rightarrow ?$



17.22 (a) ${}^{245}_{98}\text{Cf} + {}^{12}_6\text{C} \rightarrow {}^{257}_{104}\text{Rf}$

(b) ${}^{209}_{83}\text{Bi} + {}^{58}_{26}\text{Fe} \rightarrow {}^{266}_{109}\text{Mt} + {}^1_0\text{n}$



${}^{262}_{107}\text{Bh}$ is the daughter nucleus.

17.28 dis = disintegration(s); $\text{dis} \cdot \text{s}^{-1}$ = disintegrations per second = dps = Bq

(a) activity = $\left(\frac{590 \text{ clicks}}{100 \text{ s}}\right) \left(\frac{1000 \text{ dis}}{1 \text{ click}}\right) \left(\frac{1 \text{ Ci}}{3.7 \times 10^{10} \text{ dps}}\right) = 1.6 \times 10^{-7} \text{ Ci}$

(b) activity = $\left(\frac{2.7 \times 10^4 \text{ clicks}}{1.5 \text{ h}}\right) \left(\frac{1 \text{ h}}{3600 \text{ s}}\right) \left(\frac{1000 \text{ dis}}{1 \text{ click}}\right) \left(\frac{1 \text{ Ci}}{3.7 \times 10^{10} \text{ dps}}\right)$
 $= 1.4 \times 10^{-7} \text{ Ci}$

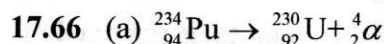
(c) activity = $\left(\frac{159 \text{ clicks}}{1.0 \text{ min}}\right) \left(\frac{1 \text{ min}}{60 \text{ s}}\right) \left(\frac{1000 \text{ dis}}{1 \text{ click}}\right) \left(\frac{1 \text{ Ci}}{3.7 \times 10^{10} \text{ dps}}\right)$
 $= 7.2 \times 10^{-8} \text{ Ci}$

$$17.30 \quad \text{dose in rads} = \left(\frac{2.0 \text{ J}}{5.0 \text{ g}} \right) \left(\frac{10^3 \text{ g}}{1 \text{ kg}} \right) \left(\frac{1 \text{ rad}}{10^{-2} \text{ J} \cdot \text{kg}^{-1}} \right) = 4.0 \times 10^4 \text{ rad}$$

dose equivalent in rems = $Q \times \text{dose in rads}$ (for α radiation, Q is about 20 rem/rad)

$$= \frac{20 \text{ rem}}{1 \text{ rad}} \times 4.0 \times 10^4 \text{ rad} = 8.0 \times 10^5 \text{ rem}$$

$$8.0 \times 10^5 \text{ rem} \div 100 \text{ rem/Sv} = 8.0 \times 10^3 \text{ Sv}$$



$$\Delta m = 230.0339 \text{ u} + 4.0026 \text{ u} - 234.0433 \text{ u} = -.0068 \text{ u}$$

$$\Delta E = \Delta mc^2 = (-0.0076 \text{ u}) \left(\frac{1.661 \times 10^{-27} \text{ kg}}{1 \text{ u}} \right) (3.00 \times 10^8 \text{ m} \cdot \text{s}^{-1})^2$$

$$= -1.0 \times 10^{-12} \text{ J}$$

$$(b) \quad \frac{1.00 \times 10^{-6} \text{ g}}{234.0433 \text{ g} \cdot \text{mol}^{-1}} = 4.27 \times 10^{-9} \text{ mol}$$

$$k = \frac{0.693}{t_{1/2}} = \frac{0.693}{8.8 \text{ h}} = 0.079 \text{ h}^{-1}$$

$$\frac{N}{N_0} = e^{-(0.079 \text{ h}^{-1})(24 \text{ h})} = 0.15$$

If N is $0.15 N_0$, then 85% of the sample decayed in the 24 h period.

$$4.27 \times 10^{-9} \text{ mol} \times 0.85 \times 6.02 \times 10^{23} \text{ atoms} \cdot \text{mol}^{-1} = 2.2 \times 10^{15} \text{ atoms}$$

$$\text{total energy released} = 2.2 \times 10^{15} \text{ atoms} \times 1.1 \times 10^{-12} \text{ J} \cdot \text{atom}^{-1}$$

$$= 2.4 \times 10^3 \text{ J, or } 2.4 \text{ kJ}$$