

NUCLEAR CHEMISTRY AND ENERGY PROBLEMS

- For a sample of water, indicate whether potential energy, kinetic energy or both increase when:
 - warming ice from -10°C to 0°C
 - melting ice at 0°C
 - warming water from 0°C to 100°C
 - vaporizing water at 100°C
 - warming water vapour from 100°C to 110°C
- Match each ΔH value with the appropriate reaction:

$\Delta H_1 = -241.8 \text{ kJ/mol}$	a) $\text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_2\text{O}(\text{g})$
$\Delta H_2 = +44.0 \text{ kJ/mol}$	b) $\text{H}_2(\text{g}) + \frac{1}{2} \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{g})$
$\Delta H_3 = -3.14 \times 10^6 \text{ kJ/mol}$	c) ${}^2_1\text{H} + {}^3_1\text{H} \rightarrow {}^4_2\text{He} + {}^1_0\text{n}$
- When stable, nonradioactive nitrogen in the air is subject to neutron bombardment during a hydrogen bomb explosion, a single neutron is absorbed by the nitrogen nucleus and a proton is emitted (given off). Write a balanced nuclear equation for this reaction and name the other product of the reaction.

- A radioactive element, A, with a mass of 212 and atomic number 84, emits an alpha particle and changes into element B. Element B emits a beta particle and is converted to element C.
 - Write nuclear equations for the formation of elements B and C.
 - What are the atomic masses and atomic number of elements A, B and C?
 - Name elements A, B and C.

- Complete the following nuclear equations:

a) ${}^{190}_{85}\text{Re} \rightarrow {}^{186}_{85}\text{Os} + ?$	d) ${}^{162}_{69}\text{Tm} \rightarrow ? + {}^0_{-1}\text{e} + ?$
b) ${}^{214}_{83}\text{Bi} \rightarrow ? + {}^4_2\text{He} + ?$	e) ${}^8_3\text{Li} \rightarrow ? + {}^4_2\text{He} + ?$
c) ${}^{120}_{49}\text{In} \rightarrow ? + {}^0_{-1}\text{e} + ?$	

Nuclear Equations

- Complete each of the following equations:

a) ${}^{18}_{10}\text{Ne} \rightarrow ? + {}^0_{-1}\text{e} + ?$
b) ${}^{212}_{86}\text{Rn} \rightarrow ? + {}^{208}_{84}\text{Po} + ?$
c) ${}^6_2\text{He} \rightarrow ? + {}^4_2\text{He} + ?$
d) ${}^{214}_{83}\text{Bi} \rightarrow ? + {}^4_2\text{He} + ?$
e) ${}^{207}_{84}\text{Po} \rightarrow ? + {}^{207}_{83}\text{Bi} + ?$
- Identify the missing particle in each of the following equations:

a) ${}^{226}_{88}\text{Ra} \rightarrow ? + {}^{222}_{86}\text{Rn} + ?$	d) ${}^{120}_{49}\text{In} \rightarrow ? + {}^0_{-1}\text{e} + ?$
b) ${}^{12}\text{C} + ? \rightarrow ? + {}^{13}\text{N} + {}^0_0\gamma$	e) ${}^{31}\text{P} + {}^4_2\text{He} \rightarrow ? + {}^{34}\text{Cl} + {}^1_0\text{n}$
c) ${}^{31}\text{P} + {}^4_2\text{He} \rightarrow ? + {}^{34}\text{Cl} + ?$	

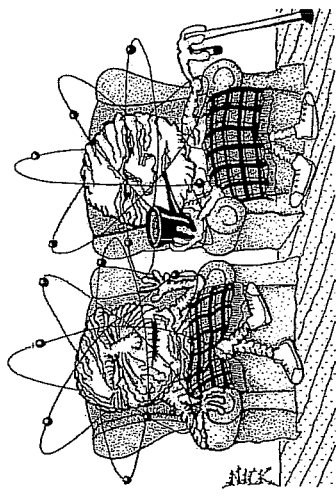
6. Write a balanced nuclear equation for each of the following:

- ${}^{216}_{85}\text{At}(d, \alpha)$
- ${}^{212}_{83}\text{Bi}(d, \alpha)$
- ${}^{208}_{81}\text{Tl}(d, \beta)$
- ${}^{25}_{12}\text{Mg}(\alpha, p)$
- ${}^{55}_{25}\text{Mn}(n, \gamma)$

7. Write balanced nuclear equations for the decay of:

- Pa-234 to U-234
- U-234 to Th-230
- Th-230 to Ra-226
- Ra-226 to Rn-222

At the home for old atoms...



"When I was young I used to feel so cute and dangerous! Would you believe I started life as a uranium-238? Then one day I accidentally ejected an alpha particle. Now look at me—a sweet old atom of lead-206. It seems that all my life since then has been nothing but decay, decay, decay..."