Chemistry 4B SP21 Exam II Name _____
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1 (10 pts; 5 each) Briefly rationalize the following observations regarding the cosmic abundance of the elements:

a) Even Z nuclei are more abundant than odd Z nuclei

b) In the lighter elements, those with mass number divisible by 4 are more abundant

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2. (10 pts; 5 each) Write balanced equations that represent the following nuclear reactions:

a) Positron emission by $^{22}_{11}Na$

b) Alpha emission by $^{222}_{88}Ra$

3 (10 pts)

One fission reaction that takes place in nuclear reactors is:

$$^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{139}_{56}Ba + {}^{94}_{36}Kr + 3{}^{1}_{0}n$$

Calculate the energy released (in joules) when 5.0 g of uranium-235 undergoes this reaction. Use the following masses:
$^{235}_{92}U$: 235.04 u , $^{139}_{56}Ba$: 138.91 u , $^{94}_{36}Kr$: 93.93 u , $^{1}_{0}n$: 1.0087u

4 (10 pts)

A 250. mg sample of carbon from a piece of cloth excavated from an ancient tomb in Nubia undergoes 1.50×10^3 disintegrations in 10.0 h. If a current 1.00 g sample of carbon shows 921 disintegrations per hour, how old is the cloth?

5 (10 pts).
Calculate the energy released per gram of starting material in the fusion reaction represented by the following equation:

$$D + D \rightarrow {}^{3}He + n$$

Use the following masses: D: $2.0141\ u$, ${}^{3}He$: $3.0160\ u$

6 (10 PTS)
Consider the fuel cell that accomplishes the overall reaction:

$$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$$

If the fuel cell operates with 60% efficiency, calculate the amount of electrical work generated per gram of water produced. The gas pressures are constant at 1 atm and the temperature is 25° C.

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7 (15 PTS). Using the given standard reduction potentials, determine the standard potential for the reaction:

$$Ce^{4+} + 4e^{-} \rightarrow Ce(s)$$

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8 (15 pts).
Determine the potential for the following cell @ 25° C

$$Cr(s)|Cr^{3+}(0.37\ M)||\ Pb^{2+}(9.5x10^{-3}M)|Pb(s)$$

9 (**10 pts).**
The potential for the cell @ 25° C

$$Zn(s)|Zn^{2+}(?)||\ Pb^{2+}(0.10\ M)|Pb(s)$$

is +0.661 V. What is the concentration of Zn^{2+} ions??