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| **WASHINGTON LATIN PUBLIC CHARTER SCHOOL****HONORS CHEMISTRY 2019-20** **UNIT 6 TEST – RADIOACTIVITY AND NUCLEAR REACTIONS** Answer all questionsRecommended time = 25 minutesYou will need a Periodic Table and a calculator

|  |  |  |  |
| --- | --- | --- | --- |
|  | Name: |  |   |
|   | Score (open response) | /15 |   |
|  | Score (multiple choice) | /5 |  |
|  | Bonus (Submits quiz on time and in correct format) | /20 |  |
|  | Total: | /40 |  |

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**SECTION A - OPEN RESPONSE**

Fill in all green cells

|  |  |  |
| --- | --- | --- |
| **1.**          | Radon is a monatomic gas released naturally by most rocks. All of its isotopes are radioactive; its most abundant isotope, radon-222, is an alpha emitter. |   |
| (a) | Write an equation to show the decay of radon-222. (Use this template: $$) |  2 |
|   |  |   |
| (b) | The radioactivity of radon-222 falls to 3.125% of its initial intensity after 19 days.Calculate the half-life of radon-222.  | 2 |
|  |   |  |
| (c) | Radon eventually decays (via several other isotopes) into lead-210. How many alpha particles and how many beta particles must be emitted to convert radon-222 into lead-210? Explain your answer. | 2 |
|  |    |  |
| (d) | Suggest why it is important to monitor the rate at which different rocks emit radon gas. | 2 |
|  |  |  |
| TOTAL | 8 |

|  |  |  |
| --- | --- | --- |
| **2.** | The sun’s energy comes from fusing the nuclei of $$ and $$ to make $$.Nuclear energy on earth is generated by the fission of large atoms such as thorium-232. |  |
| (a) | Explain why the fusion of of $$ and $$ releases so much energy. |  1 |
|   |   |
| (b) | Explain why extremely high temperatures and pressures are needed to get this fusion reaction started. |     1 |
|   |
| (c) | State how most fission reactions are started. |  1 |
|   |   |
| (d) | The fission of thorium-232 produces xenon-137, two neutrons and one other product.Identify the other product and write a nuclear equation for the fission reaction.(Use this template: $$ 🡪) |  2 |
|   |   |
| (e) | Explain why this reaction needs to be controlled, and explain how it is controlled. | 2 |
|   |  |
| TOTAL | 7 |

**SECTION B - MULTIPLE CHOICE**

**Do not answer these questions on this sheet**

**Make a note of your answers and enter them in the answer sheet.**

|  |  |
| --- | --- |
| **3.** | It is possible to monitor blood circulation by using a radioactive tracer.What type of radioactive material should be used? |
|   | **A** | An alpha emitter with a long half-life |
|   | **B** | An alpha emitter with a short half-life |
|   | **C** | A gamma emitter with a long half-life |
|   | **D** | A gamma emitter with a short half-life |
|   | **E** | A beta emitter with a medium half-life |
| 1 |

|  |  |
| --- | --- |
| **4.** | Which atom could turn into sulfur-32 by emitting a beta particle? |
|   | **A** | Sulfur-33 |
|   | **B** | Phosphorus-32 |
|   | **C** | Chlorine-32 |
|   | **D** | Phosphorus-31 |
|   | **E** | Chlorine-31 |
| 1 |

|  |  |
| --- | --- |
| **5.** | A skeleton of a mammoth was analysed and found to contain 21.2% of the carbon-14 found in living bone. The half-life of carbon-14 is 5730 years.What is the most likely year of the mammoth’s death? Use log$(\frac{N\_{i}}{N})$ = $\frac{tlog2}{t\_{1/2}}$  |
|   | **A** | 10,800 BC |
|   | **B** | 11,800 BC |
|   | **C** | 12,800 BC |
|   | **D** | 13,800 BC |
|   | **E** | 14,800 BC |
| 1 |

|  |  |
| --- | --- |
| **6.** | Which of the following statements is not true? |
|   | **A** | Hydrogen-3 is a beta emitter |
|   | **B** | All of the isotopes of astatine (At) are radioactive |
|   | **C** | Gamma radiation is most likely to be emitted alongside alpha or beta radiation if the mass defect is small. |
|   | **D** | The emission of an alpha particle and then a beta particle from neptunium-237 produces uranium-233 |
|   | **E** | Copper is unlikely to undergo fission or fusion reactions, even in stars |
| 1 |

|  |  |
| --- | --- |
| **7.** | The fusion of helium-3 with nitrogen-14 would produce oxygen-16 and |
|   | **A** | A proton |
|   | **B** | A neutron |
|   | **C** | An alpha particle |
|   | **D** | A beta particle |
|   | **E** | Nothing else (oxygen-16 would be the only product) |
| 1 |

**End of Test**

[**Answer sheet and exit ticket**](https://docs.google.com/forms/d/e/1FAIpQLSdPdRkn6O5itafcGKryQyQ_AMbhuXIrVLMzB1THm-B2T8l1sg/viewform?usp=sf_link)