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| **WASHINGTON LATIN PUBLIC CHARTER SCHOOL**  **HONORS CHEMISTRY 2019-20**  **UNIT 6 TEST – RADIOACTIVITY AND NUCLEAR REACTIONS**  Answer all questions  Recommended time = 25 minutes  You 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 |  | |

**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 = | |
|  | **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)