

Brett Robbins Academic Consulting

Physics 30 Practice Test

Unit D: Atomic Physics

10 Questions

Original practice questions written to the Alberta curriculum, in the style of past diploma examinations. Work through each question, then check your answers with the key at the end.

This practice test was made by AI and there may be mistakes. If a question or answer looks wrong, contact Brett for clarification.

Question 1

In the gold foil experiment, most alpha particles passed straight through the foil, while a small number were deflected through large angles. This evidence led Rutherford to conclude that an atom

- A) is mostly empty space, with nearly all of its mass and positive charge concentrated in a tiny central nucleus
- B) consists of electrons embedded in a sphere of uniform positive charge
- C) has electrons travelling in fixed circular orbits of any radius
- D) is a solid, indivisible sphere

Question 2

When a nucleus undergoes beta negative decay, the change to the nucleus is

- A) the atomic number increases by 1 and the mass number is unchanged
- B) the atomic number decreases by 1 and the mass number is unchanged
- C) the atomic number decreases by 2 and the mass number decreases by 4
- D) the atomic number is unchanged and the mass number decreases by 1

Question 3

A radioactive sample has a mass of 480 g and a half – life of 6.0 days.

The mass of the original sample remaining after 18 days, in grams, is

Question 4

Selected energy levels for a hydrogen atom are $E_1 = -13.6 \text{ eV}$, $E_2 = -3.40 \text{ eV}$, $E_3 = -1.51 \text{ eV}$, and $E_4 = -0.85 \text{ eV}$. An electron drops from the $n = 3$ level to the $n = 1$ level. The energy of the emitted photon is

- | | |
|------------|------------|
| A) 10.2 eV | B) 1.89 eV |
| C) 12.1 eV | D) 15.1 eV |

Question 5

Gamma radiation is best described as

- | | |
|----------------------------|----------------------------|
| A) a helium nucleus | B) a high – speed electron |
| C) a high – speed positron | D) a high – energy photon |

Question 6

An atom has a ground state energy of -8.50 eV and a first excited state energy of -2.30 eV . An electron drops from the first excited state to the ground state.

Use $h = 6.63 \times 10^{-34} \text{ J} \cdot \text{s}$, $c = 3.00 \times 10^8 \text{ m/s}$, and $1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$.

The wavelength of the emitted photon is

- | | |
|------------------------------------|------------------------------------|
| A) $2.00 \times 10^{-7} \text{ m}$ | B) $5.00 \times 10^{-7} \text{ m}$ |
| C) $2.00 \times 10^{-9} \text{ m}$ | D) $1.24 \times 10^{-6} \text{ m}$ |

Question 7

An electron travels at a speed of $6.00 \times 10^6 \text{ m/s}$. Use $h = 6.63 \times 10^{-34} \text{ J} \cdot \text{s}$ and $m_e = 9.11 \times 10^{-31} \text{ kg}$. The de Broglie wavelength of the electron, to the nearest picometre, is

Question 8

The measured mass of a nucleus is less than the total mass of its separated protons and neutrons by 1.62×10^{-28} kg. The binding energy of the nucleus is

- A) 4.86×10^{-20} J B) 1.46×10^{-11} J
C) 1.80×10^{-45} J D) 1.46×10^{-13} J

Question 9

The nuclear reaction ${}^{222}_{86}\text{Rn} \rightarrow {}^{218}_{84}\text{Po} + X$ is balanced when X is

- A) ${}^1_0\text{n}$ B) ${}^0_{-1}\text{e}$
C) ${}^4_2\text{He}$ D) ${}^0_{+1}\text{e}$

Question 10

In a nuclear fission reactor, the control rods are moved into the core in order to

- A) speed up the neutrons so that more fission occurs
B) provide additional fuel for the chain reaction
C) cool the reactor core
D) absorb neutrons so that the rate of fission stays steady

Answer Key

- | | | |
|-------|--------|-------|
| 1. A | 5. D | 9. C |
| 2. A | 6. A | 10. D |
| 3. 60 | 7. 121 | |
| 4. C | 8. B | |

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