

# Quantum Test Review (A & B)

⚠ This is a preview of the draft version of the quiz

Started: Jan 28 at 10:35am

## Quiz Instructions

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### Question 1

1 pts

Which of the following is not an isotope of hydrogen?

- deuterium
- quaternium
- protium
- tritium

### Question 2

1 pts

Which of the following nuclear transformations are possible?

- emission of a positron by a proton to produce a neutron
- capture of an electron by a proton to produce a neutron
- decay of a neutron into a proton and an electron
- decay of a proton into a neutron and an electron

### Question 3

1 pts

What is the general pattern for the number of neutrons in stable isotopes?

- The most stable isotopes always have an equal number of protons and neutrons in the nucleus.
- There seems to be no general pattern for the ratio of neutrons to protons for stable isotopes as the sizes of nuclei increase.
- The ratio of neutrons to protons tends to decrease in stable isotopes as atomic number increases.
- The ratio of neutrons to protons tends to increase in stable isotopes as atomic number increases.

#### Question 4

1 pts

Which of the following statements are true regarding atomic nuclei?

- All nuclei of a given element have the same total number of nucleons.
- All atomic nucleons are protons and neutrons.
- All nuclei of a given element have the same number of protons.
- All atomic nuclei have an approximately constant density, regardless of composition.

#### Question 5

1 pts

In the Bohr model of the atom, if  $R$  is the orbital radius of an electron in the lowest energy state, what would the orbital radius of an electron in the 2nd energy level be?

- $3R$
- $9R$
- $4R$

6R

**Question 6****1 pts**

Which of the following statements are false regarding the development of the Bohr model of the atom?

- The Bohr model was a planetary model for the electron, with the electron orbiting the nucleus in a circular path around the nucleus.
- The Bohr model had electrons orbiting at only certain distances from the nucleus, corresponding to specific energies.
- Compared to the previous Rutherford model, the Bohr model emphasized the structure of the nucleus.

**Question 7****1 pts**

As a result of the emission of an alpha particle, an atomic nucleus

- increases its atomic number by 2 and decreases its mass by 4
- Increases its atomic number by 2 and increases its mass number by 4
- decreases its atomic number by 2 and increases its mass number by 4
- decreases its atomic number by 2 and decreases its mass number by 4

**Question 8****1 pts**

During radioactive emission of gamma radiation in which no other particles are emitted, the gamma photons are emitted in pairs. Which conservation law would be defied if only one gamma photon were emitted?

- conservation of mass
- conservation of energy
- conservation of linear momentum
- conservation of charge

**Question 9****1 pts**

A radioactive element has a half-life of 16 days. Which of the following statements is true regarding one nucleus of radiant after 16 days?

- There is a 50% chance the nucleus will have decayed.
- The nucleus will decay only when a second nucleus is brought into contact with it.
- Half of the nucleus has decayed.
- The nucleus won't decay prior to 3.66 days, but should decay after that time.

**Question 10****1 pts**

What nuclear transformations do not occur during beta decay?

- A neutron decays into a proton and an electron.
- A proton decays into a neutron and an electron.
- An electron and proton combine to form a neutron.
- An electron and a neutron combine to form a proton.

**Question 11****1 pts**

Particles with mass may be given off by a nucleus through the process of radioactive decay, thus reducing the mass of the nucleus. Which of the following is NOT one of these particles?

- electrons
- alpha particles
- gammas
- positrons

**Question 12****1 pts**

A radioactive sample is placed in a cloud chamber so that the paths of radioactive decay products can be seen as “tracks” in the chamber, A magnetic field is set up across the cloud chamber to help identify the decay products, Which of the following radioactive decay products would never change direction in the magnetic field?

- positrons
- gamma rays
- alpha particles
- beta particles

**Question 13****1 pts**

When a nucleus in an excited state emits a gamma photon,

\_\_\_\_\_.

- the reduction in mass of the nucleus corresponds to the energy of the gamma photon
- a neutron in the nucleus is converted to a proton of higher energy
- the atomic number is reduced, accounting for the energy of the emitted photon
- the mass number of the nucleus is reduced accounting for the energy of this emitted photon

**Question 14****1 pts**

An alpha particle is the nucleus of which atom?

- Helium
- Uranium
- Carbon-14
- Plutonium
- Hydrogen

**Question 15****1 pts**

The Rutherford gold foil experiment demonstrated

- I. the plum pudding model
- II. atoms are mostly empty space
- III. electrons occupy specific energy levels

- III only
- I only
- I and III only

II only

II and III only

**Question 16****1 pts**

In the Bohr model of the atom,

I. electrons occupy energy levels with exact quantities of energy

II. the photoelectric effect is described

III. the absorption and emission of light spectra are predicted

I only

II and III only

III only

II only

I and III only

**Question 17****1 pts**

The photoelectric effect provided experimental evidence that light

can constructively and destructively interfere

is a transverse wave

can diffract

has a particle characteristic

has a wave characteristic

**Question 18****1 pts**

In a photoelectric experiment, the frequency of light is steadily increased. Which statement below is correct?

- Increasing the frequency of light increases the induced current.
- Increasing the frequency of light increases the energy of the emitted electrons.
- Above the threshold frequency, electrons are emitted.
- Below the threshold frequency, no electrons are emitted.
- Increasing the frequency of light increases the potential difference of the photocell.

**Question 19****1 pts**

In a photoelectric experiment, the intensity of light is steadily increased. Which statement below is correct?

- Increasing the frequency of light increases the potential difference of the photocell.
- Below the threshold frequency, no electrons are emitted.
- Increasing the frequency of light increases the induced current.
- Above the threshold frequency, electrons are emitted.
- Increasing the frequency of light increases the energy of the emitted electrons.

**Question 20****1 pts**

Which answer correctly ranks the fundamental particles in order from most massive to least massive?



- Alpha particle > proton > neutron > electron > beta particle
- Neutron > proton > electron > alpha particle > beta particle
- Alpha particle > beta particle > proton > neutron > electron
- Alpha particle > neutron > proton > electron > beta particle
- Neutron > proton > electron > alpha particle > beta particle

**Question 21****1 pts**

An alpha particle is ejected from the nucleus of an atom. Which of the following answers describes the change in the nucleus of the atom?

- The atomic number increases by 2, and the mass number increases by 4.
- The atomic number increases by 1, and the mass number remains unchanged.
- The atomic number increases by 1, and the mass number increases by 2.
- The atomic number increases by 1, and the mass number decreases by 4.
- The atomic number decreases by 2, and the mass number decreases by 4.

**Question 22****1 pts**

A radioactive sample with a half-life of 5 days is analyzed after 20 days. The amount of remaining radioactive material as a fraction of the original sample is most nearly \_\_\_\_\_%.

**Question 23****1 pts**

A radioactive sample with a half-life of 10 days is discovered to have 25% of the original radioactive material. How many days has the sample been experiencing radioactive decay?

**Question 24****1 pts**

Which statement regarding the forces in the nucleus is NOT correct?

- When the ratio of neutrons to protons falls outside of an optimal range, the nucleus becomes unstable.
- At short distances, the strong force is stronger than the electric force.
- The strong force attracts protons to protons.
- Adding neutrons to a nucleus adds to both the strong force and the electrostatic force.
- The strong force attracts neutrons to both protons and other neutrons.

**Question 25****1 pts**

Which of the following are nucleons?

- deuteron
- neutron
- proton
- electron

**Question 26****1 pts**

What happens to a stream of alpha particles that is shot at a thin sheet of gold foil?

- Most of the particles are absorbed by the foil
- All of the particles pass straight through
- All of the particles bounce back at  $180^\circ$
- None of the particles are deflected by more than  $45^\circ$
- A few of the particles bounce back at  $180^\circ$

**Question 27****1 pts**

According to Bohr's model of the atom, why do atoms emit or absorb radiation only at certain wavelengths?

- Because electrons can orbit the nucleus at any radius
- Because electrons orbit the nucleus only at certain discrete radii
- Because protons and electrons are distributed evenly throughout the atom.
- Because protons orbit the nucleus only certain discrete radii
- Because photons can only have discrete wavelengths

**Question 28****1 pts**

What is the equation for a photon's momentum?

$hc/f$

$cfh$

$cf/h$

$hf/c$

### Question 29

1 pts

Which of the following is the best definition of the uncertainty principle?

An observed particle can be in two places at the same time

Light exhibits both wave and particle properties

We cannot know for certain when any given radioactive particle will undergo decay.

The laws of physics are the same in all inertial reference frames

We cannot know both momentum and the position of a particle at the same time.

### Question 30

1 pts

Which of the following particles is most massive?

A beta particle

A neutron

A proton

An electron

An alpha particle

Quiz saved at 10:35am

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