



When and where was Niels Bohr born?

When and from where did Bohr receive his doctorate in physics?

What religion did Bohr follow?

When and for what did Bohr win a Nobel Prize in physics?

What famous WWII project did Bohr work on in the United States?

How did Niels Bohr hide Max von Laue's and James Franck's gold Nobel medals from the Nazis?

Where did Bohr go when the Nazis occupied Denmark?

What was the content of Bohr's "Open Letter to the United Nations" in June, 1950?

What element is named after Niels Bohr? What number is it?

How many papers did Niels Bohr publish?

What did Niels Bohr's children do with their lives?

When and where did Niels Bohr die?

What name did Niels Bohr take on while living in the US during WWII?

What did Bohr found at Copenhagen University in 1920?

How did Bohr participate in WWI?

For what work did Bohr win a prize in 1908?

Where and for whom was Bohr working in 1911?

Where and for whom was Bohr working in 1912?

Bohr was an atheist.

1911, Copenhagen University.

October 7, 1885.
Copenhagen, Denmark.

Bohr dissolved them in acid, then precipitated the gold out after the war and had the medals re-struck by the Nobel Foundation.

The Manhattan Project.

1922, for work on atomic structures

Number 107, bohrium

His views on nuclear weapons, and his desire for a development towards full openness between nations.

Sweden, and then the UK.

November 18, 1962, in Copenhagen.

Of the six, four reached adulthood: Aage became a physicist, Hans Henrik became a physician, Erik a chemical engineer, and Ernest a lawyer. Ernest also played field hockey for Denmark at the 1948 Summer Olympics.

At least 115.

Niels Bohr played no part in WWI.

The Institute of Theoretical Physics

Bohr was named 'Nicholas Baker' for security purposes.

Ernest Rutherford's laboratory in Manchester, UK.

The Cavendish Laboratory (Cambridge, UK) under Sir J.J. Thomson.

An investigation of surface tension by means of oscillating fluid jets.

On what order of magnitude is the weight of an electron?

On what order of magnitude is the weight of a proton?

On what order of magnitude is the weight of a neutron?

What keeps the electrons of an atom orbiting the nucleus of the atom?

What determines the atomic number of an element?

If two atoms have the same number of protons but a different number of neutrons, what are they called?

What subatomic particle has a positive charge?

What subatomic particle has a negative charge?

What subatomic particle has a neutral charge?

What subatomic particles are in the nucleus?

What happens in an ionic bond?

What happens in a covalent bond?

What is an atomic radius, and what does it assume?

What is Avogadro's number?

A proton's mass is _____ times the mass of an electron.

What is the nucleus of an atom held together by?

How many electrons can the first energy shell hold?

How many electrons can the second and third energy shells hold?

10^{-26} g

10^{-26} g

10^{-28} g

Isotopes

The number of protons.

A Coulombic attraction

A neutron

An electron

A proton

Two atoms share electrons

An atom with 'extra' electrons gives them to an atom that is 'short' of electrons

Protons and neutrons

1836

6.022×10^{23}

The distance out to which an electron cloud extends beyond the nucleus. It assumes that an atom exhibits spherical shape.

Eight each

Two

Nuclear forces

What atomic model was proposed in 1904 by J.J. Thompson?

What did the Plum Pudding atomic model look like?

What experiment disproved the Plum Pudding atomic model?

What did the Rutherford atomic model look like?

In what year did Rutherford present his model?

What Japanese scientist developed an atomic model in 1904?

What atomic model replaced the Rutherford model?

When did Niels Bohr propose the atomic model since named after him?

What atomic model was developed in 1902 but proposed in 1916 by Gilbert Lewis?

What are the main points of the Bohr model?

What atomic model is portrayed by this game board?

The Rutherford model is also known as the _____ model.

What were the significant shortcomings of the planetary model?

What element was Bohr's model good at representing?

How does Schrödinger's equation describe an electron?

What is the current model of the atom?

When was the nucleus discovered?

How did Arnold Sommerfeld change the Bohr model?

| | | |
|---|---|--|
| <p>The Geiger-Marsden gold foil experiment.</p> | <p>Negative electrons floating in a positively-charged soup</p> | <p>The Plum Pudding model</p> |
| <p>Hantaro Nagaoka</p> | <p>1911</p> | <p>A dense, positively-charged volume located in the center of the atom, surrounded by a cloud of orbiting electrons.</p> |
| <p>The cubical atom model, in which electrons are located at the corners of a cube in a nonpolar atom</p> | <p>1913</p> | <p>The Rutherford-Bohr model, also known as the Bohr model</p> |
| <p>Planetary</p> | <p>The Bohr or the Rutherford model</p> | <p>That electrons orbit the nucleus in certain orbits at discrete distances from the nucleus, and that electrons can only gain and lose energy by jumping from one orbit to another.</p> |
| <p>Schrödinger's equation describes an electron as a wavefunction.</p> | <p>Hydrogen</p> | <p>That electrons are charged particles, unlike planets orbiting the sun, and that it could not explain the highly peaked emission and absorption spectra observed.</p> |
| <p>Sommerfeld added elliptical orbits</p> | <p>1917</p> | <p>The currently accepted atomic model is the quantum-mechanical model.</p> |

What is the electromagnetic spectrum?

On what order of magnitude is the wavelength of radio waves?

On what order of magnitude is the wavelength of microwaves?

On what order of magnitude is the wavelength of infrared light?

On what order of magnitude is the wavelength of visible light?

On what order of magnitude is the wavelength of ultraviolet light?

On what order of magnitude is the wavelength of x-rays?

On what order of magnitude is the wavelength of gamma rays?

When was the first discovery of electromagnetic waves other than light?

What do Maxwell's equations predict?

Heinrich Hertz built a device in 1886.
What did it do?

When were X-rays discovered?

Does red light have a larger or smaller wavelength than violet light?

What are gamma rays generated from?

What generates X-rays?

What does terahertz radiation fall between on the electromagnetic spectrum?

What electromagnetic radiation wavelengths can the human eye detect?

What type of ray does a PET scan use?

10^{-2} m

10^3 m

The electromagnetic spectrum is the range of all possible frequencies of electromagnetic radiation.

10^{-8} m

$.05 \times 10^{-6}$ m

10^{-5} m

1800

10^{-12} m

10^{-10} m

1895

Generate and detect radio waves

An infinite number of frequencies of electromagnetic waves.

X-rays are generated by electronic transitions involving highly energetic inner atomic electrons

Gamma rays are the photons generated from nuclear decay or other subnuclear processes.

The wavelength of red light is larger than that of violet light.

Gamma rays

Anything with a wavelength between 380 and 760 nm

Terahertz waves fall between infrared and microwaves.

Who discovered radiation?

What two elements did the Curies discover?

When was it discovered that radiation could cause injury?

Who discovered the existence of the half-life of a radioactive element?

Who created the first artificial radioactivity, and when did they do it?

What series of elements on the periodic table are all radioactive?

What is nuclear fission?

What is nuclear fusion?

What is an alpha particle?

What is a beta particle?

What does a Geiger counter detect?

Who suffered the first recognized radiation burn?

What is radioactive decay?

What characteristic must a material have to be considered radioactive?

How many man-made isotopes are radioactive?

Very large nuclei tend to be unstable because of what?

Who discovered the genetic effects of radiation?

What is neutron emission?

1901

Polonium and radium

Henri Becquerel

The actinides

Marie Curie's daughter, Irene Joliot-Curie, and her husband, in 1934

Ernest Rutherford

An alpha particle consists of two protons and two neutrons bound together.

Nuclear fusion is a nuclear reaction in which two or more atomic nuclei collide at very high speed and join to form a new atomic nucleus

A nuclear reaction or decay in which the nucleus of a particle splits into smaller particles

Nikola Tesla

A Geiger counter detects the emission of nuclear radiation, including alpha particles, beta particles, and gamma rays

Beta particles are high-energy, high-speed electrons or positrons emitted by certain types of radioactive nuclei

All of them

The material must spontaneously emit ionizing radiation

The process by which a nucleus of an unstable atom loses energy by emitting particles of ionizing radiation

A type of radioactive decay of atoms containing excess neutrons, in which a neutron is simply ejected from the nucleus

Hermann Joseph Muller

The repulsive forces between protons

What are the rows of the periodic table called?

What are the columns of the periodic table called?

Who published the first periodic table, and when did he do it?

What is the first group on the periodic table, containing Li, Na, K, Rb, Cs, and Fr?

What is the second group on the periodic table, containing Be, Mg, Ca, Sr, Ba, and Ra?

What is the seventeenth group on the periodic table, containing F, Cl, Br, I, and At?

What are the six noble gases?

What are the different blocks of the periodic table?

Moving left to right across a period, does atomic radius usually decrease or increase?

How many elements does the periodic table have?

How many elements occur naturally?

What is the heaviest element to have been observed in macroscopic quantities?

What element is the most electronegative?

What is electronegativity?

Metallic properties are related to lower or higher values of ionization energy, electronegativity and electron affinity?

What were the first discovered synthetic elements, and when were they first synthesized?

What were the two original names of element 105, now known as dubnium?

In 1994, what did the International Union of Pure and Applied Chemistry (IUPAC) decide regarding element naming?

Dmitri Mendeleev, in 1869

Groups

Periods

Halogens

Alkaline earth metals

Alkali metals

Decrease

The s-block, the d-block, the p-block,
and the f-block

Helium, neon, argon, krypton, xenon,
and radon

Number 99, einsteinium

98

114, though an additional four are
claimed to have been synthesized.

Lower

Electronegativity is the tendency of
an atom to attract electrons

Fluorine

That no element can be named after a
living person

Russia named it nielsbohrium and the
US named it hahnium.

Einsteinium and fermium in 1952