

Atomic Concepts Extra Credit
Regents 1-45 Honors 1-50

1. What is the overall charge of an ion that has 12 protons, 10 electrons, and 14 neutrons?
A) 2- B) 2+ C) 4- D) 4+
2. Which particles have approximately the same mass?
A) an electron and an alpha particle
B) an electron and a proton
C) a neutron and an alpha particle
D) a neutron and a proton
3. Which phrase describes an atom?
A) a negatively charged nucleus surrounded by positively charged protons
B) a negatively charged nucleus surrounded by positively charged electrons
C) a positively charged nucleus surrounded by negatively charged protons
D) a positively charged nucleus surrounded by negatively charged electrons
4. An atom in the ground state has two electrons in its first shell and six electrons in its second shell. What is the total number of protons in the nucleus of this atom?
A) 5 B) 2 C) 7 D) 8
5. Which statement compares the masses of two subatomic particles?
A) The mass of an electron is greater than the mass of a proton.
B) The mass of an electron is greater than the mass of a neutron.
C) The mass of a proton is greater than the mass of an electron.
D) The mass of a proton is greater than the mass of a neutron.
6. In the late 1800s, experiments using cathode ray tubes led to the discovery of the
A) electron B) neutron
C) positron D) proton
7. Which subatomic particles are located in the nucleus of an He-4 atom?
A) electrons and neutrons
B) electrons and protons
C) neutrons and protons
D) neutrons, protons, and electrons
8. Which part of a helium atom is positively charged?
A) electron B) neutron
C) nucleus D) orbital
9. Which statement best describes electrons?
A) They are positive subatomic particles and are found in the nucleus.
B) They are positive subatomic particles and are found surrounding the nucleus.
C) They are negative subatomic particles and are found in the nucleus.
D) They are negative subatomic particles and are found surrounding the nucleus.
10. The mass of an electron is approximately equal to $\frac{1}{1836}$ of the mass of
A) a positron B) a proton
C) an alpha particle D) a beta particle
11. As the number of neutrons in the nucleus of an atom increases, the nuclear charge of the atom
A) decreases B) increases
C) remains the same
12. The gold foil experiment led to the conclusion that each atom in the foil was composed mostly of empty space because most alpha particles directed at the foil
A) passed through the foil
B) remained trapped in the foil
C) were deflected by the nuclei in gold atoms
D) were deflected by the electrons in gold atoms
13. Which conclusion was a direct result of the gold foil experiment?
A) An atom is mostly empty space with a dense, positively charged nucleus.
B) An atom is composed of at least three types of subatomic particles.
C) An electron has a positive charge and is located inside the nucleus.
D) An electron has properties of both waves and particles.
14. Every chlorine atom has
A) 7 electrons
B) 17 neutrons
C) a mass number of 35
D) an atomic number of 17

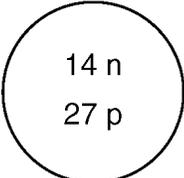
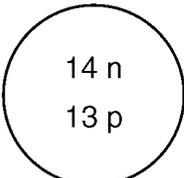
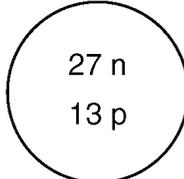
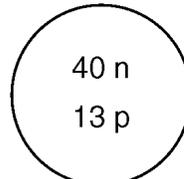
15. What is the charge of the nucleus of an oxygen atom?
 A) 0 B) -2 C) +8 D) +16
16. The notation for the nuclide $^{137}_{55}\text{Cs}$ gives information about
 A) mass number, only
 B) atomic number, only
 C) both mass number and atomic number
 D) neither mass number nor atomic number
17. An atom of any element must contain
 A) an equal number of protons and neutrons
 B) an equal number of protons and electrons
 C) more electrons than neutrons
 D) more electrons than protons
18. What is the total number of protons in an atom with the electron configuration 2-8-18-32-18-1?
 A) 69 B) 79 C) 118 D) 197
19. Compared to a proton, an electron has
 A) a greater quantity of charge and the same sign
 B) a greater quantity of charge and the opposite sign
 C) the same quantity of charge and the same sign
 D) the same quantity of charge and the opposite sign
20. What is the total number of electrons in a neutral atom of fluorine?
 A) 9 B) 10 C) 19 D) 28
21. What is the nuclear charge of an atom with a mass of 23 and an atomic number of 11?
 A) 11+ B) 12+ C) 23+ D) 34+
22. What is the mass number of a carbon atom that contains six protons, eight neutrons, and six electrons?
 A) 6 B) 8 C) 14 D) 20
23. In which list are the elements arranged in order of increasing atomic mass?
 A) Cl, K, Ar B) Fe, Co, Ni
 C) Te, I, Xe D) Ne, F, Na
24. The atomic mass unit is defined as exactly $\frac{1}{12}$ the mass of an atom of
 A) $^{12}_6\text{C}$ B) $^{14}_6\text{C}$
 C) $^{24}_{12}\text{Mg}$ D) $^{26}_{12}\text{Mg}$

25. The total number of protons, electrons, and neutrons in each of four different atoms are shown in the table below.

Subatomic Particles in Four Different Atoms

Atom	Total Number of Protons	Total Number of Electrons	Total Number of Neutrons
A	6	6	7
D	6	6	8
X	7	7	8
Z	8	8	9

Which two atoms are isotopes of the same element?

- A) A and D B) A and Z
 C) X and D D) X and Z
26. Atoms of different isotopes of the same element differ in their total number of
 A) electrons B) neutrons
 C) protons D) valence electrons
27. The most common isotope of chromium has a mass number of 52. Which notation represents a different isotope of chromium?
 A) $^{52}_{24}\text{Cr}$ B) $^{54}_{24}\text{Cr}$ C) $^{24}_{52}\text{Cr}$ D) $^{24}_{54}\text{Cr}$
28. Which diagram represents the nucleus of an atom of $^{27}_{13}\text{Al}$?
 A)  B) 
 C)  D) 
29. Which pair of atoms are isotopes?
 A) $^{14}_6\text{C}$ and $^{14}_7\text{N}$
 B) $^{40}_{19}\text{K}$ and $^{40}_{18}\text{Ar}$
 C) $^{222}_{88}\text{Ra}$ and $^{222}_{86}\text{Rn}$
 D) $^{40}_{19}\text{K}$ and $^{42}_{19}\text{K}$
30. Which nucleus contains the greatest number of neutrons?
 A) $^{31}_{16}\text{S}$ B) $^{32}_{16}\text{S}$ C) $^{31}_{15}\text{P}$ D) $^{32}_{15}\text{P}$

31. The nuclides ${}^1_6\text{C}$ and ${}^{14}_7\text{N}$ are similar in that they both have the same
- A) mass number B) atomic number
C) number of neutrons D) nuclear charge

32. The atomic masses and the natural abundances of the two naturally occurring isotopes of lithium are shown in the table below.

Lithium Isotopes

Isotope	Atomic Mass (u)	Natural Abundance (%)
Li-6	6.02	7.5
Li-7	7.02	92.5

Which numerical setup can be used to determine the atomic mass of lithium?

- A) $(0.075)(6.02 \text{ u}) + (0.925)(7.02 \text{ u})$
 B) $(0.925)(6.02 \text{ u}) + (0.075)(7.02 \text{ u})$
 C) $(7.5)(6.02 \text{ u}) + (92.5)(7.02 \text{ u})$
 D) $(92.5)(6.02 \text{ u}) + (7.5)(7.02 \text{ u})$
33. What information is necessary to determine the atomic mass of the element chlorine?
- A) the atomic mass of each artificially produced isotope of chlorine, only
 B) the relative abundance of each naturally occurring isotope of chlorine, only
 C) the atomic mass and the relative abundance of each naturally occurring isotope of chlorine
 D) the atomic mass and the relative abundance of each naturally occurring and artificially produced isotope of chlorine
34. Which atom in the ground state has an outermost electron with the most energy?
- A) Cs B) K C) Li D) Na
35. An orbital is defined as a region of the most probable location of
- A) an electron B) a neutron
C) a nucleus D) a proton

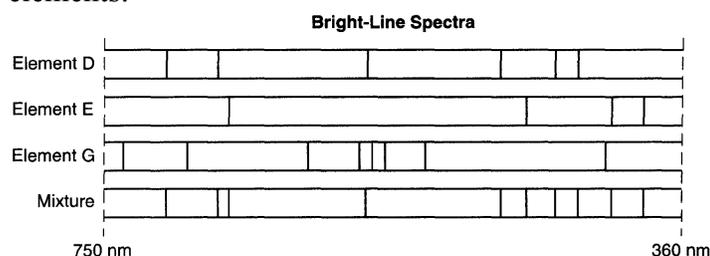
36. How do the energy and the most probable location of an electron in the third shell of an atom compare to the energy and the most probable location of an electron in the first shell of the same atom?

- A) In the third shell, an electron has more energy and is closer to the nucleus.
 B) In the third shell, an electron has more energy and is farther from the nucleus.
 C) In the third shell, an electron has less energy and is closer to the nucleus.
 D) In the third shell, an electron has less energy and is farther from the nucleus.

37. Which electron configuration represents the electrons of an atom in an excited state?

- A) 2-1 B) 2-7-4 C) 2-8-7 D) 2-4

38. Given the bright-line spectra of three elements and the spectrum of a mixture formed from at least two of these elements:



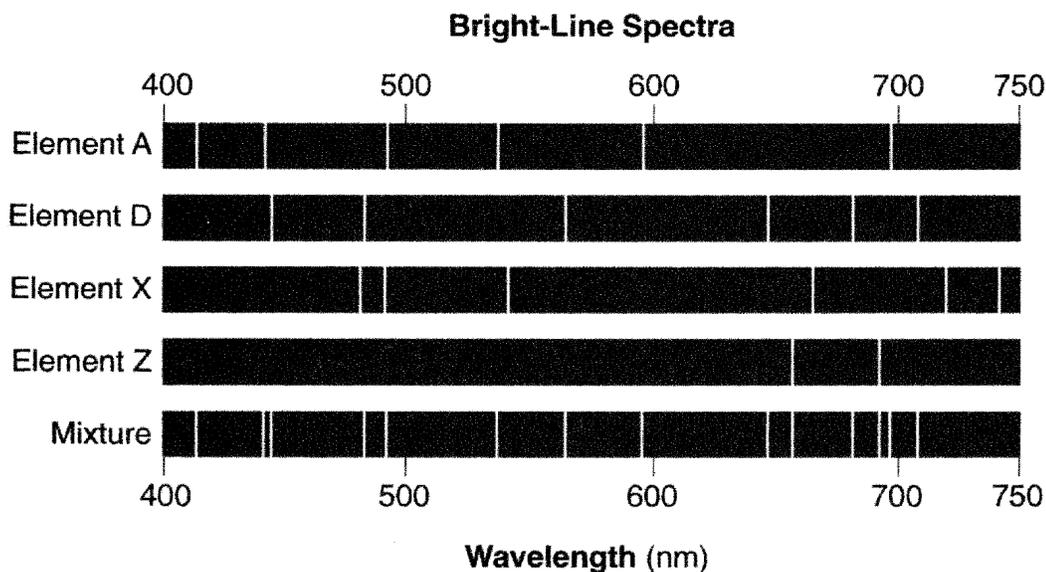
Which elements are present in this mixture?

- A) *E* and *D*, only B) *E* and *G*, only
 C) *D* and *G*, only D) *D*, *E*, and *G*

39. Which electron configuration represents an excited state for a potassium atom?

- A) 2-8-7-1 B) 2-8-7-2
 C) 2-8-8-1 D) 2-8-8-2

40. The diagram below represents the bright-line spectra of four elements and a bright-line spectrum produced by a mixture of three of these elements.



Which element is *not* present in the mixture?

- A) *A* B) *D* C) *X* D) *Z*
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41. The bright-line spectrum of an element in the gaseous phase is produced as
- protons move from lower energy states to higher energy states
 - protons move from higher energy states to lower energy states
 - electrons move from lower energy states to higher energy states
 - electrons move from higher energy states to lower energy states
42. The bright-line spectrum of sodium is produced when energy is
- absorbed as electrons move from higher to lower electron shells
 - absorbed as electrons move from lower to higher electron shells
 - released as electrons move from higher to lower electron shells
 - released as electrons move from lower to higher electron shells
43. In the electron cloud model of the atom, an orbital is defined as the most probable
- charge of an electron
 - conductivity of an electron
 - location of an electron
 - mass of an electron
44. The wave-mechanical model of the atom is required to explain the
- mass number and atomic number of an atom
 - organization of atoms in a crystal
 - radioactive nature of some atoms
 - spectra of elements with multielectron atoms
45. Which phrase describes an atom?
- a positively charged electron cloud surrounding a positively charged nucleus
 - a positively charged electron cloud surrounding a negatively charged nucleus
 - a negatively charged electron cloud surrounding a positively charged nucleus
 - a negatively charged electron cloud surrounding a negatively charged nucleus
46. The greatest absorption of energy occurs as an electron moves from
- $1s$ to $3s$
 - $3p$ to $3s$
 - $4d$ to $4s$
 - $4s$ to $3p$
47. Which electron configuration represents an atom in the excited state?
- $1s^2 2s^2 2p^5 3s^1$
 - $1s^2 2s^2 2p^6 3s^1$
 - $1s^2 2s^2 2p^6 3s^2$
 - $1s^2 2s^2 2p^6 3s^2 3p^1$

48. Which reactant is most likely to have d electrons involved in a chemical reaction?

- A) a halogen B) a noble gas
C) a transition element D) an alkali metal

49. Which element has atoms in the ground state with a sublevel that is only half filled?

- A) helium B) beryllium
C) nitrogen D) neon

50. In the ground state, which element's atoms have five completely filled orbitals?

- A) Li B) B C) C D) Ne
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