Chemistry: Unit 2, Worksheet

Name: Answer Keys

1. Which statements in Dalton's atomic theory are now considered to be incorrect? Describe how the modern atomic theory differs from these statements.

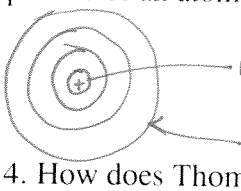
a. The atom is the smallest piece of matter - The atom consists of subatomic & fundamental particles.

b. All atoms of an element are identical - isotopes of an element have different numbers of neutrons

2. Which subatomic particles are charged?

protons are positive and electrons are negative

3. Describe the structure of a typical atom by identifying where each subatomic particle is located. Draw a picture of an atom represented by the Bohr model.



4. How does Thomson's plum pudding atomic model compare with Rutherford's nuclear atomic model.

Thomson described the atom to have a positive charge. Rutherford centered the positive charge in a much smaller, higher density region he called the nucleus

5. What caused the deflection of the alpha particles in Rutherford's gold foil experiment? Why did they deflect?

Nucleus - it was very small and high positive charge close by

6. Which statement is consistent with the results of Rutherford's gold foil experiment?

(a.) All atoms have a positive charge.
(b.) Atoms are mostly empty space.
~~c. The nucleus of an atom contains protons and electrons.~~
~~d. Mass is spread uniformly throughout an atom.~~

7. Which subatomic particle was discovered by researchers working with a cathode ray tube?

electrons - by Thomson

protons by Goldstein + Wein => canal rays

8. Which subatomic particle identifies an atom as that of a particular element? How is this particle related to the atom's atomic number?

protons identify the element. The number of protons in an atom of an element is the atomic number.

9. Which subatomic particles account for most of an atom's mass? Describe the relative masses of the subatomic particles.

protons & neutrons comprise most of the mass of the atom.

proton = 1.0073 amu

neutron = 1.0087 amu

10. Identify the number of subatomic particles in each of the following:

symbol	# of protons	# of electrons	# of neutrons	Atomic #	Mass #
$^{88}Sr^{+2}$	38	36	50	38	88
$^{110}Ag^{+1}$	47	46	63	47	110
$^{34}S^{-2}$	16	18	18	16	34

11. How are isotopes of the same element alike? How are they different?

All isotopes of an element contain the same number of protons and share most chem. and physical properties. They are different by mass because they have different number of neutrons

12. Explain how the existence of isotopes is related to atomic masses not being whole numbers.

Atomic mass is the weighted average of all naturally occurring isotopes of that element. The average takes into account the abundance of each isotope and therefore is not a whole

13. Nitrogen has two naturally occurring isotopes, N-14 and N-15. The atomic mass of nitrogen is 14.007 amu. Which isotope is more abundant in nature? Explain your answer.

N-14 is more abundant because the atomic mass is much closer to 14 than to 15.

14. An element has three naturally occurring isotopes. What other information do you need in order to calculate the element's atomic mass?

The mass and abundances of each isotope.

15. What is the average atomic mass of silicon if 92.21 % of its atoms have a mass of 27.977 amu, 4.07 % have a mass of 28.976 amu, and 3.09 % have a mass of 29.974 amu?

$A = (0.9221 \cdot 27.977) + (0.0407 \cdot 28.976) + (0.0309 \cdot 29.974)$

$= 27.25$

16. Calculate the average atomic mass of silver if 13 out of 25 atoms are silver-107 and 12 out of 25 atoms are silver-109.

$A = (13/25 \cdot 107) + (12/25 \cdot 109)$

$= 107.96$

17. A certain wavelength of violet light has a wavelength of 413 nm. What is the frequency of this wave?

$\nu = \frac{c}{\lambda}$ $\quad \frac{2.998 \times 10^8 \text{ m}}{\text{s}} \Big| \frac{1}{413 \text{ nm}} \Big| \frac{1 \times 10^9 \text{ nm}}{1 \text{ m}} = 7.26 \times 10^{14} \text{ s}^{-1}$

18. A certain wave has a frequency of 2.34×10^8 Hz. Find the wavelength, energy of a photon and the type of e.m.r.

$\lambda = \frac{c}{\nu}$ $\quad \frac{2.998 \times 10^8 \text{ m}}{\text{s}} \Big| \frac{\text{s}}{2.34 \times 10^8} = 1.27 \text{ m}$

$E = h \cdot \nu$ $\quad \frac{6.624 \times 10^{-34} \text{ J} \cdot \text{s}}{} \Big| \frac{2.34 \times 10^8}{\text{s}} = 1.55 \times 10^{-25} \text{ J}$ Radio

19. Visible light is created when electrons fall to the second energy level in an atom. Explain how red light photons are produced as compared to blue light photons.

Red light has one of the lowest frequency and longest wavelength, which means least energy. So an e^- needs to move a very short distance ($n_i = 3$ or 4)