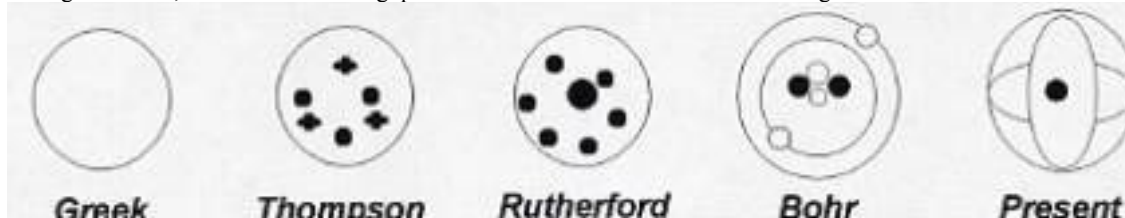


Name: _____

Date: _____

ChemT1

1) Using the diagram above, answer the following question: What can be inferred from the diagram about the structure of the atom?



- A. the atom is very small
 - B. the electrons are moving very fast
 - C. the atom is mainly empty space
 - D. the electrons are very heavy
- 2) Ernest Rutherford investigated the inner structure of the atom by scattering alpha rays through gold foil. Which of the following best describes the conclusion reached by Rutherford from this work?
- A. Nearly all the mass and the positive charge of an atom is found in a small, central nucleus.
 - B. Atoms are the smallest part of matter that can still be recognized as a particular kind of matter.
 - C. Atoms are in constant movement which explains the different characteristics of phases of matter.
 - D. The size of the nucleus in the center of atoms determines all of the atoms' properties.
- 3) An energy beam was sent from the cathode to the anode. Which of the following did J. J. Thomson study using a cathode ray tube?
- A. atoms
 - B. electrons
 - C. neutrons
 - D. nucleus
 - E. quarks
- 4) Experiments performed to reveal the structure of atoms led scientists to conclude that an atom's
- A. volume is mainly unoccupied
 - B. positive charge is evenly distributed throughout its volume
 - C. negative charge is mainly concentrated in its nucleus
 - D. mass is evenly distributed throughout its volume
- 5) Niels Bohr expanded on Rutherford's theories of atomic structure. He suggested that electrons travel in successively larger orbits and that the outer orbits hold more electrons than the inner ones. Where did this work lead other scientists?
- A. To discover that the outer orbits determine the atom's chemical properties.
 - B. To find that protons and neutrons are the smallest parts of the atom.
 - C. To discover that the orbits electrons travel in are elliptical in shape.
 - D. To find that the number of electrons must match the number of orbits.
- 6) According to Dalton's Atomic theory, how are compounds formed?
- A. two nuclei attract each other
 - B. ions are converted into the excited state
 - C. the joining of two or more atoms
 - D. through the process of distillation
 - E. through the release of alpha particles
- 7) The Big Bang Theory describes the formation of the matter in the universe. Why do scientists support this theory?
- A. Evidence from starlight shows that the universe is still expanding.
 - B. Inferences predict that matter in space is evenly spaced and alike.
 - C. Interpretation from data collected from the sun shows it is like Earth.
 - D. Classification of stars shows patterns of similar matter in each galaxy.
- 8) Assumptions arising from the 'Big Bang' theory suggest that the universe originally consisted of almost all hydrogen. If that is correct, where did other elements, like those found on earth, come from?
- A. fission (splitting) of heavy elements
 - B. fusion (joining) of light elements
 - C. chemical reactions between hydrogen atoms
 - D. diffusion from other parts of the universe

9) Scientists in the Bell laboratory in the 1965 detected “noise” from space in a radio telescope. The noise remained constant no matter which direction they scanned. What important discovery did they make that supports the Big Bang theory?

- A. They accidentally discovered radiation leftover from the Big Bang.
- B. Through analysis of data, they proved the existence of neutrons.
- C. They discovered the speed of sound by following the scientific method.
- D. They found that radiation can be measured if clean equipment is used.

10) Which of the following is an example of how science has influenced the advancement of technology?

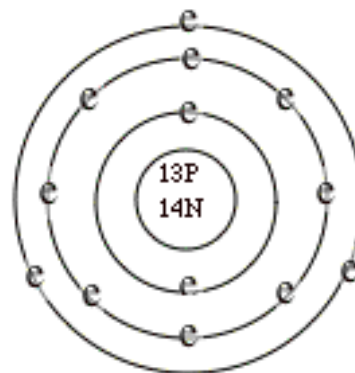
- A. The discovery of subatomic particles led to the development of nuclear power plants.
- B. The discovery of the nucleus led to the development of Avogadro’s number.
- C. The discovery of the periodic nature of matter led to the discovery of the Periodic Table.
- D. The discovery of neutrons led to the invention and use of static electricity.

11) Why is it improbable that a student would be asked to draw an atom to scale?

- A. Atoms are too small to draw.
- B. The nucleus is very small compared to the rest of the atom.
- C. Electrons do not orbit the nucleus.
- D. Electrons move too rapidly to be drawn accurately

12) Using the diagram below and a periodic table, answer the following questions (13-16)... Which symbol represents this element?

- A. He
- B. Li
- C. O
- D. Al
- E. Mn



13) What is the mass number of this element?

- A. 2
- B. 3
- C. 8
- D. 13
- E. 27

14) This element would be located in which group on the periodic table?

- A. first
- B. second
- C. third
- D. fourth
- E. fifth

15) The modern model of the atom shows that electrons are:

- A. orbiting the nucleus in fixed paths
- B. found in regions called orbitals
- C. combined with neutrons in the nucleus
- D. located in a solid sphere covering the nucleus

16) 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 orbiting the nucleus in energy levels

17) The mass of a proton is approximately equal to the total mass of 1,836 _____.

- A. electrons
- B. neutrons
- C. helium nuclei
- D. alpha particles

18) What is the structure of a krypton-85 atom?

- A. 49 electrons, 49 protons, 85 neutrons
- B. 49 electrons, 49 protons, 49 neutrons
- C. 36 electrons, 36 protons, 85 neutrons
- D. 36 electrons, 36 protons, 49 neutrons

- 19) What are the characteristics of a neutron?
- It has no charge and no mass
 - It has no charge and a mass of 1 amu
 - It has a charge of +1 and no mass
 - It has a charge of +1 and a mass of 1 amu
- 20) What is the charge and mass of a proton?
- charge of +1 and mass of 1 amu
 - charge of +1 and mass of 1/1836 amu
 - charge of and mass of 1 amu
 - charge of and mass of 1/1836 amu
- 21) When do electrons release photons? When the electrons:
- are excited to a higher energy level
 - move to a lower energy level
 - increase orbital speed around the nucleus
 - are released by the atom
- 22) Select the sequence in which the elements are arranged in order of increasing atomic mass.
- Cl, K, Ar
 - Fe, Co, Ni
 - Te, I, Sb
 - Ne, F, Na
- 23) Choose the sequence which shows the particles in order of increasing mass?
- proton --> electron --> alpha particle
 - proton --> alpha particle --> electron
 - electron --> proton --> alpha particle
 - alpha particle --> electron --> proton
- 24) What is the nuclear charge of an iron atom?
- +26
 - +30
 - +56
 - +82
- 25) All the isotopes of a given atom have:
- the same atomic mass and the same atomic number
 - the same atomic mass but different atomic numbers
 - different atomic mass but the same atomic number
 - different atomic mass and different atomic numbers
- 26) Which particles are isotopes of each other?
- 1_1X and 3_1X
 - 2_1X and 3_2X
 - 2_1X and 4_2X
 - 3_1X and 3_2X
- 27) The carbon-12 isotope and the carbon-14 isotope differ in:
- atomic number
 - atomic mass
 - nuclear charge
 - number of electrons
- 28) Use your periodic table to answer this question: The number of neutrons in the Antimony 122 isotope is?
- 51
 - 71
 - 94
 - 122
 - 172

- 29) As a Ca atom undergoes oxidation to Ca^{2+} , the number of neutrons in its nucleus:
- decreases
 - increases
 - remains the same
- 30) As an atom becomes an ion, its mass number
- decreases
 - increases
 - remains the same
- 31) Elements in the Periodic Table are arranged according to their _____.
- atomic number
 - atomic mass
 - relative activity
 - relative size
- 32) Use your periodic table to answer this question: An example of an element that can be classified as a metalloid is
- arsenic, As
 - cobalt, Co
 - sodium, Na
 - bromine, Br
- 33) Use your periodic table to answer this question: Which element would you expect to have chemical properties similar to arsenic (As)?
- germanium, Ge
 - selenium, Se
 - antimony, Sb
 - krypton, Kr
- 34) A characteristic of nonmetal is
- high melting points
 - high electronegativity
 - high electrical conductivity
 - the ability to form positive ions
- 35) Which two elements have chemical properties that are most similar?
- Cl and Ar
 - Li and Na
 - K and Ca
 - C and N
- 36) Understanding the trend of electronegativity, which of the following elements has the strongest attraction for electrons?
- boron
 - aluminum
 - oxygen
 - sulfur
- 37) Most of the Periodic table contains elements that would be classified as:
- nonmetals
 - metals
 - nonmetals and metalloids
 - metalloids
- 38) Use your periodic table to answer this question: Which of the following elements would you expect to be an unreactive gas?
- phosphorus, P
 - calcium, Ca
 - argon, Ar
 - carbon, C
- 39) Why is pure silicon chemically classified as a metalloid? Because it
- is malleable and ductile
 - is an excellent conductor of heat and electricity
 - exhibits hydrogen bonding
 - exhibits metallic and nonmetallic properties

- 40) Which of these elements has physical and chemical properties most similar to silicon (Si)?
 A. germanium (Ge)
 B. silver (Ag)
 C. phosphorus (P)
 D. chlorine (Cl)
- 41) As the elements in Group 17 are considered in order of increasing atomic number, the reactivity of each successive element:
 A. decreases
 B. increases
 C. remains the same
- 42) Arsenic and silicon are similar in that they both
 A. have the same ionization energy
 B. have the same covalent radius
 C. are transition metals
 D. are metalloids
- 43) Use your periodic table to answer this question: Lithium, sodium, potassium, and rubidium are all members of the
 A. alkali metals
 B. lanthanides
 C. halogens
 D. alkaline earth metals

- 44) Which element in Period 4 is classified as an active nonmetal?
 A. Ga
 B. Ge
 C. Br
 D. Kr

Salt	Solubility in Water at 60 °C
A	10 grams/50 mL H ₂ O
B	20 grams/60 mL H ₂ O
C	30 grams/120 mL H ₂ O
D	40 grams/80 mL H ₂ O

- 45) Solubility data for four different salts in water at 60°C are shown in the table. Which salt is the most soluble at 60 °C?
 A. A
 B. B
 C. C
 D. D
- 46) What is the total number of atoms contained in a 1.00-mole sample of helium?
 A. 1.00 atom
 B. 1.20×10^{24} atoms
 C. 6.02×10^{23} atoms
- 47) Which of the following is the best analogy for a mole?
 A. describing eggs by the dozen
 B. the number 6.02×10^{23}
 C. measuring NaCl by the gram
 D. opening surprise packages
- 48) The molar mass of NH₄Cl is
 A. 22.4 g/mole
 B. 28.0 g/mole
 C. 53.5 g/mole
 D. 95.5 g/mole
- 49) Which of the following organic compounds has the lowest molar mass?
 (Atomic mass in grams/mole: C = 12.01, O = 16.00, 14.01, H = 1.008)
 A. C₅H₁₁NO₃
 B. C₇H₁₁NO
 C. C₉H₁₈
 D. C₆H₁₁NO₂

- 50) What is the molar mass of Ca₃(PO₄)₂?
 A. 196 g
 B. 214 g
 C. 245 g
 D. 310 g

PERIODIC TABLE OF THE ELEMENTS

Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
1	Hydrogen 1 H 1.008	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Name</p> <p>Atomic Number</p> <p>Symbol</p> <p>Atomic Mass</p> </div> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>Hydrogen</p> <p>1</p> <p>H</p> <p>1.008</p> </div> </div>																		
2	Lithium 3 Li 6.941	Beryllium 4 Be 9.012																		
3	Sodium 11 Na 22.990	Magnesium 12 Mg 24.305	Scandium 21 Sc 44.956																	
4	Potassium 19 K 39.098	Calcium 20 Ca 40.078	Titanium 22 Ti 47.88	Vanadium 23 V 50.942	Chromium 24 Cr 51.996	Manganese 25 Mn 54.938	Iron 26 Fe 55.847	Cobalt 27 Co 58.933	Nickel 28 Ni 58.693	Copper 29 Cu 63.546	Zinc 30 Zn 65.39									
5	Rubidium 37 Rb 85.468	Strontium 38 Sr 87.62	Yttrium 39 Y 88.906	Zirconium 40 Zr 91.224	Niobium 41 Nb 92.906	Molybdenum 42 Mo 95.94	Technetium 43 Tc 97.907	Ruthenium 44 Ru 101.07	Rhodium 45 Rh 102.906	Palladium 46 Pd 106.42	Silver 47 Ag 107.868	Cadmium 48 Cd 112.411	Indium 49 In 114.82	Lead 82 Pb 207.2						
6	Cesium 55 Cs 132.905	Barium 56 Ba 137.327	Lanthanum 57 La 138.905	Hafnium 72 Hf 178.49	Tantalum 73 Ta 180.948	Tungsten 74 W 183.84	Rhenium 75 Re 186.207	Osmium 76 Os 190.2	Iridium 77 Ir 192.22	Platinum 78 Pt 195.08	Gold 79 Au 196.967	Mercury 80 Hg 200.59	Thallium 81 Tl 204.383	Lead 82 Pb 207.2	Bismuth 83 Bi 208.980	Poisonium 84 Po 209	Astatine 85 At 209	Radon 86 Rn 222.018		
7	Francium 87 Fr 223	Radium 88 Ra 226	Actinium 89 Ac 227																	
Lanthanide Series			Cerium 58 Ce 140.116	Praseodymium 59 Pr 140.908	Neodymium 60 Nd 144.24	Promethium 61 Pm 144.913	Samarium 62 Sm 150.36	Europium 63 Eu 151.965	Gadolinium 64 Gd 157.25	Terbium 65 Tb 158.925	Dysprosium 66 Dy 162.50	Holmium 67 Ho 164.930	Erbium 68 Er 167.26	Thulium 69 Tm 168.934	Ytterbium 70 Yb 173.04	Lutetium 71 Lu 174.967				
Actinide Series			Thorium 90 Th 232.038	Protactinium 91 Pa 231.038	Uranium 92 U 238.029	Neptunium 93 Np 237.046	Plutonium 94 Pu 244.064	Americium 95 Am 243.061	Curium 96 Cm 247.070	Berkelium 97 Bk 247.070	Californium 98 Cf 251.080	Einsteinium 99 Es 252.083	Fermium 100 Fm 257.085	Mendelevium 101 Md 258.103	Nobelium 102 No 259.101	Lawrencium 103 Lr 260.105				

$$1 \text{ Mole} = 6.02 \times 10^{23}$$