1. The equation I₂ (s) → I₂ (g) represents a(n) ___ change.
   A. Physical
   B. Chemical
   C. Intensive
   D. Extensive
   E. Nuclear

2. From the previous problem, I₂ (g) represents a(n) ___.
   A. atom of an element
   B. molecule of an element
   C. atom of a compound
   D. molecule of a compound
   E. homogeneous mixture
3. A student measures the mass of an object as $5.82 \times 10^{-3}$ milligrams. This is equivalent to
   A. $582 \times 10^{-6}$ grams
   B. $58.2 \times 10^{-2}$ grams
   C. $5.82 \times 10^3$ grams
   D. $5.82 \times 10^{-6}$ grams
   E. $5.82 \times 10^2$ grams

4. Which of the following quantities has five significant figures?
   A. 0.0245
   B. 0.002090
   C. 0.0005
   D. 0.00050000

5. Which compound listed below is hydrosulfuric acid?
   A. H2S
   B. H2SO4 (aq)
   C. H2SO3 (aq)
   D. SO2 (aq)

6. In the following list, only ____ is NOT an example of a chemical reaction
   A. increased acidity of water after addition of solid carbon dioxide
   B. sublimation of carbon dioxide
   C. Explosion of hydrogen and oxygen balloon
   D. transfer of an electron from sodium to water

7. A helicopter was reported to have been spotted at an altitude of 12,600 ft. before disappearing into the clouds on a stormy day. How many meters is this? (1 m = 1.0936 yd, 1 yd = 3 ft)
   A. 3,841 m
   B. 4,593 m
   C. 34,565 m
8. During a routine visit to the doctor, a patient was found to have a fever of 103.5 °F. What is this temperature in °C?
   A. 376.5 °C
   B. 73.58 °C
   C. 39.72 °C
   D. 37.95 °C

9. A temperature of 294.15 Kelvin was recorded as the highest, on a hot day in Clear Lake, IA. What is this temperature in °F?
   A. 21.0°F
   B. 69.8°F
   C. 90.8°F
   D. 273°F

10. Given the density of gold as $19.3 \text{ g/cm}^3$, what is the mass of a gold bar that is $7.379 \times 10^{-4} \text{ m}^3$ in volume? (1 m = 100 cm)
    A. $1.42 \times 10^4 \text{ g}$
    B. $1.424 \times 10^{-2} \text{ g}$
    C. $2.616 \times 10^2 \text{ g}$
    D. $2.62 \times 10^{-4} \text{ g}$

11. A runner completes a 10K (10.0 km) road race in 44 minutes and 55 seconds. What is the runner's average speed in miles per hour? (1 km = 0.621 miles)
    A. 6.21 mi/hr
    B. 7.49 mi/hr
    C. 8.29 mi/hr
    D. 9.82 mi/hr

12. When you place a piece of dry ice (solid carbon dioxide) on a plate at room temperature, you notice that no liquid forms, unlike ice that melts to form liquid water. This is because dry ice __
    A. as a liquid quickly evaporates.
    B. undergoes deposition instead of melting.
    C. sublimes instead of melting.
D. contains no water.

13. A student performed three measurements to determine the density of water at 25 °C to three significant figures. She obtained the results as 2.01 g/mL, 1.95 g/mL, and 2.10 g/mL. If the known density of water at 25 °C to three significant figures is 0.958 g/mL, the measurements obtained by the student can be described as:
   A. accurate
   B. precise
   C. accurate and precise
   D. neither accurate nor precise

14. Filtration can be used to separate components in a mixture based on differences in
   __________
   A. solubility
   B. particle size
   C. boiling point
   D. melting point

15. Which of the following is an element?
   A. CO
   B. KI
   C. H2O
   D. He

16. Which pair of elements both have chemical properties similar to that of carbon?
   A. N,O
   B. H,O
   C. Si,Ge

17. In which compound can the bonds be described as covalent?
   A. NaCl
   B. MgF₂
   C. SrCl₂
   D. Mn,Ca
18. Complete the following statement. “Isotopes are different forms of the same element, with nuclei that have the same number of protons but different numbers of ________.
   A. neutrons
   B. electrons
   C. charges
   D. bond order

19. Provide the number of protons, neutrons, and electrons in 79Br - isotope.
   A. 45 protons, 34 neutrons, and 36 electrons
   B. 79 protons, 35 neutrons, and 44 electrons
   C. 35 protons, 44 neutrons, and 36 electrons
   D. 44 protons, 35 neutrons, and 35 electrons

20. There are two stable isotopes of gallium. Their masses are 68.9256 and 70.9247 amu. If the average atomic mass of gallium is 69.7231 amu, what is the natural abundance of the heavier isotope?
   A. 11.44 %
   B. 88.56%
   C. 39.89 %
   D. 60.11%

21. Which ion has the same number of electrons as an atom of argon?
   A. Sb³⁻
   B. O²⁻
   C. S²⁻
   D. Be²⁺

22. The following salts are used in fireworks. Which one has an incorrect formula?
   A. BaNO₃, barium nitrate
   B. CuO, copper(II) oxide
   C. CaSO₄, calcium sulfate
   D. NH₄Cl, ammonium chloride
23. A small amount of table salt, NaCl(s) is stirred and completely dissolved in 50.0 mL water. The resultant solution is an example of a __________.
   A. homogeneous mixture
   B. Compound
   C. heterogeneous mixture
   D. pure substance

24. Which one of the following is the highest temperature?
   A. 38 °C
   B. 38 °F
   C. 38 K
   D. they are all the same

25. Which pair of elements should have similar chemical properties?
   A. N and O
   B. P and S
   C. K and Ca
   D. K and Mg
   E. Sr and Ba

26. The elements in Groups 1, 16, and 17 are called ____, _____, and ____, respectively.
   A. alkaline earth metals, halogens, chalcogens
   B. alkali metals, chalcogens, halogens
   C. alkali metals, halogens, noble gases
   D. alkaline earth metals, transition metals, halogens
   E. halogens, alkaline earth metals, alkali metals

27. Which acid in the following series of acids is hypobromous acid?
   A. HBrO4(aq)
   B. HBrO3(aq)
   C. HBrO2(aq)
   D. HBrO(aq)
28. Which answer has the chemical name and formula correctly matched?

A. Potassium Chlorate, KClO3  
B. Potassium trichloride, PCl3  
C. Sulfuric acid, H2SO3  
D. Silicon tetrachloride, SCl4

29. The phase transition from solid to a gas is called ___________.

A. deposition  
B. sublimation  
C. condensation  
D. evaporation

30. What is the identity of element X if the ion X^{2+} contains 18 electrons?

A. argon  
B. sulfur  
C. potassium  
D. calcium

31. What is the chemical formula for magnesium phosphide?

A. MgP2  
B. Mg2P3  
C. Mg3P2  
D. MgP

32. Consider the isotopes {eq}^{37}\text{Cl}^- \text{, } ^{40}\text{Ca}^{2+} \text{ and } ^{48}\text{Ti}^{4+} \text{. These three isotopes have:} 

A. the same number of protons  
B. the same number of neutrons  
C. the same number of electrons  
D. the same number of protons and neutrons
33. Liquid aluminum has a density \( d = 2.375 \text{ g/cm}^3 \) at the melting point. What would be the mass of 0.33 L of liquid aluminum at the melting point?
   A. 0.78 kg
   B. 40 kg
   C. 0.33 kg
   D. 1.8 kg

34. The atomic weight of chlorine is 35.45 amu. The masses for the two most stable isotopes are 34.969 amu for chlorine-35 and 36.969 amu for chlorine-37. Which of these isotopes is more abundant?
   A. chlorine-35
   B. chlorine-37
   C. They have equal abundance
   D. Not enough information is provided

35. Rutherford’s observation of alpha particles passing through a thin gold foil ____.
   A. confirmed the plum-pudding model of the atom
   B. determined the magnitude of the elementary charge
   C. led to the discovery of the dense and compact atomic nucleus
   D. supports Dalton’s atomic theory of matter

36. Which of the following ions results when lead sulfate, PbSO4, is dissolved in water?
   A. Pb4+, S2-, O2-
   B. Pb4+, SO42-
   C. Pb2+, S4+, O2-
   D. Pb2+, SO42-

37. Which of the following elements is a halogen?
   A. Ba
   B. Be
   C. B
   D. Br

38. What is the correct name for the compound P4O6?
39. Dry ice is carbon dioxide, CO₂, in its solid form. At normal atmospheric pressure, CO₂ transitions from a solid to a gas above -78.5°C. This process is called ___.
   A. Sublimation
   B. Solidification
   C. Condensation
   D. Deposition

40. This temperature -78.5°C is ____°F and _____ K (Kelvin)?
   A. -109, 195
   B. -61, 195
   C. -61, 164
   D. -109, 164

41. Which of the following polyatomic ions is named correctly?
   A. SO₃²⁻, sulfate
   B. NO₃⁻, nitrite
   C. CO₃²⁻, carbonate
   D. NO₂⁻, nitrate