Student name:_____

TRUE/FALSE - Write 'T' if the statement is true and 'F' if the statement is false.

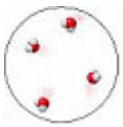
1) PVC plastic, which is used in pipes, is an example of a synthetic material.
   - ◎ true
   - ◎ false

2) Nitrogen gas (N_2) would properly be classified as a compound.
   - ◎ true
   - ◎ false

3) Changes in state such as melting and boiling are physical changes.
   - ◎ true
   - ◎ false

4) A compound cannot be broken down into simpler substances.
   - ◎ true
   - ◎ false

5) The water molecules in this image are best described as being in the liquid state.



   - ◎ true
   - ◎ false

6) The base unit for mass in the metric system is kilograms (kg).
   - ◎ true
   - ◎ false

7) The base unit for volume in the metric system is liter (L).
   - ◎ true
   - ◎ false

8) An inexact number results from a measurement or observation and contains some uncertainty.
   - ◎ true
   - ◎ false

9) A zero counts as a significant figure when it occurs at the end of a number that contains a decimal point.
   - ◎ true
   - ◎ false

10) 8 mL is larger than 8 dL.
   - ◎ true
   - ◎ false

11) Specific gravity is a quantity that compares the density of a substance with the density of water.
   - ◎ true
   - ◎ false

12) The specific gravity of a substance has units of g/mL.
   - ◎ true
   - ◎ false

13) When the liquid carbon tetrachloride (density = 1.59 g/mL) is added to water, the top layer will be the water layer.
   - ◎ true
   - ◎ false

14) When a piece of magnesium (density = 1.738 g/mL) is placed in a container of liquid carbon tetrachloride (density = 1.59 g/mL), the piece of magnesium will float on top of the carbon tetrachloride.
   - ◎ true
   - ◎ false

15) In reading a number with a decimal point from left to right, all digits starting with the first nonzero number are significant figures.
   - ◎ true
   - ◎ false

16) The number 900,027,300 has four significant figures.

- ◎ true
- ◎ false

17) The number 900,027,300 has nine significant figures.

- ◎ true
- ◎ false

18) The two conversion factors for the equality 1 in = 2.54 cm are properly shown below.

$$\frac{1\text{ in}}{2.54\text{ cm}} \quad \text{and} \quad \frac{2.54\text{ in}}{1\text{ cm}}$$

- ◎ true
- ◎ false

19) Dissolving sugar in water involves a chemical change.

- ◎ true
- ◎ false

20) Burning gasoline is a chemical change.

- ◎ true
- ◎ false

21) One-thousand (1,000) ms is the same length of time as one (1) μs.

- ◎ true
- ◎ false

22) Assuming the numbers are measured values, when multiplying 762.85 by 15, the answer should be reported with two significant figures.

- ◎ true
- ◎ false

23) When subtracting 15 from 762.85 the answer should be reported with two significant figures.

- ◎ true
- ◎ false

24) In scientific notation, a number is written as $y \times 10^{x}$, where x can be any positive or negative number or fraction.

- ◎ true
- ◎ false

25) If the density of a substance is greater than 1 g/mL, the mass of a sample of this substance will be greater than the volume of the sample.
- ◎ true
- ◎ false

26) Dividing a number by 10^5 is the same as multiplying a number by 10^{-5}.
- ◎ true
- ◎ false

27) The measurement 10.3 cm has more significant figures than the measurement 10.3 m.
- ◎ true
- ◎ false

28) The density of olive oil is greater at 200 °C than at 25 °C.
- ◎ true
- ◎ false

29) One Kelvin is the same size as one degree Celsius.
- ◎ true
- ◎ false

30) The temperature 60 °C is higher than 60 °F.
- ◎ true
- ◎ false

31) The temperature −60 °C is higher than −60 °F.
- ◎ true
- ◎ false

32) The temperature 60 °C is higher than 60 K.
- ◎ true
- ◎ false

33) Elements and compounds are both classified as pure substances.
- ◎ true
- ◎ false

34) The terms used in conversion factors must always be exact numbers.
- ◎ true
- ◎ false

35) The number 87,927,000 is larger than the number 9.7×10^{6}.
- ◎ true
- ◎ false

36) The number 0.0007270 is larger than the number 5.7×10^{-3}.
- ◎ true
- ◎ false

37) A mixture can be separated into its components by physical changes.
- ◎ true
- ◎ false

38) For a number written in scientific notation, a negative exponent indicates the value of the number is less than 1.
- ◎ true
- ◎ false

39) The meaning of the metric prefix *milli-* is 1000.
- ◎ true
- ◎ false

40) All of the following are examples of physical properties: color, odor, boiling point, solubility.
- ◎ true
- ◎ false

41) A liquid has a definite volume and takes the shape of the container that it is in.
- ◎ true
- ◎ false

42) In a measured number, the significant digits are all of the digits shown except the one estimated digit.
- ◎ true
- ◎ false

43) One milliliter is the same volume as one cubic centimeter.
- ◎ true
- ◎ false

44) When setting up a dimensional analysis problem, in order for a unit to cancel, the same unit must appear in the numerator of one term and in the denominator of another term.
- ◎ true
- ◎ false

45) The temperature of two objects are measured in the laboratory. The temperature of Object A is 40°C, and the temperature of Object B is 200K. It can be concluded that the temperature of Object B is higher than that of Object A.
- ◎ true
- ◎ false

46) A beaker filled with 52 g of hydrochloric acid was carelessly spilled on the laboratory floor. Prior to the spill, the density of the acid was determined to be 1.2 g/mL. Is the student's claim that the beaker contained 43 mL of acid true or false?
- ◎ true
- ◎ false

47) Isotopes are atoms of the same element with the same atomic number but different mass numbers.
- ◎ true
- ◎ false

48) Beta particles move faster than alpha particles, but they do not penetrate into tissue as far as an alpha particle.
- ◎ true
- ◎ false

49) To decrease the incidence of harmful bacteria in foods, certain fruits and vegetables are irradiated with g rays that kill any bacteria contained in them.
- ◎ true
- ◎ false

50) The sum of the mass numbers and the sum of the atomic numbers must be equal on both sides of a nuclear equation.

- ◎ true
- ◎ false

51) Alpha emission is the decay of a nucleus by emitting an α particle, resulting in a new nucleus that has two fewer protons than the original nucleus.

- ◎ true
- ◎ false

52) During gamma emission there is no change in the atomic number or mass number of a radioactive nucleus.

- ◎ true
- ◎ false

53) The emission of gamma rays frequently occurs during alpha decay and beta particle emission.

- ◎ true
- ◎ false

54) An accurate assessment of the total volume of circulating blood is necessary to determine the filtration volume for hemodialysis, a procedure where a dialysis machine filters wastes and fluids and balances electrolytes to clean the blood of patients with chronic renal disease or experiencing renal failure. Often, Iodine-131, a radioisotope, is injected into the blood and the dilution factor is calculated to determine the total blood volume. This radioisotope contains 53 protons, 78 neutrons, and 53 electrons.

- ◎ true
- ◎ false

55) The rad is the amount of radiation that also factors in its energy and potential to damage tissue.

- ◎ true
- ◎ false

56) A radiation source used external to the body for therapeutic purposes must have a much shorter half-life than radioisotopes that are ingested for diagnostic purposes.

- ◎ true
- ◎ false

57) PET scans are used to detect tumors and coronary artery disease, determine whether cancer has spread to other organs of the body, and monitor whether cancer treatment has been successful.

- ◎ true
- ◎ false

58) Radon-222, which originates in soil and rocks from the radioactive decay of uranium isotopes, can concentrate in buildings leading to unsafe levels of radioactivity that have been linked to the development of lung cancer. When radon-222 undergoes radioactive decay, it emits radiation in the form of alpha particles. Rn-222 decays to form Po-218.

- ◎ true
- ◎ false

59) Nuclear fusion is the splitting apart of a heavy nucleus into lighter nuclei and neutrons.

- ◎ true
- ◎ false

60) A nuclear power plant utilizes the tremendous amount of energy produced by fission of the uranium-235 nucleus to heat water to steam, which powers a generator to produce electricity.

- ◎ true
- ◎ false

61) X-rays, CT scans, and MRIs are techniques that utilize nuclear reactions to provide an image of an organ or extremity that is used for diagnosis of a medical condition.

- ◎ true
- ◎ false

62) When a positron is emitted from the nucleus of an atom, the nuclear mass remains the same.

- ◎ true
- ◎ false

63) A positron is formed when a neutron is converted to a proton and an electron.

- ◎ true
- ◎ false

64) To decrease the incidence of harmful bacteria in foods, certain fruits and vegetables are irradiated with α particles that kill any bacteria contained in them.

- ◎ true
- ◎ false

65) Radioisotopes that are used for diagnosis and imaging in medicine have short half-lives so they do not linger in the body.

- ◎ true
- ◎ false

66) The technique of radiocarbon dating is based on the fact that the ratio of radioactive carbon-14 to stable carbon-12 is a constant value in a living organism that is constantly taking in CO_2 and other carbon-containing nutrients from its surroundings.

- ◎ true
- ◎ false

67) A microcurie of radioactivity is larger than a Becquerel of radioactivity.

- ◎ true
- ◎ false

68) Hydrogen-3 is a radioactive isotope of hydrogen. When hydrogen-3 undergoes beta decay, helium-3 is formed.

- ◎ true
- ◎ false

69) One rem is equivalent to 100 Sv.

- ◎ true
- ◎ false

70) Generally, no detectable biological effects are noticed when the dose of radiation is less than 25 rem.

- ◎ true
- ◎ false

71) Two problems that surround nuclear power generation are the possibility of radiation leaks and the disposal of nuclear waste.

- ◎ true
- ◎ false

72) Nuclear fission and nuclear fusion both release a great deal of energy.

- ◎ true
- ◎ false

73) The light and heat of the sun and other stars is a result of nuclear fusion.

- ◎ true
- ◎ false

74) Red blood cells tagged with technetium-99m are used to find the site of a gastrointestinal bleed.

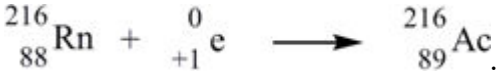
- ◎ true
- ◎ false

75) Cobalt-60 is used as an external source of radiation for cancer treatment.

- ◎ true
- ◎ false

76) Uranium-235 is used in nuclear weapons. This radioactive isotope contains 92 protons and 235 neutrons.

- ◎ true
- ◎ false

77) The balanced nuclear equation for the decay of radon-216 by positron emission is  .

- ◎ true
- ◎ false

78) The balanced nuclear equation for the decay of radon-220 by α decay is $^{220}_{86}\mathrm{Rn} \rightarrow {}^{216}_{84}\mathrm{Po} + {}^{4}_{2}\mathrm{He}$.</p>

- ◎ true
- ◎ false

79) The balanced nuclear equation for the decay of neon-31 by β decay is $^{31}_{10}\mathrm{Ne} \rightarrow {}^{31}_{11}\mathrm{Na} + {}^{0}_{-1}\mathrm{e}$.</p>

- ◎ true
- ◎ false

80) Exposure to 600 rem of radiation is fatal for an entire population.

- ◎ true
- ◎ false

81) Only fusion can involve bombarding a nucleus with a neutron.

- ◎ true
- ◎ false

82) Nuclear fission reactions generate radioactive waste with long half-lives, often hundreds or even thousands of years.

- ◎ true
- ◎ false

83) Rb-84 is used to monitor cardiac output and has a half life of 33 days. It would take approximately 165 days for a 1.000 mg sample of Rb-84 to decay to 0.063 mg.

- ◎ true
- ◎ false

84) Isotopes are atoms of the same element having a different number of protons.

- ◎ true
- ◎ false

85) A gamma ray has twice the mass of an alpha particle.
- ◎ true
- ◎ false

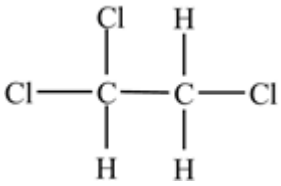
86) An alpha particle is identical to a helium atom.
- ◎ true
- ◎ false

87) Hydrocarbons are nonpolar molecules.
- ◎ true
- ◎ false

88) Organic compounds have lower boiling points and melting points than most ionic compounds, because they have weaker attractions between compounds.
- ◎ true
- ◎ false

89) All molecules with polar bonds are polar molecules.
- ◎ true
- ◎ false

90) The compound below is a nonpolar molecule.



- ◎ true
- ◎ false

91) All hydrocarbon molecules are insoluble in water.
- ◎ true
- ◎ false

92) Cholesterol is soluble in a nonpolar solvent, such as gasoline.
- ◎ true
- ◎ false

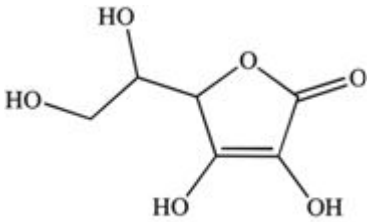
93) Polar organic compounds are water soluble only if they are small and contain a nitrogen or oxygen atom that can hydrogen bond with water.

◎ true
◎ false

94) MTBE is soluble in both gasoline and in water.

◎ true
◎ false

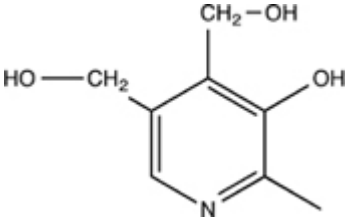
95) Vitamin C is a water-soluble vitamin.



Vitamin C

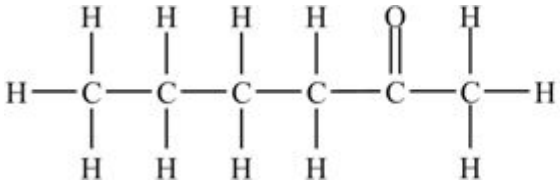
◎ true
◎ false

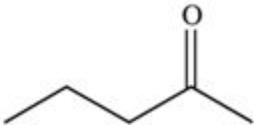
96) Vitamin B6, shown below, is a fat-soluble vitamin.



◎ true
◎ false

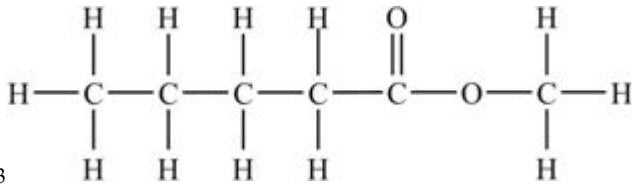
97) The two structures shown below represent the same compound.





◎ true
◎ false

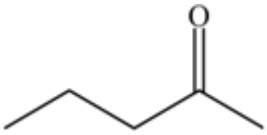
98) The two structures shown below represent the same compound.



$CH_3CH_2CH_2CH_2CO_2CH_3$

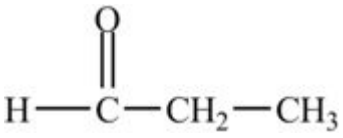
- ◎ true
- ◎ false

99) The compound represented by the skeletal structure below contains eleven (11) H atoms and two lone pairs of electrons that are not shown.



- ◎ true
- ◎ false

100) The molecule below is an example of a ketone.



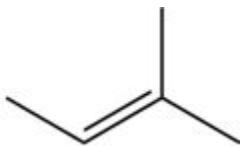
- ◎ true
- ◎ false

101) An aldehyde functional group is always located at the end of a molecule.

- ◎ true
- ◎ false

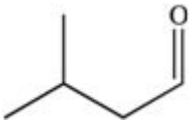
102) The condensed structure and skeletal structure shown below represent the same compound.

$CH_3CH{=}CHCH_2CH_3$ =



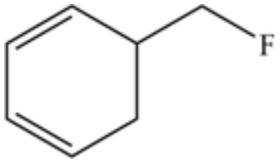
- ◎ true
- ◎ false

103) The molecule with the condensed formula $(CH_3)_2CHCH_2CHO$ can be represented as the skeletal structure below.



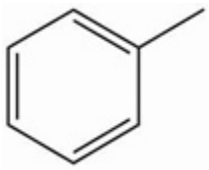
◎ true
◎ false

104) The molecule below is an example of an aromatic compound.



◎ true
◎ false

105) The molecule below is an example of an aromatic compound.

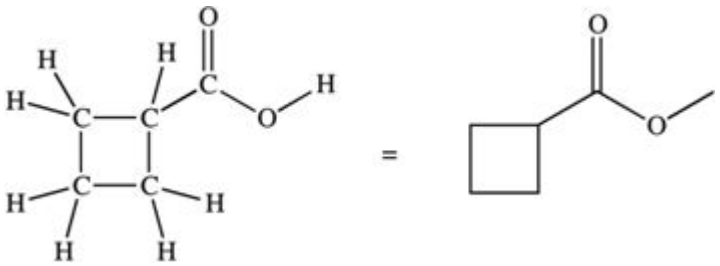


◎ true
◎ false

106) VSEPR theory is based on the concept that the most stable arrangement of atoms in a molecule keeps the atoms and lone pair electrons as far away from each other as possible.

◎ true
◎ false

107) The two structures shown below represent the same compound.



◎ true
◎ false

108) A bond angle of 109.5° is associated with a tetrahedral molecular shape, and a bond angle of 120° is associated with a trigonal planar molecular shape.
◎ true
◎ false

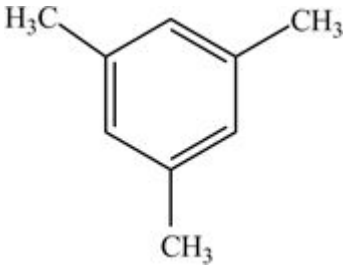
109) A functional group is an atom or a group of atoms with characteristic chemical and physical properties.
◎ true
◎ false

110) The abbreviation "R" in a chemical formula represents a hydrocarbon portion of the molecule.
◎ true
◎ false

111) Alkanes have only C–C single bonds and no functional group.
◎ true
◎ false

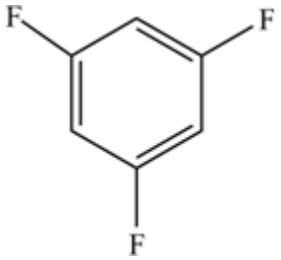
112) Alkanes, which have no functional groups, and therefore no reactive sites, are relatively unreactive.
◎ true
◎ false

113) The compound below contains no polar bonds.



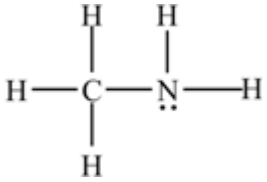
◎ true
◎ false

114) The compound below is a polar molecule.



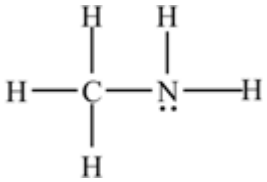
◎ true
◎ false

115) The compound below is expected to be soluble in water.



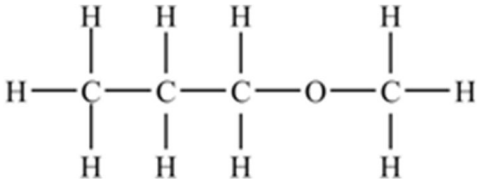
◎ true
◎ false

116) In the molecule below, the shape around the carbon atom is tetrahedral and the shape around the nitrogen atom is trigonal planar.



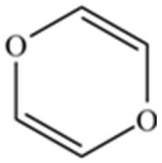
◎ true
◎ false

117) The shape around the oxygen atom in the molecule below is linear.



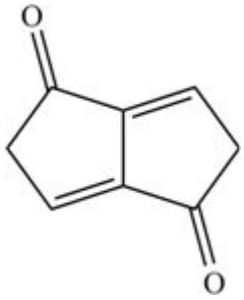
◎ true
◎ false

118) In order to complete the structure of the environmental toxin dioxin shown below, four H atoms and two lone pairs need to be added.



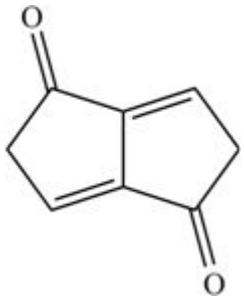
◎ true
◎ false

119) The molecule below contains alkyne and carbonyl functional groups.



◎ true
◎ false

120) In order to complete the structure shown below, six H atoms and four lone pairs need to be added.

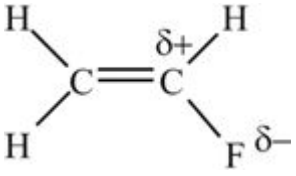


◎ true
◎ false

121) CH_2F_2 is a nonpolar molecule.

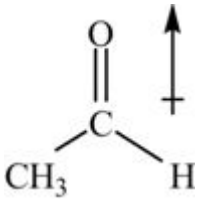
◎ true
◎ false

122) The polarity in CH_2=CHF can be represented as indicated below.



◎ true
◎ false

123) The net dipole in CH_3CHO is shown as indicated below.

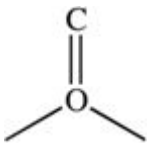


◎ true
◎ false

124) Organic compounds are produced only by living systems, and cannot be synthesized in the laboratory.

◎ true
◎ false

125) Many organic compounds contain the carbonyl group as part of their functional group. A carbonyl group has the general structure indicated below.



◎ true
◎ false

126) A C atom surrounded by three atoms forms one double bond and two single bonds.

◎ true
◎ false

127) Carbons atoms can form single, double, triple, and quadruple bonds.

◎ true
◎ false

128) The compound below is an example of an amine.

◎ true
◎ false