Name: _____

1) Matter is defined as anything that occupies space and has

A) a definite shape B) mass C) color D) odor

2) The list below shows four samples: *A*, *B*, *C*, and *D*.

(*A*) HCl(aq)
(*B*) NaCl(aq)
(*C*) HCl(g)
(*D*) NaCl(s)

Which samples are substances?

A) *C* and *D* B) *C* and *B* C) *A* and *C* D) *A* and *B*

3) Which of the following can *not* be decomposed into simpler substances?

A) solutions B) mixtures C) elements D) compounds

4) Which could be the chemical formula of an element?

A) *ab* B) *AB* C) *aB* D) *Ab*

5) Element *A* and element *B* become chemically bonded together to form substance *C*. Substance *C* must be

A) a solution B) an element C) a mixture D) a compound

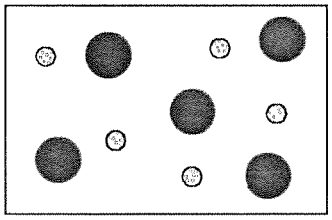
6) Which of the following statements describes a characteristic of *all* compounds?

A) Compounds can be decomposed by chemical means.
B) Compounds can be decomposed by physical means.
C) Compounds contain one element, only.
D) Compounds contain two elements, only.

7) At 1 atmosphere and 20°C, *all* samples of $H_2O(\ell)$ must have the same

A) weight B) volume C) density D) mass

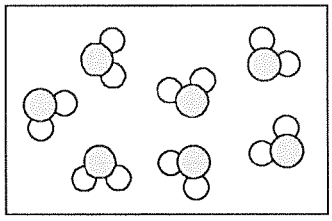
8) The particle diagram below represents a sample of matter.



Which *best* describes the composition of the sample?

A) a single compound
B) a single element
C) a mixture of compounds
D) a mixture of elements

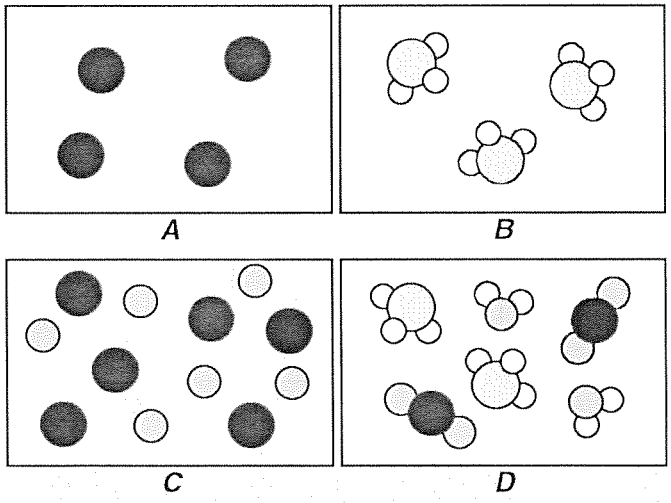
9) The particle diagram below represents a sample of matter.



Which *best* describes the composition of the sample?

A) a single element
B) a single compound
C) a mixture of compounds
D) a mixture of elements

Questions 10 through 13 refer to the following:



10) Which particle diagram above *best* represents a single element?

A) *A* B) *B* C) *C* D) *D*

11) Which particle diagram above *best* represents a single compound?

A) *A* B) *B* C) *C* D) *D*

12) Which particle diagram above *best* represents a mixture of elements?

A) *A* B) *B* C) *C* D) *D*

13) Which particle diagram above *best* represents a mixture of compounds?

A) *A* B) *B* C) *C* D) *D*

14) In an equation, what symbol would indicate a mixture?

A) (g) B) (s) C) (ℓ) D) (aq)

15) Which material is a mixture?

A) air B) magnesium C) methane D) water

16) An example of a mixture is

A) salt water B) pure water C) gold D) silver

17) A true solution is *best* described as a

A) heterogeneous compound
B) homogeneous mixture
C) homogeneous compound
D) heterogeneous mixture

18) An example of a homogeneous mixture is

A) granite B) air C) oil and water D) concrete

19) Which represents a homogeneous mixture?

A) $Br_2(\ell)$ B) $CuSO_4(s)$ C) $NaCl(aq)$ D) $CO_2(g)$

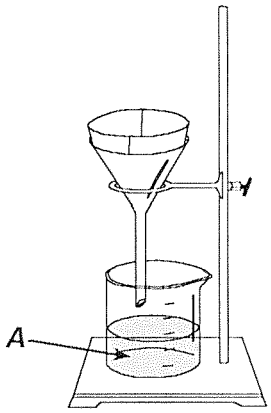
20) When sample *X* is passed through a filter paper, a white residue, *Y*, remains on the paper and a clear liquid, *Z*, passes through. When liquid *Z* is vaporized, another white residue remains. Sample *X* is *best* classified as

A) a homogeneous mixture
B) a heterogeneous mixture
C) a compound
D) an element

21) What process is used to separate a mixture of liquids based on a difference in boiling point?

A) distillation B) titration C) filtration D) chromatography

22)



What separation procedure uses the laboratory apparatus shown above?

A) distillation B) chromatography C) filtration D) titration

23) Which would be considered a chemical change?

A) melting of iron
B) magnitizing of iron
C) bending of iron
D) rusting of iron

24) When a substance was dissolved in water, the temperature of the water increased. This process is described as

A) exothermic, with the release of energy
B) endothermic, with the absorption of energy
C) exothermic, with the absorption of energy
D) endothermic, with the release of energy

25) Which *best* describes exothermic chemical reactions?

A) They never release heat.
B) They never occur spontaneously.
C) They always release heat.
D) They always occur spontaneously.

26) If 4.0 grams of water at 1°C absorbs 33 joules of heat, what will be the change in temperature of the water?

A) 3.0°C B) 1.0°C C) 2.0°C D) 4.0°C

27) When 84 joules of heat are added to 2.0 grams of water at 15°C, what will be the final temperature of the water?

A) 15°C B) 25°C C) 50.°C D) 5.0°C

28) How many kilojoules of heat are needed to raise the temperature of 500. grams of water from 10.0°C to 30.0°C?

A) 2.09 kJ B) 62.7 kJ C) 10.0 kJ D) 41.8 kJ

29) What is the total number of joules of heat energy released when 20 grams of water is cooled from 20°C to 10°C?

A) 836 J B) 200 J C) 4,000 J D) 30 J

30) What occurs when the temperature of 10.0 grams of water is changed from 15.5°C to 14.5°C?

A) The water absorbs 155 joules.
B) The water releases 155 joules.
C) The water absorbs 41.8 joules.
D) The water releases 41.8 joules.

31) If 4 grams of water at 1°C absorbs 8 calories of heat, the temperature of the water will change by

A) 1°C B) 2°C C) 3°C D) 4°C

32) Energy of position or stored energy is also called

A) kinetic energy B) chemical energy C) activation enery D) potential energy

33) The amount of heat required to raise the temperature of one gram of a substance by one degree Celsius is called

A) specific heat capacity
B) vapor pressure
C) heat of vaporization
D) heat of fusion

34) What is the specific heat capacity of $H_2O(\ell)$?

A) 333.6 J/g
B) 1.0 J/g•K
C) 4.2 J/g•K
D) 2,259 J/g

35) What quantity of heat does a kilojoule represent?

A) 100 joules
B) 1,000 joules
C) $\frac{1}{1{,}000}$ of a joule
D) $\frac{1}{100}$ of a joule

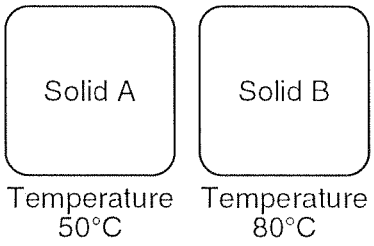
36) How many kilojoules are equivalent to 10 joules?

A) 0.001 kJ
B) 10,000 kJ
C) 0.01 kJ
D) 1,000 kJ

37) Solid *X* is placed in contact with solid *Y*. Heat will flow spontaneously from *X* to *Y* when

A) *X* is 25°C and *Y* is 30°C
B) *X* is 10°C and *Y* is 5°C
C) *X* is -25°C and *Y* is -10°C
D) *X* is 20°C and *Y* is 20°C

38) The diagrams below represent two solids and the temperature of each.



What occurs when the two solids are placed in contact with each other?

A) Heat energy flows from solid *B* to solid *A*. Solid *B* decreases in temperature.
B) Heat energy flows from solid *A* to solid *B*. Solid *A* decreases in temperature.
C) Heat energy flows from solid *A* to solid *B*. Solid *A* increases in temperature.
D) Heat energy flows from solid *B* to solid *A*. Solid *B* increases in temperature.

39) The temperature of a substance is a measure of its particles'

A) enthalpy
B) entropy
C) average potential energy
D) average kinetic energy

40) As the temperature of a gas is increased, the average kinetic energy of its molecules

A) increases
B) remains the same
C) decreases

41) As ice at 0°C changes to water at 0°C, the average kinetic energy of the ice molecules

A) increases
B) decreases
C) remains the same

42) As ice cools from 273 K to 263 K, the average kinetic energy of its molecules will

A) remain the same
B) decrease
C) increase

43) Which substance is made of particles with the *highest* average kinetic energy?

A) $Br_2(\ell)$ at 20°C
B) $CO_2(g)$ at 25°C
C) $H_2O(\ell)$ at 30°C
D) Fe(s) at 35°C

44) Which temperature represents absolute zero?

A) 0 K
B) 273 K
C) 273°C
D) 0°C

45) What Kelvin temperature is equal to -33°C?

A) 306 K
B) -33 K
C) 240 K
D) 33 K

46) Human body temperature is 37° Celsius. What temperature does this correspond to on the Kelvin scale?

A) -236 K
B) 98.6 K
C) 310 K
D) 236 K

47) The temperature of a sample of a substance changes from 10.°C to 20.°C. How many Kelvin degrees does the temperature change?

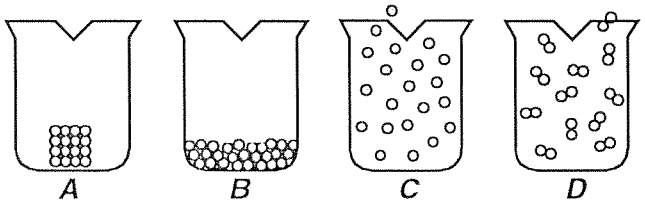
A) 293
B) 283
C) 20.
D) 10.

48) The minimum number of fixed points required to establish the Celsius temperature scale for a thermometer is

A) 1 B) 2 C) 3 D) 4

Questions 49 through 52 refer to the following:

The particle diagrams below represent elements at STP.



49) Which particle diagram *best* represents a substance in the solid state?

A) *A* B) *B* C) *C* D) *D*

50) Which particle diagram *best* represents a substance in the liquid state?

A) *A* B) *B* C) *C* D) *D*

51) Which particle diagram *best* represents a monoatomic gas?

A) *A* B) *B* C) *C* D) *D*

52) Which particle diagram *best* represents a diatomic gas?

A) *A* B) *B* C) *C* D) *D*

53) In an equation, which symbol would indicate a gas?

A) $NH_3(s)$ B) $NH_3(g)$ C) $NH_3(\ell)$ D) $NH_3(aq)$

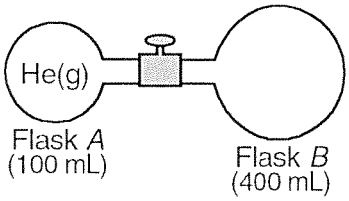
54) A 1-gram sample of which substance in a sealed 1-liter container will occupy the container completely and uniformly?

A) Ag(s) B) $H_2O(\ell)$ C) $H_2O(g)$ D) $Hg(\ell)$

55) Which set of properties does a substance such as $CO_2(g)$ have?

A) no definite shape and no definite volume
B) no definite shape but definite volume
C) definite shape but no definite volume
D) definite shape and definite volume

56) The diagram below shows two flasks connected by a stopcock. Flask *A* contains helium gas. Flask *B* contains a vacuum.



What final volume will the gas occupy after the stopcock is opened?

A) 300 mL
B) 500 mL
C) 400 mL
D) 100 mL

57) Under the same conditions of temperature and pressure, a liquid differs from a gas because the particles of the liquid

A) are in constant straight-line motion
B) have no regular arrangement
C) take the shape of the container they occupy
D) have stronger forces of attraction between them

58) Which sample contains particles arranged in a regular geometric pattern?

A) $CO_2(aq)$
B) $CO_2(s)$
C) $CO_2(g)$
D) $CO_2(\ell)$

59) The characteristic which distinguishes a true solid from other phases of matter at STP is that in a true solid, the particles are

A) motionless but changing their relative positions
B) vibrating without changing their relative positions
C) motionless without changing their relative positions
D) vibrating and changing their relative positions

60) At what point do a liquid and a solid exist at equilibrium?

A) vaporization point
B) boiling point
C) melting point
D) sublimation point

61) The amount of energy needed to change a given mass of ice to water at constant temperature is called the heat of

A) formation B) crystallization C) condensation D) fusion

62) The number of joules per gram required to melt ice at its melting point is called

A) heat of fusion
B) vapor pressure
C) sublimation
D) heat of vaporization

63) What is the total number of joules of heat needed to change 150.0 grams of ice to water at 0°C? (heat of fusion = 333.6 J/g)

A) 1,394 B) 50,040 C) 2.224 D) 333.6

64) What is the total amount of heat energy (kilojoules) needed to change 200.0 grams of ice to water at 0°C?

A) 451.8 kJ B) 66.72 kJ C) 45,180 kJ D) 333.6 kJ

65) The phase change represented by the equation $I_2(s) \longrightarrow I_2(g)$ is called

A) sublimation B) melting C) condensation D) boiling

66) The boiling point of water at standard pressure is

A) 373 K B) 100. K C) 273 K D) 0 K

67) At standard pressure, the steam-water equilibrium temperature occurs at

A) 0 K B) 273 K C) 100 K D) 373 K

68) The heat of vaporization for water at its normal boiling point is

A) 333.6 J/g B) 273 J/g C) 4.2 J/g D) 2,259 J/g

69) What Greek philosopher was the first person to propose the idea that matter is made of tiny individual particles called atoms?

A) Bohr B) Dalton C) Democritus D) Rutherford

70) The development of the cathode ray tube led to the discovery of what subatomic particle?

A) proton B) electron C) neutron D) positron

71) Experimental evidence indicates that the nucleus of an atom

A) contains a small percentage of the mass of the atom
B) has no charge
C) contains most of the mass of the atom
D) has a negative charge

72) In an experiment, alpha particles were used to bombard gold foil. As a result of this experiment, the conclusion was made that the nucleus of an atom is

A) larger than the atom and positively charged
B) smaller than the atom and negatively charged
C) smaller than the atom and positively charged
D) larger than the atom and negatively charged

73) After bombarding a gold foil sheet with alpha particles, scientists concluded that atoms consist mainly of

A) empty space B) protons C) electrons D) neutrons

74) Which particle has the *least* mass?

A) a proton B) an electron C) a neutron D) a deuteron

75) What particle has a negative charge and a mass that is approximately $\frac{1}{1{,}836}$ the mass of a proton?

A) an alpha particle B) a positron C) a neutron D) an electron