

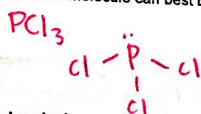
- C 48. The geometry of the H_2S molecule can best be described as
 A) tetrahedral
 B) linear
 C) bent
 D) trigonal pyramidal

*Draw Lewis structure:



- C 49. The geometry of the phosphorous trichloride molecule can best be described as
 A) tetrahedral
 B) bent
 C) trigonal pyramidal
 D) trigonal planar

*Draw Lewis structure



Standard 1.3 Understand the physical and chemical properties of atoms based on their position on the Periodic Table.

- B 50. The representative elements are usually called
 A) noble gases
 B) Group A elements
 C) Group B elements
 D) Halogens

- A 61. What is the chief characteristic of the noble gases?
 A) very low reactivity
 B) red color
 C) high boiling point
 D) high density

*Why? They have 8 valence e⁻s (full shell)

- B 62. The modern periodic table is arranged according to
 A) atomic mass
 B) atomic number
 C) mass number
 D) alphabetical order

*Define atomic number: # of protons

- D 63. The category of elements that is characterized by the filling of d orbitals is the
 A) alkaline earth metals
 B) halogens
 C) alkali metals
 D) transition metals

- B 64. Which of the following is the correct electron configuration for an oxygen atom?
 A) $1s^2 2s^2 2p^6$
 B) $1s^2 2s^2 2p^4$
 C) $1s^2 2s^2 3s^2 4s^2$
 D) $1s^2 2s^2 2p^6 3s^1$

- D 65. What is the next atomic orbital in the series, 1s, 2s, 2p, 3s, 3p, 4s, 3d?
 A) 5s
 B) 2d
 C) 4d
 D) 4p

- C 66. Which of the following has the greatest electronegativity?
 A) potassium
 B) zinc
 C) chlorine
 D) calcium

*Define electronegativity: How strong an atom pulls e⁻s from other atoms

- D 67. Which of the following has the largest atomic radius?
 A) lithium
 B) sodium
 C) hydrogen
 D) cesium

*What is the trend? ↑ going down, ↓ going across

- A 68. The amount of energy required to remove an electron completely from an atom is called
 A) ionization energy
 B) electronegativity
 C) a quantum
 D) atomic absorption

*What is the trend? ↓ going down, ↑ going across

- A 69. Each period number in the periodic table corresponds to
 A) a principal energy level $n=1, n=2, \dots$
 B) an energy sublevel
 C) an atomic mass
 D) an atomic number

- C 70. Which of the following groupings contains only representative elements?
 A) Cu, Co, Cd
 B) Ni, Fe, Zn
 C) Al, Mg, Li
 D) Hg, Cr, Ag

Group A (#s 1-8)

- A 71. Why is the radius of a positive ion always less than the radius of its neutral atom?
 A) the nucleus pulls the remaining electrons in closer
 B) the number of principal energy levels is always reduced
 C) the atomic orbitals contract all by themselves
 D) electron speeds are reduced

B 72. The modern periodic table is arranged according to
 A) atomic mass
 B) atomic number
 C) mass number
 D) alphabetical order

D 73. Which of the following has the lowest electronegativity?
 A) fluorine
 B) chlorine
 C) sodium
 D) potassium
trend: →

C 74. Which of the following occurs when an alkaline earth metal (Group 2A) attains a stable electron configuration?
 A) it gains two electrons
 B) it gains 8 electrons
 C) it loses two electrons
 D) it loses 8 electrons
+2 charge
 *What would its charge be? +2

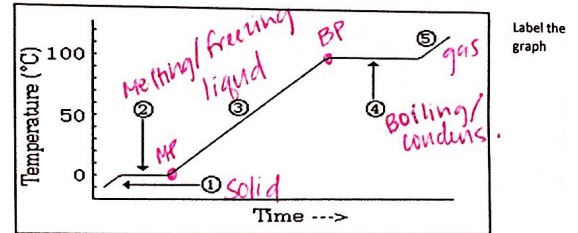
A 75. The electron configuration of K^+ is most similar to that of
 A) Ar
 B) Ca^{2+}
 C) Na^+
 D) K
 *Define ion: charged atom, diff # of pt & e⁻

Standard 2.1 Understand the relationship among pressure, temperature, volume and phase.

C 76. As the temperature of a substance decreases, the average kinetic energy of its particles
 A) remains constant
 B) increases, then decreases
 C) decreases
 D) increases

C 77. Which of the following substances takes the most heat energy to raise the temperature of one gram of the substance by 1°C?
 A) aluminum ($c = 0.90 \text{ J/g}^\circ\text{C}$)
 B) iron ($c = 0.46 \text{ J/g}^\circ\text{C}$)
 C) water ($c = 4.18 \text{ J/g}^\circ\text{C}$)
 D) silver ($c = 0.24 \text{ J/g}^\circ\text{C}$)
 *The underlined part is the definition of specific heat

A 78. When the particles of a solid gain enough kinetic energy to break their ordered arrangement and slip past one another, the solid
 A) melts
 B) freezes
 C) decomposes
 D) vaporizes



A 79. What is happening at the part of the graph marked 2?
 A) a solid is melting
 B) a liquid is freezing
 C) the temperature of a solid is increasing
 D) the temperature of a liquid is increasing
 E) a liquid is boiling
look @ direction of graph

C 80. What is the boiling point of the substance described by the graph above?
 A) 0°C
 B) 50°C
 C) 100°C
 D) 120°C

Calorimetry Problem!
 A 25.0 g gold ingot with a temperature of 177°C is dropped into 200.0 g of ethanol at a temperature of 20°C. The system comes to thermal equilibrium at 21°C. *SHOW ALL WORK W/ FORMULA

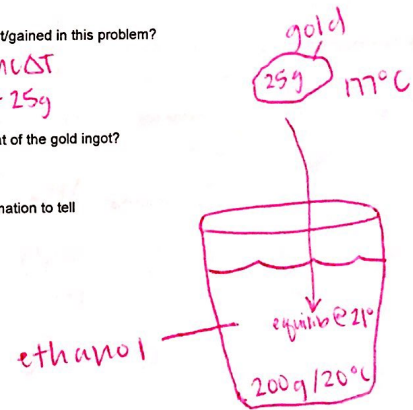
D 81. What gained heat and what lost heat?
 A) The gold ingot gained heat and the ethanol lost heat.
 B) The gold ingot and the ethanol both lost heat.
 C) The gold ingot and the ethanol both gained heat.
 D) The gold ingot lost heat and the ethanol gained heat.
**C_p Ethanol = 2.46
 You would be given this*

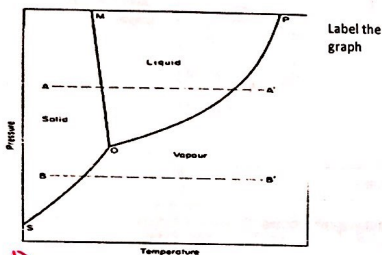
D 82. What is the final temperature of the ethanol in Kelvins?
 A) -252 K
 B) 21 K
 C) 1 K
 D) 294 K
K = °C + 273

A 83. How much heat was lost/gained in this problem?
 A) 492 J
 B) 1°C
 C) 156°C
 D) 9594 J
*Q = mcΔT
 = 25g*

B 84. What is the specific heat of the gold ingot?
 A) 2.46 J/g°C
 B) 0.126 J/g°C
 C) 0.235 J/g°C
 D) not enough information to tell

$Q = mc\Delta T$
 $mc\Delta T = mc\Delta T$





D 85. What does point O represent on the diagram above?
 A) the melting point
 B) the boiling point
 C) the normal boiling point
 D) the triple point

A 86. What is happening along curve OM?
 A) melting
 B) boiling
 C) sublimation
 D) vaporization

solid → liq

C 87. Which of the following processes is exothermic?
 A) sublimation
 B) vaporization
 C) condensation
 D) none of these

*Define exothermic: releases heat

Must convert to Joules!
 88. If it takes 10.0 kJ of heat to raise the temperature of 100.0 g of a substance by 50°C, what is the specific heat of the substance?
 10 kJ = 10,000 J

$Q = mc\Delta T \quad c = \frac{Q}{m\Delta T} = \frac{10,000 J}{100g(50)} = 2.0 J/g^{\circ}C$

89. How much heat is required to turn 27.0 g of water at 20.0°C to steam at 100.0°C?
 ① $Q = mc\Delta T = 27g(4.18) 80^{\circ}$ ② $Q = m\Delta H_v = 27(2260)$
 ① 20°C ② 100°C
 = 70078.8 J

C 90. The energy required to change one gram of a solid to a liquid at its melting point is the
 A) specific heat
 B) heat of vaporization
 C) heat of fusion
 D) heat of formation
 *What is the variable/symbol for this? ΔH_f

Temp changes: $Q = mc\Delta T$
phase changes:
 $Q = m\Delta H_f$
 or
 $Q = m\Delta H_v$

D 91. In what units must temperature be measured for all of the gas laws?
 A) degrees Fahrenheit
 B) degrees Celsius
 C) degrees Centigrade
 D) Kelvins

B 92. According to Gay-Lussac's Law, what happens to the pressure of a gas if the absolute temperature is cut in half?
 A) the pressure doubles
 B) the pressure is cut in half
 C) the pressure quadruples
 D) the pressure remains constant

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$

*Formula:

B 93. As the temperature of the gas in a balloon decreases ____
 A) the volume increases
 B) the average kinetic energy of the gas decreases
 C) the pressure increases
 D) all of the above

*Formula: Temp = Avg Kinetic Energy

Standard 2.1 Understand the relationship among pressure, temperature, volume and phase. (continued)

D 94. What is the volume occupied by 18×10^{23} molecules of fluorine at STP?
 A) 22.4 L
 B) 44.8 L
 C) 56.0 L
 D) 67.2 L
 E) 78.4 L

$\frac{18 \times 10^{23} \text{ molec}}{6.02 \times 10^{23} \text{ molec/mol}} \times 22.4 \text{ L/mol} = 67.2 \text{ L}$

B 95. What is the pressure when a liquid is boiling at its normal boiling point?
 A) 0 atm
 B) 1 atm
 C) 2 atm
 D) 5 atm

C 96. If heat is added to a boiling liquid, what happens to the temperature of the liquid?
 A) it increases
 B) it decreases
 C) it does not change

changing phase (temp does not change)

A 97. Which of these changes would NOT cause an increase in the pressure of a gaseous system?
 A) the container is made larger
 B) additional amounts of the same gas are added to the container
 C) the temperature is increased
 D) another gas is added to the container