


Matter and Energy Questions

- ___ 1. Which Kelvin temperature is equal to -33 C? (1) -33 K; (2) 33 K; (3) 240 K; (4) 306 °K.
- ___ 2. If 4 grams of water at 1 °C absorbs 8 calories of heat the temperature of the water will change by (1) 1 °C; (2) 2 °C; (3) 3 °C; (4) 4 °C.
- ___ 3.  Which change of phase represents fusion? (1) gas to liquid; (2) gas to solid; (3) solid to liquid; (4) liquid to gas.
- ___ 4. Which formula represents a mixture? (1) NH₃(aq); (2) NH₃(l); (3) NH₃(g); (4) NH₃(s).
- ___ 5. A sample of pure water is boiling at 90.0 degrees Celsius. The vapor pressure of the water is closest to (1) 90.0 mM; (2) 760. mM; (3) 526 mM; (4) 363 mM.
- ___ 6. A 100. milliliter sample of a gas at a pressure of 380. mM. is reduced to 190. mM at constant temperature. What is the new volume of the gas? (1) 50.0 mL; (2) 90.0 mL; (3) 200. mL; (4) 290. mL.
- ___ 7. As the temperature of a sample of an ideal gas increases at constant pressure the volume occupied by the sample (1) decreases; (2) increases; (3) remains the same.
- ___ 8. Which is the equivalent of 750. calories? (1) 0.750 kcal; (2) 7.50 kcal; (3) 75.0 kcal; (4) 750. kcal.
- ___ 9. Which change must result in an increase in the average kinetic energy of the molecules of a sample of nitrogen gas? (1) The pressure changes from 0.5 atmosphere to 1 atmosphere; (2) The volume changes from 1 liter to 2 liters; (3) The temperature changes from 20 C to 30 C; (4) The density changes from 2.0 g/l to 2.5 g/l.
- ___ 10. At constant temperature the pressure on 8.0 liters of a gas increases from 1 atmosphere to 4 atmospheres. What will be the new volume of the gas? (1) 1.0 L; (2) 2.0 L; (3) 32 L; (4) 4.0 L.
- ___ 11. Which sample of methane gas contains the greatest number of molecules at standard temperature? (1) 22.4 liters at 1 atmosphere; (2) 22.4 liters at 2 atmospheres; (3) 11.2 liters at 1 atmosphere; (4) 11.2 liters at 2 atmospheres.
- ___ 12. Which substance readily sublimates at room temperature? (1) H₂O(l); (2) O₂(g); (3) Fe(s); (4) CO₂(s).
- ___ 13. Which is the formula of a compound? (1) C; (2) Cl₂; (3) HF; (4) N₂.
- ___ 14. Which is a measure of the average kinetic energy of the particles of a substance? (1) pressure; (2) mass; (3) density; (4) temperature.
- ___ 15. At STP 1 liter of oxygen gas would have the same number of molecules as (1) 1 liter of H₂; (2) 2 liters of CO; (3) 3 liters of CO₂; (4) 3 liters of Ne.
- ___ 16. What is the normal boiling point of water? (1) 0 °K; (2) 100 °K; (3) 273 °K; (4) 373 °K.

- ___ 17. The number of calories needed to raise the temperature of 100 grams of water 10 degrees Celsius is the same as the number of calories needed to raise the temperature of 1,000 grams of water (1) 1 °C; (2) 10 °C; (3) 0.1 °C; (4) 100 °C.
- ___ 18. Which will sublime when heated? (1) SO₂(aq); (2) H₂O(l); (3) N₂(g); (4) I₂(s).
- ___ 19. As the temperature of a gas increases with the volume remaining constant the pressure of the gas (1) decreases; (2) increases; (3) remains the same.
- ___ 20. When the vapor pressure of a liquid is equal to the atmospheric pressure the liquid will (1) freeze; (2) boil; (3) melt; (4) condense.
- ___ 21. What is the equivalent of 0 Kelvin on the Celsius scale? (1) -100 °C; (2) 100 °C; (3) -273 °C; (4) 273 °C.
- ___ 22. Under which conditions of temperature and pressure would a real gas be most likely to act as an ideal gas? (1) high temperature and high pressure; (2) high temperature and low pressure; (3) low temperature and high pressure; (4) low temperature and low pressure.
- ___ 23. The energy required to change a unit mass of a solid to a liquid at constant temperature is called its heat of (1) sublimation; (2) condensation; (3) vaporization; (4) fusion.
- ___ 24. How many significant numbers are in the number 0.00120 (1) 6; (2) 2; (3) 3; (4) 4.
- ___ 25. Which gas has the greatest density at STP? (1) nitrogen; (2) oxygen; (3) chlorine; (4) fluorine.
- ___ 26. Which substance has a definite shape and a definite volume at STP? (1) NaCl(aq); (2) Cl₂(g); (3) CCl₄(l); (4) AlCl₃(s).
- ___ 27. What is the total mass of 2.0 moles of hydrogen gas? (1) 1.0 G; (2) 2.0 G; (3) 3.0 G; (4) 4.0 G.
- ___ 28. The pressure on 20 milliliters of a gas at constant temperature is changed from 4 atmospheres to 2 atmospheres. The new volume of the gas is (1) 5 mL; (2) 10 mL; (3) 40 mL; (4) 80 mL.
- ___ 29. Which is an example of an exothermic phase change? (1) liquid to solid; (2) liquid to gas; (3) solid to liquid; (4) solid to gas.
- ___ 30. A sample of water is heated from 10 °C to 15 °C by the addition of 30 calories of heat. What is the mass of the water? (1) 5.0 G; (2) 6.0 G; (3) 30 G; (4) 150 G.
- ___ 31. When heat energy is lost by a pure substance at its freezing point its potential energy (1) decreases; (2) increases; (3) remains the same.
- ___ 32. At standard temperature, 1.0 liter of oxygen gas at 760 torr contains the same number of molecules as (1) 2.0 l of oxygen gas at 380 torr; (2) 2.0 L of oxygen gas at 760 torr; (3) 0.50 L of oxygen gas at 380 torr; (4) 0.50 L of oxygen gas at 760 torr.

- ___ 33. When 500. milliliters of hydrogen gas is heated from 30 °C at constant pressure the volume of the gas at 60 °C is equal to (1) 500 mL x .8765; (2) 500 mL x 1.1408; (3) 500 mL x 1.0990; (4) 500 mL x .9099.
- ___ 34. The temperature at which a substance in the liquid state freezes is the same as the temperature at which the substance (1) melts; (2) sublimes; (3) boils; (4) condenses.
- ___ 35. The temperature of a sample of water increases from 30 degrees Celsius to 40 degrees Celsius as 100 calories of heat is added. What is the mass of the sample of water? (1) 1 G; (2) 10 G; (3) 100 G; (4) 1,000 G.
- ___ 36. Which may be heterogeneous? (1) a substance; (2) an element; (3) a compound; (4) a mixture.
- ___ 37. The neutral atoms in a given sample of an element could have different (1) mass numbers; (2) atomic numbers; (3) numbers of protons; (4) numbers of electrons.
- ___ 38. A 1.00 mole sample of a gas is at STP. If the temperature remains constant and the pressure is doubled, the new volume will be (1) 11.2 liters; (2) 22.4 liters; (3) 33.6 liters; (4) 44.8 liters.
- ___ 39. Heat is added to a substance at a constant rate and the temperature of the substance remains the same. This substance is (1) solid melting at its melting point; (2) solid below its melting point; (3) liquid above its freezing point; (4) liquid freezing at its freezing point.
- ___ 40. The difference between the boiling point and the freezing point of pure water at standard pressure is (1) 32 °K; (2) 100 °K; (3) 273 °K; (4) 373 °K.
- ___ 41. If water is boiling in an open container then its (1) temperature must equal 100 °C; (2) vapor pressure must equal 760 torr; (3) temperature must equal atmospheric temperature; (4) vapor pressure must equal atmospheric pressure.
- ___ 42. Which 1 liter sample contains the same number of molecules as 1 liter of oxygen gas at STP? (1) H₂O(l) at 0 °C and 1 atm; (2) Hg(l) at 0 °C and 2 atm; (3) NO₂(g) at 0 °C and 1 atm; (4) Ne(g) at 0 °C and 2 atm.
- ___ 43. The temperature of 20 liters of a gas is changed from 0 °C to 273 °C at constant pressure. The new volume of the gas will be (1) 5 liters; (2) 10 liters; (3) 20 liters; (4) 40 liters.
- ___ 44. All atoms of a given element must have the same (1) atomic mass; (2) atomic weight; (3) mass number; (4) atomic number.
- ___ 45. When 100 calories of heat energy is added to 10 grams of water at 20°C the final temperature of the water will be (1) 10 °C; (2) 30 °C; (3) 40 °C; (4) 100 °C.
- ___ 46. The vapor pressure of 25 milliliters of water at 25 degrees Celsius will be the same as (1) 50. mL of water at 25 °C; (2) 25 mL of water at 50 °C; (3) 50. mL of alcohol at 25 °C; (4) 25 mL of alcohol at 50 °C.
- ___ 47. In what type of reaction do the products of the reaction always possess more

- potential energy than the reactants? (1) endothermic; (2) exothermic; (3) spontaneous; (4) redox.
- ___ 48. As the atmospheric pressure decreases the temperature at which water will boil in an open container (1) decreases; (2) increases; (3) remains the same.
- ___ 49. Which is the most common property of all liquids? (1) definite shape; (2) definite volume; (3) high compressibility; (4) high vapor pressure.
- ___ 50. A gas sample occupies 10. milliliters at one atmosphere of pressure. If the volume changes to 20. milliliters and the temperature remains the same the pressure will be (1) 1.0 atm; (2) 2.0 atm; (3) 0.25 atm; (4) 0.50 atm.
- ___ 51. The average kinetic energies of the molecules in two gas samples could best be compared by measuring their (1) temperatures; (2) volumes; (3) pressures; (4) densities.
- ___ 52. Which is not a form of energy? (1) light; (2) electricity; (3) temperature; (4) heat.
- ___ 53. At its normal boiling point of 100 degrees Celsius the vapor pressure of water in millimeters of mercury is (1) 0; (2) 100; (3) 373; (4) 760.
- ___ 54. When 5 grams of a substance is burned in a calorimeter 3 kilocalories of energy is released. The energy released per gram of substance is (1) 600 cal; (2) 1,700 cal; (3) 5,000 cal; (4) 15,000 cal..
- ___ 55. How many grams of oxygen at STP contain the same number of molecules as 14 grams of nitrogen at STP? (1) 14; (2) 16; (3) 28; (4) 32.
- ___ 56. At constant pressure the volume of a mole of any ideal gas varies (1) directly with the radius of the gas molecules; (2) inversely with the radius of the gas molecules; (3) directly with the Kelvin (absolute) temperature; (4) inversely with the Kelvin (absolute) temperature.
- ___ 57. Which conditions generally cause the characteristics of a gas to deviate most from the ideal gas laws? (1) low temperature and low pressure; (2) low temperature and high pressure; (3) high temperature and low pressure; (4) high temperature and high pressure.
- ___ 58. At standard temperature the volume occupied by 1.00 mole of gas is 11.2 liters. The pressure exerted on this gas is (1) 1.00 atm; (2) 2.00 atm; (3) 0.50 atm; (4) 1.50 atm.
- ___ 59. What is the boiling point of water when the atmospheric pressure is 23.8 mM. of mercury? (1) 0 °C; (2) 25 °C; (3) 100 °C; (4) 200 °C.
- ___ 60. Which formula represents a mixture? (1) NaCl(aq); (2) NaCl(s); (3) H₂O(l); (4) H₂O(s).
- ___ 61. What is the total pressure exerted by a mixture containing two gases if the partial pressure of one gas is 70 mM and the partial pressure of the other gas is 30 mM? (1) 30 mM; (2) 40 mM; (3) 70 mM; (4) 100 mM.

- ___ 62. Which change of phase is exothermic? (1) gas to liquid; (2) solid to liquid; (3) solid to gas; (4) liquid to gas.
- ___ 63. At STP 44.8 liters of carbon dioxide contains the same number of molecules as (1) 1.00 mole of helium; (2) 2.00 moles of neon; (3) 0.500 moles of hydrogen; (4) 4.00 moles of nitrogen.
- ___ 64. The normal boiling point of water is equal to (1) 173 °K; (2) 273 °K; (3) 373 °K; (4) 473 °K.
- ___ 65. An original sample of a radioisotope had a mass of 10 grams. After 2 days 5 grams of the radioisotope remains unchanged. What is the half-life of this radioisotope? (1) 1 day; (2) 2 days; (3) 5 days; (4) 4 days.
- ___ 66. As the pressure on a given sample of a gas increases at constant temperature the mass of the sample (1) decreases; (2) increases; (3) remains the same.
- ___ 67. Which change of phase represents sublimation? (1) solid to liquid; (2) solid to gas; (3) liquid to gas; (4) liquid to solid.
- ___ 68. A gas sample is at 10.0 degrees Celsius. If pressure remains constant the volume will increase when the temperature is changed to (1) 263 °K; (2) 273 °K; (3) 283 °K; (4) 293 °K.
- ___ 69. At which temperature would the molecules in a one gram sample of water have the lowest average kinetic energy? (1) 5 °C; (2) -100 °C; (3) 5 °K; (4) 100 °K.
- ___ 70. How many kilocalories of heat energy are absorbed when 100 grams of water is heated from 20 degrees Celsius to 30 degrees Celsius? (1) 1 kcal; (2) 10 kcal; (3) 100 kcal; (4) 0.1 kcal.
- ___ 71. A cube has a volume of 8.0 cubic centimeters and a mass of 21.6 grams. The density of the cube, in grams per cubic centimeter, is best expressed as (1) 2.7; (2) 2.70; (3) 0.37; (4) 0.370.
- ___ 72. What would be the volume of 0.500 mole of an ideal gas at S.T.P.? (1) 0.500 liter; (2) 11.2 liters; (3) 22.4 liters; (4) 44.8 liters.
- ___ 73. The temperature of a sample of water in the liquid phase is changed from 15 degrees Celsius to 25 degrees Celsius by the addition of 500 calories. What is the mass of the water? (1) 10 grams; (2) 50 grams; (3) 100 grams; (4) 5,000 grams.
- ___ 74. The boiling point of a pure substance is defined as the temperature at which (1) the kinetic energy of the molecules begins to increase; (2) the vapor pressure equals the external pressure; (3) the liquid phase can be completely evaporated; (4) the molecules of the substance break apart.
- ___ 75. Which change of phase is endothermic? (1) $\text{H}_2\text{O}(\text{g}) \rightleftharpoons \text{H}_2\text{O}(\text{l})$; (2) $\text{H}_2\text{O}(\text{g}) \rightleftharpoons \text{H}_2\text{O}(\text{s})$; (3) $\text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{H}_2\text{O}(\text{s})$; (4) $\text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{H}_2\text{O}(\text{g})$.
- ___ 76. Which gas would deviate least from ideal gas behavior at low temperatures? (1) CO_2 ; (2) Cl_2 ; (3) HCl ; (4) He .
- ___ 77. At constant pressure the volume of a gas will increase when its temperature is

changed from 10 degrees Celsius to (1) 263 °K; (2) 273 °K; (3) 283 °; (4) 293 °K.

- ___ 78. Which compound is most soluble in water? (1) silver acetate; (2) silver chloride; (3) silver nitrate; (4) silver sulfate.
- ___ 79. As the temperature of a radioactive sample increases the rate of nuclear decay (1) decreases; (2) increases; (3) remains the same.
- ___ 80. As the volume of a 1 mole sample of gas increases, with temperature remaining constant, the pressure exerted by the gas (1) decreases; (2) increases; (3) remains the same.
- ___ 81. A liquid's freezing point is -38 °C and its boiling point is 357 °C. What is the number of Kelvin degrees between the boiling point and the freezing point of the liquid? (1) 319; (2) 395; (3) 592; (4) 668.
- ___ 82. A 16-gram sample of oxygen has a volume of 11.2 liters at standard pressure. What is the temperature of the oxygen? (1) 0 °C; (2) 100 °C; (3) 273 °C; (4) 373 °C.
- ___ 83. A liquid would boil at the lowest temperature at a pressure of (1) 1 atmosphere; (2) 2 atmospheres; (3) 380 mM. of Hg; (4) 760 mM. of Hg.
- ___ 84. The change from the solid phase directly to the gaseous phase is called (1) sublimation; (2) evaporation; (3) condensation; (4) crystallization.
- ___ 85. A sample of hydrogen has a volume of 100 milliliters at a pressure of 1 atmosphere. If the temperature is kept constant and the pressure is raised to 2 atmospheres, the volume will now be (1) 25 mL; (2) 50 mL; (3) 100 mL; (4) 200 mL.
- ___ 86. A liquid which evaporates rapidly at room temperature would most likely have a high (1) vapor pressure; (2) boiling point; (3) melting point; (4) attraction between molecules.
- ___ 87. Exothermic reactions are usually self-sustaining because (1) exothermic reactions usually require low activation energies; (2) exothermic reactions usually require high activation energies; (3) the energy released is sufficient to maintain the reaction; (4) the products contain more potential energy than the reactants.
- ___ 88. If the temperature of a substance changes 40 Celsius degrees, how many degrees would its temperature change on the Kelvin scale? (1) 40; (2) 233; (3) 273; (4) 313.
- ___ 89. Sublimation is a change directly from the (1) solid phase to the gaseous phase; (2) solid phase to the liquid phase; (3) liquid phase to the gaseous phase; (4) gaseous phase to the liquid phase.
- ___ 90. At a pressure of one atmosphere the temperature of a mixture of ice and water at equilibrium would be (1) 25 °K; (2) 32 °K; (3) 273 °K; (4) 298 °K.
- ___ 91. A liter of chlorine at S.T.P. has a mass of approximately (1) 1; (2) 1.5; (3) 3; (4) .3.
- ___ 92. When 25 grams of water is cooled from 20 °C to 10 °C the number of calories of heat

energy released is (1) 10; (2) 25; (3) 200; (4) 250.

- ___ 93. In a closed system the vapor pressure for water is highest at a temperature of (1) $-40\text{ }^{\circ}\text{C}$; (2) $0\text{ }^{\circ}\text{C}$; (3) $20\text{ }^{\circ}\text{C}$; (4) $30\text{ }^{\circ}\text{C}$.
- ___ 94. Which is characteristic of a compound? (1) It can consist of a single element; (2) It is homogeneous; (3) Its chemical composition can be varied; (4) It can be decomposed by a physical change.
- ___ 95. Which is a formula of a binary compound? (1) BaSO_4 ; (2) BiPO_4 ; (3) MgCl_2 ; (4) $\text{Mg}(\text{ClO})_2$.
- ___ 96. Which substance can be decomposed by a chemical change? (1) ammonia; (2) argon; (3) iron; (4) helium.
- ___ 97. Which Kelvin temperatures represent, respectively, the normal freezing point and the normal boiling point of water? (1) $0\text{ }^{\circ}\text{K}$ and $273\text{ }^{\circ}\text{K}$; (2) $0\text{ }^{\circ}\text{K}$ and $100\text{ }^{\circ}\text{K}$; (3) $100\text{ }^{\circ}\text{K}$ and $273\text{ }^{\circ}\text{K}$; (4) $273\text{ }^{\circ}\text{K}$ and $373\text{ }^{\circ}\text{K}$.
- ___ 98. At STP, equal volumes of $\text{N}_2(\text{g})$ and $\text{CO}_2(\text{g})$ contain equal numbers of (1) atoms; (2) electrons; (3) molecules; (4) protons.
- ___ 99. The volume of 50.0 milliliters of an ideal gas at STP increases to 100. milliliters. If the pressure remains constant the new temperature must be (1) $0\text{ }^{\circ}\text{K}$; (2) $100\text{ }^{\circ}\text{K}$; (3) $273\text{ }^{\circ}\text{K}$; (4) $546\text{ }^{\circ}\text{K}$.
- ___ 100. Which gas has the greatest density at STP? (1) oxygen; (2) helium; (3) krypton; (4) nitrogen.
- ___ 101. As the temperature of a liquid increases its vapor pressure (1) decreases; (2) increases; (3) remains the same.
- ___ 102. At constant temperature, which 10 mL sample, measured at STP, will uniformly take the shape and volume of a 100 mL container into which it is placed? (1) water; (2) mercury; (3) sodium chloride; (4) carbon dioxide.
- ___ 103. Which sample represents a homogeneous mixture? (1) $\text{C}_2\text{H}_5\text{OH}(\text{l})$; (2) $\text{C}_2\text{H}_5\text{OH}(\text{aq})$; (3) $\text{C}_2\text{H}_5\text{OH}(\text{g})$; (4) $\text{C}_2\text{H}_5\text{OH}(\text{s})$.
- ___ 104. Which gas under high pressure and low temperature has a behavior closest to that of an ideal gas? (1) $\text{H}_2(\text{g})$; (2) $\text{O}_2(\text{g})$; (3) $\text{NH}_3(\text{g})$; (4) $\text{CO}_2(\text{g})$.
- ___ 105. What is the volume of 4.40 grams of CO_2 at STP? (1) 2.24 L; (2) 4.48 L; (3) 22.4 L; (4) 44.8 L.
- ___ 106. Under the same conditions of temperature and pressure which of the following gases would behave most like an ideal gas? (1) $\text{He}(\text{g})$; (2) $\text{NH}_3(\text{g})$; (3) $\text{Cl}_2(\text{g})$; (4) $\text{CO}_2(\text{g})$.
- ___ 107. In an equation which symbol would indicate a mixture? (1) $\text{NH}_3(\text{s})$; (2) $\text{NH}_3(\text{l})$; (3) $\text{NH}_3(\text{aq})$; (4) $\text{NH}_3(\text{g})$.
- ___ 108. Given the equilibrium $\text{H}_2\text{O}(\text{s}) \rightleftharpoons \text{H}_2\text{O}(\text{l})$ at a pressure of 1 atmosphere. The temperature of the ice-water mixture must be (1) $0\text{ }^{\circ}\text{C}$; (2) $32\text{ }^{\circ}\text{C}$; (3) $110\text{ }^{\circ}\text{C}$;

(4) 212 °C.

- ___ 109. When the vapor pressure of a liquid in an open container equals the atmospheric pressure then the liquid will (1) freeze; (2) crystallize; (3) melt; (4) boil.
- ___ 110. In a closed system, as the temperature of a liquid increases, the kinetic energy of its molecules (1) decreases; (2) increases; (3) remains the same.
- ___ 111. A sample of oxygen gas has a volume of 150 milliliters at 300 °K. If the pressure of the sample is held constant and the temperature is raised 600 °K the new volume of the sample will be (1) 75.0 mL; (2) 150. mL; (3) 300. mL; (4) 600. mL.
- ___ 112. A flask containing molecules of gas A and a separate flask containing molecules of gas B are both at the same temperature. Gases A and B must have equal (1) volumes; (2) masses; (3) pressures; (4) average kinetic energies.
- ___ 113. A sample of H₂(g) and a sample of N₂(g) at STP contain the same number of molecules. Each sample must have (1) the same volume, but a different mass; (2) the same mass, but a different volume; (3) both the same volume and the same mass; (4) neither the same volume nor the same mass.
- ___ 114. Water will boil at a temperature of 29 °C if the pressure on the surface of the water is (1) 4.6 mM of Hg; (2) 30.0 mM of Hg; (3) 92.5 mM of Hg; (4) 760.0 mM of Hg.
- ___ 115. How many calories of heat energy are released when 50 grams of water are cooled from 70 °C to 60 °C? (1) 10 calories; (2) 50 calories; (3) 500 calories; (4) 1,000 calories.
- ___ 116. Which temperature is the same as -13 °C? (1) 260 °K; (2) 286 °K; (3) 747 °K; (4) 773 °K.
- ___ 117. Which substance can not be decomposed by a chemical change? (1) mercuric oxide; (2) potassium chlorate; (3) water; (4) copper.
- ___ 118. A gas occupies a volume of 30 mL at 273 °K. If the temperature is increased to 364 °K while the pressure remains constant what will be the volume of the gas? (1) 60 mL; (2) 40 mL; (3) 30 mL; (4) 20 mL.
- ___ 119. At 1 atmosphere which substance will sublime when heated? (1) CO₂(s); (2) H₂O(l); (3) CH₄(g); (4) HCl(aq).
- ___ 120. As a given volume of gas is compressed the number of molecules (1) decreases; (2) increases; (3) remains the same.
- ___ 121. A sample of H₂O(l) at 20 °C is in equilibrium with its vapor in a sealed container. When the temperature increases to 25 °C the entropy of the system will (1) decrease; (2) increase; (3) remain the same.
- ___ 122. As a 1 gram sample of H₂O(l) changes to H₂O(g) at 100 °C the potential energy of the molecules (1) decreases; (2) increases; (3) remains the same.
- ___ 123. A sealed flask contains 1 mole of hydrogen and 3 moles of helium at 20 °C. If the total pressure is 400 torr the partial pressure of hydrogen is (1) 100 torr; (2) 200 torr; (3) 300 torr; (4) 400 torr.

- ___ 124. A sample of nitrogen containing 0.25 moles has the same number of molecules as a sample containing (1) 1.0 mole of H₂; (2) 2.0 moles of He; (3) 0.25 mole of O₂; (4) 0.50 mole of Ne.
- ___ 125. Which term represents the change of a substance from the solid phase to the liquid phase? (1) condensation; (2) vaporization; (3) evaporation; (4) fusion.
- ___ 126. Under which conditions does a real gas behave most like an ideal gas? (1) at high temperatures and low pressures; (2) at high temperatures and high pressures; (3) at low temperatures and low pressures; (4) at low temperatures and high pressures.
- ___ 127. A student determined the melting point of a substance to be 55.2 degrees Celsius. If the accepted value is 50.1 degrees Celsius then the percent error in her determination is (1) 5.10; (2) 9.24; (3) 10.2; (4) 12.0.
- ___ 128. Using the rules for significant figures the sum of 0.027 gram and 0.0023 gram should be expressed as (1) 0.029 gram; (2) 0.0293 gram; (3) 0.03 gram; (4) 0.030 gram.
- ___ 129. A 1-liter flask contains two gases at a total pressure of 3.0 atmospheres. If the partial pressure of one of the gases is 0.5 atmosphere then the partial pressure of the other gas must be (1) 1.0 atm; (2) 2.5 atm; (3) 1.5 atm; (4) 0.50 atm.
- ___ 130. Which of the following best describes exothermic chemical reactions? (1) They never release heat; (2) They always release heat; (3) They never occur spontaneously; (4) They always occur spontaneously..
- ___ 131. What is the total number of molecules in 1.0 mole of Cl₂(g)? (1) 35; (2) 70; (3) 6.0×10^{23} ; (4) 12×10^{24} .
- ___ 132. The number of calories needed to raise the temperature of 10 grams of water from 20 °C to 30 °C is (1) 10; (2) 20; (3) 100; (4) 40.
- ___ 133. The heat of fusion for ice is 80 calories per gram. Adding 80 calories to one gram of ice at STP will cause the ice to (1) increase in temperature; (2) decrease in temperature; (3) change to water at a higher temperature; (4) change to water at the same temperature.
- ___ 134. Which of the following substances is most soluble at 60 °C? (1) NH₄Cl; (2) KCl; (3) NaCl; (4) NH₃.
- ___ 135. As the pressure on a sample of gas increases at constant temperature, the volume of the gas (1) decreases; (2) increases; (3) remains the same.
- ___ 136. Which is the formula of a binary compound? (1) KOH; (2) NaClO₃; (3) Al₂S₃; (4) Bi(NO₃)₃.
- ___ 137. Which of the following substances is made up of particles with the highest average kinetic energy? (1) Fe(s) at 35 °C; (2) Br₂(l) at 20 °C; (3) H₂O(l) at 30 °C; (4) CO₂(g) at 25 °C.
- ___ 138. Solid substances are most likely to sublime if they have (1) high vapor pressures

and strong intermolecular attractions; (2) high vapor pressures and weak intermolecular attractions; (3) low vapor pressures and strong intermolecular attractions; (4) low vapor pressures and weak intermolecular attractions.

- ___ 139. In an experiment the gram atomic mass of magnesium was determined to be 24.7. Compared to the accepted value 24.3, the percent error for this determination was (1) 0.400; (2) 1.65; (3) 24.7; (4) 98.4.