Gas Laws

Multiple Choice
Identify the choice that best completes the statement or answers the question.

_____ 1. According to the kinetic-molecular theory, particles of matter
    a. are in constant motion.
    b. have different shapes.
    c. have different colors.
    d. are always fluid.

_____ 2. According to the kinetic-molecular theory, which substances are made of particles?
    a. ideal gases only
    b. all gases
    c. all matter
    d. all matter except solids

_____ 3. Which is NOT an assumption of the kinetic-molecular theory?
    a. Matter is composed of tiny particles.
    b. The particles of matter are in continual motion.
    c. The total kinetic energy of colliding particles remains constant.
    d. When individual particles collide, energy is transferred.

_____ 4. According to the kinetic-molecular theory, particles of a gas
    a. attract each other but do not collide.
    b. repel each other and collide.
    c. neither attract nor repel each other but collide.
    d. neither attract nor repel each other and do not collide.

_____ 5. Which is an example of gas diffusion?
    a. inflating a flat tire
    b. the odor of perfume spreading throughout a room
    c. a cylinder of oxygen stored under high pressure
    d. All of the above

_____ 6. If a gas with an odor is released in a room, it quickly can be detected across the room because it
    a. diffuses.
    b. is dense.
    c. is compressed.
    d. condenses.

_____ 7. Which is an example of effusion?
    a. air slowly escaping from a pinhole in a tire
    b. the aroma of a cooling pie spreading across a room
    c. helium dispersing into a room after a balloon pops
    d. oxygen and gasoline fumes mixing in an automobile carburetor

_____ 8. What happens to the volume of a gas during compression?
    a. The volume increases.
    b. The volume decreases.
    c. The volume remains constant.
    d. It is impossible to tell because all gases are different.

_____ 9. What does the constant bombardment of gas molecules against the inside walls of a container produce?
    a. temperature
    b. density
    c. pressure
    d. diffusion

_____ 10. Why does a can collapse when a vacuum pump removes air from the can?
    a.   The inside and outside forces balance out and crush the can.
    b.   The unbalanced outside force from atmospheric pressure crushes the can.
    c.   The atmosphere exerts pressure on the inside of the can and crushes it.
    d.   The vacuum pump creates a force that crushes the can.

_____ 11. What instrument measures atmospheric pressure?
    a.   barometer   c.   vacuum pump
    b.   manometer   d.   torrometer

_____ 12. Standard temperature is exactly
    a.   100°C.   c.   0°C.
    b.   273°C.   d.   0 K.

_____ 13. Standard pressure is exactly
    a.   1 atm.   c.   101.325 atm.
    b.   760 atm.   d.   101 atm.

_____ 14. Pressure and volume changes at a constant temperature can be calculated using
    a.   Boyle's law.   c.   Kelvin's law.
    b.   Charles's law.   d.   Dalton's law.

_____ 15. Gay-Lussac recognized that at constant temperature and pressure, the volumes of gaseous reactants and products
    a.   always equal 1 L.
    b.   add up to 22.4 L.
    c.   equal R.
    d.   can be expressed as ratios of small whole numbers.

_____ 16. When Gay-Lussac's law of combining volumes holds, which of the following can be expressed in ratios of small whole numbers?
    a.   pressure before and pressure after reaction
    b.   volumes of gaseous reactants and products
    c.   Kelvin temperatures
    d.   molar masses of products and reactants

_____ 17. In the equation $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$, one volume of hydrogen yields how many volumes of hydrogen chloride?
    a.   1   c.   3
    b.   2   d.   4

_____ 18. Which is a common unit for the ideal gas constant R?
    a.   L·atm   c. $\dfrac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}$

    b.   mol·K   d. $\dfrac{\text{atm}}{\text{K}}$

_____ 19. In a chemical equation, the coefficients for reactants and products that are gases indicate
    a.   volumes at STP.   c.   molar mass of each substance.
    b.   volume ratios.   d.   densities.

_____ 20. What law helps explain the volume ratios in a chemical reaction?
    a.   Charles's law   c.   Boyle's law
    b.   Graham's law   d.   Gay-Lussac's law of combining volumes

_____ 21. In the reaction $2C + O_2(g) \rightarrow 2CO(g)$, what is the volume ratio of O_2 to CO?

    a. 1:1   c. 1:2

    b. 2:1   d. 2:2

_____ 22. What is the number of moles of H_2 produced when 23 g of sodium react with water according to the equation $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$?

    a. 0.50 mol   c. 2 mol

    b. 1 mol   d. 4 mol

_____ 23. Chlorine is produced by the reaction $2HCl(g) \rightarrow H_2(g) + Cl_2(g)$. How many grams of HCl (36.5 g/mol) must be used to produce 10 L of chlorine at STP?

    a. 15.8 g   c. 32.6 g

    b. 30.2 g   d. 36.5 g

_____ 24. What is the process by which molecules of a gas randomly encounter and pass through a small opening in a container?

    a. diffusion   c. distillation

    b. osmosis   d. effusion

_____ 25. According to Graham's law, the rates of diffusion of two gases at the same temperature and pressure are inversely proportional to

    a. their volumes.   c. their compressibilities.

    b. the square roots of their molar masses.   d. their rates of effusion.

_____ 26. What determines the average kinetic energy of the molecules of any gas?

    a. temperature   c. temperature and pressure

    b. pressure   d. molar mass

Gas Laws
Answer Section

MULTIPLE CHOICE

   1. ANS: A   PTS: 1
   2. ANS: C   PTS: 1
   3. ANS: D   PTS: 1
   4. ANS: C   PTS: 1
   5. ANS: B   PTS: 1
   6. ANS: A   PTS: 1
   7. ANS: A   PTS: 1
   8. ANS: B   PTS: 1
   9. ANS: C   PTS: 1
  10. ANS: B   PTS: 1
  11. ANS: A   PTS: 1
  12. ANS: C   PTS: 1
  13. ANS: A   PTS: 1
  14. ANS: A   PTS: 1
  15. ANS: D   PTS: 1
  16. ANS: B   PTS: 1
  17. ANS: B   PTS: 1
  18. ANS: C   PTS: 1
  19. ANS: B   PTS: 1
  20. ANS: D   PTS: 1
  21. ANS: C   PTS: 1
  22. ANS: A   PTS: 1
  23. ANS: C   PTS: 1
  24. ANS: D   PTS: 1
  25. ANS: B   PTS: 1
  26. ANS: A   PTS: 1