1) The National Weather Service routinely supplies atmospheric pressure data to help pilots set their altimeters. The units the NWS uses for atmospheric pressure are inches of mercury. A barometric pressure of 30.51 inches of mercury corresponds to ________ kPa.
   A) 103.3
   B) 77.50
   C) 775
   D) 1.020
   E) 16.01

2) A closed-end manometer was attached to a vessel containing argon. The difference in the mercury levels in the two arms of the manometer was 12.2 cm. Atmospheric pressure was 783 mmHg. The pressure of the argon in the container was ________ mmHg.
   A) 882
   B) 661
   C) 122
   D) 795
   E) 771

3) A sample of gas (24.2 g) initially at 4.00 atm was compressed from 8.00 L to 2.00 L at constant temperature. After the compression, the gas pressure was ________ atm.
   A) 2.00
   B) 16.0
   C) 1.00
   D) 8.00
   E) 4.00

4) A balloon originally had a volume of 4.39 L at 44 °C and a pressure of 729 torr. The balloon must be cooled to ________ °C to reduce its volume to 3.78 L (at constant pressure).
   A) 38
   B) 0
   C) 546
   D) 72.9
   E) 273

5) If 3.21 mol of a gas occupies 56.2 L at 44 °C and 793 torr, 5.29 mol of this gas occupies ________ L under these conditions.
   A) 30.9
   B) 14.7
   C) 478
   D) 92.6
   E) 61.7

6) A gas originally at 27 °C and 1.00 atm pressure in a 3.9 L flask is cooled at constant pressure until the temperature is 11 °C. The new volume of the gas is ________ L.
   A) 0.27
   B) 0.24
   C) 3.9
   D) 4.1
   E) 3.7
7) A sample of H\textsubscript{2} gas (12.28 g) occupies 100.0 L at 400.0 K and 2.00 atm. A sample weighing 9.49 g occupies ________ L at 353 K and 2.00 atm.
   A) 54.7
   B) 77.3
   C) 147
   D) 68.2
   E) 109

8) If 50.75 g of a gas occupies 10.0 L at STP, 129.3 g of the gas will occupy ________ L at STP.
   A) 3.92
   B) 5.08
   C) 50.8
   D) 12.9
   E) 25.5

9) A sample of a gas originally at 25 °C and 1.00 atm pressure in a 2.5 L container is allowed to expand until the pressure is 0.85 atm and the temperature is 15 °C. The final volume of the gas is ________ L.
   A) 2.1
   B) 2.8
   C) 3.0
   D) 0.38
   E) 2.6

10) The reaction of 50 mL of N\textsubscript{2} gas with 150 mL of H\textsubscript{2} gas to form ammonia via the equation:
    \[ \text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g}) \]
    will produce ________ mL of ammonia if pressure and temperature are kept constant.
    A) 50
    B) 150
    C) 200
    D) 250
    E) 100

11) The density of ammonia gas in a 4.32 L container at 837 torr and 45.0 °C is ________ g/L.
    A) 0.194
    B) 0.432
    C) 0.717
    D) 3.86
    E) 4.22 \times 10^{-2}

12) A sample of gas (1.9 mol) is in a flask at 21 °C and 697 mmHg. The flask is opened and more gas is added to the flask. The new pressure is 795 mmHg and the temperature is now 26 °C. There are now ________ mol of gas in the flask.
    A) 3.5
    B) 1.6
    C) 2.9
    D) 0.28
    E) 2.1
13) The density of N₂O at 1.53 atm and 45.2 °C is ________ g/L.
   A) 1.76
   B) 2.58
   C) 9.99
   D) 18.2
   E) 0.388

14) The molecular weight of a gas is ________ g/mol if 3.5 g of the gas occupies 2.1 L at STP.
   A) 2.7 × 10⁻²
   B) 41
   C) 5.5 × 10³
   D) 4.6 × 10²
   E) 37

15) The volume of hydrogen gas at 38.0 °C and 763 torr that can be produced by the reaction of 4.33 g of zinc with excess sulfuric acid is ________ L.
   A) 2.71 × 10⁻⁴
   B) 0.592
   C) 3.69 × 10⁴
   D) 2.84
   E) 1.69

16) What volume (mL) of sulfur dioxide can be produced by the complete reaction of 3.82 g of calcium sulfite with excess HCl (aq), when the final SO₂ pressure is 827 torr at 44.0 °C?
   A) 1.39 × 10⁻⁴
   B) 1.00 × 10⁻³
   C) 761
   D) 578
   E) 0.106

17) Ammonium nitrite undergoes thermal decomposition to produce only gases:

   \[ \text{NH₄NO₂ (s)} \rightarrow \text{N₂ (g)} + 2\text{H₂O (g)} \]

   What volume (L) of gas is produced by the decomposition of 35.0 g of NH₄NO₂ (s) at 525 °C and 1.5 atm?
   A) 160
   B) 24
   C) 15
   D) 47
   E) 72

18) A sample of He gas (3.0 L) at 5.6 atm and 25 °C was combined with 4.5 L of Ne gas at 3.6 atm and 25 °C at constant temperature in a 9.0 L flask. The total pressure in the flask was ________ atm. Assume the initial pressure in the flask was 0.00 atm.
   A) 1.0
   B) 3.7
   C) 9.2
   D) 24
   E) 2.6
19) Since air is a mixture, it does not have a "molar mass." However, for calculation purposes, it is possible to speak of its "effective molar mass." (An effective molar mass is a weighted average of the molar masses of a mixture’s components.) If air at STP has a density of 1.285 g/L, its effective molar mass is ________ g/mol.
   A) 26.9
   B) 31.4
   C) 28.8
   D) 34.4
   E) 30.0

20) In a gas mixture of He, Ne, and Ar with a total pressure of 8.40 atm, the mole fraction of Ar is ________ if the partial pressures of He and Ne are 1.50 and 2.00 atm, respectively.
   A) 0.417
   B) 0.238
   C) 0.179
   D) 0.357
   E) 0.583

21) A gas mixture of Ne and Ar has a total pressure of 4.00 atm and contains 16.0 mol of gas. If the partial pressure of Ne is 2.75 atm, how many moles of Ar are in the mixture?
   A) 5.00
   B) 11.0
   C) 6.75
   D) 12.0
   E) 9.25

22) Sodium hydride reacts with excess water to produce aqueous sodium hydroxide and hydrogen gas:

   \[
   \text{NaH (s)} + \text{H}_2\text{O (l)} \rightarrow \text{NaOH (aq)} + \text{H}_2 (g)
   \]

   A sample of NaH weighing ________ g will produce 982 mL of gas at 28.0 °C and 765 torr, when the hydrogen is collected over water. The vapor pressure of water at this temperature is 28 torr.
   A) 0.960
   B) 2.93
   C) 0.925
   D) 925
   E) 0.0388

23) CO (5.00 g) and CO\(_2\) (5.00 g) were placed in a 750.0 mL container at 50.0 °C. The partial pressure of CO\(_2\) in the container was ________ atm.
   A) 1.60
   B) 4.01
   C) 6.31
   D) 10.3
   E) 0.292

24) The root-mean-square speed of CO at 113 °C is ________ m/s.
   A) 58.3
   B) 586
   C) 31.5
   D) 317
   E) 993
25) Which of the following statements about gases is false?
   A) Distances between molecules of gas are very large compared to bond distances within molecules.
   B) Non-reacting gas mixtures are homogeneous.
   C) Gases expand spontaneously to fill the container they are placed in.
   D) Gases are highly compressible.
   E) All gases are colorless and odorless at room temperature.

26) Molecular compounds of low molecular weight tend to be gases at room temperature. Which of the following is most likely not a gas at room temperature?
   A) LiCl
   B) CH₄
   C) H₂
   D) HCl
   E) Cl₂

27) Gaseous mixtures ________.
   A) are all heterogeneous
   B) can only contain isolated atoms
   C) are all homogeneous
   D) can only contain molecules
   E) must contain both isolated atoms and molecules

28) Standard temperature and pressure (STP), in the context of gases, refers to ________.
   A) 273 K and 1 pascal
   B) 298 K and 1 torr
   C) 273 K and 1 atm
   D) 273 K and 1 torr
   E) 298 K and 1 atm

29) The molar volume of a gas at STP is ________ L.
   A) 14.7
   B) 0.08206
   C) 62.36
   D) 1.00
   E) 22.4

30) “Isothermal” means ________.
    A) at constant pressure
    B) at ideal temperature and pressure conditions
    C) at constant temperature
    D) that ΔH_{rxn} = 0
    E) at variable temperature and pressure conditions
31) The pressure exerted by a column of liquid is equal to the product of the height of the column times the gravitational constant times the density of the liquid, \( P = gh \). How high a column of water (\( d = 1.0 \text{ g/mL} \)) would be supported by a pressure that supports a 713 mm column of mercury (\( d = 13.6 \text{ g/mL} \))?
   A) \( 9.7 \times 10^3 \) mm
   B) 14 mm
   C) 713 mm
   D) \( 1.2 \times 10^4 \) mm
   E) 52 mm

32) Which statement about atmospheric pressure is false?
   A) Atmospheric pressure prevents water in lakes, rivers, and oceans from boiling away.
   B) With an increase in altitude, atmospheric pressure increases as well.
   C) The warmer the air, the lower the atmospheric pressure.
   D) Air actually has weight.
   E) As air becomes thinner, its density decreases.

33) The kinetic-molecular theory predicts that pressure rises as the temperature of a gas increases because 
   A) the gas molecules collide more frequently with the wall
   B) the gas molecules collide less frequently with the wall
   C) the gas molecules collide more energetically with the wall
   D) the average kinetic energy of the gas molecules decreases
   E) both the gas molecules collide more frequently with the wall and the gas molecules collide more energetically with the wall

34) A 255 mL round-bottom flask is weighed and found to have a mass of 114.85 g. A few milliliters of an easily vaporized liquid are added to the flask and the flask is immersed in a boiling water bath. All of the liquid vaporizes at the boiling temperature of water, filling the flask with vapor. When all of the liquid has vaporized, the flask is removed from the bath, cooled, dried, and reweighed. The new mass of the flask and the condensed vapor is 115.23 g. Which of the following compounds could the liquid be? (Assume the ambient pressure is 1 atm.)
   A) \( \text{C}_2\text{H}_6 \)
   B) \( \text{C}_3\text{H}_7\text{OH} \)
   C) \( \text{C}_4\text{H}_9\text{OH} \)
   D) \( \text{C}_2\text{H}_5\text{OH} \)
   E) \( \text{C}_4\text{H}_{10} \)
35) The average kinetic energy of the particles of a gas is directly proportional to __________.
   A) the particle mass
   B) the square of the rms speed
   C) the square of the particle mass
   D) the rms speed
   E) the square root of the rms speed

36) According to kinetic-molecular theory, in which of the following gases will the root-mean-square speed of the molecules be the highest at 200 °C?
   A) H2O
   B) SF6
   C) HCl
   D) Cl2
   E) None. The molecules of all gases have the same root-mean-square speed at any given temperature.

37) According to kinetic-molecular theory, if the temperature of a gas is raised from 100 °C to 200 °C, the average kinetic energy of the gas will __________.
   A) decrease by a factor of 100
   B) increase by a factor of 100
   C) increase by a factor of 1.27
   D) decrease by half
   E) double

38) Which one of the following gases would have the highest average molecular speed at 25 °C?
   A) O2
   B) SF6
   C) CO2
   D) CH4
   E) N2

39) A 1.44-g sample of an unknown pure gas occupies a volume of 0.335 L at a pressure of 1.00 atm and a temperature of 100.0 °C. The unknown gas is __________.
   A) argon
   B) helium
   C) krypton
   D) xenon
   E) neon

40) Given the equation
   \[ \text{C}_2\text{H}_6 (g) + \text{O}_2 (g) \rightarrow \text{CO}_2 (g) + \text{H}_2\text{O} (g) \]
   Determine the number of liters of O2 consumed at STP when 270.0 grams of C2H6 is burned.
Answer Key
Testname: CHAPTER 10 WORKSHEET

1) A
   Page Ref: Sec. 10.2
2) C
   Page Ref: Sec. 10.2
3) B
   Page Ref: Sec. 10.3
4) B
   Page Ref: Sec. 10.3
5) D
   Page Ref: Sec. 10.3
6) E
   Page Ref: Sec. 10.3
7) D
   Page Ref: Sec. 10.3
8) E
   Page Ref: Sec. 10.3
9) B
   Page Ref: Sec. 10.3
10) E
    Page Ref: Sec. 10.3
11) C
    Page Ref: Sec. 10.5
12) E
    Page Ref: Sec. 10.4
13) B
    Page Ref: Sec. 10.5
14) E
    Page Ref: Sec. 10.5
15) E
    Page Ref: Sec. 10.5
16) C
    Page Ref: Sec. 10.5
17) E
    Page Ref: Sec. 10.5
18) B
    Page Ref: Sec. 10.6
19) C
    Page Ref: Sec. 10.5
20) E
    Page Ref: Sec. 10.6
21) A
    Page Ref: Sec. 10.6
22) C
    Page Ref: Sec. 10.6
23) B
    Page Ref: Sec. 10.6
24) B
    Page Ref: Sec. 10.8
25) E
    Page Ref: Sec. 10.1
26) A
    Page Ref: Sec. 10.1
27) C
    Page Ref: Sec. 10.1
28) C
    Page Ref: Sec. 10.4
29) E
    Page Ref: Sec. 10.4
30) C
    Page Ref: Sec. 10.3
31) A
    Page Ref: Sec. 10.2
32) B
    Page Ref: Sec. 10.2, 10.3
33) E
    Page Ref: Sec. 10.3
34) D
    Page Ref: Sec. 10.7
35) B
    Page Ref: Sec. 10.7
36) A
    Page Ref: Sec. 10.7
37) C
    Page Ref: Sec. 10.7
38) D
    Page Ref: Sec. 10.8
39) D
    Page Ref: Sec. 10.5
40) 706
    Page Ref: Sec. 10.5