2.2. What is the definition of the fluid?

A) a substance that doesn't permanently resist distortion
B) has shear stress
C) a substance that does permanently resist distortion
D) shear stress magnitudes depend on the volume of the fluid

3.1. What is the symbol for density?
A) β
B) ρ
C) η
D) σ

3.4. What is the unit of the relative density?
A) g/cm^3
B) N/m^3
C) dimensionless
D) kg/m^3

3.7. Convert the density from kilogram/liter [kg/L] to gram/cubic centimeter [g/cm^3]!

11.22 kg/L = ……. g/cm^3
A) 0.01122
B) 11.22
C) 11220
D) 11220000

3.8. Convert the density from gram/cubic centimeter [g/cm^3] to kilogram/cubic meter [kg/m^3]!

2.9 g/cm^3 = ……. kg/m^3
A) 2.9
B) 0.0029
C) 2900
D) 2900000

3.12. Density of water is maximum at
A) - 4 °C
B) 4 °C
C) 100 °C
D) 0 °C

3.13. The calculation of the specific weight
A) $\gamma=\rho/g$
B) $\gamma=\rho\eta$
C) $\gamma=\rho\nu$
D) $\gamma=\rho g$

3.14. True or falls?
A) Specific gravity usually means relative density with respect to water. T
B) The symbol of the relative density is R F
C) Relative density is dimensionless T
D) Relative density = $\rho_{substance} / \rho_{reference}$ T
E) Relative density is the specific weight F

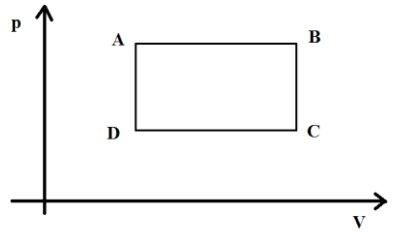
3.88. If the changes in density occurs at constant temperature, then the process is called

A) adiabatic
B) isothermal
C) isobaric
D) isochoric

3.89. In isochoric process …….is constant during process

A) pressure
B) temperature
C) volume
D) heat transfer

3.90. Consider the cycle in the diagram made of 2 isobaric process. What are these?



A) AB and DC
B) AD and DC
C) BC and CD
D) AD and BC

3.99. Isochoric process

A) no change in temperature
B) no change in volume
C) no change in pressure
D) the system does no work

3.103. Pressure law

A) V / T = constant
B) p ·V = constant
C) p / T = constant
D) (p · V) / T = n · R

3.104. Charles' law

A) $V / T = constant$
B) $p \cdot V = constant$
C) $p / T = constant$
D) $(p \cdot V) / T = n \cdot R$

3.105. The ideal gas equation

A) $V / T = constant$
B) $(p \cdot V) / T = n \cdot R$
C) $p \cdot V = constant$
D) $p / T = constant$

3.106. Boyle's law

A) $p / T = constant$
B) $V / T = constant$
C) $(p \cdot V) / T = n \cdot R$
D) $p \cdot V = constant$

3.107. True or false? Ideal gases……

A) collisions aren't elastic F

B) There are no intermolecular forces T

C) Molecules are in rapid motion T

D) The total volume of the molecules isn't negligible compared to the volume of the container F

3.110. One kilogram of hydrogen is confined in a volume of 220 dm^3 at -55 °C. What is the pressure if R is 4.115 kJ/kg·K?

Solution:

$p = \rho \times R \times T$

$\rho = m/V = 1/0.220 = 4.54\ kg/m^3$

$R = 4.115\ kJ/kg \cdot K = 4115\ J/kg \cdot K$

$T = -55 + 273 = 218\ K$

$p = 4.54 \times 4115 \times 218 = 4.073 \times 10^6\ Pa$

3.111. In all gas equations, temperature is measured in

A) Celsius
B) Fahrenheit
C) Kelvin
D) It doesn't matter

3.112. In the ideal gas law, which variable represents the gas constant?

A) n
B) R
C) V
D) T

3.117. The SI unit for pressure

A) bar
B) kPa
C) atm
D) Pa

3.123. What Is The Formula For Boyle's Law?

A) $p_i \times V_i = p_f \times V_f$
B) p x V = zero
C) p/V = const
D) p/T = const

3.124. In the Boyle's Law Formula V_i is the

A) initial pressure
B) initial volume
C) final pressure
D) final volume

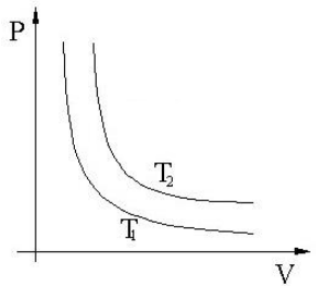
3.125. In the Boyle's Law Formula p_f is the

A) initial pressure
B) initial volume
C) final pressure
D) final volume

3.126. True or false? Boyle's Law means: the volume of a mass of gas is inversely proportional to its pressure.

A) True
B) False

3.127. What is the correct option?



A) $T_1 = T_2$
B) $T_1 > T_2$
C) $T_1 < T_2$

3.128. If 22.5 dm3 of nitrogen at 758 Hgmm are compressed to 737 Hgmm at constant temperature. What is the new volume in m3?

Solution:

p1 x V1 = p2 x V2
V2 = (p1 x V1) / p2
V1= 22.5 /1000 = 0.0225 m3

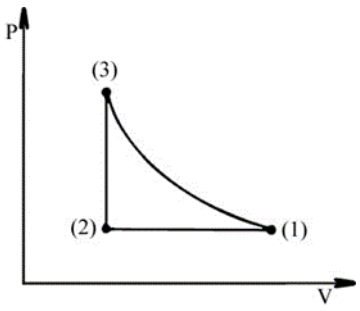
1 [mmHg] = 133.3224 [Pa]
p1= 758 Hgmm = 101058,38 Pa
p2 = 737 Hgmm = 98258,61 Pa
V2= (101058,38 x 0.0225) / 98258,61 = 0.023 m3

3.129. 2000 cm^3 of a gas at standard temperature and pressure is compressed to 1473 mL. What is the new pressure of the gas?

Solution:

p_1 = 1 atm
V_1 = 2000 cm^3 = 2 dm^3 = 0.002 m^3
V_2 = 1473 mL = 1.473 dm^3 = 0.001473 m^3
p_2 = ?
$p_1 \times V_1 = p_2 \times V_2$
$p_2 = [p_1 \times V_1] / V_2$
p_2 = [1 x 0.002] / 0.001473 = 1.358 atm

3.132. What is isochoric process in the diagram?



A) (3) → (1)
<u>B) (2) → (3)</u>
C) (2) → (1)
D) (1) → (2)

3.134. The symbol of the gas constant

A) k
<u>B) R</u>
C) f
D) n

3.135. The units of the gas constant

A) bar/K
B) Pa/K
C) J/mol·K
D) cal/mol

3.136. The symbol of the Boltzmann constant

A) B
B) z
C) c
D) k

3.137. Which is the correct answer?

A) $k = 8.31\ J / K^{-1}$
B) $k = 1.3806 \times 10^{-23}\ J \cdot K^{-1}$
C) $k = 6 \times 10^{23}$
D) $k = 1.3806 \times 10^{-26}\ J \cdot K^{-1}$

3.138. R is related to the Boltzmann constant (k) by

A) $R = m/M \cdot k \cdot N_A$
B) $R = n \cdot k \cdot N_A$
C) $R = k \cdot N_A$
D) $R = N_A / k$

3.142. Fill up the missing spots in the table below!

Type of Gas Law	Formula	Description
1. E	2. $p_1 \times V_1 = p_2 \times V_2$	3. H
4. B	5. G	6.D
7.I	8. C	9. J
10. Charles' Law	11. A	12. F
13. -	14. pV = nRT	

A) $V_1 / T_1 = V_2 / T_2$
B) Combined Law
C) $p_1 / T_1 = p_2 / T_2$
D) Obtained by combining Boyle's Law, Charles' Law and Gay-Lussac's Law
E) Boyle's Law
F) At constant P, as volume increases, temperature increases
G) $(p_1 \times V_1) / T_1 = (p_2 \times V_2) / T_2$
H) At constant T, as pressure increases, volume decreases
I) Gay - Lussac's Law
J) At constant V, as pressure increases, temperature increases

3.148. In the gas laboratory is an air compressor. The tank of the leaky air compressor originally holds 100 dm^3 of air at 28 °C and 207 kPa. During a compression process, 3 grams of air is lost, the remaining air occupies 47 L at 490 kPa. What is the temperature of the remaining air?

Solution:

p_1 = 207 kPa = 207000 Pa
R = 287 J/ kg x K
T_1 = 28 °C = 28 + 273 = 301 K
V_1= 100 dm^3 = 0.1 m^3
p_2 = 490 kPa = 490000 Pa
V_2 = 47 L = 0.047 m^3

$\rho_1 = p_1 / RT_1$ = 207000 / (287 x 301) = 2.396 kg/m^3

$m_1 = \rho_1 \times V_1$ = 2.396 x 0.1 = 0.2396 kg

$\rho_2 = p_2 / RT_2$

$\rho_2 = m_2 / V_2$ = [0.2396 – 0.003] / 0.047 = 5.034 kg /m^3

5.034 = 490000 / [287 x T_2]
1444.758 T_2 = 490000
T_2 = 339.16 K

3.153. Calculate the density, the specific weight and the volume of chloride gas at 27°C and pressure of 750 000 N/m^2.

T = 27 + 273 = 300 K

R = 118 J / mol K

p = 750 000 N/m^2

Solution:

$\rho = p / R \cdot T$

ρ = 750000 /(118 x 300) = 21.186 kg/m^3

$\gamma = \rho \times g$ = 21.186 x 9.81 = 207.83 N/m^3

V = 1 / ρ = 1 / 21.186 = 0.0472 m^3 / kg

3.168. How to Convert Kelvin to Celsius?

A) T(°C) = T(K) - 273.15
B) T(°C) = T(K) - 273
C) T(°C) = T(K) + 273.15
D) T(°C) = T(K) + 273

3.169. What are extensive properties in thermodynamics?

A) density, mass, length
B) mass, volume, length
C) boiling point, mass, density
D) mass, volume, shape

3.170. The mass is 600 g and the volume is 200 cm3. Determine the specific volume!

A) 3 g/cm^3
B) 0.33 g/cm^3
C) 3.33 x 10^{-4} m^3/kg
D) 0.33 m^3/ kg

Solution:

m= 600 g = 0.6 kg
V = 200 cm^3= 0.0002 m^3
specific volume = 0.0002 / 0.6 = 3.33 x 10^{-4} m^3/kg

4.7. The weight density is given by
A) $w = \gamma \times g$
B) $w = \rho \times g$
C) $\rho = w \times g$
D) $\gamma = w \times g$

4.20. Absolute pressure
A) $p_{abs} = p_{atm} - p_{gage}$
B) $p_{abs} = p_{atm} + p_{gage}$
C) $p_{abs} = p_{atm}$
D) $p_{abs} = p_{gage}$

4.21. Pressure head
A) $Z = p \times (\rho \times g)$
B) $Z = p/(\rho \times g)$
C) $Z = \gamma \times h$
D) $Z = \rho \times g \times h$

4.23.Which of the following is the hydrostatic equation?
A) $P = \rho g d$
B) $P = \rho g h$
C) $P/(\rho g) = d$
D) $\rho = P/(gd)$

4.54. A U-tube about half filled with liquid, with both ends of the tube open, the liquid is

A) at the same height in each leg
B) at the different height in each leg