Question 1.

The vapor pressure of cesium at 373 C is 10 torr. What is the pressure in atmospheres?

- a) 1.0×10^{-1}
- b) 1.0×10^{1}
- c) 1.3×10^{-2}
- d) 1.3×10^{-1}
- e) 1.3

Question 2.

The vapor pressure of mercury is 0.0012 torr at 20 C. What is this pressure in atmospheres?

- a) 6.3×10^{-5}
- b) 1.6×10^{-5}
- c) 1.6×10^{-6}
- d) 6.3×10^{-6}
- e) 1.2×10^{-3}

Question 3.

The vapor pressure of gallium at 1350 C is 1.3×10^{-3} atm. What is this pressure in mm Hg?

- a) 0.099
- b) 9.9
- c) 0.99
- d) 0.013
- e) 0.0013

Question 4.

A weather record low pressure is recorded as 88.4 kPa. What is the pressure in cm Hg?

- a) **73.1**
- b) **66.3**
- c) **69.2**
- d) **64.5**
- e) **72.3**

Question 5

The pressure of a gas is reported as 75 kPa. What is the pressure in atmospheres?

- a) **0.69**
- b) **0.74**
- c) **0.72**
- d) **0.76**
- e) **0.79**

Question 6.

The pressure in a basketball is 22.7 lb/in^2. What is the pressure in kPa?

- a) **164**
- b) **156**
- c) **125**
- d) **142**
- e) **138**

Question 7.

A 25 L cylinder contains 128 g of nitrogen gas at 10°C. How many grams of nitrogen must be released to reduce the pressure to 1.75 atm assuming ideal gas

behavior?
(Atomic weight: N = 14.01).

☐ a) 90

☐ b) 75

☐ c) 82

☐ d) 65

☐ e) 58

Question 8.

A 25 L cylinder contains 128 g of nitrogen gas at 10^oC. How many grams of nitrogen must be added to increase the pressure to 5.00 atm assuming ideal gas behavior?
(Atomic weight: N = 14.01).

☐ a) 25.4

☐ b) 22.7

☐ c) 15.9

☐ d) 12.5

☐ e) 18.9

Question 9.

How many nanograms of helium exist in a 250 mL container at 1.5×10^{-8} torr and 1200^oC?
(Atomic weight: He = 4.00).

☐ a) 2.2×10^{-4}

☐ b) 1.6×10^{-4}

☐ c) 2.2×10^{-2}

☐ d) 3.3×10^{-3}

☐ e) 1.6×10^{-1}

Question 10.

3

A barge on the Ohio river contains 625 tons of liquid chlorine under pressure. What volume (m^3) would the chlorine occupy at 730 torr and 20^oC? (Atomic weight: Cl = 35.45).

- a) 5.00×10^4
- b) 1.00×10^5
- c) 2.00×10^5
- d) 1.00×10^3
- e) 2.00×10^3

Question 11

What volume (L) is occupied by 19.6 g of methane (CH_4) at 27^oC and 1.59 atm? (Atomic weights: C = 12.01, H = 1.008).

- a) 23.2
- b) 27.7
- c) 18.9
- d) 30.2
- e) 17.1

Question 12.

What volume (in L) is occupied by 3.50 g of chlorine gas at 45^oC and 745 mm Hg? (Atomic weight: Cl = 35.45).

- a) 1.64
- b) 1.04
- c) 1.31
- d) 0.66
- e) 1.50

Question 13.

4

A 1.0 g sample of a radioactive element decays to produce 1.16×10^{18} alpha particles per year. Each alpha particle becomes a helium atom. What pressure in Pa of helium is produced in a 125 mL volume at 25^oC? (1 atm = 101.3 kPa).

- a) 31.6
- b) 28.2
- c) 41.4
- d) 35.4
- e) 38.2

Question 14.

Assume 453.6 g of dry ice (solid CO_2) is placed in an evacuated 50.0 L closed tank. What will be the pressure in the tank in atmospheres at a temperature of 45^oC. Assume that all the CO_2 has been converted into gas?
(Atomic weights: C = 12.01, O = 16.00).

- a) 9.15
- b) 10.8
- c) 7.25
- d) 6.10
- e) 5.38

Question 15.

A 4.5 L container at 70^oC has 220 grams of SF_6. What is the pressure (atm) of SF_6 in atm?
(Atomic weights: S = 32.06, F = 19.00).

- a) 8.6
- b) 5.7
- c) 6.2
- d) 9.9
- e) 9.4

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Gasses

Question 16.

The pressure of sodium vapor in a 1.00 L container is 10 torr at 1000^oC. How many moles are in the container?
(Atomic weight: Na = 22.99).

- ☐ a) 1.6×10^{-2}
- ☐ b) 1.3×10^{-3}
- ☐ c) 1.3×10^{-4}
- ☐ d) 1.6×10^{-4}
- ☐ e) 2.1×10^{-2}

Question 17.

How many moles of helium exist in a 250 mL container at 1.5×10^{-8} torr and 1200^oC?
(Atomic weight: He = 4.00).

- ☐ a) 3.7×10^{-12}
- ☐ b) 4.5×10^{-11}
- ☐ c) 4.1×10^{-14}
- ☐ d) 5.0×10^{-14}
- ☐ e) 3.7×10^{-11}

Question 18.

A small cylinder of helium for use in chemistry lectures has volume of 334 mL. How many moles of helium are contained in the cylinder at a pressure of 154 atm and 23^oC?
(Atomic weight: He = 4.00).

- ☐ a) 1.95
- ☐ b) 1.52
- ☐ c) 2.12
- ☐ d) 1.80
- ☐ e) 1.06

Question 19.

The pressure in a 2.0 L container is 1.5 x 10^{-7} torr at 1115°K. How many gaseous molecules are in the container?

- ☐ a) 4.2 x 10^{10}
- ☐ b) 4.2 x 10^{10}
- ☐ c) 2.0 x 10^{15}
- ☐ d) 2.6 x 10^{12}
- ☐ e) 3.4 x 10^{9}

Question 20.

The Goodyear blimp has 5.1 x 10^{6} liters of helium at 25°C and 1.00 atm. How many molecules of helium are in the blimp?
(Atomic weight: He = 4.00).

- ☐ a) 1.3 x 10^{28}
- ☐ b) 2.6 x 10^{27}
- ☐ c) 2.6 x 10^{28}
- ☐ d) 1.3 x 10^{29}
- ☐ e) 2.9 x 10^{29}

Question 21.

How many atoms of neon exist in a 250 mL container at 1.5 x 10^{-6} torr and 1200°C?
(Atomic weight: Ne = 20.2).

- ☐ a) 3.7 x 10^{12}
- ☐ b) 3.7 x 10^{11}
- ☐ c) 2.5 x 10^{11}
- ☐ d) 2.5 x 10^{12}
- ☐ e) 4.9 x 10^{10}

Question 22.

What is the density (g/L) of pure oxygen gas at STP?
(Atomic weight: O = 16).

- a) 1.52
- b) 1.34
- c) 1.24
- d) 1.43
- e) 1.12

Question 23.

What is the density (g/L) of nitrogen at STP?
(Atomic weight: N = 14.01).

- a) 0.800
- b) 1.60
- c) 0.625
- d) 1.25
- e) 0.312

Question 24.

What is the density in g/L of BrF_3 at STP?
(Atomic weights: Br = 79.90, F = 19.00).

- a) 5.77
- b) 4.35
- c) 7.02
- d) 6.11
- e) 5.23

Question 25.

A 2.15 g sample of a gas occupies 750 mL at STP, What is the molecular weight of the gas at 125 C?

- a) 70.1
- b) 75.0
- c) 48.2
- d) 64.3
- e) 30.7

Question 26.

The density of a hydrocarbon at STP is 1.97 g/L. What is the molecular weight of the gas?

- a) 40
- b) 30
- c) 26
- d) 44
- e) 16

Question 27.

The density of a fluoride of a nonmetal is 5.63 g/L at STP. What is the molecular weight of the gas?

- a) 104
- b) 145
- c) 88.0
- d) 126
- e) 136

Question 28.

At $1000^{o}C$ and 10 torr, the density of a certain element in the gaseous state is 2.9×10^{-3} g/L. Using the atomic weights given in parenthesis, determine the identity of the element.

- a) Hg(201)
- b) Na(23)

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c) K(39)

d) Ne(20)

e) Rb(85.5)

Question 29.

The density of a gaseous element at 310^oC and 775 mm Hg is 2.64 g/L. What is the molecular weight of the element?

a) 93

b) 124

c) 84

d) 106

e) 114

Question 30.

At 950^oC and 15 torr, the density of a certain element in the gaseous state is 1.68 x 10^{-2} g/L. Using the atomic weights given in parenthesis, determine the identity of the element.

a) Hg(201)

b) Rb(85.5)

c) K(39)

d) Na(23)

e) Ne(20)

Question 31.

A gaseous mixture consists of 50.0% O_2, 25.0% N_2 and 25.0% Cl_2 by mass and is maintained at STP. What is the partial pressure (atm) of N_2 in the mixture? (Atomic weights: O = 16.00, N = 14.01, Cl = 35.45).

a) 0.251

b) 0.075

c) 0.426

☐ d) 0.126

☐ e) 0.318

Question 32.

A mixture of 3.65 g of CH_2Cl_2 and 1.50 g of CH_4 is contained in a 50.0 mL container at 400^oC. What is the mole fraction of CH_2Cl_2?
(Atomic weights: C = 12.01, Cl = 35.45, H = 1.008).

☐ a) 0.520

☐ b) 0.452

☐ c) 0.244

☐ d) 0.684

☐ e) 0.316

Question 33.

A 10.0 L flask contains 0.200 moles of CH_4, 0.300 moles of C_2H_6 and 0.400 moles of C_3H_8 at 25^oC. What is the total pressure in atm?
(Atomic weights: C = 12.01, H = 1.008).

☐ a) 0.734

☐ b) 0.621

☐ c) 0.979

☐ d) 0.489

☐ e) 2.20

Question 34.

Two identical balloons are filled, one with helium and one with nitrogen at the same temperature. If the nitrogen balloon leaks at the rate of 75 mL per hour, what will be the rate of leakage from the helium balloon?
(Atomic weights: He = 4.00, N = 14.01).

☐ a) 122 mL/hr

☐ b) 198 mL/hr

    c) 28 mL/hr

    d) 14 mL/hr

    e) 75 mL/hr

Question 35.

A mixture of 0.50 mole H_2 and 0.50 mole of SO_2 is introduced into a 10.0 L container at 25^oC. The container has pinhole leak. After a period of time:
(Atomic weights: H = 1.008, S = 32.06, O = 16.00).

    a) the partial pressure of H_2 exceeds that of SO_2 in the remaining gas

    b) the partial pressure of SO_2 exceeds that of H_2 in the remaining gas

    c) the partial pressures of the two gases remain equal throughout this time

Question 36.

Which gases, N_2O, C_2H_2, NO, diffuse more slowly than O_2 under identical experimental conditions?
(Atomic weights: N = 14.01, O = 16.00, C = 12.01, H = 1.008).

    a) NO and C_2H_2

    b) N_2O only

    c) C_2H_2 only

    d) N_2O and C_2H_2

    e) NO only

Question 37.

Calculate the relative rate of diffusion of HF compared to HCl.
(Atomic weights: H = 1.008, Cl = 35.45, F = 19.00).

    a) 1.21

    b) 0.741

    c) 0.549

d) 1.82

e) 1.35

Question 38.

Calculate the relative rate of diffusion of O_2 compared to O_3.
(Atomic weight: O = 16.00).

a) 1.30

b) 0.672

c) 0.820

d) 1.49

e) 1.22

Question 39.

A mixture of 0.50 mole H_2 and 0.50 mole of SO_2 is introduced into a 10.0 L container at 25°C. The container has pinhole leak. After a period of time:
(Atomic weights: H = 1.008, S = 32.06, O = 16.00).

a) the partial pressure of H_2 exceeds that of SO_2 in the remaining gas

b) the partial pressure of SO_2 exceeds that of H_2 in the remaining gas

c) the partial pressures of the two gases remain equal throughout this time

Question 40.

How many milliliters of N_2 at STP would be produced from 0.0013 g of H_2 according to the following equation?
(Atomic weights: N = 14.01, O = 16.00, H = 1.008).

$$2 \; NO(g) \; + \; 2 \; H_2(g) \; \rightarrow \; 2 \; H_2O(g) \; + \; N_2(g)$$
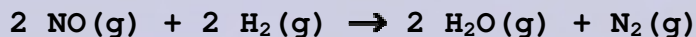
a) 1.8

b) 3.6

c) 15

- [ ] d) 30
- [ ] e) 7.2

Question 41.

Sodium reacts with water according to the following reaction. How many millliter of hydrogen at STP would be produced by the reaction of 1.20 grams of sodium? (Atomic weights: Na = 22.99, H = 1.008, O = 16.00).

```
2 Na(s) + 2 H₂O(l) 8 2 NaOH(aq) + H₂(g)
```

- [ ] a) 260
- [ ] b) 342
- [ ] c) 292
- [ ] d) 445
- [ ] e) 585

Question 42.

Pure tungsten can be prepared by the following reaction. What volume (L) of H_2 at 0.980 atm and 20°C is required to react with 25.2 g of WO_3? (Atomic weights: W = 183.85, H = 1.008, O = 16.00).

```
3 H₂(g) + WO₃(s) 8 W(s) + 3 H₂O(g)
```

- [ ] a) 2.67
- [ ] b) 7.20
- [ ] c) 4.50
- [ ] d) 9.00
- [ ] e) 8.00

Question 43.

A 1.14 g sample of impure aluminum carbide reacts with water to give 463 mL of CH_4 collected by water displacement at 20°C and 745 mm Hg. The vapor pressure of water is 17.5 mm Hg. What is the % Al_4C_3? (Atomic weights: Al = 26.98, C = 12.01, H = 1.008, O = 16.00).
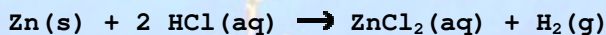
```
Al₄C₃(s) + H₂O(l) ⟶ 3 CH₄(g) + 4 Al(OH)₃(s)
```
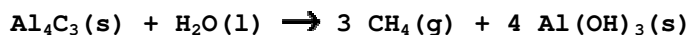
☐ a) 80.2

☐ b) 77.6

☐ c) 72.1

☐ d) 82.4

☐ e) 74.2

Question 44.

A 3.00 g sample of a mixture contains copper and zinc. Zinc reacts with HCl but copper does not. What is the % Zn if 927 mL of hydrogen gas is collected by displacement of water at 740 mm Hg and 20ºC. The vapor pressure of water is 17.5 mm Hg.
**(Atomic weights: Zn = 65.39, H = 1.008, Cl = 35.45, O = 16.00).**

$$Zn(s) + 2\ HCl(aq) \longrightarrow ZnCl_2(aq) + H_2(g)$$

☐ a) 82.8

☐ b) 79.8

☐ c) 85.3

☐ d) 81.7

☐ e) 77.1

Question 45.

A 0.815 g sample of a mixture contains copper and aluminum. Aluminum reacts with HCl but copper does not. What is the % Al if 927 mL of hydrogen gas is collected by displacement of water at 740 mm Hg and 20ºC. The vapor pressure of water is 17.5 mm Hg.
(Atomic weights: Al = 26.98, H = 1.008, Cl = 35.45, O = 16.00).

$$2\ Al(s) + 6\ HCl(aq) \longrightarrow 2\ AlCl_3(aq) + 3\ H_2$$
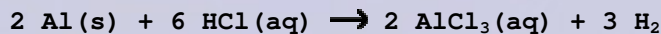
☐ a) 77.1

☐ b) 80.8

☐ c) 81.7

      d) 85.3

      e) 79.2

Question 47.

The average velocity of He at 100^oK will be _____ times that of the average velocity of O_2 at 400^oK.
(Atomic weights: He = 4.00, O = 16.00).

      a) (2)-1/2

      b) (2)1/2

      c) 4

      d) 1/2

      e) 2

Question 48.

The average velocity of H_2 at 250^oK will be _____ the average velocity of He at 250^oK.
(Atomic weights: He = 4.00, H = 1.008).

      a) larger than

      b) smaller than

      c) the same as

Question 49.

Which of the following is the ordering of average velocities of He, N_2 and H_2O at 600^oK?
(Atomic weights: He = 4.00, H = 1.008, O = 16.00, N = 14.01).

      a) $H_2O > N_2 > He$

      b) $He > H_2O > N_2$

      c) $He = N_2 = H_2O$

      d) $N_2 > H_2O > He$

      e) $He > N_2 > H_2O$