

Chemistry Exam Review Questions

SCH3U_2013

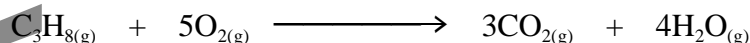
The Gas State

- The term "absolute zero" refers to
 - the temperature at which water freezes.
 - the temperature at which water freezes at zero atmospheric pressure
 - the temperature at which molecular motion is believed to stop.
 - the temperature at which molecular kinetic energy equals the potential energy
 - 273K
- When the pressure exerted on 1L of an ideal gas is tripled and the absolute temperature doubled, the volume in litres is:
 - 1/6 L
 - 2/3 L
 - 1 L
 - 3/2 L
 - 6 L
- The volume occupied by 2.50 mol of CO₂ at STP, in litres is
 - 8.96 L
 - 22.4 L
 - 15.1x10²³ L
 - 56.0 L
- Which one of the following quantities is the same for equal volumes of HCl and NH₃ at the same temperature and pressure?
 - Density
 - Mass
 - Number of molecules
 - Velocity

Problems

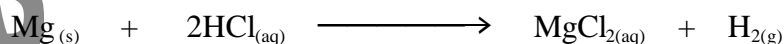
- A sample of hydrogen gas has a volume of 54.0 L at 22.0 °C. What volume will it occupy at a temperature of - 55.0 °C
- The pressure on 925 mL of oxygen gas is 120 kPa. What must the pressure be changed to in order to make the volume 0.700 L?
- A 50.0 L volume of gas is at 42.0 °C and 87.0 kPa. Calculate the temperature required to change the volume to 35.0 L at a pressure of 96.5 kPa.
- Calculate the number of moles in:
 - 45.2 L of carbon dioxide gas at STP
 - 125.0 L of helium gas at STP
 - 2.24 L of hydrogen gas at STP
- Calculate the volume of:
 - 0.25 moles of carbon dioxide gas at STP
 - 1.66 moles of helium gas at STP
 - 5.65 moles of hydrogen gas at STP
- Nitrogen gas is reacted with fluorine gas to form nitrogen trifluoride gas, NF_{3(g)}, at the same temperature and the same pressure, according to the following equation:
$$\text{N}_{2(g)} + 3\text{F}_{2(g)} \longrightarrow 2\text{NF}_3$$
What is the maximum volume of nitrogen trifluoride that can be formed from 2.0 mol of nitrogen gas and 3.0 mol of fluorine gas ?

11. 3.60 L of oxygen at STP are converted to 100.0 °C and 250.0 kPa.
- Calculate the new volume.
 - How many moles of oxygen are present in the gas sample?
 - How many molecules of oxygen are present in the gas sample?
12. How many moles of oxygen will occupy 95.8 L at a temperature of 45.5°C and a pressure of 43.2 kPa?
13. How many moles of oxygen will occupy 95.8 L at a temperature of 45.5°C and a pressure of 43.2 kPa?
14. The equation for the complete combustion of propane gas, C₃H_{8(g)} is:



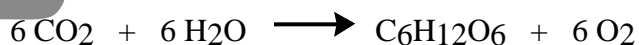
What is the volume, at STP, of carbon dioxide that is formed by the complete combustion of 4.40 g of propane?

15. Magnesium metal reacts with excess hydrochloric acid according to the following equation:



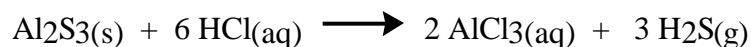
If 1.20 g of magnesium metal is reacted with excess hydrochloric acid, what volume of hydrogen gas is obtained at STP?

16. The overall equation for photosynthesis is:



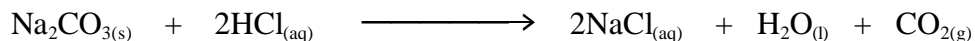
What volume of oxygen gas would be produced at STP by the photosynthesis of 180 g of glucose

17. Consider the following reaction:



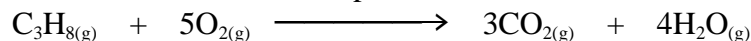
- If 2.56 g of aluminium sulphide is reacted with 25.0 mL of 0.200 mol L⁻¹ hydrochloric acid, determine the limiting reactant.
- Calculate the number of moles of hydrogen sulphide gas that would be obtained.
- Calculate the volume of hydrogen sulphide gas that would be obtained at 75.0 °C and 95.2 kPa.
- If the solution was evaporated to dryness calculate the mass of aluminium chloride solid that would be obtained.
- In such a reaction at the Colonel By Laboratory a student obtained 1.65 g of solid aluminium chloride, determine the percentage yield.

18. Consider the following reaction:



What mass of sodium carbonate, $\text{Na}_2\text{CO}_{3(s)}$ must be used to produce 10.36 L of carbon dioxide gas at 24.0 °C and 103.1 kPa ?

19. If 300.0 g of propane gas and 129.0 g of oxygen gas are mixed and allowed to react as shown below, determine the volume of water vapour formed at 120 °C and 116 kPa.



On the surface of a planet called Cyanogen, in the Helios Galaxy, Cyanogen's atmosphere contains a high concentration of a gas unknown on Earth, it contains 46.2 % carbon, 53.8 % nitrogen.

- Calculate the empirical formula of this unusual gas.
- On the surface of Cyanogen, where the temperature is 25 °C and the pressure is 101.32 kPa, 0.476 dm³ of this gas has a mass of 1.00 g. Calculate the molar mass of the gas.
- Use the results of your calculations on parts (a) and (b) to determine the molecular formula of the gas.

Solutions, Solubility and Reactions, Acids & Bases

- Calculate the mass of $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ required to make 350.0 mL of a 0.0200 mol/L solution.
- What volume of a 0.240 mol/L copper (I) sulfate solution would contain 8.92 g of copper (I) sulfate (Cu_2SO_4)?
- Concentrated sulphuric acid has a concentration of 18.0 M. What volume of concentrated sulphuric acid is needed to make 8.00 l of 1.50 mol L⁻¹ solution? What volume of water is needed to make this solution?
- What is the hydronium ion concentration, $[\text{H}_3\text{O}^+]$, of a hydrobromic acid solution, $\text{HBr}_{(aq)}$ with a pH of 0.75 ? What is the $[\text{OH}^-]$?
- Distinguish between a strong and a weak acid.
- What is the pH of the following solutions:
 - 0.05 M $\text{HNO}_{3(aq)}$
 - 0.122 M $\text{H}_2\text{SO}_{4(aq)}$
 - 0.0150 M $\text{Ba}(\text{OH})_{2(aq)}$
- What volume of 0.520 mol L⁻¹ sodium hydroxide is needed to neutralize 50.00 mL of 1.15 mol L⁻¹ hydrobromic acid solution, $\text{HBr}_{(aq)}$? (Write a balanced equation first!)
- 100.00 mL of 0.500 mol L⁻¹ sulphuric acid is titrated with 24.50 mL of sodium hydroxide. Calculate the concentration of the sodium hydroxide. (Write a balanced equation first!)