Q1. The work function of gold metal is 8.16×10^{-19} J. Calculate the kinetic energy (in Joules) of the ejected electrons if light of frequency 2.11×10^{15} s^{-1} is used to irradiate the metal?

A) 1.40×10^{-18} B) 1.71×10^{-19} C) 5.83×10^{-19} D) 2.21×10^{-18}

Q2. What is the wavelength of a photon (in nanometers) absorbed during a transition from the $n_i = 2$ state to the $n_f = 7$ state in the hydrogen atom?

A) 3970 B) 397 C) 5 D) 501

Q3. What is the wavelength (in nanometer) of an N_2 gas molecule moving at 5.00×10^2 cm/s?

A) 2.85 B) 2.85×10^{-9} C) 285 D) 2.85×10^{9}

Q4. Which of the following sets of quantum numbers (n, l, m_l, m_s) is possible for an electron in a $5f$ orbital?

A) (5, 1, +1, +1/2) B) (5, 2, +1, −1/2) C) (3, 5, +1, −1/2) D) (5, 3, −1, +1/2)

Q5. Knowing that silver sulfate is insoluble in water, what is the net ionic reaction when a sodium sulfate (Na_2SO_4) solution is mixed with a silver nitrate ($AgNO_3$) solution?

A) $Na^+ + SO_4^{2-} + Ag^+ + NO_3^- \rightarrow NaNO_3(s) + Ag^+ + SO_4^{2-}$

B) $Na^+ + NO_3^- \rightarrow NaNO_3(s)$

C) $2Ag^+ + SO_4^{2-} \rightarrow Ag_2SO_4(s)$

D) $2Na^+ + SO_4^{2-} + 2Ag^+ + 2NO_3^- \rightarrow Ag_2SO_4(s) + 2Na^+ + 2NO_3^-$

Q6. What is the oxidation state of phosphorous in the compound NaH_2PO_4?

A) +2 B) +5 C) −3 D) −5

Q7. Which of the following reactions would happen?

A) $Cl_2(g) + 2NaF(aq) \rightarrow 2NaCl(aq) + F_2(g)$

B) $Br_2(l) + 2LiF(aq) \rightarrow 2LiBr(aq) + F_2(g)$

C) $Br_2(l) + 2CsCl(aq) \rightarrow 2CsBr(aq) + Cl_2(g)$

D) $F_2(g) + 2RbCl(aq) \rightarrow 2RbF(aq) + Cl_2(g)$

Q8. To what volume (in liters) should you dilute 10.0 mL of a 12 M stock HCl solution to obtain a 0.100 M HCl solution?

A) 1.2 B) 1200 C) 1.19 D) 1190

Q9. How many grams of sucrose ($C_{12}H_{22}O_{11}$) are in 1.55 L of 0.26 M sucrose solution?

A) 26 B) 0.403 C) 155 D) 138

Q10. A 0.735-g sample of an ionic compound containing the iodide ions (I^-) and unknown metal is dissolved in water and treated with an excess of $Pb(NO_3)_2$. If 1.025 g of PbI_2 precipitate is formed, what is the percent by mass of (I) in the original compound?

A) 40.46% B) 20.74 % C) 76.78% D) 55.05%

Q11. What volume (in liters) does 0.665 mol of gas occupy at a pressure of 725 mmHg and a temperature of 58°C?

A) 18.944 B) 3.321 C) 0.025 D) 0.004

Q12. A sample of gas has a mass of 0.309 g. Its volume is 0.108 L at STP. Which of the following could be the gas?

A) CO B) SO_2 C) Cl_2O D) SF_6

Q13. Calcium carbide reacts with water to form calcium hydroxide and acetylene as shown in the chemical equation below:

$$CaC_2(s) + 2H_2O(l) \rightarrow Ca(OH)_2(aq) + C_2H_2(g)$$

When the acetylene is collected over water, there is water vapor mixed with the acetylene gas. The vapor pressure of the water at 25°C is 24 mmHg. What amount (in moles) of acetylene gas is contained in 1.56 L of this mixture at 25°C if the total pressure is 0.97 atm?

A) 0.006 B) 0.710 C) 0.740 D) 0.060

Q14. Methanol (CH_3OH) can be synthesized by the reaction:

$$CO(g) + 2H_2(g) \rightarrow CH_3OH(g)$$

What volume (in liters) of hydrogen gas, at a temperature of 355 K and a pressure of 9.83×10^4 Pa, is needed to synthesize 37.5 g of methanol?

A) 2.34 B) 70.32 C) 35.16 D) 76.30

Q15. Calculate the root-mean-square speed (in m/s) of CO_2 molecules at 25°C.

A) 119 B) 13 C) 411 D) 41