

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 $2.11 \times 10^{15} \text{ s}^{-1}$ 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}
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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
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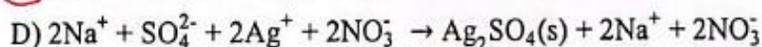
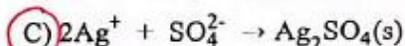
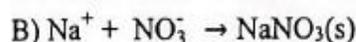
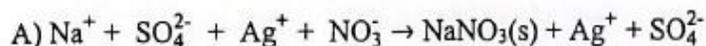
Q3. What is the wavelength (in nanometer) of an N_2 gas molecule moving at $5.00 \times 10^2 \text{ cm/s}$?

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



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

- A) +2 B) +5 C) -3 D) -5
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Q7. Which of the following reactions would happen?



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
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Q9. How many grams of sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) are in 1.55 L of 0.26 M sucrose solution?

- A) 26 B) 0.403 C) 155 D) 138
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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%
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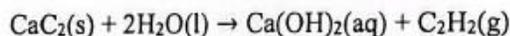
Q11. What volume (in liters) does 0.665 mol of gas occupy at a pressure of 725 mmHg and a temperature of $58^\circ C$?

- A) 18.944 B) 3.321 C) 0.025 D) 0.004
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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
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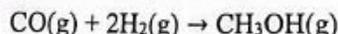
Q13. Calcium carbide reacts with water to form calcium hydroxide and acetylene as shown in the chemical equation below:



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

- A) 0.006 B) 0.710 C) 0.740 D) 0.060
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Q14. Methanol (CH_3OH) can be synthesized by the reaction:



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

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