Question 1: Match each of the following electrolyte definitions.

Name:	Behavior:
Strong electrolyte	Ionizes completely in water
Weak electrolyte	Does not form ions in water
Non-electrolyte	Forms some ions in water

Question 2: Which pairs of compounds are soluble when mixed?

- Potassium chloride (KCl) and water
- Octane (C_8H_{18}) and water
- Carbon tetrachloride (CCl_4) and hexane (C_6H_{14})
- Drinking alcohol (C_2H_6O) and water
- Ammonia (NH_3) and benzene (C_6H_6)

Question 3: Predict if the solubility of the solute increases or decreases in each situation below?

- A solution of sugar and water at room temperature is placed in the refrigerator. Decreases
- An open can of soda water (a solution of carbon dioxide gas and water) at room temperature is placed in the refrigerator. Increases
- A solution of table salt (NaCl) and water is heated on the stove. Increases
- A sealed bottle of soda water (a solution of carbon dioxide gas and water) is opened. Decreases

Question 4: What is the % w/v of a 152 mL saline solution containing 230 mg of NaCl dissolved in water?

$$230 \text{ mg NaCl} \times \frac{1 \text{ g}}{1000 \text{ mg}} = 0.230 \text{ g NaCl}$$

$$\frac{0.230 \text{ g NaCl}}{152 \text{ mL soln}} \times 100 = \boxed{0.15 \text{ \% w/v}}$$

Question 5: What is the % w/v of a 1.4 L solution containing 12 g of sucrose in water.

$$\frac{12\text{ g sucrose}}{1400\text{ mL soln}} \times 100 = \boxed{0.86\%\ \text{w/v}}$$

Question 6: What is the % v/v of a solution containing 16 mL hydrogen peroxide in 84 mL of water.

$$\frac{16\text{ mL } H_2O_2}{84\text{ mL soln}} \times 100 = \boxed{19\%\ \text{v/v}}$$

Question 7: How many milliliters of methanol are in 1500 mL of a 5.0% v/v solution?

$$1500\text{ mL methanol soln} \times \frac{5.0\text{ mL methanol}}{100\text{ mL soln}} = \boxed{75\text{ mL methanol}}$$

Question 8: How many grams of glucose are in 2.2 L of a 0.30% w/v solution?

$$2.2\text{ L soln} \times \frac{1000\text{ mL}}{1\text{ L}} \times \frac{0.30\text{ g glucose}}{100\text{ mL soln}} = \boxed{6.6\text{ g glucose}}$$

Question 9: The human body contains roughly 5.0 L of blood. How many grams of glucose are present in the blood if the concentration is 90.0 mg / 100.0 mL?

$$5.0\text{ L blood} \times \frac{1000\text{ mL}}{1\text{ L}} \times \frac{90\text{ mg glucose}}{100\text{ mL blood}} = 4500\text{ mg}$$

$$4500\text{ mg glucose} \times \frac{1\text{ g}}{1000\text{ mg}} = \boxed{4.5\text{ g glucose}}$$

Question 10: What is the molarity of a solution containing 5.0 moles of NaCl in 10 L of solution?

$$\frac{5.0 \text{ mol NaCl}}{10 \text{ L soln}} = \boxed{0.5 \text{ M}}$$

Question 11: How many moles of an antibiotic are in 0.500 L of a 0.30 M solution?

$$0.500 \text{ L soln} \times \frac{0.30 \text{ mol antibiotic}}{1 \text{ L soln}} = \boxed{0.15 \text{ mol antibiotic}}$$

Question 12: What volume of a 4 M NaOH solution is needed to prepare 32 moles of NaOH?

$$32 \text{ mol NaOH} \times \frac{1 \text{ L soln}}{4 \text{ mol NaOH}} = \boxed{8 \text{ L soln}}$$

Question 13: How many moles of solute are in 8.0 L of a 4.0 M solution of acetic acid?

$$8.0 \text{ L soln} \times \frac{4.0 \text{ mol acid}}{1 \text{ L soln}} = \boxed{32 \text{ mol acetic acid}}$$

Question 14: How many **grams** of glucose (hint: molar mass=180.2 g/mol) are in 1.00 L of a 0.20 M solution?

$$1.00 \text{ L}_{\text{soln}} \times \frac{0.20 \text{ mol glucose}}{1 \text{ L soln}} \times \frac{180.2 \text{ g glucose}}{1 \text{ mol glucose}} = \boxed{36 \text{ g glucose}}$$

Question 15: Standard intravenous (IV) saline solution given to hospital patients has a concentration of 0.920% w/v of NaCl in water. If an IV bag contains 896 mL of saline solution remaining, calculate the amount (in grams) of NaCl that will be administered to the patient.

$$896 \text{ mL soln} \times \frac{0.920 \text{ g NaCl}}{100 \text{ mL soln}} = \boxed{8.24 \text{ g NaCl}}$$

Question 16: A tired runner has just finished the Honolulu Marathon and drank lots of water before, during and after the race. She starts feeling ill and upon visiting the E.R., the doctor determines she has hyponatremia (low sodium level in the blood) caused from drinking too much water. The doctor orders a 1.38% w/v saline solution. You measure out 14.1 grams of NaCl then start adding water to obtain the correct concentration. What will be the final volume of the saline solution (in mL)?

$$\frac{14.1 \text{ g NaCl}}{\text{Vol of soln}} \times 100 = 1.38$$

- Divide both sides by 100
- Solve for volume of soln

Volume of solution = $\boxed{1020 \text{ mL}}$

↑ *3 sig figs only!

Challenge Question: A study of 175 post-mortem cases (J. *Med. Sci. Law* **1990**, *30*, 101) determined the fatal concentration of ethanol (drinking alcohol) in your blood to be 355 mg/dL, significantly lower than previous studies. If a man has 4.7 L of blood his body, how many mL of ethanol would need be in man's blood to receive a fatal dose? The density of ethanol is 0.789 g/mL.

$$4.7 \text{ L blood} \times \frac{10 \text{ dL}}{1 \text{ L}} \times \frac{355 \text{ mg alcohol}}{1 \text{ dL blood}} \times \frac{1 \text{ g}}{1000 \text{ mg}} \times \frac{1 \text{ mL}}{0.789 \text{ g}} =$$

$\boxed{21 \text{ mL ethanol (drinking alcohol)}}$

Question 18: What is the final molarity of a solution made from 440 mL of 0.82 M saline solution and diluted to a final volume of 880 mL?

$C_1 \times V_1 = C_2 \times V_2$

$\frac{0.82\ M \times 440\ mL}{880\ mL} = \frac{C_2 \times 880\ mL}{880\ mL}$

$\boxed{0.41\ M = C_2}$

Question 19: A 1.50 L stock glucose solution at a concentration of 2.12 M was diluted to a final concentration of 0.53 M, what is the new volume?

$C_1 \times V_1 = C_2 \times V_2$

$\frac{2.12\ M \times 1.50\ L}{0.53\ M} = \frac{0.53\ M \times V_2}{0.53\ M}$

$\boxed{6.0\ L = V_2}$

Question 20: What initial volume of a 4.00 M stock acetic acid solution was used to prepare 2.0 liters of dilute acetic acid with a final concentration of 1.0 M?

$C_1 \times V_1 = C_2 \times V_2$

$\frac{4.00\ M \times V_1}{4.00\ M} = \frac{1.0\ M \times 2.0\ L}{4.00\ M}$

$\boxed{V_1 = 0.50\ L}$

Question 21: A lab technician measures out 150 mL of a stock electrolyte solution in order to create 680 mL of a 0.0820 M dilute solution. What is the initial concentration of the solution?

$C_1 \times V_1 = C_2 \times V_2$

$\frac{C_1 \times 150\ mL}{150\ mL} = \frac{0.0820\ M \times 680\ mL}{150\ mL}$

$\boxed{C_1 = 0.37\ M}$