**Lab Report 1: Introduction To Science**

**Part 1: Data Interpretation** (40 Points)

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**Instructions**: Answer the following questions in complete sentences using correct grammar, spelling, and terminology. Include your graph in question 7.

Dissolved oxygen is oxygen that is trapped in a fluid, such as water. Since many living organism requires oxygen to survive, it is a necessary component of water systems such as streams, lakes and rivers in order to support aquatic life. The dissolved oxygen is measured in units of parts per million (ppm). Examine the data in Table 4 showing the amount of dissolved oxygen present and the number of fish observed in the body of water the sample was taken from; finally, answer the questions below.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 4: Water Quality vs. Fish Population** | | | | | | | | | | |
| **Dissolved Oxygen (ppm)** | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| **Number of Fish Observed** | 0 | 1 | 3 | 10 | 12 | 13 | 15 | 10 | 12 | 13 |

**Questions**

1. What patterns do you observe based on the information in Table 4?

The table is showing that the dissolved oxygen is constantly increasing, and furthermore there is an increasing and decreasing pattern in the population of the fish. This can be interpreted in two different aspects. If noted, the column 1-7 shows a continuous increase, telling us that water in the oxygen is directly proportional to the fish population which reports the 15 fishes in the 12 ppm of the dissolved oxygen. In the column 7 and 8, transition showed an inverse proportion, and after that the remaining columns again showed direct proportionality. Thus, it can be formulated that lesser the fish population, more the oxygen will be present in the water.

2. Develop a hypothesis relating to the amount of dissolved oxygen measured in the water sample and the number of fish observed in the body of water.

The dissolved oxygen in the water shows a decline with an increase in the fish of the population of the fish. If the oxygen that is dissolved in the water decreases in its concentration, and decreases below the equilibrium, fishes mortality rate will increase.

(Fondriest Environmental, 2019).

3. What would your experimental approach be to test this hypothesis?

The experiments that I would like to conduct would be in two different containers. The first container would contain less number of fishes, and the other container would container a higher number of wishes, and as the time is passed, the water quality will be continuously increased by 2 ppm within equal time intervals. Then, I would prefer to increase the population fish in the first container, and in the second, I would like to decrease the quantity in the fish population to notice the effects on the quality of water in both situations.

4. What would be the independent and dependent variables?

The dependent variable is the oxygen which is dissolved in the water or the quality of water. However, independent variable is the population of the fishes.

5. What would be your control?

The control measures should be taken with care and great concern. As my control for the experiment would be the same water source throughout the whole experimental approach that I designed, same rate of the addition of the dissolved oxygen, same temperature of the environment throughout and fishes that possibly have the same size and weight.

6. What type of graph would be appropriate for this data set? Why?

A line graph would be better as it will clearly and easily show the change that occurred while being in the transition.

7. Graph the data from the table 4: Water Quality vs. Fish Population (found at the beginning of this exercise).

8. Interpret the data from the graph made in Question 7.

This graph is showing that when the dissolved oxygen is ranging from 0-4 ppm, the rate of the dissolved oxygen is higher because of the lesser number of fishes. However, during 6-12, the water show a decline in its quality, as there is an increase in the number of the fishes than the dissolved oxygen rate in the water. In 12-14, since, the quantity of the fishes decreased from 15 to 10, the making the water quality higher. During 14-18, the water quality will be high, since the rate of dissolved oxygen is higher than the number of fishes.

**Part 2: Clinical Calculations** (50 points)

**Instructions**: Use your knowledge of chemistry, textbook, and lab manual to answer the following questions. Show your work for calculations. Answers should include units and use appropriate significant figures.

NOTE: In order to prevent medication errors in the clinical setting, a placeholder zero is always used before a decimal (0.5 mg NOT .5 mg) but not after a decimal (5 mg NOT 5.0 mg).

**Case 1**. You are performing an assessment of a 26-year-old male patient. You measure his height to be 5’11” and his weight to be 186 pounds. What is the patient’s Body Mass Index (BMI)?

1. What is the patient’s height in centimeters?

Since, the formula for 1 inch is equal to 2.54 cm, height of the patient in centimeters will be

5’11” \* 2.54 = 13 cm Approximately (12.979 cm)

2. What is the patient’s weight in kilograms?

The formula for 1 pound into kilogram is

1 pound = 0.45kg

Therefore, the patient’s total weight will be

186 \* 0.45 kg = 84.362kg

3. What is the patient’s BMI? (BMI = kg / m2)

We have height in centimeter, for the conversion into m2 , we will divide height in cm by 10000

Height in m2 = 13 / 10000 = 0.0013

The patients BMI would be 25.9

**Case 2**. According to Saladin (7th ed.), the oral body temperature may rise as high as 40 oC during hard exercise (p. 1019).

1. What is this temperature in oF?

The formula for the oC to oF?, would be (0**°C** × 9/5) + 32 = 32**°F.** By putting the values in the formula, which is 40 oC, the answer is 104 °F/

2. What is the typical oral body temperature range in oF?

The oral body temperature is 98.6 oC.

3. Convert this range into oC.

The formula for the oC to oF is 32**°F** − 32) × 5/9 = 0**°C.** After putting the values and the calculations, we would get 37 oC.

**Case 3**. In the United States, blood glucose concentration is expressed in mg/dL. However, the international standard is to report blood glucose in mmol/L. You are checking your patient’s blood glucose level and your finger-stick glucose meter (glucometer) is stuck on the mmol/L setting. It displays a value of 3.4 mmol/L. Is this value within the typical range for blood glucose?

1. Convert 3.4 mmol/L to mol/L.

For the conversion of the mmol/L to mol/L, the formula used is

Total amount of the given substance divided by the volume value by 1000

3.4 mmol/L to mol/L = 3.4/1000 = 0.0034 mol/L

2. What is the molecular weight of glucose? Complete the following table. Round atomic mass to the nearest whole number.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Element** | **Symbol** | **Atomic Mass**  **(amu)** | **X** | **# of Atoms**  **in a Glucose**  **Molecule** | **=** | **Total Mass**  **(amu)** |
| Carbon | C | 12 | X | 6 | = | 72 |
| Hydrogen | H | 1 | X | 12 | = | 12 |
| Oxygen | p | 16 | X | 6 | = | 96 |
| **Total** | | | | | | **180** |

3. What is the mass of one mole of glucose?

The mass of one mole of glucose is 180 amu.

4. How many milligrams are in one gram?

There are a thousand milligrams in one grams.

5. How many deciliters are in one liter?

There are 10 deciliters in one liter.

6. What is the patient’s blood glucose concentration in mg/dL?

For the conversion of 3.4 mmol/L to mg/dL, we will multiply it by 18.

3.4 \* 18 = 61.2 mg/dL

7. What is the typical range for glucose in the blood (in mg/dL)?

The normal range of glucose in the blood ranges from 70 to 130 mg/dL.

8. Is the patient’s blood glucose reading within the typical range?

As mentioned, the normal range of glucose in the blood ranges from 70 to 130 mg/dL. However, the patient’s glucose level is 61 as per the calculation. So, it is below than the average.

**Case 4**. In an emergency, an adult with low blood sugar (hypoglycemia) can be treated with an injectable solution of 50% dextrose (w/v) in water. A preloaded syringe contains 50 mL of the dextrose solution.

1. What does (w/v) mean?

It means the amount of solute in a solution in grams and the volume of that solution in mL. For Example, the 5% w/v KCl solution implies the dissolving of 5g of KCl in a 100mL of solution.

2. How many grams of dextrose are in the syringe?

There is 25g of dextrose in the syringe.

3. What is the concentration of the dextrose solution, expressed in mg/mL?

The concentration of the solution would be same as the g/L.

4. If 40 mL of the dextrose solution are administered to the patient, how many grams of dextrose did they receive?

The patient will receive 20 grams of the dextrose solution.

**Case 5**. A flexible 1 L “bag” of intravenous saline solution is more accurately described as 0.9% sodium chloride (w/v) in water.

1. How many grams of sodium chloride are in the 1 L bag?

There is 0.09 gram of sodium chloride in 1L bag.

1. What is the molarity of the sodium chloride solution, expressed in mmol/L?

The molarity of the sodium chloride solution expressed in mmol/L will be 0.154M.

3. What is the osmolarity of the sodium chloride solution, expressed in mOsm/L?

Since, the in water the NaCl dissociates into two ions. Hence, the osmolarity will be

0.9 \* 2 = 1.8 mOsm/L

4. According to Saladin (7th ed.), the osmolarity of blood ranges from 280 to 296 mOsm/L (p. 675). Based on your calculations, does the sodium chloride solution have an osmolarity similar to blood?

No, our osmolarity is 1.8 in mOsm/L which is far more different.

5. How many milliequivalents (mEq) of Na+ are contained in the 1 L of sodium chloride solution? How many mEq of Cl-?

The mEq of Na+ will be 23mg and that of the Cl- will be 35.5 mg

**Part 3: Anatomy of the Head** (10 points)

1. List the bones of the skull that make up the orbit.

Following are the seven bones that make up the orbit

Frontal Bone

Lacrimal Bone

Ethmoid Bone

Zygomatic Bone

Maxillary Bone

Palatine Bone

Sphenoid Bone

1. List the posterior openings into the orbit.

Optic canal

Sphenoid strut