**Page 10 of your workbook – fixed up.**

Summary Table (including all titration results)

|  |  |
| --- | --- |
| **Sample** | **Copper concentration (g/L)** |
| *Primary Leach solution*  | *1.98 g/L* |
| *Secondary Leach solution* | *0.02 g/L* |
| *Acid solution (before stripping)* | *0.0 g/L* |
| *Acid solution (after stripping)* | *3.6 g/L* |

**Analysis of results:**

10. How many grams of copper were extracted from the original 100mL of leaching solution?

 *PLS SLS*

 *1.98 x 0.1 - 0.02 x 0.1 = 0.196 g*

 *This is how many grams of Cu were in 100mL*

11. Use your result from Q2(means Q 10) To calculate what percentage of copper has been extracted.

 *We used 100mL and found 0.196 g of Cu.*

 *So in 1L there would have been 10 x 0.196 g Cu = 1.96 g/L Cu*

 *The original conc of PLS was found to be 1.98 g/L of Cu*

 *So….* $\% copper =\frac{1.96 }{1.98}×100\%$ ***= 99 %*** *- That’s amazing dudes!*

12. How many grams of copper were ‘stripped (transferred into the acid solution from the organic reagent?

 *Acid Solution*

 *3.6 g/L x 50 mL – 0 g/L x 50 mL*

 *= 3.6 x 0.05*

 *= 0.18 g*

13. What is the total percentage of copper recovered thru the solvent extraction process?

 $\frac{0.18}{0.198}×100\%=91\%$

14. Why is solvent extraction used after copper leaching?

* *To separate Cu away from other impurities in leach solution. ONLY the Cu is attracted and ‘caught’ in the solvent.*
* *To increase Cu concentration suitable for electrowinning.*

*Sample Data to analyse:*

1. **Copper concentration**
2. 10mL copper primary leach solution is titrated against sodium thiosulfate. Potassium iodide is added to act as an indicator. The titration results are below:

|  |  |  |  |
| --- | --- | --- | --- |
| **Titration** | **Burette reading** | **Volume** | **Copper Concentration** |
|  | **Initial** | **Final** | **mL** | **g/L** | **M** |
| 1 | 1.2 | 10.4 |  |  |  |
| 2 | 10.4 | 18.9 |  |  |  |
| 3 | 18.9 | 27.6 |  |  |  |

Calculate the copper concentration of the primary leach solution.

1. The primary leach solution was also analysed using spectroscopy. The table below gives the absorbance readings for 6 copper standard solutions. Use this information to verify the concentration of copper calculated in the titration given that the primary leach solution absorbance reading was 0.225

|  |  |
| --- | --- |
| **Copper standard (g/L Cu)** | **Absorbance reading** **(at 700nm)** |
| 0 | 0 |
| 1 | 0.115 |
| 2 | 0.240 |
| 3 | 0.354 |
| 4 | 0.473 |
| 5 | 0.596 |

1. **Electrowinning**

Solution exchange electrowinning is used at Mt isa. The concentrated copper solution is passed into the electrowinning tanks which contain alternating rows of lead anodes and stainless steel cathodes. Data for small scale electrowinning process is given below.

Mass of stainless steel cathode = 194.29 g

Mass of stainless steel cathode after electrowinning = 196.95 g

|  |  |  |
| --- | --- | --- |
| **Time** | **Current** | **voltage** |
| **Actual** | **Calculated (hours)** | **Amps** | **Volts** |
| 9:14 a.m. |  | 1.9 | 2.1 |
| 9:44 a.m. |  | 1.8 | 2.0 |
| 10:14 a.m. |  | 2.0 | 2.3 |
| 10:44 a.m. |  | 1.9 | 2.1 |
| 11:01 a.m. |  |  |  |

Compare the theoretical and actual copper deposited.