**Note: Take care of the significant figures in the final result(s).**

**Q1:** A student calibrated 5.0 mL pippet and got the following data at 17.0 °C:

| | |
|---|---|
| Initial burette reading, mL | 1.1 ± 0.04 |
| ~~Initial~~ burette reading, mL | 5.2 ± 0.04 |
| Apparent volume, mL | 4.1 ± 0.05 |
| Weight of water, g | 9.9907 |
| Volume of 1g of water @ 17 °C, mL | 1.0023 |
| Actual volume, mL | 10.0136 |
| Correction, mL | 5.9 mL |

Final → (5.2 − 1.1) = 4.1

$\sqrt{(0.04)^2 + (0.04)^2} = \pm 0.05$

5

Calculate the actual volume and the correction of water in mL (show your work)? (6 marks)

actual

1 g → 1.0023

9.9907 (×) → ?

⇒ 10.0136 mL ✓

correction

(actual − apparent)

10.0136 − 4.1 = 5.9 mL ✓

**Q2:** Answer the followings

(4 marks) 4

a) Oil and acetic acid solution ( homogenous or heterogeneous ) ✓

b) NaOH solution ( homogenous or heterogeneous ) ✓

c) Blank is ----- ✗

**Note: Take care of the significant figures in the final result(s).**

**Q1:** A student carries out the titration of 10 mL acetic acid with sodium hydroxide (0.3 M) and he got the following volume of sodium hydroxide: 9.1, 9.4, 9.3, 9.0, 9.8 mL, if the standard deviation is 0.3 and the true volume is 9.2 mL, Answer the following questions:

1- How precise (RSD) and accurate (relative error) the student results? (6 marks) $\bar{X} = 9.32$

$$RSD = \frac{S}{\bar{X}} * 100\%$$

$$= \frac{0.3}{9.32} * 100\%$$

$$= 3.2\%$$

precise

$$r = \frac{\bar{X} - X_t}{X_t} = 0.013 \Rightarrow 1.3\%$$

accurate

(5

2- Should the value 9.8 mL be rejected or retained? Knowing that the $Q_{crit}$ at 90% confidence level is 0.64? (2 marks) 9.0, 9.1, 9.3, 9.4, 9.8 ⇒

$$\left|\frac{9.8 - 9.4}{9.8 - 9.0}\right| = 0.5$$

(1

$\Rightarrow 0.64 > 0.5 \Rightarrow$ rejected

**Q2:** In the gravimetric determination of sulfate, write the chemical reaction equation and why the precipitate digest for half an hour? (2 marks) $SO_4^{-2} + Ba^{+2} \rightarrow BaSO_4$

2?

(1

Note: Take care of the significant figures in the final result(s).

Q1: In a neutralization titration, 10 mL of $Na_2CO_3$ solution were used to standardize HCl solution with bromocresol green indicator were 9.8 mL volume of HCl required. In another titration 10 mL of standardized NaOH solution of 0.09 M required 9.00 mL of HCl Solution. What was the concentration of the $Na_2CO_3$ solution? (write the balance chemical equation for this reaction) (6 marks)

10 mL $Na_2CO_3$
9.8 mL HCl

10 mL, 0.09 NaOH

9.00 HCl

$M_{(NaOH)} V_{(NaOH)} = M_{(HCl)} V_{(HCl)} \Rightarrow (0.09)(10) = M_{(HCl)}(9.00)$

(2

$M_{(HCl)} = 0.1\ M\ (HCl)$

$\frac{1}{2} M_{(Na_2CO_3)} V_{(Na_2CO_3)} = M_{(HCl)} V_{(HCl)} \Rightarrow (\frac{1}{2})(M)(10) = (0.1)(9.8)$

$M_{(Na_2CO_3)} = 0.196\ M\ (Na_2CO_3)$

Q2: TRUE/False, write "T" if the statement is true and "F" if the statement is false: (3 marks)

(3

✓T A. Argentimetry mean silver nitrate is the titrant

✓F B. Mohr's method used weak organic acid adsorption indicator

✓T C. Volhard's method is used back titration to determine the analyte