Answers to practice exam questions for Chapter 2 Volumetric analysis

Question 1
Redox titrations

$$n(H_2C_2O_4) = \frac{0.01412\ g}{126\ g\ mol^{-1}}$$
$$= 3.269 \times 10^{-4}\ mol$$
$$\frac{n(MnO_4^-)}{n(H_2C_2O_4)} = \frac{2}{5}$$
$$n(MnO_4^-) = \frac{2}{5} \times 3.269 \times 10^{-4}\ mol$$
$$= 1.31 \times 10^{-4}\ mol$$
$$c(MnO_4^-) = \frac{n}{V}$$
$$= \frac{1.31 \times 10^{-4}\ mol}{0.02436\ L}$$
$$= 5.37 \times 10^{-3}\ mol\ L^{-1}$$

A = correct amount of $H_2C_2O_4$, M = correct mole ratio and amount of MnO_4^-, E = correct concentration of MnO_4^- to 3 sig fig

Question 2
Hypochlorite solution

a blue-black to colourless **A**

b

$$n(S_2O_3^{2-}) = cV$$
$$= 0.100\ mol\ L^{-1} \times 0.009\ 25\ L$$
$$= 9.25 \times 10^{-4}\ mol$$
$$n(OCl^-) = \tfrac{1}{2}n(S_2O_3^{2-})$$
$$= \tfrac{1}{2} \times 9.25 \times 10^{-4}\ mol$$
$$= 4.625 \times 10^{-4}\ mol$$
$$c(OCl^-) = \frac{n}{V}$$
$$= \frac{4.625 \times 10^{-4}\ mol}{0.0200\ L}$$
$$= 0.0231\ mol\ L^{-1}$$
$$c(OCl^-)_{original} = 10 \times 0.0231\ mol\ L^{-1}$$
$$= 0.231\ mol\ L^{-1}$$

A = correct amount of $S_2O_3^{2-}$, M = correct mole ratio and concentration of OCl^-, E = correct concentration of OCl^- in original to 3 sig fig

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c 2% = 2 g in 100 mL
= 20 g L^{-1}

$$20 \text{ g NaOCl} = \frac{20.0 \text{ g}}{74.5 \text{ g mol}^{-1}}$$

$$= 0.268 \text{ mol}$$

$$c(\text{NaOCl}) = 0.268 \text{ mol L}^{-1}$$

A = correct conversion of % to g L^{-1}, M = correct concentration of NaOCl

d Correct: concentration of sodium thiosulfate not diluted
Incorrect: adds extra OCl^- to volume from pipette
Incorrect: the resulting solution has a volume of more than 250 mL
A = 2 correct, M = all 3 correct