NAME_____

Year 12 Chemistry Test

Analytical Techniques 2

1.

(a) $n = CV = 0.0368 \times 0.100 = 0.00368 \text{ mol}$

(b) $n = \dfrac{m}{M} = \dfrac{1.02}{158.11} = 0.00645 \text{ mol}$

$C = \dfrac{n}{V} = \dfrac{0.00645}{0.250} = 0.0258 \text{ mol L}^{-1}$

(c)

(i) Dark blue to colourless.

(ii) $n = CV = 0.0258 \times 0.02405 = 6.21 \times 10^{-4} \text{ mol}$

(iii) $\dfrac{n_{I_2}}{n_{Na_2S_2O_3}} = \dfrac{1}{2}$

$\therefore n_{I_2} = \frac{1}{2} \times n_{Na_2S_2O_3} = \frac{1}{2} \times 6.21 \times 10^{-4} = 3.10 \times 10^{-4} \text{ mol}$

(iv) There are seven and a half 20.0 mL samples in 150 mL $(\frac{150}{20})$

$\therefore 3.10 \times 10^{-4} \times 7.5 = 0.00233 \text{ mol}$

(d) $0.00368 - 0.00233 = 0.00135 \text{ mol}$

(e) $\dfrac{n_{Fe^{2+}}}{n_{I_2}} = \dfrac{2}{1}$

$\therefore n_{Fe^{2+}} = \frac{2}{1} \times n_{I_2} = 2 \times 0.00135 = 0.00271 \text{ mol}$

(f) $C = \dfrac{n}{v} = \dfrac{0.00271}{0.0500} = 0.0541 \text{ mol L}^{-1}$

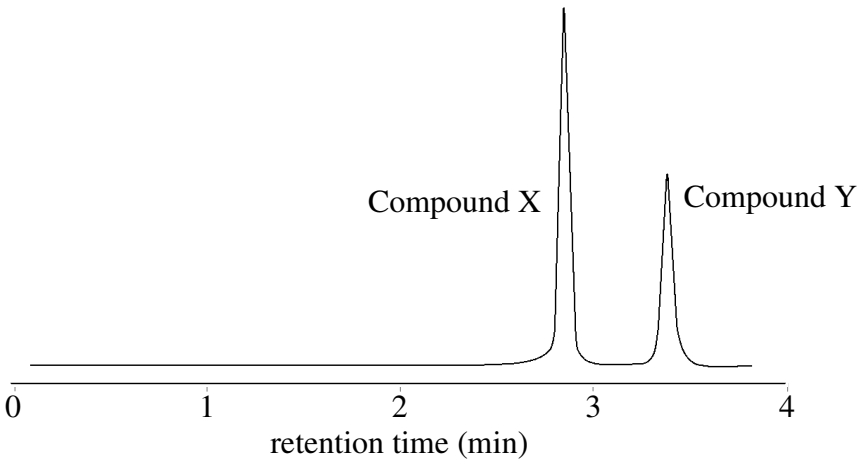
(g) $M_{Fe} = 55.85 \text{ g mol}^{-1}$

$0.0541 \times 55.85 = 3.02 \text{ g L}^{-1}$

$3.02 \div 10 = 0.302 \text{ g}(100\text{mL})^{-1} = 0.302 \text{ \%w/v}$

(h) All answers above should be to 3 s.f.

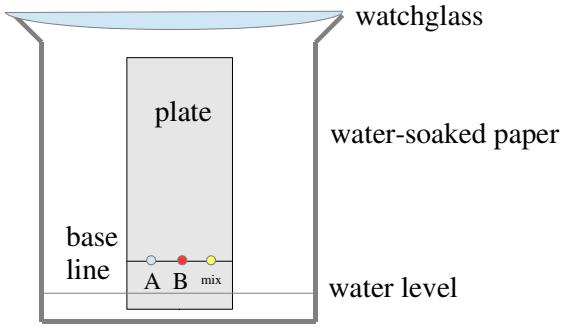
2.



(a) Compound X is present in greater concentration as it has more area under its peak.

(b) Compound Y is more polar.

3. *(this is just one way of doing it, there are other valid approaches)*



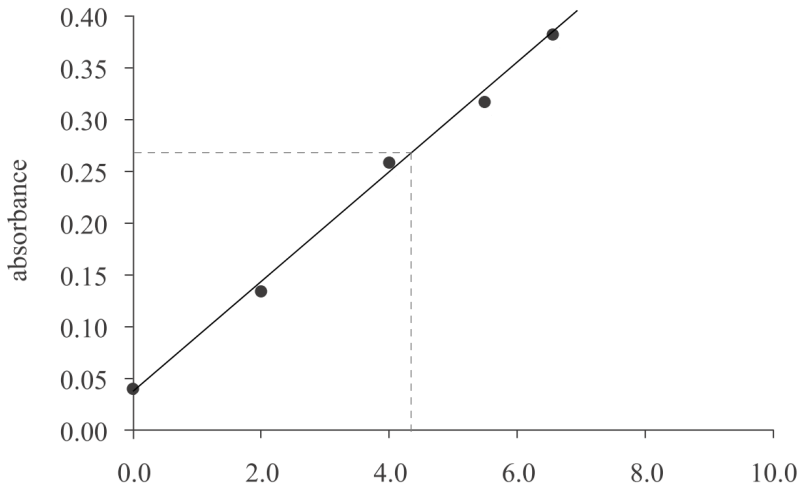
1. In separate test tubes, add a small amount of water to each of sample A, sample B, and the mixture, and stir to dissolve the powder.
2. Add water to a 250 mL beaker to a depth of approximately half a centimeter
3. Cut a rectangle of TLC plate to fit in the beaker, as shown above
4. Use a pencil to gently rule a base line, making sure it will rest above the water level
5. For each of sample A, sample B, and the mixture, use a toothpick to place a small amount of solution on the baseline, as shown above
6. Place the plate into the water and put a watchglass on top
7. Wait for the water to rise near the top of the plate, then remove and use a pencil to mark the solvent front
8. Compare the spots formed by the upward movement of A, B, and the mixture – if there is a spot in 'mix' at the same height (R_f value) as A and/or B, then it is likely to be present in the mixture.

4. The amount of sodium present in water can be determined by quantitative AAS by producing a calibration graph such as the one below from standard solutions of sodium ions.

(a) The combination of energy levels in an atom and therefore wavelengths of light it absorbs is unique to that element. The wavelength selected for analysis is absorbed only by sodium and not by calcium, therefore the absorbance reading will not be affected.

(b) Light from the environment entering the apparatus / Inaccurate standard solutions / Possibly others

(c)



~4.3 mg L^{-1}

(d) 4.3 mg L^{-1} = 4.3 ppm $\therefore 4.3 \times 1000 = 4300$ ppb