

1a)

$$\begin{array}{r} 1.2567 \\ 2.346 \\ -3.9876 \\ + \underline{8.34} \\ 7.9551 \\ \quad \uparrow \\ \boxed{7.96} \end{array}$$

1b)

$$\begin{array}{r} 25.346 \\ - 3.561 \\ \hline \end{array} \cdot \begin{array}{r} 2.3567 \\ \hline \end{array} = 16.77419\dots$$

(5) (5) (4)

$\boxed{16.77}$

1c)

$$\begin{array}{r} 44.84 \\ 45.7 \\ \hline 90.54 \end{array}$$

(3) (2)

$$90.59 \cdot 4.56 = 413.0904$$

(3) (3)

$\boxed{413}$

1d)

$$\begin{array}{r} (3) \quad (4) \\ 2.59 \cdot 4.356 \\ + 4.123 \\ \hline 11.28204 \end{array} + \begin{array}{r} (4) \quad (3) \\ 7.865 \cdot 3.24 \\ + 6.776 \\ \hline 25.4826 \end{array}$$

(3) (4)

$$\begin{array}{r} 11.28204 \\ + 25.4826 \\ \hline 36.76464 \\ \quad \uparrow \\ \boxed{36.8} \end{array}$$

1e)

$$\begin{array}{r} 1.234 \cdot 10^{-3} + 3.45 \cdot 10^{-2} \\ 34.5 \cdot 10^{-3} \\ + 1.234 \cdot 10^{-3} \\ \hline 35.734 \cdot 10^{-3} \\ \quad \uparrow \\ 35.7 \cdot 10^{-3} \\ \boxed{3.57 \cdot 10^{-2}} \end{array}$$

2a) pure substance

2b) heterogeneous mixture (oil and water do not mix well)

2c) homogeneous mixture (cooking oil is a mix of different hydrocarbons)

3a) chemical, usually a precipitation reaction

3b) physical, we can separate with physical methods

3c) chemical, make gas releases heat

3d) physical, simple separation based on boiling point.

4) Compound B has a higher boiling point. In distillation the substance with the lower boiling point vaporizes first and is then recondensed and collected. We can see substance A as a gas in the flask being heated and as a liquid in the collection flask at the end of the condenser. This shows that substance A has the lower boiling point and that substance B has a higher boiling point.

5) A) $25.47_{\text{cm}} \cdot 25.39_{\text{cm}} = 646.6833$
 646.7 cm^2

B)
$$\begin{array}{r} 26.70 \\ 25.67 \\ \hline 1.03 \\ \uparrow \end{array} \quad 1.03 \text{ mL}$$

C) $1.03 \text{ mL} = 1.03 \text{ cm}^3$

$$\frac{1.03 \text{ cm}^3}{646.6833 \text{ cm}^2} = 0.0015927 \text{ cm}$$

 0.00159 cm
 $1.59 \cdot 10^{-3} \text{ cm}$

6) To calculate the density the student needs to know the mass of the aluminum. To find the density the student needs to take the mass and divide it by the volume.

$$D = \frac{m}{V}$$

7) Aye 4 shows 3 distinct components as 3 spots on the chromatogram.

The dye that moves the most will have the greatest attraction to the solvent. In this example dye 3 has moved the most so has the greatest affinity for the solvent.

The dye that moves the least has the lowest attraction for the solvent. In this case that is dye 1.