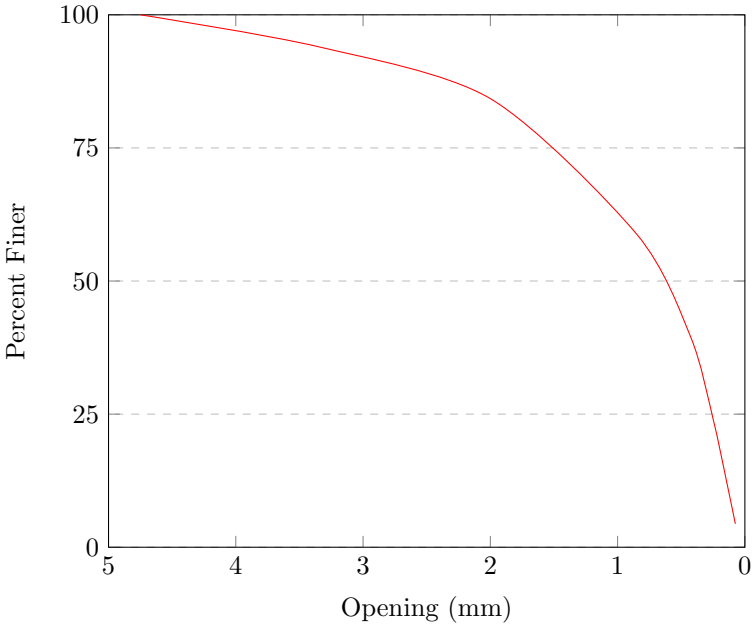
Question 2.4

The following table can be obtained to determine the percent finer than each sieve.

US sieve	Opening (mm)	Retained Mass (g)	Cumulative Mass (g)	Percent Finer
4	4.75	0	0	100.00%
6	3.35	30	30	94.00%
10	2	48.7	78.7	84.26%
20	0.85	127.3	206	58.80%
40	0.425	96.8	302.8	39.44%
60	0.25	76.6	379.4	24.12%
100	0.15	55.2	434.6	13.08%
200	0.075	43.4	478	4.40%
Pan	-	22	500	0.00%

Below is the grain-size distribution curve.



D_{10}, D_{30}, and D_{60} can be calculated using linear interpolation (done in Excel).

$$D_{10} = \boxed{0.12 \text{ mm}}$$

$$D_{30} = \boxed{0.32 \text{ mm}}$$

$$D_{60} = \boxed{0.9 \text{ mm}}$$

The uniformity coefficient is calculated as follows.

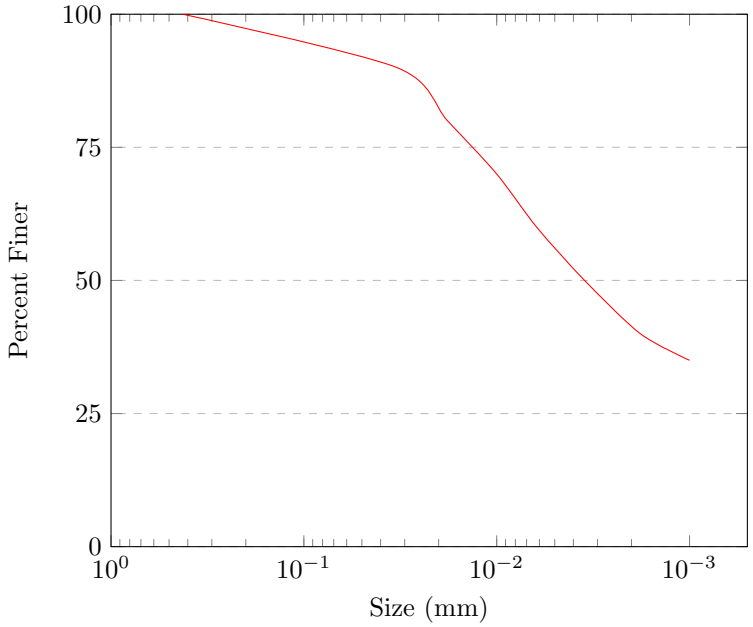
$$C_u = \frac{D_{60}}{D_{10}} = \frac{0.9 \text{ mm}}{0.12 \text{ mm}} = \boxed{7.33}$$

The coefficient of gradation is calculated as follows.

$$C_c = \frac{D_{30}^2}{D_{60} \times D_{10}} = \frac{(0.32 \text{ mm})^2}{(0.9 \text{ mm}) \times (0.12 \text{ mm})} = \boxed{0.9}$$

Question 2.8

Below is the grain-size distribution curve plotted on a logarithmic scale.



First, the values according to USDA system are used, these values were calculated using linear interpolation (done in Excel).

Passing 2 mm: 100% Passing 0.05 mm: 90.4% Passing 0.002 mm: 41.2%

The percentages of gravel, sand, slit, and clay are calculated as follows:

$$\%_{\text{Gravel}} = 100\% - 100\% = \boxed{0\%}$$

$$\%_{\text{Sand}} = 100\% - 90.4\% = \boxed{9.6\%}$$

$$\%_{\text{Slit}} = 90.4\% - 41.2\% = \boxed{49.3\%}$$

$$\%_{\text{Clay}} = \boxed{41.2\%}$$

Next, the values according to AASHTO system are used, these values were calculated using linear interpolation (done in Excel).

Passing 2 mm: 100% Passing 0.075 mm: 91.1% Passing 0.002 mm: 41.2%

The percentages of gravel, sand, slit, and clay are calculated as follows:

$$\%_{\text{Gravel}} = 100\% - 100\% = \boxed{0\%}$$

$$\%_{\text{Sand}} = 100\% - 91.1\% = \boxed{8.9\%}$$

$$\%_{\text{Slit}} = 91.1\% - 41.2\% = \boxed{49.9\%}$$

$$\%_{\text{Clay}} = \boxed{41.2\%}$$

Question 2.10

The K was determined to be 0.1321 from Table 2.9 for the given specific gravity of 2.6 and the given temperature of 24°C. Equation 2.9 is used to determine L.

$$L = 16.29 - 0.164 \times R = 16.29 - 0.164 \times 43 = 9.238 \text{ cm}$$

D is determined using the following equation, using the determined L and K values along with a t value of 60 minutes.

$$D = K\sqrt{\frac{L}{t}} = 0.1321\sqrt{\frac{9.238 \text{ cm}}{60 \text{ min}}} = \boxed{0.052 \text{ mm}}$$