Question 1:

$$C1 \times V1 = C2 \times V2$$

$$2000 \times V1 = 1 \times 100$$

$$V1 = \frac{1 \times 100}{2000} = 0.05\ mL = 50\ \mu L$$

Question 2:

$$HEPES: V1 = \frac{20 \times 1000}{1000} = 20\ mL$$

$$NaCl: V1 = \frac{150 \times 1000}{5000} = 30\ mL$$

$$MQW: 1000 - (20 + 30) = 950\ mL$$

Question 3:

$$HEPES: V1 = \frac{20 \times 200}{1000} = 4\ mL$$

$$NaCl: V1 = \frac{500 \times 200}{5000} = 20\ mL$$

$$Imidazole: V1 = \frac{20 \times 200}{2000} = 2\ mL$$

$$MQW: 200 - (4 + 20 + 2) = 174\ mL$$

Question 4:

$$mass = mol \times Mw$$

$$mol = C \times V = 50\ mmol/L \times 0.005\ L = 0.25\ mmol$$

$$mass = 0.00025\ mol \times 307.32\ g/mol = 0.07683\ g = 76.83\ mg$$

Question 5:

$$TWEEN20: C2 = \frac{10 \times 200}{40000} = 0.05\%$$

$$MgCl_2: C2 = \frac{0.5 \times 40}{40000} = 5 \times 10^{-4} M = 0.5\ mM$$

Question 6:

$$\frac{1}{0.5} = 2\ mL$$

Question 7:

$$14000 = RPM^2 \times 8.2 \times 1.118 \times 10^{-5}$$

$$RPM = \sqrt{\frac{14000}{8.2 \times 1.118 \times 10^{-5}}} = 12358\ RPM$$

Question 8:

$$mol = \frac{mass}{Mw}$$

$$Density\ of\ water = 1\ g/mL$$

$$In\ 1\ Litre:$$

$$M = \frac{1000}{18.02} = 55.5\ M$$

Question 9:

$$In\ 1\ Litre:$$

$$mass = 1.11 \times 1000 = 1110g$$

$$M = \frac{1110g}{78.13g/mol} = 14.2\ M$$

Question 10:

$$A = \varepsilon \times C \times L$$

$$C = \frac{A}{\varepsilon \times L} = \frac{1.6}{1.2} = 1.33\ mg/mL$$

$$C(\mu M) = \frac{1.33}{26} = 51.3\ \mu M$$

Question 11:

$$36\%\ weight\ by\ volume\ HCL$$

$$Density\ proportion\ HCL = 1179 \times 0.36 = 424.44\ g/L$$

$$M = \frac{424.44}{36.46} = 11.64\ M$$

Question 12:

$$pH = pK_a + \log_{10}\left(\frac{[Tris\ Base]}{[Tris\ Acid]}\right)$$

$$7.5 = 8.08 + \log_{10}\left(\frac{[Tris\ Base]}{[Tris\ Acid]}\right)$$

$$10^{(7.5-8.08)} = \left(\frac{[Tris\ Base]}{[Tris\ Acid]}\right)$$

$$0.263 = \left(\frac{[Tris\ Base]}{[Tris\ Acid]}\right)$$

$$[Tris\ Base] = 0.236 \times [Tris\ Acid]$$

$$\boldsymbol{For\ 1\ M}$$

$$[Tris\ Base] + [Tris\ Acid] = 1\ mol/L$$

$$0.236 \times [Tris\ Acid] + [Tris\ Acid] = 1\ mol/L$$

$$1.236 \times [Tris\ Acid] = 1\ mol/L$$

$$[Tris\ Acid] = \frac{1}{1.236} = 0.7918\ mol/L$$

$$\boldsymbol{For\ 1\ L}$$

$$Tris\ Acid: 1\ L \times 0.7918\frac{mol}{L} * 157.6\frac{g}{mol} = 124.075\ g$$

$$Tris\ Base: 1\ L \times (1 - 0.7918)\frac{mol}{L} * 121.14\frac{g}{mol} = 25.221\ g$$