1. A container with cross-sectional area 0.02 m$^2$ is filled with 10 L equal parts saltwater (SG = 1.035) and fresh water. Assume properties of mixing are negligible. What will be its gauge pressure at the bottom? (Atmospheric pressure is 1.013*10$^5$ Pa)
   a) 5072 Pa    b) 68920 Pa    c) 10208 Pa    d) 12930 Pa    e) 15120 Pa

2. A flask has a base of radius 12 cm and narrows to a neck of radius 6 cm. It’s filled to the base of the neck with water. If 5.5x10$^{-4}$ m$^3$ of additional water is poured into the flask, by how much does the force of the water on the base increase?
   a) 21.6 N    b) 17.6 N    c) 15.5 N    d) 13.7 N    e) 9.80 N

3. A U tube closed at one end holds mercury, for which the level on the open-end side is 31 cm higher than it is on the closed-end side. What is the absolute pressure in the air that is trapped in the closed end of the tube? The density of mercury is 13.6 grams/cm$^3$.
   a) 143 kPa    b) 156 kPa    c) 169 kPa    d) 183 kPa    e) 0

4. A +15 nC point charge is placed on the x axis at x = 1.5 m, and a -20 nC charge is placed on the y axis at y = -2.0 m. What is the magnitude of the electric field at the origin?
   a) 33.6 N/C    b) 64.8 N/C    c) 54.4 N/C    d) 91.6 N/C    e) 74.9 N/C

5. A proton is fired at 5500 m/s directly toward an infinite plane of surface charge density 1.8 nC/m$^2$. Assuming it doesn’t hit the plane, how far does it travel before turning around?
   a) 1.04 mm    b) 1.55 mm    c) 2.17 mm    d) 2.48 mm    e) 2.89

6. A solid, nonconducting shell (inner radius 5 cm and outer radius 10 cm) has a total charge of 5 µC. What is the electric field at a point 8 cm from the center of the sphere?
a) $4.0 \times 10^3$ kN/C  
 b) $3.1 \times 10^3$ kN/C  
 c) $2.2 \times 10^3$ kN/C  
 d) $1.8 \times 10^3$ kN/C  
 e) $1.1 \times 10^3$ kN/C

7. Two infinitely long wires carry charges $8 \text{nC/m}$ and $-6 \text{nC/m}$ as shown in the figure. Where on the x-axis is the electric field zero?

a) 14.4 cm  
 b) 18.0 cm  
 c) 24.0 cm  
 d) 21.3 cm  
 e) 36.0 cm

8. A $-3 \mu \text{C}$ charge is held stationary while a $-19 \mu \text{C}$ charge (weighing 1 g) is placed 2 m away and released. As it reaches a maximum speed, it encounters an opposing electric field. What field strength is necessary to stop the particle over a distance of 3 m?

a) 1540 V/m  
 b) 1960 V/m  
 c) 2120 V/m  
 d) 4495 V/m  
 e) 5990 V/m

9. Points A (3 m, 6 m) and B (6 m, -3 m) are in a region where the electric field is uniform and given by $E = 12 \text{ N/C}$ in the positive x direction. What is the electric potential difference $V_A - V_B$?

a) 24.0 V  
 b) 48.0 V  
 c) 60.0 V  
 d) 72.0 V  
 e) 36.0 V

10. An infinite plane has a surface charge density of $80 \text{nC/m}^2$. What distance towards the plane must be traveled to experience a voltage decrease of 98 V?

a) -2.16 cm  
 b) -1.04 cm  
 c) 0.00 cm  
 d) 1.04 cm  
 e) 2.16 cm