## Chapter 9 Answers to Problems

**1.** 49 atm **2.** 140 N **3.** 22 **kPa** **4.** (a) $1.0\times10^5$ N (b) $2.2\times10^4$ lb (c) The pressure of the air under the desktop pushes upward counteracting the downward force. **5.** The baby applies 2.0 times as much pressure as the adult. **6.** (a) 420 N (b) No force is needed. **7.** 4.0 kN southward **8.** 88.0 kPa **9.** 1.0 m **10.** (a) 625 N (b) 6.25 mm (c) 16.0 **11.** (a) 30 N (b) 5.8 N·m **12.** 31 m **13.** 2.0 atm **14.** 1.0 m **15.** 0.126 **16.** 2.9 N **17.** 1.0 MN **18.** 10 km **19.** (a) 343 kPa (b) 410 Pa **20.** (a) 21 kPa (b) 3.1 lb/in$^2$ (c) 0.21 atm (d) 160 torr **21.** (a) $2.2\times10^5$ Pa (b) 1700 torr (c) 2.2 atm **22.** 15 cm **23.** 114.0 cm Hg **24.** 390 Pa **25.** (a) 5.6 cm (b) 0.37 cm **26.** 211 mm Hg **27.** 250 kg/m$^3$ **28.** 1.5 m **29.** (a) 91.7% (b) 0.917 **30.** (a) 140 kg/m$^3$ (b) 18% **31.** (a) 8.8 N upward (b) 9.6 N upward **32.** 0.74 g/cm$^3$ **33.** 100% **34.** (a) 0.910 (b) 1.28 cm (c) 0.13 cm **35.** 0.78 **36.** 0.17 cm$^3$ **37.** Yes **38.** 1080 kg/m$^3$ **39.** (a) 9.8 m/s$^2$ upward (b) 3.3 m/s$^2$ upward (c) 68.6 m/s$^2$ upward **40.** 0.80$g$ downward **41.** 50 m/s **42.** 28 cm/s **43.** (a) 39.1 cm/s (b) 78.5 cm$^3$/s (c) 78.5 g/s **44.** 3.2 m/s **45.** $1.12\times10^5$ Pa **46.** $5.0\times10^5$ N **47.** $1.9\times10^5$ N **48.** (a) $1.0\times10^5$ N (b) 85 m/s **49.** 310 kPa **50.** 1.82 m/s **51.** 8.6 m **52.** (a) 78 W (b) 392 kPa (c) At the bottom **54.** 1/8 the original flow rate **55.** (a) 6850 Pa (b) 0.685 N **56.** 12 m/s **57.** 0.040 m$^3$/s **58.** $17\times10^5$ Pa **59.** (a) 50 Pa (b) 1100 Pa (c) 13 kPa **60.** (b) $R = 8\eta L/\pi r^4$ **61.** 0.4 Pa·s **62.** 2.4 Pa·s **63.** (a) $1.3\times10^{-10}$ N (b) $2.6\times10^{-14}$ W **64.** 1.5 cm/s **65.** Since $m/v_f$ is constant, the drag force is primarily viscous. **66.** Since $m/v_f^2$ is constant, the drag force is primarily turbulent. **67.** 3.0 mm/s **68.** 2.9 cm/s **69.** 5 Pa **70.** (a) $9\times10^{-6}$ N (b) 5 mg **71.** (a) $\gamma L\Delta s$ (b) $\Delta E = \gamma\Delta A$ **73.** (a) 1.54 N (b) $1.54\times10^4$ N (c) For a given depth, the pressure is the same everywhere, so the very tall, narrow column of water is as effective as having a whole barrel of water filled to the same height and pushing upward on the barrel top. **74.** (a) 0.794 N (b) 0.544 N **75.** (a) 7.43% (b) 1060 kg **76.** The scale reading for the pine doesn't change. 0.538 N **77.** (a) 5.94 m/s (b) As long as we can assume that Bernoulli's equation applies, it doesn't matter what fluid is in the vat. (c) The speed would be reduced by a factor of 0.40. **78.** 12.5 N/m **79.** 230 kg **80.** (a) $1.10\times10^8$ Pa (b) $1.1\times10^8$ N **81.** 23.0 m **82.** 20% **83.** 110 m **84.** (a) 0.600$W$ (b) 0.64$W$ **85.** 1.1 cm **86.** 0.4 mm/s **87.** 27 kPa **88.** 76 Pa **89.** (a) 2.2 m/s up (b) 21 kPa/s **90.** (a) 10.3 m (b) A pump at the bottom of the well does not rely on a pressure difference to bring the water to the surface; it pushes the water up from below. **91.** (a) 1.4 N (b) 0.43 N upward (c) 6.8 m/s$^2$ downward **92.** 8.7 kg **93.** $d$ is not a linear function of $\rho$; $d = m/\pi\rho r^2$ **94.** (a) 10.0 cm (b) 0.814 (c) 0.545 **95.** (a) 26 m/s (b) 2.6 m/s **96.** 270 m/s **97.** 0.83 g/cm$^3$ **98.** (b) 8.0 km (c) lower limit **99.** (a) 5.2 kPa = 0.051 atm (b) 11.8 Pa/m (c) 8.61 km (d) A decreasing air density means that atmosphere extends to a higher altitude. **100.** –110 kPa **101.** (a) 220% (b) 0.68