9.17 Pressure at the tip of anvil is 2.5×10^{11} Pa

9.18 (a) 0.7 m (b) 0.43 m from steel wire

9.19 Approximately 0.01 m

9.20 260 kN

9.21 2.51×10^{-4} m^3

Chapter 10

10.3 (a) decreases (b) η of gases increases, η of liquid decreases with temperature (c) shear strain, rate of shear strain (d) conservation of mass, Bernoulli's equation (e) greater.

10.5 6.2×10^6 Pa

10.6 10.5 m

10.7 Pressure at that depth in the sea is about 3×10^7 Pa. The structure is suitable since it can withstand far greater pressure or stress.

10.8 6.92×10^5 Pa

10.9 0.800

10.10 Mercury will rise in the arm containing spirit; the difference in levels of mercury will be 0.221 cm.

10.11 No, Bernoulli's principle applies to streamline flow only.

10.12 No, unless the atmospheric pressures at the two points where Bernoulli's equation is applied are significantly different.

10.13 9.8×10^2 Pa (The Reynolds number is about 0.3 so the flow is laminar).

10.14 1.5×10^3 N

10.15 Fig (a) is incorrect [Reason: at a constriction (i.e. where the area of cross-section of the tube is smaller), flow speed is larger due to mass conservation. Consequently pressure there is smaller according to Bernoulli's equation. We assume the fluid to be incompressible].

10.16 0.64 m s^{-1}

10.17 2.5×10^{-2} N m^{-1}

10.18 4.5×10^{-2} N for (b) and (c), the same as in (a).

10.19 Excess pressure = 310 Pa, total pressure = 1.0131×10^5 Pa. However, since data are correct to three significant figures, we should write total pressure inside the drop as 1.01×10^5 Pa.

10.20 Excess pressure inside the soap bubble = 20.0 Pa; excess pressure inside the air bubble in soap solution = 10.0 Pa. Outside pressure for air bubble = $1.01 \times 10^5 + 0.4 \times 10^3 \times 9.8 \times 1.2 = 1.06 \times 10^5$ Pa. The excess pressure is so small that up to three significant figures, total pressure inside the air bubble is 1.06×10^5 Pa.

10.21 55 N (Note, the base area does not affect the answer)

10.22 (a) absolute pressure = 96 cm of Hg; gauge pressure = 20 cm of Hg for (a), absolute pressure = 58 cm of Hg, gauge pressure = -18 cm of Hg for (b); (b) mercury would rise in the left limb such that the difference in its levels in the two limbs becomes19 cm.

10.23 Pressure (and therefore force) on the two equal base areas are identical. But force is exerted by water on the sides of the vessels also, which has a nonzero vertical component when the sides of the vessel are not perfectly normal to the base. This net vertical component of force by water on sides of the vessel is greater for the first vessel than the second. Hence the vessels weigh different even when the force on the base is the same in the two cases.

10.24 0.2 m

10.25 (a) The pressure drop is greater (b) More important with increasing flow velocity.

10.26 (a) 0.98 m s^{-1}; (b) $1.24 \times 10^{-5} \text{ m}^3 \text{ s}^{-1}$

10.27 4393 kg

10.28 5.8 cm s^{-1}, 3.9×10^{-10} N

10.29 5.34 mm

10.30 For the first bore, pressure difference (between the concave and convex side) = $2 \times 7.3 \times 10^{-2} / 3 \times 10^{-3}$ = 48.7 Pa. Similarly for the second bore, pressure difference = 97.3 Pa. Consequently, the level difference in the two bores is $[48.7 / (10^3 \times 9.8)]$ m = 5.0 mm.

The level in the narrower bore is higher. (Note, for zero angle of contact, the radius of the meniscus equals radius of the bore. The concave side of the surface in each bore is at 1 atm).

10.31 (b) 8 km. If we consider the variation of g with altitude the height is somewhat more, about 8.2 km.

Chapter 11

11.1 Neon: – 248.58 °C = – 415.44 °F;

CO_2: – 56.60 °C = – 69.88 °F

(use $t_F = \frac{9}{5} t_c + 32$)

11.2 $T_A = (4/7)\ T_B$

11.3 384.8 K

11.4 (a) Triple-point has a *unique* temperature; fusion point and boiling point temperatures depend on pressure; (b) The other fixed point is the absolute zero itself; (c) Triple-point is 0.01°C, not 0 °C; (d) 491.69.