

- Q.1** A 5 m^3 container is filled with 900 kg of granite (density 2400 kg/m^3) and the rest of the volume is air with density 1.15 kg/m^3 . Find the mass of air and the overall (average) specific volume.

- Q.2** A piston/cylinder with cross sectional area of 0.01 m^2 has a piston mass of 100 kg resting on the stops, as shown in Fig. 1. With an outside atmospheric pressure of 100 kPa, what should the water pressure be to lift the piston?

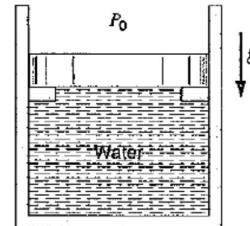


Fig. 1

- Q.3** A 2.5 m tall steel cylinder has a cross sectional area of 1.5 m^2 as shown in Fig. 2. At the bottom with a height of 0.5 m is liquid water on top of which is a 1 m high layer of gasoline. The gasoline surface is exposed to atmospheric air at 101 kPa . What is the highest pressure in the water?

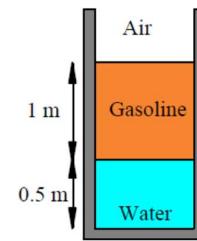


Fig. 2

- Q.4** A pipe flowing light oil has a manometer attached as shown in Fig. 3. What is the absolute pressure in the pipe flow? Density of oil 910 kg/m^3 and Density of water 997 kg/m^3

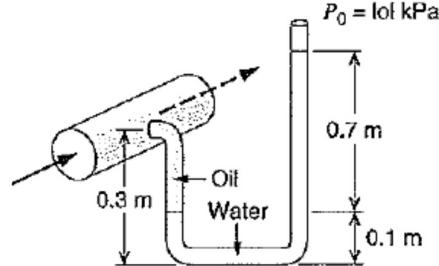


Fig. 3

- Q.5** The density of mercury changes approximately linearly with temperature as

$$\rho_{\text{Hg}} = 13595 - 2.5 T \text{ kg/m}^3, \text{ T in Celsius}$$

so the same pressure difference will result in a manometer reading that is influenced by temperature. If a pressure difference of 100 kPa is measured in the summer at 35°C and in the winter at -15°C , what is the difference in column height (in mm) between the two measurements?

- Q.6** A car of mass 1100 kg drives with a velocity such that its K.E. of 400 kJ. Find its velocity. If the car is raised with a crane how high should it be lifted in the standard gravitational field to have a P.E. that equals the K.E.?