

## 9.4.2 PRESSURE<sup>M12</sup>

### 9.4.2.2 The Earth's Atmosphere

The **gravitational attraction of the earth** holds the gases of the atmosphere mainly within 10 km of the earth's surface.

#### 9.4.2.2.1 Atmospheric Pressure

**Pressure** is the term used to mean **force per unit area**.

**Atmospheric pressure** is the result of **bombardment** by rapidly **moving air particles**.

The pressure exerted by the air particles at the earth's surface is about  $1 \text{ kg}\cdot\text{cm}^{-2}$ .

The **pressure acts in all directions** because the particles are travelling in all directions.

#### 9.4.2.2.2 Measuring Air Pressure

The instrument used to measure air pressure is the **barometer**.

At **sea level**, the particle bombardment is such as to be able to support a **column of mercury** about 760 mm high. The air pressure is measured as 760 mm of mercury.

#### 9.4.2.2.3 Air Resistance

**Friction** due to air reduces the net force acting on **falling bodies**. Hence their acceleration is affected to some degree. This is important for light objects with large areas or objects moving at very high speeds.

### 9.4.2.3 Effects of Forces between Particles

In solid materials under **forces of strain** the forces between the particles of the material tend to restore them to their original position and provide the **stress** or **restoring force**.

Examples of important physical effects due to **inter-particle forces** and displayed by liquids is provided by the phenomena of **surface tension** and **capillarity**. These can be understood on the basis of the interplay of the **cohesive** and **adhesive** forces that enter.

### 9.4.2.4 Pressure in Liquids

**Liquids transmit pressure.**

**Pressure** due to a **liquid** depends on:

- the **depth of the liquid**
- its **density**

Osmotic pressure is a special case of pressure in liquids and plays a most important role in life processes.

### 9.4.2.5 Pressure Due to Solids

The **pressure** due to a **solid** depends on:

- the **weight-force** of the solid
- the **area** over which it acts

## References

Holt Physics, Serway, R.A. and Faughn, J.S. (Holt, Rinehart and Winston, 2000)  
[ISBN 0-03-056544-8] Ch. 9

Work directly from text, with exercises:

### **9 Fluid Mechanics**

- 9.1 Fluids and buoyant force
- 9.2 Fluid pressure and temperature
- 9.3 Fluids in motion
- 9.4 Properties of gases