

## COMMON PHYSICAL QUANTITIES

| Quantity                            | Symbol   | Value   | Quantity                   | Symbol       | Value                                  |
|-------------------------------------|----------|---|----------------------------|--------------|--|
| Gravitational acceleration on Earth | $g$      | $9.8 \text{ ms}^{-2}$   | Mass of electron           | $m_e$        | $9.11 \times 10^{-31} \text{ kg}$      |
| Radius of Earth                     | $R_E$    | $6.4 \times 10^6 \text{ m}$                                   | Charge on electron         | $e$          | $1.60 \times 10^{-19} \text{ C}$       |
| Mass of Earth                       | $M_E$    | $6.0 \times 10^{24} \text{ kg}$                               | Mass of neutron            | $m_n$        | $1.675 \times 10^{-27} \text{ kg}$     |
| Mass of Jupiter                     | $M_J$    | $1.9 \times 10^{27} \text{ kg}$                               | Mass of proton             | $m_p$        | $1.673 \times 10^{-27} \text{ kg}$     |
| Radius of Jupiter                   | $R_J$    | $7.15 \times 10^7 \text{ m}$                                  | Mass of alpha particle     | $m_\alpha$   | $6.645 \times 10^{-27} \text{ kg}$     |
| Mean radius of Jupiter orbit        |          | $7.79 \times 10^{11} \text{ m}$                               | Charge on alpha particle   |              | $3.20 \times 10^{-19} \text{ kg}$      |
| Mass of Moon                        | $M_M$    | $7.3 \times 10^{22} \text{ kg}$                               | Planck's constant          | $h$          | $6.63 \times 10^{-34} \text{ Js}$      |
| Radius of Moon                      | $R_M$    | $1.7 \times 10^6 \text{ m}$                                   | Permittivity of free space | $\epsilon_0$ | $8.85 \times 10^{-12} \text{ Fm}^{-1}$ |
| Mean radius of Moon orbit           |          | $3.84 \times 10^8 \text{ m}$                                  | Permeability of free space | $\mu_0$      | $4\pi \times 10^{-7} \text{ Hm}^{-1}$  |
| Solar radius                        |          | $7.955 \times 10^8 \text{ m}$                                 | Speed of light in vacuum   | $c$          | $3.00 \times 10^8 \text{ ms}^{-1}$     |
| Mass of Sun                         |          | $2.0 \times 10^{30} \text{ kg}$                               | Speed of sound in air      | $v$          | $3.4 \times 10^2 \text{ ms}^{-1}$      |
| 1 AU                                |          | $1.5 \times 10^{11} \text{ m}$                                |                            |              |  |
| Stefan-Boltzmann constant           | $\sigma$ | $5.67 \times 10^{-8} \text{ Wm}^{-2}\text{K}^{-4}$            |                            |              |  |
| Universal constant of gravitation   | $G$      | $6.67 \times 10^{-11} \text{ m}^3\text{kg}^{-1}\text{s}^{-2}$ |                            |              |  |

## REFRACTIVE INDICES

The refractive indices refer to sodium light of wavelength 589 nm and to substances at a temperature of 273 K.

| Substance | Refractive index | Substance          | Refractive index |
|-----------|------------------|--------------------|------------------|
| Diamond   | 2.42             | Glycerol           | 1.47             |
| Glass     | 1.51             | Water              | 1.33             |
| Ice       | 1.31             | Air                | 1.00             |
| Perspex   | 1.49             | Magnesium fluoride | 1.38             |

## SPECTRAL LINES

| Element  | Wavelength/nm | Colour      | Element        | Wavelength/nm        | Colour        |
|----------|---------------|-------------|----------------|----------------------|---------------|
| Hydrogen | 656           | Red         | Cadmium        | 644                  | Red           |
|          | 486           | Blue-green  |                | 509                  | Green         |
|          | 434           | Blue-violet |                | 480                  | Blue          |
|          | 410           | Violet      | <b>Lasers</b>  |                      |               |
|          | 397           | Ultraviolet | <i>Element</i> | <i>Wavelength/nm</i> | <i>Colour</i> |
|          | 389           | Ultraviolet | Carbon dioxide | 9550                 | Infrared      |
| Sodium   | 589           | Yellow      |                | 10590                | Infrared      |
|          |               |             | Helium-neon    | 633                  | Red           |

## PROPERTIES OF SELECTED MATERIALS

| Substance | Density/kgm <sup>-3</sup> | Melting Point/K | Boiling Point/K | Specific Heat Capacity (J kg <sup>-1</sup> °C <sup>-1</sup> ) | Specific latent heat of fusion (J kg <sup>-1</sup> ) | Specific latent heat of vaporisation (J kg <sup>-1</sup> ) |
|-----------|---------------------------|-----------------|-----------------|---|--|--|
| Aluminium | $2.70 \times 10^3$        | 933             | 2623            | $9.02 \times 10^2$  | $3.95 \times 10^5$                                   | ...  |
| Copper    | $8.96 \times 10^3$        | 1357            | 2853            | $3.86 \times 10^2$  | $2.05 \times 10^5$                                   | ...  |
| Glass     | $2.60 \times 10^3$        | 1400            | ...             | $6.70 \times 10^2$  | ...  | ...  |
| Ice       | $9.20 \times 10^3$        | 273             | ...             | $2.10 \times 10^2$  | $3.34 \times 10^5$                                   | ...  |
| Glycerol  | $1.26 \times 10^3$        | 291             | 563             | $2.43 \times 10^3$  | $1.81 \times 10^5$                                   | $8.30 \times 10^5$   |
| Methanol  | $7.91 \times 10^2$        | 175             | 338             | $2.52 \times 10^3$  | $9.9 \times 10^4$                                    | $1.12 \times 10^6$   |
| Sea Water | $1.02 \times 10^3$        | 264             | 377             | $3.93 \times 10^3$  | ...  | ...  |
| Water     | $1.00 \times 10^3$        | 273             | 373             | $4.18 \times 10^3$  | $3.34 \times 10^5$                                   | $2.26 \times 10^6$   |
| Air       | 1.29                      | ...             | ...             | ...   | ...  | ...  |
| Hydrogen  | $9.0 \times 10^3$         | 14              | 20              | $1.43 \times 10^4$  | ...  | $4.50 \times 10^5$   |
| Nitrogen  | 1.25                      | 63              | 77              | $1.04 \times 10^3$  | ...  | $2.00 \times 10^5$   |
| Oxygen    | 1.43                      | 55              | 90              | $9.18 \times 10^2$  | ...  | $2.40 \times 10^4$   |

The gas densities refer to a temperature of 273 K and a pressure of  $1.01 \times 10^5 \text{ Pa}$ .