

## TITAN TABLE OF CONSTANTS

| CONSTANTS AND CONVERSION FACTORS  |  |
|---|--|
| Proton mass, $m_p = 1.67 \times 10^{-27}$ kg<br>Neutron mass, $m_n = 1.67 \times 10^{-27}$ kg<br>Electron mass, $m_e = 9.11 \times 10^{-31}$ kg<br>Avogadro's number, $N_0 = 6.02 \times 10^{23}$ mol <sup>-1</sup><br>Universal gas constant, $R = 8.31$ J/(mol·K)<br>Boltzmann's constant, $k_B = 1.38 \times 10^{-23}$ J/K | Electron charge magnitude, $e = 1.60 \times 10^{-19}$ C<br>1 electron volt, $1 \text{ eV} = 1.60 \times 10^{-19}$ J<br>Speed of light, $c = 3.00 \times 10^8$ m/s<br>Universal gravitational constant, $G = 6.67 \times 10^{-11}$ m <sup>3</sup> /kg·s <sup>2</sup><br>Acceleration due to gravity at Earth's surface, $g = 9.8$ m/s <sup>2</sup>  |
| 1 unified atomic mass unit,<br>Planck's constant,<br>Vacuum permittivity,<br>Coulomb's law constant, $k = 1/4\pi\epsilon_0 = 9.0 \times 10^9$ N·m <sup>2</sup> /C <sup>2</sup><br>Vacuum permeability,<br>Magnetic constant, $k' = \mu_0/4\pi = 10^{-7}$ (T·m)/A<br>1 atmosphere pressure,                                    | $1 \text{ u} = 1.66 \times 10^{-27}$ kg = 931 MeV/c <sup>2</sup><br>$h = 6.63 \times 10^{-34}$ J·s = 4.14 × 10 <sup>-15</sup> eV·s<br>$hc = 1.99 \times 10^{-25}$ J·m = 1.24 × 10 <sup>3</sup> eV·nm<br>$\epsilon_0 = 8.85 \times 10^{-12}$ C <sup>2</sup> /N·m <sup>2</sup><br>$\mu_0 = 4\pi \times 10^{-7}$ (T·m)/A<br>$1 \text{ atm} = 1.0 \times 10^5$ N/m <sup>2</sup> = 1.0 × 10 <sup>5</sup> Pa |

| UNIT SYMBOLS | meter, m | kilogram, kg | second, s | ampere, A | kelvin, K | mole, mol | hertz, Hz | newton, N | pascal, Pa | joule, J | watt, W | coulomb, C | volt, V | ohm, Ω | henry, H | farad, F | tesla, T | degree Celsius, °C | electron-volt, eV |
|--------------|----------|--------------|-----------|-----------|-----------|-----------|-----------|-----------|------------|----------|---------|------------|---------|--------|----------|----------|----------|--------------------|-------------------|
|--------------|----------|--------------|-----------|-----------|-----------|-----------|-----------|-----------|------------|----------|---------|------------|---------|--------|----------|----------|----------|--------------------|-------------------|

| PREFIXES          |        |        |
|-------------------|--------|--------|
| Factor            | Prefix | Symbol |
| 10 <sup>9</sup>   | giga   | G      |
| 10 <sup>6</sup>   | mega   | M      |
| 10 <sup>3</sup>   | kilo   | k      |
| 10 <sup>-2</sup>  | centi  | c      |
| 10 <sup>-3</sup>  | milli  | m      |
| 10 <sup>-6</sup>  | micro  | μ      |
| 10 <sup>-9</sup>  | nano   | n      |
| 10 <sup>-12</sup> | pico   | p      |

| VALUES OF TRIGONOMETRIC FUNCTIONS FOR COMMON ANGLES |    |              |     |              |     |              |     |
|---|----|--------------|-----|--------------|-----|--------------|-----|
| $\theta$  | 0° | 30°          | 37° | 45°          | 53° | 60°          | 90° |
| $\sin \theta$                                       | 0  | 1/2          | 3/5 | $\sqrt{2}/2$ | 4/5 | $\sqrt{3}/2$ | 1   |
| $\cos \theta$                                       | 1  | $\sqrt{3}/2$ | 4/5 | $\sqrt{2}/2$ | 3/5 | 1/2          | 0   |
| $\tan \theta$                                       | 0  | $\sqrt{3}/3$ | 3/4 | 1            | 4/3 | $\sqrt{3}$   | ∞   |

The following conventions are used in this exam.

- I. Unless otherwise stated, the frame of reference of any problem is assumed to be inertial.
- II. The direction of any electric current is the direction of flow of positive charge (conventional current).
- III. For any isolated electric charge, the electric potential is defined as zero at an infinite distance from the charge.
- \*IV. For mechanics and thermodynamics equations,  $W$  represents the work done on a system.
- \*V. Several different symbols (e.g.,  $d, r, s, h, \dots$ ) are used for linear dimensions such as length. The particular symbol used in an equation is one that is commonly used for that equation in textbooks. The symbol  $\Delta$  before a variable in an equation specifically indicates a change in the variable (i.e., final value minus initial value).

