

## APPENDIX I

### ELEMENTS, THEIR ATOMIC NUMBER AND MOLAR MASS

| Element     | Symbol | Atomic Number | Molar mass/<br>(g mol <sup>-1</sup> ) | Element       | Symbol | Atomic Number | Molar mass/<br>(g mol <sup>-1</sup> ) |
|-------------|--------|---------------|---------------------------------------|---------------|--------|---------------|---------------------------------------|
| Actinium    | Ac     | 89            | 227.03                                | Mercury       | Hg     | 80            | 200.59                                |
| Aluminium   | Al     | 13            | 26.98                                 | Molybdenum    | Mo     | 42            | 95.94                                 |
| Americium   | Am     | 95            | (243)                                 | Neodymium     | Nd     | 60            | 144.24                                |
| Antimony    | Sb     | 51            | 121.75                                | Neon          | Ne     | 10            | 20.18                                 |
| Argon       | Ar     | 18            | 39.95                                 | Neptunium     | Np     | 93            | (237.05)                              |
| Arsenic     | As     | 33            | 74.92                                 | Nickel        | Ni     | 28            | 58.71                                 |
| Astatine    | At     | 85            | 210                                   | Niobium       | Nb     | 41            | 92.91                                 |
| Barium      | Ba     | 56            | 137.34                                | Nitrogen      | N      | 7             | 14.0067                               |
| Berkelium   | Bk     | 97            | (247)                                 | Nobelium      | No     | 102           | (259)                                 |
| Beryllium   | Be     | 4             | 9.01                                  | Osmium        | Os     | 76            | 190.2                                 |
| Bismuth     | Bi     | 83            | 208.98                                | Oxygen        | O      | 8             | 16.00                                 |
| Bohrium     | Bh     | 107           | (264)                                 | Palladium     | Pd     | 46            | 106.4                                 |
| Boron       | B      | 5             | 10.81                                 | Phosphorus    | P      | 15            | 30.97                                 |
| Bromine     | Br     | 35            | 79.91                                 | Platinum      | Pt     | 78            | 195.09                                |
| Cadmium     | Cd     | 48            | 112.40                                | Plutonium     | Pu     | 94            | (244)                                 |
| Caesium     | Cs     | 55            | 132.91                                | Polonium      | Po     | 84            | 210                                   |
| Calcium     | Ca     | 20            | 40.08                                 | Potassium     | K      | 19            | 39.10                                 |
| Californium | Cf     | 98            | 251.08                                | Praseodymium  | Pr     | 59            | 140.91                                |
| Carbon      | C      | 6             | 12.01                                 | Promethium    | Pm     | 61            | (145)                                 |
| Cerium      | Ce     | 58            | 140.12                                | Protactinium  | Pa     | 91            | 231.04                                |
| Chlorine    | Cl     | 17            | 35.45                                 | Radium        | Ra     | 88            | (226)                                 |
| Chromium    | Cr     | 24            | 52.00                                 | Radon         | Rn     | 86            | (222)                                 |
| Cobalt      | Co     | 27            | 58.93                                 | Rhenium       | Re     | 75            | 186.2                                 |
| Copper      | Cu     | 29            | 63.54                                 | Rhodium       | Rh     | 45            | 102.91                                |
| Curium      | Cm     | 96            | 247.07                                | Rubidium      | Rb     | 37            | 85.47                                 |
| Dubnium     | Db     | 105           | (263)                                 | Ruthenium     | Ru     | 44            | 101.07                                |
| Dysprosium  | Dy     | 66            | 162.50                                | Rutherfordium | Rf     | 104           | (261)                                 |
| Einsteinium | Es     | 99            | (252)                                 | Samarium      | Sm     | 62            | 150.35                                |
| Erbium      | Er     | 68            | 167.26                                | Scandium      | Sc     | 21            | 44.96                                 |
| Europium    | Eu     | 63            | 151.96                                | Seaborgium    | Sg     | 106           | (266)                                 |
| Fermium     | Fm     | 100           | (257.10)                              | Selenium      | Se     | 34            | 78.96                                 |
| Fluorine    | F      | 9             | 19.00                                 | Silicon       | Si     | 14            | 28.08                                 |
| Francium    | Fr     | 87            | (223)                                 | Silver        | Ag     | 47            | 107.87                                |
| Gadolinium  | Gd     | 64            | 157.25                                | Sodium        | Na     | 11            | 22.99                                 |
| Gallium     | Ga     | 31            | 69.72                                 | Strontium     | Sr     | 38            | 87.62                                 |
| Germanium   | Ge     | 32            | 72.61                                 | Sulphur       | S      | 16            | 32.06                                 |
| Gold        | Au     | 79            | 196.97                                | Tantalum      | Ta     | 73            | 180.95                                |
| Hafnium     | Hf     | 72            | 178.49                                | Technetium    | Tc     | 43            | (98.91)                               |
| Hassium     | Hs     | 108           | (269)                                 | Tellurium     | Te     | 52            | 127.60                                |
| Helium      | He     | 2             | 4.00                                  | Terbium       | Tb     | 65            | 158.92                                |
| Holmium     | Ho     | 67            | 164.93                                | Thallium      | Tl     | 81            | 204.37                                |
| Hydrogen    | H      | 1             | 1.0079                                | Thorium       | Th     | 90            | 232.04                                |
| Indium      | In     | 49            | 114.82                                | Thulium       | Tm     | 69            | 168.93                                |
| Iodine      | I      | 53            | 126.90                                | Tin           | Sn     | 50            | 118.69                                |
| Iridium     | Ir     | 77            | 192.2                                 | Titanium      | Ti     | 22            | 47.88                                 |
| Iron        | Fe     | 26            | 55.85                                 | Tungsten      | W      | 74            | 183.85                                |
| Krypton     | Kr     | 36            | 83.80                                 | Ununbium      | Uub    | 112           | (277)                                 |
| Lanthanum   | La     | 57            | 138.91                                | Ununnilium    | Uun    | 110           | (269)                                 |
| Lawrencium  | Lr     | 103           | (262.1)                               | Unununium     | Uuu    | 111           | (272)                                 |
| Lead        | Pb     | 82            | 207.19                                | Uranium       | U      | 92            | 238.03                                |
| Lithium     | Li     | 3             | 6.94                                  | Vanadium      | V      | 23            | 50.94                                 |
| Lutetium    | Lu     | 71            | 174.96                                | Xenon         | Xe     | 54            | 131.30                                |
| Magnesium   | Mg     | 12            | 24.31                                 | Ytterbium     | Yb     | 70            | 173.04                                |
| Manganese   | Mn     | 25            | 54.94                                 | Yttrium       | Y      | 39            | 88.91                                 |
| Meitneium   | Mt     | 109           | (268)                                 | Zinc          | Zn     | 30            | 65.37                                 |
| Mendelevium | Md     | 101           | 258.10                                | Zirconium     | Zr     | 40            | 91.22                                 |

The value given in parenthesis is the molar mass of the isotope of largest known half-life.

## APPENDIX II

### SOME USEFUL CONVERSION FACTORS

#### Common Unit of Mass and Weight

**1 pound = 453.59 grams**

1 pound = 453.59 grams = 0.45359 kilogram

1 kilogram = 1000 grams = 2.205 pounds

1 gram = 10 decigrams = 100 centigrams  
= 1000 milligrams

1 gram =  $6.022 \times 10^{23}$  atomic mass units or u

1 atomic mass unit =  $1.6606 \times 10^{-24}$  gram

1 metric tonne = 1000 kilograms  
= 2205 pounds

#### Common Unit of Volume

**1 quart = 0.9463 litre**

**1 litre = 1.056 quarts**

1 litre = 1 cubic decimetre = 1000 cubic centimetres = 0.001 cubic metre

1 millilitre = 1 cubic centimetre = 0.001 litre  
=  $1.056 \times 10^{-3}$  quart

1 cubic foot = 28.316 litres = 29.902 quarts  
= 7.475 gallons

#### Common Units of Energy

**1 joule =  $1 \times 10^7$  ergs**

1 thermochemical calorie\*\* = 4.184 joules  
=  $4.184 \times 10^7$  ergs  
=  $4.129 \times 10^{-2}$  litre-atmospheres  
=  $2.612 \times 10^{19}$  electron volts

1 ergs =  $1 \times 10^{-7}$  joule =  $2.3901 \times 10^{-8}$  calorie

1 electron volt =  $1.6022 \times 10^{-19}$  joule  
=  $1.6022 \times 10^{-12}$  erg  
= 96.487 kJ/mol†

1 litre-atmosphere = 24.217 calories  
= 101.32 joules  
=  $1.0132 \times 10^9$  ergs

1 British thermal unit = 1055.06 joules  
=  $1.05506 \times 10^{10}$  ergs  
= 252.2 calories

#### Common Units of Length

**1 inch = 2.54 centimetres (exactly)**

1 mile = 5280 feet = 1.609 kilometres

1 yard = 36 inches = 0.9144 metre

1 metre = 100 centimetres  
= 39.37 inches  
= 3.281 feet  
= 1.094 yards

1 kilometre = 1000 metres  
= 1094 yards  
= 0.6215 mile

1 Angstrom =  $1.0 \times 10^{-8}$  centimetre  
= 0.10 nanometre  
=  $1.0 \times 10^{-10}$  metre  
=  $3.937 \times 10^{-9}$  inch

#### Common Units of Force\* and Pressure

1 atmosphere = 760 millimetres of mercury  
=  $1.013 \times 10^5$  pascals  
= 14.70 pounds per square inch

1 bar =  $10^5$  pascals

1 torr = 1 millimetre of mercury

1 pascal =  $1 \text{ kg/ms}^2 = 1 \text{ N/m}^2$

#### Temperature

**SI Base Unit: Kelvin (K)**

K =  $-273.15^\circ\text{C}$

K =  $^\circ\text{C} + 273.15$

$^\circ\text{F} = 1.8(^\circ\text{C}) + 32$

$^\circ\text{C} = \frac{^\circ\text{F} - 32}{1.8}$

\* Force: 1 newton (N) =  $1 \text{ kg m/s}^2$ , i.e., the force that, when applied for 1 second, gives a 1-kilogram mass a velocity of 1 metre per second.

\*\* The amount of heat required to raise the temperature of one gram of water from  $14.5^\circ\text{C}$  to  $15.5^\circ\text{C}$ .

† Note that the other units are per particle and must be multiplied by  $6.022 \times 10^{23}$  to be strictly comparable.

### APPENDIX III

#### STANDARD POTENTIALS AT 298 K IN ELECTROCHEMICAL

| Reduction half-reaction                                                                                         | $E^\circ / \text{V}$ | Reduction half-reaction                                                                               | $E^\circ / \text{V}$ |
|-----------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------|----------------------|
| $\text{H}_4\text{XeO}_6 + 2\text{H}^+ + 2\text{e}^- \longrightarrow \text{XeO}_3 + 3\text{H}_2\text{O}$         | +3.0                 | $\text{Pu}^{4+} + \text{e}^- \longrightarrow \text{Pu}^{3+}$                                          | +0.97                |
| $\text{F}_2 + 2\text{e}^- \longrightarrow 2\text{F}^-$                                                          | +2.87                | $\text{NO}_3^- + 4\text{H}^+ + 3\text{e}^- \longrightarrow \text{NO} + 2\text{H}_2\text{O}$           | +0.96                |
| $\text{O}_3 + 2\text{H}^+ + 2\text{e}^- \longrightarrow \text{O}_2 + \text{H}_2\text{O}$                        | +2.07                | $2\text{Hg}_2^{2+} + 2\text{e}^- \longrightarrow \text{Hg}_2^{2+}$                                    | +0.92                |
| $\text{S}_2\text{O}_8^{2-} + 2\text{e}^- \longrightarrow 2\text{SO}_4^{2-}$                                     | +2.05                | $\text{ClO}^- + \text{H}_2\text{O} + 2\text{e}^- \longrightarrow \text{Cl}^- + 2\text{OH}^-$          | +0.89                |
| $\text{Ag}^+ + \text{e}^- \longrightarrow \text{Ag}$                                                            | +1.98                | $\text{Hg}_2^{2+} + 2\text{e}^- \longrightarrow \text{Hg}$                                            | +0.86                |
| $\text{Co}^{3+} + \text{e}^- \longrightarrow \text{Co}^{2+}$                                                    | +1.81                | $\text{NO}_3^- + 2\text{H}^+ + \text{e}^- \longrightarrow \text{NO}_2 + \text{H}_2\text{O}$           | +0.80                |
| $\text{H}_2\text{O}_2 + 2\text{H}^+ + 2\text{e}^- \longrightarrow 2\text{H}_2\text{O}$                          | +1.78                | $\text{Ag}^+ + \text{e}^- \longrightarrow \text{Ag}$                                                  | +0.80                |
| $\text{Au}^+ + \text{e}^- \longrightarrow \text{Au}$                                                            | +1.69                | $\text{Hg}_2^{2+} + 2\text{e}^- \longrightarrow 2\text{Hg}$                                           | +0.79                |
| $\text{Pb}^{4+} + 2\text{e}^- \longrightarrow \text{Pb}^{2+}$                                                   | +1.67                | $\text{Fe}^{3+} + \text{e}^- \longrightarrow \text{Fe}^{2+}$                                          | +0.77                |
| $2\text{HClO} + 2\text{H}^+ + 2\text{e}^- \longrightarrow \text{Cl}_2 + 2\text{H}_2\text{O}$                    | +1.63                | $\text{BrO}^- + \text{H}_2\text{O} + 2\text{e}^- \longrightarrow \text{Br}^- + 2\text{OH}^-$          | +0.76                |
| $\text{Ce}^{4+} + \text{e}^- \longrightarrow \text{Ce}^{3+}$                                                    | +1.61                | $\text{Hg}_2\text{SO}_4 + 2\text{e}^- \longrightarrow 2\text{Hg} + \text{SO}_4^{2-}$                  | +0.62                |
| $2\text{HBrO} + 2\text{H}^+ + 2\text{e}^- \longrightarrow \text{Br}_2 + 2\text{H}_2\text{O}$                    | +1.60                | $\text{MnO}_4^{2-} + 2\text{H}_2\text{O} + 2\text{e}^- \longrightarrow \text{MnO}_2 + 4\text{OH}^-$   | +0.60                |
| $\text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \longrightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$               | +1.51                | $\text{MnO}_4^- + \text{e}^- \longrightarrow \text{MnO}_4^{2-}$                                       | +0.56                |
| $\text{Mn}^{3+} + \text{e}^- \longrightarrow \text{Mn}^{2+}$                                                    | +1.51                | $\text{I}_2 + 2\text{e}^- \longrightarrow 2\text{I}^-$                                                | +0.54                |
| $\text{Au}^{3+} + 3\text{e}^- \longrightarrow \text{Au}$                                                        | +1.40                | $\text{I}_3^- + 2\text{e}^- \longrightarrow 3\text{I}^-$                                              | +0.53                |
| $\text{Cl}_2 + 2\text{e}^- \longrightarrow 2\text{Cl}^-$                                                        | +1.36                | $\text{Cu}^+ + \text{e}^- \longrightarrow \text{Cu}$                                                  | +0.52                |
| $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{e}^- \longrightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$ | +1.33                | $\text{NiOOH} + \text{H}_2\text{O} + \text{e}^- \longrightarrow \text{Ni}(\text{OH})_2 + \text{OH}^-$ | +0.49                |
| $\text{O}_3 + \text{H}_2\text{O} + 2\text{e}^- \longrightarrow \text{O}_2 + 2\text{OH}^-$                       | +1.24                | $\text{Ag}_2\text{CrO}_4 + 2\text{e}^- \longrightarrow 2\text{Ag} + \text{CrO}_4^{2-}$                | +0.45                |
| $\text{O}_2 + 4\text{H}^+ + 4\text{e}^- \longrightarrow 2\text{H}_2\text{O}$                                    | +1.23                | $\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^- \longrightarrow 4\text{OH}^-$                         | +0.40                |
| $\text{ClO}_4^- + 2\text{H}^+ + 2\text{e}^- \longrightarrow \text{ClO}_3^- + \text{H}_2\text{O}$                | +1.23                | $\text{ClO}_4^- + \text{H}_2\text{O} + 2\text{e}^- \longrightarrow \text{ClO}_3^- + 2\text{OH}^-$     | +0.36                |
| $\text{MnO}_2 + 4\text{H}^+ + 2\text{e}^- \longrightarrow \text{Mn}^{2+} + 2\text{H}_2\text{O}$                 | +1.23                | $[\text{Fe}(\text{CN})_6]^{3-} + \text{e}^- \longrightarrow [\text{Fe}(\text{CN})_6]^{4-}$            | +0.36                |
| $\text{Pt}^{2+} + 2\text{e}^- \longrightarrow \text{Pt}$                                                        | +1.20                | $\text{Cu}^{2+} + 2\text{e}^- \longrightarrow \text{Cu}$                                              | +0.34                |
| $\text{Br}_2 + 2\text{e}^- \longrightarrow 2\text{Br}^-$                                                        | +1.09                | $\text{Hg}_2\text{Cl}_2 + 2\text{e}^- \longrightarrow 2\text{Hg} + 2\text{Cl}^-$                      | +0.27                |

|                                                                                                           |       |                                                                                 |       |
|-----------------------------------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------|-------|
| $\text{AgCl} + \text{e}^- \longrightarrow \text{Ag} + \text{Cl}^-$                                        | +0.27 | $\text{S} + 2\text{e}^- \longrightarrow \text{S}^{2-}$                          | -0.48 |
| $\text{Bi}^{3+} + 3\text{e}^- \longrightarrow \text{Bi}$                                                  | +0.20 | $\text{In}^{3+} + \text{e}^- \longrightarrow \text{In}^{2+}$                    | -0.49 |
| $\text{SO}_4^{2-} + 4\text{H}^+ + 2\text{e}^- \longrightarrow \text{H}_2\text{SO}_3 + \text{H}_2\text{O}$ | +0.17 | $\text{U}^{4+} + \text{e}^- \longrightarrow \text{U}^{3+}$                      | -0.61 |
| $\text{Cu}^{2+} + \text{e}^- \longrightarrow \text{Cu}^+$                                                 | +0.16 | $\text{Cr}^{3+} + 3\text{e}^- \longrightarrow \text{Cr}$                        | -0.74 |
| $\text{Sn}^{4+} + 2\text{e}^- \longrightarrow \text{Sn}^{2+}$                                             | +0.15 | $\text{Zn}^{2+} + 2\text{e}^- \longrightarrow \text{Zn}$                        | -0.76 |
| $\text{AgBr} + \text{e}^- \longrightarrow \text{Ag} + \text{Br}^-$                                        | +0.07 | $\text{Cd}(\text{OH})_2 + 2\text{e}^- \longrightarrow \text{Cd} + 2\text{OH}^-$ | -0.81 |
| $\text{Ti}^{4+} + \text{e}^- \longrightarrow \text{Ti}^{3+}$                                              | 0.00  | $2\text{H}_2\text{O} + 2\text{e}^- \longrightarrow \text{H}_2 + 2\text{OH}^-$   | -0.83 |
| $2\text{H}^+ + 2\text{e}^- \longrightarrow \text{H}_2$ (by definition)                                    | 0.0   | $\text{Cr}^{2+} + 2\text{e}^- \longrightarrow \text{Cr}$                        | -0.91 |
| $\text{Fe}^{3+} + 3\text{e}^- \longrightarrow \text{Fe}$                                                  | -0.04 | $\text{Mn}^{2+} + 2\text{e}^- \longrightarrow \text{Mn}$                        | -1.18 |
| $\text{O}_2 + \text{H}_2\text{O} + 2\text{e}^- \longrightarrow \text{HO}_2^- + \text{OH}^-$               | -0.08 | $\text{V}^{2+} + 2\text{e}^- \longrightarrow \text{V}$                          | -1.19 |
| $\text{Pb}^{2+} + 2\text{e}^- \longrightarrow \text{Pb}$                                                  | -0.13 | $\text{Ti}^{2+} + 2\text{e}^- \longrightarrow \text{Ti}$                        | -1.63 |
| $\text{In}^+ + \text{e}^- \longrightarrow \text{In}$                                                      | -0.14 | $\text{Al}^{3+} + 3\text{e}^- \longrightarrow \text{Al}$                        | -1.66 |
| $\text{Sn}^{2+} + 2\text{e}^- \longrightarrow \text{Sn}$                                                  | -0.14 | $\text{U}^{3+} + 3\text{e}^- \longrightarrow \text{U}$                          | -1.79 |
| $\text{AgI} + \text{e}^- \longrightarrow \text{Ag} + \text{I}^-$                                          | -0.15 | $\text{Sc}^{3+} + 3\text{e}^- \longrightarrow \text{Sc}$                        | -2.09 |
| $\text{Ni}^{2+} + 2\text{e}^- \longrightarrow \text{Ni}$                                                  | -0.23 | $\text{Mg}^{2+} + 2\text{e}^- \longrightarrow \text{Mg}$                        | -2.36 |
| $\text{V}^{3+} + \text{e}^- \longrightarrow \text{V}^{2+}$                                                | -0.26 | $\text{Ce}^{3+} + 3\text{e}^- \longrightarrow \text{Ce}$                        | -2.48 |
| $\text{Co}^{2+} + 2\text{e}^- \longrightarrow \text{Co}$                                                  | -0.28 | $\text{La}^{3+} + 3\text{e}^- \longrightarrow \text{La}$                        | -2.52 |
| $\text{In}^{3+} + 3\text{e}^- \longrightarrow \text{In}$                                                  | -0.34 | $\text{Na}^+ + \text{e}^- \longrightarrow \text{Na}$                            | -2.71 |
| $\text{Tl}^+ + \text{e}^- \longrightarrow \text{Tl}$                                                      | -0.34 | $\text{Ca}^{2+} + 2\text{e}^- \longrightarrow \text{Ca}$                        | -2.87 |
| $\text{PbSO}_4 + 2\text{e}^- \longrightarrow \text{Pb} + \text{SO}_4^{2-}$                                | -0.36 | $\text{Sr}^{2+} + 2\text{e}^- \longrightarrow \text{Sr}$                        | -2.89 |
| $\text{Ti}^{3+} + \text{e}^- \longrightarrow \text{Ti}^{2+}$                                              | -0.37 | $\text{Ba}^{2+} + 2\text{e}^- \longrightarrow \text{Ba}$                        | -2.91 |
| $\text{Cd}^{2+} + 2\text{e}^- \longrightarrow \text{Cd}$                                                  | -0.40 | $\text{Ra}^{2+} + 2\text{e}^- \longrightarrow \text{Ra}$                        | -2.92 |
| $\text{In}^{2+} + \text{e}^- \longrightarrow \text{In}^+$                                                 | -0.40 | $\text{Cs}^+ + \text{e}^- \longrightarrow \text{Cs}$                            | -2.92 |
| $\text{Cr}^{3+} + \text{e}^- \longrightarrow \text{Cr}^{2+}$                                              | -0.41 | $\text{Rb}^+ + \text{e}^- \longrightarrow \text{Rb}$                            | -2.93 |
| $\text{Fe}^{2+} + 2\text{e}^- \longrightarrow \text{Fe}$                                                  | -0.44 | $\text{K}^+ + \text{e}^- \longrightarrow \text{K}$                              | -2.93 |
| $\text{In}^{3+} + 2\text{e}^- \longrightarrow \text{In}^+$                                                | -0.44 | $\text{Li}^+ + \text{e}^- \longrightarrow \text{Li}$                            | -3.05 |

# LOGARITHMS

Table 1

| N  | 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 1 | 2 | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
|----|------|------|------|------|------|------|------|------|------|------|---|---|----|----|----|----|----|----|----|
| 10 | 0000 | 0043 | 0086 | 0128 | 0170 | 0212 | 0253 | 0294 | 0334 | 0374 | 5 | 9 | 13 | 17 | 21 | 26 | 30 | 34 | 38 |
| 11 | 0414 | 0453 | 0492 | 0531 | 0569 | 0607 | 0645 | 0682 | 0719 | 0755 | 4 | 8 | 12 | 16 | 20 | 23 | 27 | 31 | 35 |
| 12 | 0792 | 0828 | 0864 | 0899 | 0934 | 0969 | 1004 | 1038 | 1072 | 1106 | 3 | 7 | 11 | 14 | 18 | 21 | 25 | 28 | 32 |
| 13 | 1139 | 1173 | 1206 | 1239 | 1271 | 1303 | 1335 | 1367 | 1399 | 1430 | 3 | 6 | 10 | 13 | 16 | 19 | 23 | 26 | 29 |
| 14 | 1461 | 1492 | 1523 | 1553 | 1584 | 1614 | 1644 | 1673 | 1703 | 1732 | 3 | 6 | 9  | 12 | 15 | 19 | 22 | 25 | 28 |
| 15 | 1761 | 1790 | 1818 | 1847 | 1875 | 1903 | 1931 | 1959 | 1987 | 2014 | 3 | 6 | 9  | 11 | 14 | 17 | 20 | 23 | 26 |
| 16 | 2041 | 2068 | 2095 | 2122 | 2148 | 2175 | 2201 | 2227 | 2253 | 2279 | 3 | 6 | 8  | 11 | 14 | 16 | 19 | 22 | 24 |
| 17 | 2304 | 2330 | 2355 | 2380 | 2405 | 2430 | 2455 | 2480 | 2504 | 2529 | 3 | 5 | 8  | 10 | 13 | 15 | 18 | 20 | 23 |
| 18 | 2553 | 2577 | 2601 | 2625 | 2648 | 2672 | 2695 | 2718 | 2742 | 2765 | 2 | 5 | 7  | 9  | 12 | 14 | 17 | 19 | 21 |
| 19 | 2788 | 2810 | 2833 | 2856 | 2878 | 2900 | 2923 | 2945 | 2967 | 2989 | 2 | 4 | 7  | 9  | 11 | 13 | 16 | 18 | 20 |
| 20 | 3010 | 3032 | 3054 | 3075 | 3096 | 3118 | 3139 | 3160 | 3181 | 3201 | 2 | 4 | 6  | 8  | 11 | 13 | 15 | 17 | 19 |
| 21 | 3222 | 3243 | 3263 | 3284 | 3304 | 3324 | 3345 | 3365 | 3385 | 3404 | 2 | 4 | 6  | 8  | 10 | 12 | 14 | 16 | 18 |
| 22 | 3424 | 3444 | 3464 | 3483 | 3502 | 3522 | 3541 | 3560 | 3579 | 3598 | 2 | 4 | 6  | 8  | 10 | 12 | 14 | 15 | 17 |
| 23 | 3617 | 3636 | 3655 | 3674 | 3692 | 3711 | 3729 | 3747 | 3766 | 3784 | 2 | 4 | 6  | 7  | 9  | 11 | 13 | 15 | 17 |
| 24 | 3802 | 3820 | 3838 | 3856 | 3874 | 3892 | 3909 | 3927 | 3945 | 3962 | 2 | 4 | 5  | 7  | 9  | 11 | 12 | 14 | 16 |
| 25 | 3979 | 3997 | 4014 | 4031 | 4048 | 4065 | 4082 | 4099 | 4116 | 4133 | 2 | 3 | 5  | 7  | 9  | 10 | 12 | 14 | 15 |
| 26 | 4150 | 4166 | 4183 | 4200 | 4216 | 4232 | 4249 | 4265 | 4281 | 4298 | 2 | 3 | 5  | 7  | 8  | 10 | 11 | 13 | 15 |
| 27 | 4314 | 4330 | 4346 | 4362 | 4378 | 4393 | 4409 | 4425 | 4440 | 4456 | 2 | 3 | 5  | 6  | 8  | 9  | 11 | 13 | 14 |
| 28 | 4472 | 4487 | 4502 | 4518 | 4533 | 4548 | 4564 | 4579 | 4594 | 4609 | 2 | 3 | 5  | 6  | 8  | 9  | 11 | 12 | 14 |
| 29 | 4624 | 4639 | 4654 | 4669 | 4683 | 4698 | 4713 | 4728 | 4742 | 4757 | 1 | 3 | 4  | 6  | 7  | 9  | 10 | 12 | 13 |
| 30 | 4771 | 4786 | 4800 | 4814 | 4829 | 4843 | 4857 | 4871 | 4886 | 4900 | 1 | 3 | 4  | 6  | 7  | 9  | 10 | 11 | 13 |
| 31 | 4914 | 4928 | 4942 | 4955 | 4969 | 4983 | 4997 | 5011 | 5024 | 5038 | 1 | 3 | 4  | 6  | 7  | 8  | 10 | 11 | 12 |
| 32 | 5051 | 5065 | 5079 | 5092 | 5105 | 5119 | 5132 | 5145 | 5159 | 5172 | 1 | 3 | 4  | 5  | 7  | 8  | 9  | 11 | 12 |
| 33 | 5185 | 5198 | 5211 | 5224 | 5237 | 5250 | 5263 | 5276 | 5289 | 5302 | 1 | 3 | 4  | 5  | 6  | 8  | 9  | 10 | 12 |
| 34 | 5315 | 5328 | 5340 | 5353 | 5366 | 5378 | 5391 | 5403 | 5416 | 5428 | 1 | 3 | 4  | 5  | 6  | 8  | 9  | 10 | 11 |
| 35 | 5441 | 5453 | 5465 | 5478 | 5490 | 5502 | 5514 | 5527 | 5539 | 5551 | 1 | 2 | 4  | 5  | 6  | 7  | 9  | 10 | 11 |
| 36 | 5563 | 5575 | 5587 | 5599 | 5611 | 5623 | 5635 | 5647 | 5658 | 5670 | 1 | 2 | 4  | 5  | 6  | 7  | 8  | 10 | 11 |
| 37 | 5682 | 5694 | 5705 | 5717 | 5729 | 5740 | 5752 | 5763 | 5775 | 5786 | 1 | 2 | 3  | 5  | 6  | 7  | 8  | 9  | 10 |
| 38 | 5798 | 5809 | 5821 | 5832 | 5843 | 5855 | 5866 | 5877 | 5888 | 5899 | 1 | 2 | 3  | 5  | 6  | 7  | 8  | 9  | 10 |
| 39 | 5911 | 5922 | 5933 | 5944 | 5955 | 5966 | 5977 | 5988 | 5999 | 6010 | 1 | 2 | 3  | 4  | 5  | 7  | 8  | 9  | 10 |
| 40 | 6021 | 6031 | 6042 | 6053 | 6064 | 6075 | 6085 | 6096 | 6107 | 6117 | 1 | 2 | 3  | 4  | 5  | 6  | 8  | 9  | 10 |
| 41 | 6128 | 6138 | 6149 | 6160 | 6170 | 6180 | 6191 | 6201 | 6212 | 6222 | 1 | 2 | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
| 42 | 6232 | 6243 | 6253 | 6263 | 6274 | 6284 | 6294 | 6304 | 6314 | 6325 | 1 | 2 | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
| 43 | 6335 | 6345 | 6355 | 6365 | 6375 | 6385 | 6395 | 6405 | 6415 | 6425 | 1 | 2 | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
| 44 | 6435 | 6444 | 6454 | 6464 | 6474 | 6484 | 6493 | 6503 | 6513 | 6522 | 1 | 2 | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
| 45 | 6532 | 6542 | 6551 | 6561 | 6471 | 6580 | 6590 | 6599 | 6609 | 6618 | 1 | 2 | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
| 46 | 6628 | 6637 | 6646 | 6656 | 6665 | 6675 | 6684 | 6693 | 6702 | 6712 | 1 | 2 | 3  | 4  | 5  | 6  | 7  | 7  | 8  |
| 47 | 6721 | 6730 | 6739 | 6749 | 6758 | 6767 | 6776 | 6785 | 6794 | 6803 | 1 | 2 | 3  | 4  | 5  | 5  | 6  | 7  | 8  |
| 48 | 6812 | 6821 | 6830 | 6839 | 6848 | 6857 | 6866 | 6875 | 6884 | 6893 | 1 | 2 | 3  | 4  | 4  | 5  | 6  | 7  | 8  |
| 49 | 6902 | 6911 | 6920 | 6928 | 6937 | 6946 | 6955 | 6964 | 6972 | 6981 | 1 | 2 | 3  | 4  | 4  | 5  | 6  | 7  | 8  |

# LOGARITHMS

Table 1 continued

| N  | 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----|------|------|------|------|------|------|------|------|------|------|---|---|---|---|---|---|---|---|---|
| 50 | 6990 | 6998 | 7007 | 7016 | 7024 | 7033 | 7042 | 7050 | 7059 | 7067 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 8 |
| 51 | 7076 | 7084 | 7093 | 7101 | 7110 | 7118 | 7126 | 7135 | 7143 | 7152 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 8 |
| 52 | 7160 | 7168 | 7177 | 7185 | 7193 | 7202 | 7210 | 7218 | 7226 | 7235 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 7 |
| 53 | 7243 | 7251 | 7259 | 7267 | 7275 | 7284 | 7292 | 7300 | 7308 | 7316 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 6 | 7 |
| 54 | 7324 | 7332 | 7340 | 7348 | 7356 | 7364 | 7372 | 7380 | 7388 | 7396 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 6 | 7 |
| 55 | 7404 | 7412 | 7419 | 7427 | 7435 | 7443 | 7451 | 7459 | 7466 | 7474 | 1 | 2 | 2 | 3 | 4 | 5 | 5 | 6 | 7 |
| 56 | 7482 | 7490 | 7497 | 7505 | 7513 | 7520 | 7528 | 7536 | 7543 | 7551 | 1 | 2 | 2 | 3 | 4 | 5 | 5 | 6 | 7 |
| 57 | 7559 | 7566 | 7574 | 7582 | 7589 | 7597 | 7604 | 7612 | 7619 | 7627 | 1 | 2 | 2 | 3 | 4 | 5 | 5 | 6 | 7 |
| 58 | 7634 | 7642 | 7649 | 7657 | 7664 | 7672 | 7679 | 7686 | 7694 | 7701 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 7 |
| 59 | 7709 | 7716 | 7723 | 7731 | 7738 | 7745 | 7752 | 7760 | 7767 | 7774 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 7 |
| 60 | 7782 | 7789 | 7796 | 7803 | 7810 | 7818 | 7825 | 7832 | 7839 | 7846 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 |
| 61 | 7853 | 7860 | 7868 | 7875 | 7882 | 7889 | 7896 | 7903 | 7910 | 7917 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 |
| 62 | 7924 | 7931 | 7938 | 7945 | 7952 | 7959 | 7966 | 7973 | 7980 | 7987 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 6 |
| 63 | 7993 | 8000 | 8007 | 8014 | 8021 | 8028 | 8035 | 8041 | 8048 | 8055 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 64 | 8062 | 8069 | 8075 | 8082 | 8089 | 8096 | 8102 | 8109 | 8116 | 8122 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 65 | 8129 | 8136 | 8142 | 8149 | 8156 | 8162 | 8169 | 8176 | 8182 | 8189 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 66 | 8195 | 8202 | 8209 | 8215 | 8222 | 8228 | 8235 | 8241 | 8248 | 8254 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 67 | 8261 | 8267 | 8274 | 8280 | 8287 | 8293 | 8299 | 8306 | 8312 | 8319 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 68 | 8325 | 8331 | 8338 | 8344 | 8351 | 8357 | 8363 | 8370 | 8376 | 8382 | 1 | 1 | 2 | 3 | 3 | 4 | 4 | 5 | 6 |
| 69 | 8388 | 8395 | 8401 | 8407 | 8414 | 8420 | 8426 | 8432 | 8439 | 8445 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 6 |
| 70 | 8451 | 8457 | 8463 | 8470 | 8476 | 8482 | 8488 | 8494 | 8500 | 8506 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 6 |
| 71 | 8513 | 8519 | 8525 | 8531 | 8537 | 8543 | 8549 | 8555 | 8561 | 8567 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 |
| 72 | 8573 | 8579 | 8585 | 8591 | 8597 | 8603 | 8609 | 8615 | 8621 | 8627 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 |
| 73 | 8633 | 8639 | 8645 | 8651 | 8657 | 8663 | 8669 | 8675 | 8681 | 8686 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 |
| 74 | 8692 | 8698 | 8704 | 8710 | 8716 | 8722 | 8727 | 8733 | 8739 | 8745 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 |
| 75 | 8751 | 8756 | 8762 | 8768 | 8774 | 8779 | 8785 | 8791 | 8797 | 8802 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 5 | 5 |
| 76 | 8808 | 8814 | 8820 | 8825 | 8831 | 8837 | 8842 | 8848 | 8854 | 8859 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 5 | 5 |
| 77 | 8865 | 8871 | 8876 | 8882 | 8887 | 8893 | 8899 | 8904 | 8910 | 8915 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 78 | 8921 | 8927 | 8932 | 8938 | 8943 | 8949 | 8954 | 8960 | 8965 | 8971 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 79 | 8976 | 8982 | 8987 | 8993 | 8998 | 9004 | 9009 | 9015 | 9020 | 9025 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 80 | 9031 | 9036 | 9042 | 9047 | 9053 | 9058 | 9063 | 9069 | 9074 | 9079 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 81 | 9085 | 9090 | 9096 | 9101 | 9106 | 9112 | 9117 | 9122 | 9128 | 9133 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 82 | 9138 | 9143 | 9149 | 9154 | 9159 | 9165 | 9170 | 9175 | 9180 | 9186 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 83 | 9191 | 9196 | 9201 | 9206 | 9212 | 9217 | 9222 | 9227 | 9232 | 9238 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 84 | 9243 | 9248 | 9253 | 9258 | 9263 | 9269 | 9274 | 9279 | 9284 | 9289 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 85 | 9294 | 9299 | 9304 | 9309 | 9315 | 9320 | 9325 | 9330 | 9335 | 9340 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 86 | 9345 | 9350 | 9355 | 9360 | 9365 | 9370 | 9375 | 9380 | 9385 | 9390 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 87 | 9395 | 9400 | 9405 | 9410 | 9415 | 9420 | 9425 | 9430 | 9435 | 9440 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 88 | 9445 | 9450 | 9455 | 9460 | 9465 | 9469 | 9474 | 9479 | 9484 | 9489 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 89 | 9494 | 9499 | 9504 | 9509 | 9513 | 9518 | 9523 | 9528 | 9533 | 9538 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 90 | 9542 | 9547 | 9552 | 9557 | 9562 | 9566 | 9571 | 9576 | 9581 | 9586 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 91 | 9590 | 9595 | 9600 | 9605 | 9609 | 9614 | 9619 | 9624 | 9628 | 9633 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 92 | 9638 | 9643 | 9647 | 9652 | 9657 | 9661 | 9666 | 9671 | 9675 | 9680 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 93 | 9685 | 9689 | 9694 | 9699 | 9703 | 9708 | 9713 | 9717 | 9722 | 9727 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 94 | 9731 | 9736 | 9741 | 9745 | 9750 | 9754 | 9759 | 9763 | 9768 | 9773 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 95 | 9777 | 9782 | 9786 | 9791 | 9795 | 9800 | 9805 | 9809 | 9814 | 9818 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 96 | 9823 | 9827 | 9832 | 9836 | 9841 | 9845 | 9850 | 9854 | 9859 | 9863 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 97 | 9868 | 9872 | 9877 | 9881 | 9886 | 9890 | 9894 | 9899 | 9903 | 9908 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 98 | 9912 | 9917 | 9921 | 9926 | 9930 | 9934 | 9939 | 9943 | 9948 | 9952 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| 99 | 9956 | 9961 | 9965 | 9969 | 9974 | 9978 | 9983 | 9987 | 9997 | 9996 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 |

# ANTILOGARITHMS

Table 2

| N   | 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----|------|------|------|------|------|------|------|------|------|------|---|---|---|---|---|---|---|---|---|
| .00 | 1000 | 1002 | 1005 | 1007 | 1009 | 1012 | 1014 | 1016 | 1019 | 1021 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| .01 | 1023 | 1026 | 1028 | 1030 | 1033 | 1035 | 1038 | 1040 | 1042 | 1045 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| .02 | 1047 | 1050 | 1052 | 1054 | 1057 | 1059 | 1062 | 1064 | 1067 | 1069 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| .03 | 1072 | 1074 | 1076 | 1079 | 1081 | 1084 | 1086 | 1089 | 1091 | 1094 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| .04 | 1096 | 1099 | 1102 | 1104 | 1107 | 1109 | 1112 | 1114 | 1117 | 1119 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| .05 | 1122 | 1125 | 1127 | 1130 | 1132 | 1135 | 1138 | 1140 | 1143 | 1146 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| .06 | 1148 | 1151 | 1153 | 1156 | 1159 | 1161 | 1164 | 1167 | 1169 | 1172 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| .07 | 1175 | 1178 | 1180 | 1183 | 1186 | 1189 | 1191 | 1194 | 1197 | 1199 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| .08 | 1202 | 1205 | 1208 | 1211 | 1213 | 1216 | 1219 | 1222 | 1225 | 1227 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .09 | 1230 | 1233 | 1236 | 1239 | 1242 | 1245 | 1247 | 1250 | 1253 | 1256 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .10 | 1259 | 1262 | 1265 | 1268 | 1271 | 1274 | 1276 | 1279 | 1282 | 1285 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .11 | 1288 | 1291 | 1294 | 1297 | 1300 | 1303 | 1306 | 1309 | 1312 | 1315 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .12 | 1318 | 1321 | 1324 | 1327 | 1330 | 1334 | 1337 | 1340 | 1343 | 1346 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .13 | 1349 | 1352 | 1355 | 1358 | 1361 | 1365 | 1368 | 1371 | 1374 | 1377 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .14 | 1380 | 1384 | 1387 | 1390 | 1393 | 1396 | 1400 | 1403 | 1406 | 1409 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .15 | 1413 | 1416 | 1419 | 1422 | 1426 | 1429 | 1432 | 1435 | 1439 | 1442 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .16 | 1445 | 1449 | 1452 | 1455 | 1459 | 1462 | 1466 | 1469 | 1472 | 1476 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .17 | 1479 | 1483 | 1486 | 1489 | 1493 | 1496 | 1500 | 1503 | 1507 | 1510 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .18 | 1514 | 1517 | 1521 | 1524 | 1528 | 1531 | 1535 | 1538 | 1542 | 1545 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .19 | 1549 | 1552 | 1556 | 1560 | 1563 | 1567 | 1570 | 1574 | 1578 | 1581 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .20 | 1585 | 1589 | 1592 | 1596 | 1600 | 1603 | 1607 | 1611 | 1614 | 1618 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .21 | 1622 | 1626 | 1629 | 1633 | 1637 | 1641 | 1644 | 1648 | 1652 | 1656 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .22 | 1660 | 1663 | 1667 | 1671 | 1675 | 1679 | 1683 | 1687 | 1690 | 1694 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .23 | 1698 | 1702 | 1706 | 1710 | 1714 | 1718 | 1722 | 1726 | 1730 | 1734 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .24 | 1738 | 1742 | 1746 | 1750 | 1754 | 1758 | 1762 | 1766 | 1770 | 1774 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .25 | 1778 | 1782 | 1786 | 1791 | 1795 | 1799 | 1803 | 1807 | 1811 | 1816 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .26 | 1820 | 1824 | 1828 | 1832 | 1837 | 1841 | 1845 | 1849 | 1854 | 1858 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .27 | 1862 | 1866 | 1871 | 1875 | 1879 | 1884 | 1888 | 1892 | 1897 | 1901 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .28 | 1905 | 1910 | 1914 | 1919 | 1923 | 1928 | 1932 | 1936 | 1941 | 1945 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .29 | 1950 | 1954 | 1959 | 1963 | 1968 | 1972 | 1977 | 1982 | 1986 | 1991 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .30 | 1995 | 2000 | 2004 | 2009 | 2014 | 2018 | 2023 | 2028 | 2032 | 2037 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .31 | 2042 | 2046 | 2051 | 2056 | 2061 | 2065 | 2070 | 2075 | 2080 | 2084 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .32 | 2089 | 2094 | 2099 | 2104 | 2109 | 2113 | 2118 | 2123 | 2128 | 2133 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .33 | 2138 | 2143 | 2148 | 2153 | 2158 | 2163 | 2168 | 2173 | 2178 | 2183 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| .34 | 2188 | 2193 | 2198 | 2203 | 2208 | 2213 | 2218 | 2223 | 2228 | 2234 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .35 | 2239 | 2244 | 2249 | 2254 | 2259 | 2265 | 2270 | 2275 | 2280 | 2286 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .36 | 2291 | 2296 | 2301 | 2307 | 2312 | 2317 | 2323 | 2328 | 2333 | 2339 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .37 | 2344 | 2350 | 2355 | 2360 | 2366 | 2371 | 2377 | 2382 | 2388 | 2393 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .38 | 2399 | 2404 | 2410 | 2415 | 2421 | 2427 | 2432 | 2438 | 2443 | 2449 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .39 | 2455 | 2460 | 2466 | 2472 | 2477 | 2483 | 2489 | 2495 | 2500 | 2506 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .40 | 2512 | 2518 | 2523 | 2529 | 2535 | 2541 | 2547 | 2553 | 2559 | 2564 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .41 | 2570 | 2576 | 2582 | 2588 | 2594 | 2600 | 2606 | 2612 | 2618 | 2624 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .42 | 2630 | 2636 | 2642 | 2649 | 2655 | 2661 | 2667 | 2673 | 2679 | 2685 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .43 | 2692 | 2698 | 2704 | 2710 | 2716 | 2723 | 2729 | 2735 | 2742 | 2748 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .44 | 2754 | 2761 | 2767 | 2773 | 2780 | 2786 | 2793 | 2799 | 2805 | 2812 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .45 | 2818 | 2825 | 2831 | 2838 | 2844 | 2851 | 2858 | 2864 | 2871 | 2877 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .46 | 2884 | 2891 | 2897 | 2904 | 2911 | 2917 | 2924 | 2931 | 2938 | 2944 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .47 | 2951 | 2958 | 2965 | 2972 | 2979 | 2985 | 2992 | 2999 | 3006 | 3013 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .48 | 3020 | 3027 | 3034 | 3041 | 3048 | 3055 | 3062 | 3069 | 3076 | 3083 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| .49 | 3090 | 3097 | 3105 | 3112 | 3119 | 3126 | 3133 | 3141 | 3148 | 3155 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |

# ANTILOGARITHMS

Table 2 continued

| N   | 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 1 | 2 | 3 | 4 | 5  | 6  | 7  | 8  | 9  |
|-----|------|------|------|------|------|------|------|------|------|------|---|---|---|---|----|----|----|----|----|
| .50 | 3162 | 3170 | 3177 | 3184 | 3192 | 3199 | 3206 | 3214 | 3221 | 3228 | 1 | 1 | 2 | 3 | 4  | 4  | 5  | 6  | 7  |
| .51 | 3236 | 3243 | 3251 | 3258 | 3266 | 3273 | 3281 | 3289 | 3296 | 3304 | 1 | 2 | 2 | 3 | 4  | 5  | 5  | 6  | 7  |
| .52 | 3311 | 3319 | 3327 | 3334 | 3342 | 3350 | 3357 | 3365 | 3373 | 3381 | 1 | 2 | 2 | 3 | 4  | 5  | 5  | 6  | 7  |
| .53 | 3388 | 3396 | 3404 | 3412 | 3420 | 3428 | 3436 | 3443 | 3451 | 3459 | 1 | 2 | 2 | 3 | 4  | 5  | 6  | 6  | 7  |
| .54 | 3467 | 3475 | 3483 | 3491 | 3499 | 3508 | 3516 | 3524 | 3532 | 3540 | 1 | 2 | 2 | 3 | 4  | 5  | 6  | 6  | 7  |
| .55 | 3548 | 3556 | 3565 | 3573 | 3581 | 3589 | 3597 | 3606 | 3614 | 3622 | 1 | 2 | 2 | 3 | 4  | 5  | 6  | 7  | 7  |
| .56 | 3631 | 3639 | 3648 | 3656 | 3664 | 3673 | 3681 | 3690 | 3698 | 3707 | 1 | 2 | 3 | 3 | 4  | 5  | 6  | 7  | 8  |
| .57 | 3715 | 3724 | 3733 | 3741 | 3750 | 3758 | 3767 | 3776 | 3784 | 3793 | 1 | 2 | 3 | 3 | 4  | 5  | 6  | 7  | 8  |
| .58 | 3802 | 3811 | 3819 | 3828 | 3837 | 3846 | 3855 | 3864 | 3873 | 3882 | 1 | 2 | 3 | 4 | 4  | 5  | 6  | 7  | 8  |
| .59 | 3890 | 3899 | 3908 | 3917 | 3926 | 3936 | 3945 | 3954 | 3963 | 3972 | 1 | 2 | 3 | 4 | 5  | 5  | 6  | 7  | 8  |
| .60 | 3981 | 3990 | 3999 | 4009 | 4018 | 4027 | 4036 | 4046 | 4055 | 4064 | 1 | 2 | 3 | 4 | 5  | 6  | 6  | 7  | 8  |
| .61 | 4074 | 4083 | 4093 | 4102 | 4111 | 4121 | 4130 | 4140 | 4150 | 4159 | 1 | 2 | 3 | 4 | 5  | 6  | 7  | 8  | 9  |
| .62 | 4169 | 4178 | 4188 | 4198 | 4207 | 4217 | 4227 | 4236 | 4246 | 4256 | 1 | 2 | 3 | 4 | 5  | 6  | 7  | 8  | 9  |
| .63 | 4266 | 4276 | 4285 | 4295 | 4305 | 4315 | 4325 | 4335 | 4345 | 4355 | 1 | 2 | 3 | 4 | 5  | 6  | 7  | 8  | 9  |
| .64 | 4365 | 4375 | 4385 | 4395 | 4406 | 4416 | 4426 | 4436 | 4446 | 4457 | 1 | 2 | 3 | 4 | 5  | 6  | 7  | 8  | 9  |
| .65 | 4467 | 4477 | 4487 | 4498 | 4508 | 4519 | 4529 | 4539 | 4550 | 4560 | 1 | 2 | 3 | 4 | 5  | 6  | 7  | 8  | 9  |
| .66 | 4571 | 4581 | 4592 | 4603 | 4613 | 4624 | 4634 | 4645 | 4656 | 4667 | 1 | 2 | 3 | 4 | 5  | 6  | 7  | 9  | 10 |
| .67 | 4677 | 4688 | 4699 | 4710 | 4721 | 4732 | 4742 | 4753 | 4764 | 4775 | 1 | 2 | 3 | 4 | 5  | 7  | 8  | 9  | 10 |
| .68 | 4786 | 4797 | 4808 | 4819 | 4831 | 4842 | 4853 | 4864 | 4875 | 4887 | 1 | 2 | 3 | 4 | 6  | 7  | 8  | 9  | 10 |
| .69 | 4898 | 4909 | 4920 | 4932 | 4943 | 4955 | 4966 | 4977 | 4989 | 5000 | 1 | 2 | 3 | 5 | 6  | 7  | 8  | 9  | 10 |
| .70 | 5012 | 5023 | 5035 | 5047 | 5058 | 5070 | 5082 | 5093 | 5105 | 5117 | 1 | 2 | 4 | 5 | 6  | 7  | 8  | 9  | 11 |
| .71 | 5129 | 5140 | 5152 | 5164 | 5176 | 5188 | 5200 | 5212 | 5224 | 5236 | 1 | 2 | 4 | 5 | 6  | 7  | 8  | 10 | 11 |
| .72 | 5248 | 5260 | 5272 | 5284 | 5297 | 5309 | 5321 | 5333 | 5346 | 5358 | 1 | 2 | 4 | 5 | 6  | 7  | 9  | 10 | 11 |
| .73 | 5370 | 5383 | 5395 | 5408 | 5420 | 5433 | 5445 | 5458 | 5470 | 5483 | 1 | 3 | 4 | 5 | 6  | 8  | 9  | 10 | 11 |
| .74 | 5495 | 5508 | 5521 | 5534 | 5546 | 5559 | 5572 | 5585 | 5598 | 5610 | 1 | 3 | 4 | 5 | 6  | 8  | 9  | 10 | 12 |
| .75 | 5623 | 5636 | 5649 | 5662 | 5675 | 5689 | 5702 | 5715 | 5728 | 5741 | 1 | 3 | 4 | 5 | 7  | 8  | 9  | 10 | 12 |
| .76 | 5754 | 5768 | 5781 | 5794 | 5808 | 5821 | 5834 | 5848 | 5861 | 5875 | 1 | 3 | 4 | 5 | 7  | 8  | 9  | 11 | 12 |
| .77 | 5888 | 5902 | 5916 | 5929 | 5943 | 5957 | 5970 | 5984 | 5998 | 6012 | 1 | 3 | 4 | 5 | 7  | 8  | 10 | 11 | 12 |
| .78 | 6026 | 6039 | 6053 | 6067 | 6081 | 6095 | 6109 | 6124 | 6138 | 6152 | 1 | 3 | 4 | 6 | 7  | 8  | 10 | 11 | 13 |
| .79 | 6166 | 6180 | 6194 | 6209 | 6223 | 6237 | 6252 | 6266 | 6281 | 6295 | 1 | 3 | 4 | 6 | 7  | 9  | 10 | 11 | 13 |
| .80 | 6310 | 6324 | 6339 | 6353 | 6368 | 6383 | 6397 | 6412 | 6427 | 6442 | 1 | 3 | 4 | 6 | 7  | 9  | 10 | 12 | 13 |
| .81 | 6457 | 6471 | 6486 | 6501 | 6516 | 6531 | 6546 | 6561 | 6577 | 6592 | 2 | 3 | 5 | 6 | 8  | 9  | 11 | 12 | 14 |
| .82 | 6607 | 6622 | 6637 | 6653 | 6668 | 6683 | 6699 | 6714 | 6730 | 6745 | 2 | 3 | 5 | 6 | 8  | 9  | 11 | 12 | 14 |
| .83 | 6761 | 6776 | 6792 | 6808 | 6823 | 6839 | 6855 | 6871 | 6887 | 6902 | 2 | 3 | 5 | 6 | 8  | 9  | 11 | 13 | 14 |
| .84 | 6918 | 6934 | 6950 | 6966 | 6982 | 6998 | 7015 | 7031 | 7047 | 7063 | 2 | 3 | 5 | 6 | 8  | 10 | 11 | 13 | 15 |
| .85 | 7079 | 7096 | 7112 | 7129 | 7145 | 7161 | 7178 | 7194 | 7211 | 7228 | 2 | 3 | 5 | 7 | 8  | 10 | 12 | 13 | 15 |
| .86 | 7244 | 7261 | 7278 | 7295 | 7311 | 7328 | 7345 | 7362 | 7379 | 7396 | 2 | 3 | 5 | 7 | 8  | 10 | 12 | 13 | 15 |
| .87 | 7413 | 7430 | 7447 | 7464 | 7482 | 7499 | 7516 | 7534 | 7551 | 7568 | 2 | 3 | 5 | 7 | 9  | 10 | 12 | 14 | 16 |
| .88 | 7586 | 7603 | 7621 | 7638 | 7656 | 7674 | 7691 | 7709 | 7727 | 7745 | 2 | 4 | 5 | 7 | 9  | 11 | 12 | 14 | 16 |
| .89 | 7762 | 7780 | 7798 | 7816 | 7834 | 7852 | 7870 | 7889 | 7907 | 7925 | 2 | 4 | 5 | 7 | 9  | 11 | 13 | 14 | 16 |
| .90 | 7943 | 7962 | 7980 | 7998 | 8017 | 8035 | 8054 | 8072 | 8091 | 8110 | 2 | 4 | 6 | 7 | 9  | 11 | 13 | 15 | 17 |
| .91 | 8128 | 8147 | 8166 | 8185 | 8204 | 8222 | 8241 | 8260 | 8279 | 8299 | 2 | 4 | 6 | 8 | 9  | 11 | 13 | 15 | 17 |
| .92 | 8318 | 8337 | 8356 | 8375 | 8395 | 8414 | 8433 | 8453 | 8472 | 8492 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 15 | 17 |
| .93 | 8511 | 8531 | 8551 | 8570 | 8590 | 8610 | 8630 | 8650 | 8670 | 8690 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| .94 | 8710 | 8730 | 8750 | 8770 | 8790 | 8810 | 8831 | 8851 | 8872 | 8892 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| .95 | 8913 | 8933 | 8954 | 8974 | 8995 | 9016 | 9036 | 9057 | 9078 | 9099 | 2 | 4 | 6 | 8 | 10 | 12 | 15 | 17 | 19 |
| .96 | 9120 | 9141 | 9162 | 9183 | 9204 | 9226 | 9247 | 9268 | 9290 | 9311 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 17 | 19 |
| .97 | 9333 | 9354 | 9376 | 9397 | 9419 | 9441 | 9462 | 9484 | 9506 | 9528 | 2 | 4 | 7 | 9 | 11 | 13 | 15 | 17 | 20 |
| .98 | 9550 | 9572 | 9594 | 9616 | 9638 | 9661 | 9683 | 9705 | 9727 | 9750 | 2 | 4 | 7 | 9 | 11 | 13 | 16 | 18 | 20 |
| .99 | 9772 | 9795 | 9817 | 9840 | 9863 | 9886 | 9908 | 9931 | 9954 | 9977 | 2 | 5 | 7 | 9 | 11 | 14 | 16 | 18 | 20 |

## NOTES

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