Note: Do not return this handout when you turn in your exam. Instead, save it and use it when you are working homework problems. You will receive a fresh copy with additional equations and tables for the next exam.

Information Handout – Constants, Conversion Factors, Equations, and Other Data

Physical Constants:

$N_A = 6.022 \times 10^{23}$ mol^{-1} (i.e. 1 mol = 6.022×10^{23})
g (gravitational constant) = 9.807 m/s^2
$h = 6.626 \times 10^{-34}$ J·s
c (speed of light) = 2.998×10^8 m/s
R = 0.08206 (L·atm)/(K·mol) = 8.314 J/(K·mol)

Water:

specific heat of water = 4.184 J/(g·K)
density of water = 1.0 g/mL

Nomenclature Prefixes

Number	Prefix		Number	Prefix
1 (sometimes omitted)	mono-		6	hexa-
2	di-		7	hepta-
3	tri-		8	octa-
4	tetra-		9	nona-
5	penta-		10	deca-

Table 2.10

Abbreviations and Prefixes:

amu	atomic mass unit
lb	pound
mi	mile
in	inch
ft	foot
yd	yard
min	minute
hr	hour
yr	year

Prefix	Symbol	Factor	Example
femto	f	10^{-15}	1 femtosecond (fs) = 1×10^{-15} s (0.000000000000001 s)
pico	p	10^{-12}	1 picometer (pm) = 1×10^{-12} m (0.000000000001 m)
nano	n	10^{-9}	4 nanograms (ng) = 4×10^{-9} g (0.000000004 g)
micro	μ	10^{-6}	1 microliter (μL) = 1×10^{-6} L (0.000001 L)
milli	m	10^{-3}	2 millimoles (mmol) = 2×10^{-3} mol (0.002 mol)
centi	c	10^{-2}	7 centimeters (cm) = 7×10^{-2} m (0.07 m)
deci	d	10^{-1}	1 deciliter (dL) = 1×10^{-1} L (0.1 L)
kilo	k	10^{3}	1 kilometer (km) = 1×10^{3} m(1000 m)
mega	M	10^{6}	3 megahertz (MHz) = 3×10^{6} Hz (3,000,000 Hz)
giga	G	10^{9}	8 gigayears (Gyr) = 8×10^{9} yr (8,000,000,000 Gyr)
tera	T	10^{12}	5 terawatts (TW) = 5×10^{12} W (5,000,000,000,000 W)

Conversion Factors:

mass

1 lb = 453.6 g
1 amu = 1.66×10^{-24} g
1 ton = 2000 lb

length

1 inch ≡ 2.54 cm (exact)
1 yard = 3 feet
1 angstrom (Å) = 1×10^{-10} m
1 foot = 12 inches
1 mile = 1.609 km

volume

1 cm^3 = 1 mL
1 gallon = 3.785 L
1 m^3 = 1000 L
1 mL = 0.033814 fl oz
1 gallon = 4 quarts = 8 pints = 16 cups = 128 fl oz
1 ft^3 = 28.3168 L

time

1 minute = 60 seconds
1 day = 24 hours
1 hour = 60 minutes
1 year = 365.25 days

pressure

760 mm Hg = 760 torr = 1 atm = 1.01325 bar = 101,325 Pa = 101.325 kPa = 14.73 psi absolute

energy

1 cal ≡ 4.184 J (exact)
1 food Calorie = 1000 cal = 1 kcal
1 L·atm = 101.3 J

Selected Formulas and Equations:

unit definitions

$1\ N = 1\ kg\ m\ s^{-1}$ $1\ J = 1\ kg\ m^2\ s^{-2}$ $1\ Pa = 1\ N\ m^{-2} = 1\ kg\ m^{-1}\ s^{-2}$

temperature conversions

$T\ (in\ °F) = {}^{9}/_{5}\ T\ (in\ °C) + 32$ $T\ (in\ °C) = {}^{5}/_{9}\ [T\ (in\ °F) - 32]$ $T\ (in\ K) = T\ (in\ °C) + 273.15$

equations for volume

$V_{sphere} = {}^{4}/_{3}\pi r^3$ $V_{cube} = s^3$ $V_{cylinder} = \pi r^2 h$

$V_{box} = lwh$ $V_{cone} = {}^{1}/_{3}\pi r^2 h$ $V = Ah$

miscellaneous conversion units

1 warhol = 15 minutes 1 kardashian = 72 days = 6912 warhols

Figures and Tables

Properties of Subatomic Particles

Name	Location	Charge (C)	Unit Charge	Mass (amu)	Mass (g)
electron	outside nucleus	-1.602×10^{-19}	1−	0.00055	0.00091×10^{-24}
proton	nucleus	1.602×10^{-19}	1+	1.00727	1.67262×10^{-24}
neutron	nucleus	0	0	1.00866	1.67493×10^{-24}

Table 2.2

Common Polyatomic Ions	
ammonium	NH_4^+
mercury(I)	Hg_2^{2+}
acetate	$C_2H_3O_2^-$
azide	N_3^-
cyanide	CN^-
hydroxide	OH^-
chlorate	ClO_3^-
bromate	BrO_3^-
iodate	IO_3^-
nitrate	NO_3^-
sulfate	SO_4^{2-}
thiosulfate	SO_3S^{2-}
phosphate	PO_4^{3-}
carbonate	CO_3^{2-}
chromate	CrO_4^{2-}
dichromate	$Cr_2O_7^{2-}$
manganate	MnO_3^-