

CHEMISTRY
Unit 1 Trial Examination

DATA SHEET

Directions to students

Detach this data sheet during reading time.
This data sheet is provided for your reference.

SI prefixes , their symbols and values

SI prefix	Scientific notation	Multiplying factor
giga (G)	10^9	1 000 000 000
mega (M)	10^6	1 000 000
kilo (k)	10^3	1000
deci (d)	10^{-1}	0.1
centi (c)	10^{-2}	0.01
milli (m)	10^{-3}	0.001
micro (μ)	10^{-6}	0.000001
nano (n)	10^{-9}	0.000000001
pico (p)	10^{-12}	0.000000000001

Constants and useful formulae

Avogadro's constant (N_A) = $6.02 \times 10^{23} \text{ mol}^{-1}$

Density (d) of water at 25 °C = 1.00 g mL^{-1}

Specific heat capacity (c) of water = $4.18 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$

Ionic product for water (K_W) = $1.00 \times 10^{-14} \text{ mol}^2 \text{ L}^{-2}$

$0 \text{ }^\circ\text{C} = 273 \text{ K}$

$1 \text{ ppm (m/V)} = 1 \text{ mg L}^{-1}$

$n = \frac{m}{M}$; $n = \frac{N}{N_A}$; $c = \frac{n}{V}$; $c_1 V_1 = c_2 V_2$

$\Delta E = mc\Delta T$

$\text{pH} = -\log_{10}[\text{H}^+]$; $\text{pOH} = -\log_{10}[\text{OH}^-]$

$\text{pH} + \text{pOH} = 14.0 \text{ at } 25 \text{ }^\circ\text{C}$

Table of some selected ions

1+		2+		3+	
Silver	Ag ⁺	Zinc	Zn ²⁺	Iron(III)	Fe ³⁺
Copper(I)	Cu ⁺	Copper(II)	Cu ²⁺	Chromium(III)	Cr ³⁺
Ammonium	NH ₄ ⁺	Mercury(II)	Hg ²⁺		
		Iron(II)	Fe ²⁺		
1-		2-		3-	
Hydroxide	OH ⁻	Carbonate	CO ₃ ²⁻	Phosphate	PO ₄ ³⁻
Nitrate	NO ₃ ⁻	Sulfate	SO ₄ ²⁻		
Nitrite	NO ₂ ⁻	Sulfite	SO ₃ ²⁻		
Ethanoate	CH ₃ COO ⁻	Dichromate	Cr ₂ O ₇ ²⁻		
Permanganate	MnO ₄ ⁻	Hydrogenphosphate	HPO ₄ ²⁻		
Hydrogencarbonate	HCO ₃ ⁻				
Hydrogensulfate	HSO ₄ ⁻				

Some Solubility Data

Level of Solubility	Ionic compounds containing	Exceptions
Generally soluble	Na ⁺ , K ⁺ , NH ₄ ⁺ , NO ₃ ⁻ , CH ₃ COO ⁻	None
	Cl ⁻ , Br ⁻ , I ⁻	Ag ⁺ compounds
	SO ₄ ²⁻	Pb ²⁺ , Ba ²⁺ , Ag ⁺ and Ca ²⁺ compounds
Low solubility	CO ₃ ²⁻ , PO ₄ ³⁻ , S ²⁻	Na ⁺ , K ⁺ , and NH ₄ ⁺ compounds
	OH ⁻	Na ⁺ , K ⁺ , NH ₄ ⁺ , Ba ²⁺ and Sr ²⁺ compounds

Some electronegativity values

H 2.1

Li 1.0	Be 1.6	B 2.0	C 2.5	N 3.0	O 3.5	F 4.0
Na 0.9	Mg 1.3	Al 1.6	Si 1.9	P 2.2	S 2.6	Cl 3.2

Useful Rules for Polarity of Bonds

$\Delta EN < 0.5$ non-polar covalent

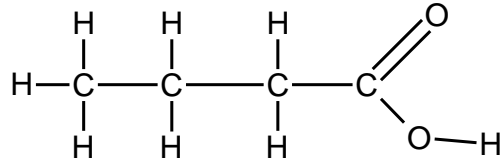
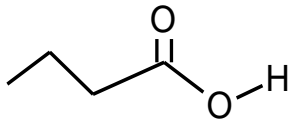
$0.5 < \Delta EN < 1.5$ polar covalent to highly polar covalent

$1.5 < \Delta EN < 2.0$ highly polar covalent or ionic

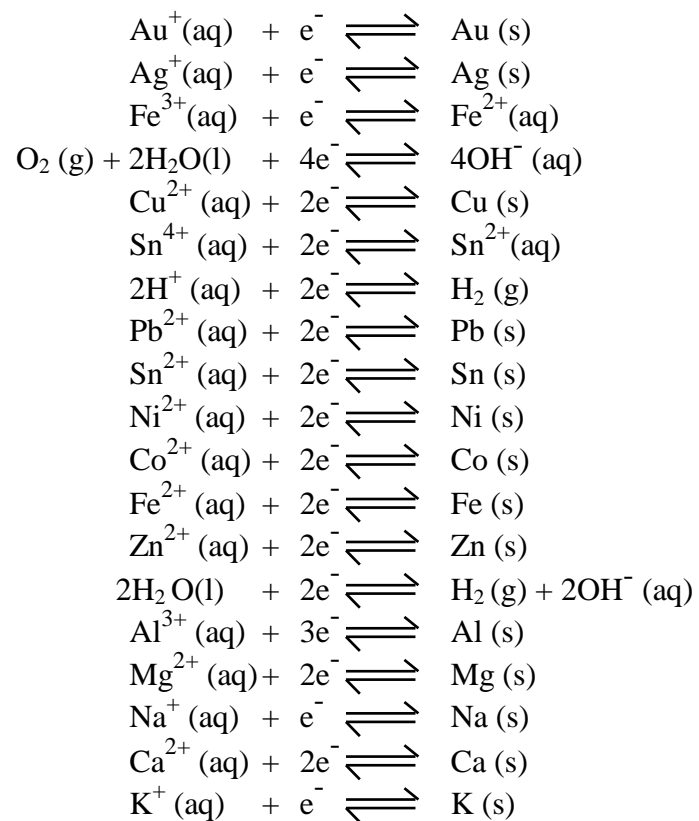
$\Delta EN > 2.0$ ionic

Some Information on Organic Chemistry

Sample representation of organic molecules

Molecular formula	$C_4H_8O_2$ or C_3H_7COOH
Semi-structural formula	$CH_3CH_2CH_2COOH$
Structural formula	
Skeletal structure	

Category of substance	Representation	Functional group
halocarbons	RCH_2F , RCH_2Cl , RCH_2Br , RCH_2I	fluoro, chloro, bromo, iodo
alcohols	RCH_2OH	hydroxy(l)
carboxylic acids	$RCOOH$	carboxy(l)
amines	RCH_2NH_2	amine
alkenes	$RCH=CHR$	

An abridged Reactivity Series

Periodic table of the elements

1 H 1.0 hydrogen																	2 He 4.0 helium						
3 Li 6.9 lithium	4 Be 9.0 beryllium																	5 B 10.8 boron	6 C 12.0 carbon	7 N 14.0 nitrogen	8 O 16.0 oxygen	9 F 19.0 fluorine	10 Ne 20.2 neon
11 Na 23.0 sodium	12 Mg 24.3 magnesium																	13 Al 27.0 aluminium	14 Si 28.1 silicon	15 P 31.0 phosphorus	16 S 32.1 sulfur	17 Cl 35.5 chlorine	18 Ar 39.9 argon
19 K 39.1 potassium	20 Ca 40.1 calcium	21 Sc 45.0 scandium	22 Ti 47.9 titanium	23 V 50.9 vanadium	24 Cr 52.0 chromium	25 Mn 54.9 manganese	26 Fe 55.8 iron	27 Co 58.9 cobalt	28 Ni 58.7 nickel	29 Cu 63.5 copper	30 Zn 65.4 zinc	31 Ga 69.7 gallium	32 Ge 72.6 germanium	33 As 74.9 arsenic	34 Se 79.0 selenium	35 Br 79.9 bromine	36 Kr 83.8 krypton						
37 Rb 85.5 rubidium	38 Sr 87.6 strontium	39 Y 88.9 yttrium	40 Zr 91.2 zirconium	41 Nb 92.9 niobium	42 Mo 96.0 molybdenum	43 Tc (98) technetium	44 Ru 101.1 ruthenium	45 Rh 102.9 rhodium	46 Pd 106.4 palladium	47 Ag 107.9 silver	48 Cd 112.4 cadmium	49 In 114.8 indium	50 Sn 118.7 tin	51 Sb 121.8 antimony	52 Te 127.6 tellurium	53 I 126.9 iodine	54 Xe 131.3 xenon						
55 Cs 132.9 caesium	56 Ba 137.3 barium	57-71 lanthanoids	72 Hf 178.5 hafnium	73 Ta 180.9 tantalum	74 W 183.8 tungsten	75 Re 186.2 rhenium	76 Os 190.2 osmium	77 Ir 192.2 iridium	78 Pt 195.1 platinum	79 Au 197.0 gold	80 Hg 200.6 mercury	81 Tl 204.4 thallium	82 Pb 207.2 lead	83 Bi 209.0 bismuth	84 Po (210) polonium	85 At (210) astatine	86 Rn (222) radon						
87 Fr (223) francium	88 Ra (226) radium	89-103 actinoids	104 Rf (261) rutherfordium	105 Db (262) dubnium	106 Sg (266) seaborgium	107 Bh (264) bohrium	108 Hs (267) hassium	109 Mt (268) meitnerium	110 Ds (271) darmstadtium	111 Rg (272) roentgenium	112 Cn (285) copernicium	113 Nh (280) nihonium	114 Fl (289) flerovium	115 Mc (289) moscovium	116 Lv (292) livermorium	117 Ts (294) tennessine	118 Og (294) oganesson						

Key to table

79	– Atomic number
Au	– Symbol of element
197.0	– Relative atomic mass
gold	– Name of element

57 La 138.9 lanthanum	58 Ce 140.1 cerium	59 Pr 140.9 praseodymium	60 Nd 144.2 neodymium	61 Pm (145) promethium	62 Sm 150.4 samarium	63 Eu 152.0 europium	64 Gd 157.3 gadolinium	65 Tb 158.9 terbium	66 Dy 162.5 dysprosium	67 Ho 164.9 holmium	68 Er 167.3 erbium	69 Tm 168.9 thulium	70 Yb 173.1 ytterbium	71 Lu 175.0 lutetium
89 Ac (227) actinium	90 Th 232.0 thorium	91 Pa 231.0 protactinium	92 U 238.0 uranium	93 Np (237) neptunium	94 Pu (244) plutonium	95 Am (243) americium	96 Cm (247) curium	97 Bk (247) berkelium	98 Cf (251) californium	99 Es (252) einsteinium	100 Fm (257) fermium	101 Md (258) mendelevium	102 No (259) nobelium	103 Lr (262) lawrencium

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