Key H Chemistry Unit 1 Test Study Guide

Math Skills

1. a) 102.10 g 5 s.f.
   b) 0.046020 cm 5 sf
   c) 5.78×10^4 mg 3 s.f
   d) 100 km/hr 1 sf
   e) 100. km/hr 3 sf

Add a decimal point that is visible makes trailing zeroes significant

2. a) 2.23g + 8.3g = 10.53g ⇒ 10.5g can only have 1 sig. figure after the decimal

   b) 1.0005m × 0.0560m = 0.056028 m^2 ⇒ 0.0560 m^2 can have 3 sig. figures total

   c) 68.120 miles − 40.17854 miles = 27.94146 miles
   = 27.941 miles can have 3 sig. figures after the decimal

   d) $\frac{3.0 \times 10^8 \text{ m/s}}{1.50 \times 10^{-7} \text{ m}} = 2 \times 10^{15}$ 1/s ⇒ 2.0×10^{15} 1/s needs 2 sig. figures total

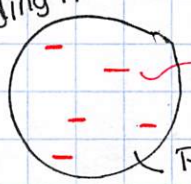
Atomic Theory

3a) Democritus - 1st person to say all matter is made of tiny, indivisible particles, called atomos.

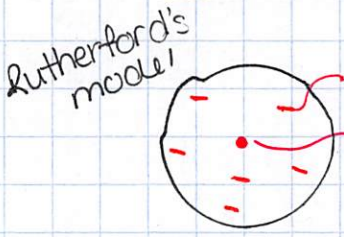
b) John Dalton - developed Dalton's Atomic Theory
   a) All matter is made of tiny, indivisible particles, called atoms
   b) All atoms of an element are identical
   c) Atoms of 1 element are different from atoms of another element
   d) Atoms of elements combine in simple whole # ratios
   e) Atoms cannot be created or destroyed by a chemical reaction

c) JJ Thomson - completed the cathode ray experiment and proved that atoms have tiny negative particles in them called electrons

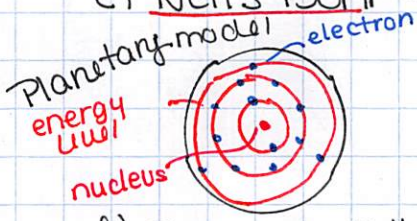
Plum Pudding model



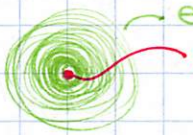
d) Ernest Rutherford - completed the gold foil experiment, that showed atoms have a tiny, positively charged nucleus at their centers. He later determined that there were positively charged protons in the nucleus and neutrons with no charge (w/his student James Chadwick)



e) Neils Bohr - developed the planetary model in which electrons orbit the nucleus in energy levels with specific amounts of energy associated with them



f.) Erwin Schrödinger, Albert Einstein, Neils Bohr, & Werner Heisenberg developed the quantum mechanical model



Atomic Structure

4. a) proton } nucleus
neutron }
electron - e⁻ cloud

b) atomic number - # protons in the nucleus
mass number - sum of the protons & neutron in the nucleus

c.) isotope - atoms of the same element with different amounts of neutrons

d) ignore

e)

Name	Symbol	Atomic #	Mass #	# p^+	# e^-	# n^0	Isotopic Symbol
beryllium	Be	4	9	4	4	9-4=5	$^{9}_{4}Be$
manganese	Mn	25	56	25	25	56-25=31	$^{56}_{25}Mn$
cadmium	Cd	48	48+62=110	48	48	62	$^{110}_{48}Cd$
arsenic	As	33	75	33	33	75-33=42	$^{75}_{33}As$

f) A.M. = (23.98504 · .7870) + (24.98584 · .1013) + (25.98259 · .1117)

A.M. = 24.30954738 = 24.31 g

5. a) O - 16e⁻ $1s^2 2s^2 2p^4$ or $[He]2s^2 2p^4$

b) K - 19e⁻ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$ or $[Ar]4s^1$

c) As - 33e⁻ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^3$ or $[Ar]4s^2 3d^{10} 4p^3$

d) Tc - 43e⁻ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^5$ or $[Kr]5s^2 4d^5$

6. a) when an element is heated, its electrons absorb energy and jump to a higher orbital where it is unstable. In order to move back down to its original orbital, the electron releases photons, packets of energy that have frequencies in the visible light part of the electromagnetic spectrum.

b) i) $c = 3.00 \times 10^8 \text{ m/s}$
$\lambda = 6.80 \times 10^{-7} \text{ m}$
$\nu = ?$

$\nu = \frac{c}{\lambda} = \frac{3.00 \times 10^8 \text{ m/s}}{6.80 \times 10^{-7} \text{ m}} = 4.41 \times 10^{14} \text{ 1/s}$

$E = ?$
$h = 6.626 \times 10^{-34} \text{ J} \cdot \text{s}$
$\nu = 4.41 \times 10^{14} \text{ 1/s}$

$E = h \cdot \nu$
$E = 6.626 \times 10^{-34} \text{ J} \cdot \text{s} \cdot 4.41 \times 10^{14} \text{ 1/s}$
$E = 2.92 \times 10^{-19} \text{ J}$

ii) $c = 3.00 \times 10^8 \text{ m/s}$
$\lambda = ?$
$\nu = 5.25 \times 10^{14} \text{ 1/s}$

$\lambda = \frac{c}{\nu} = \frac{3.00 \times 10^8 \text{ m/s}}{5.25 \times 10^{14} \text{ 1/s}} = 5.71 \times 10^{-7} \text{ m}$

iii) $c = 3.00 \times 10^8 \text{ m/s}$
$\lambda = 4.85 \times 10^{-7} \text{ m}$
$\nu = ?$

$\nu = \frac{c}{\lambda} = \frac{3.00 \times 10^8 \text{ m/s}}{4.85 \times 10^{-7} \text{ m}} = 6.19 \times 10^{14} \text{ 1/s}$

$E = ?$
$h = 6.626 \times 10^{-34} \text{ J} \cdot \text{s}$
$\nu = 6.19 \times 10^{14} \text{ 1/s}$

$E = 6.626 \times 10^{-34} \text{ J} \cdot \text{s} \cdot 6.19 \times 10^{14} \text{ 1/s}$
$E = 4.10 \times 10^{-19} \text{ J}$

iv) $c = 3.00 \times 10^8 \text{ m/s}$
$\lambda = ?$
$\nu = 7.00 \times 10^{14} \text{ 1/s}$

$\lambda = \frac{c}{\nu} = \frac{3.00 \times 10^8 \text{ m/s}}{7.00 \times 10^{14} \text{ 1/s}} = 4.29 \times 10^{-7} \text{ m}$

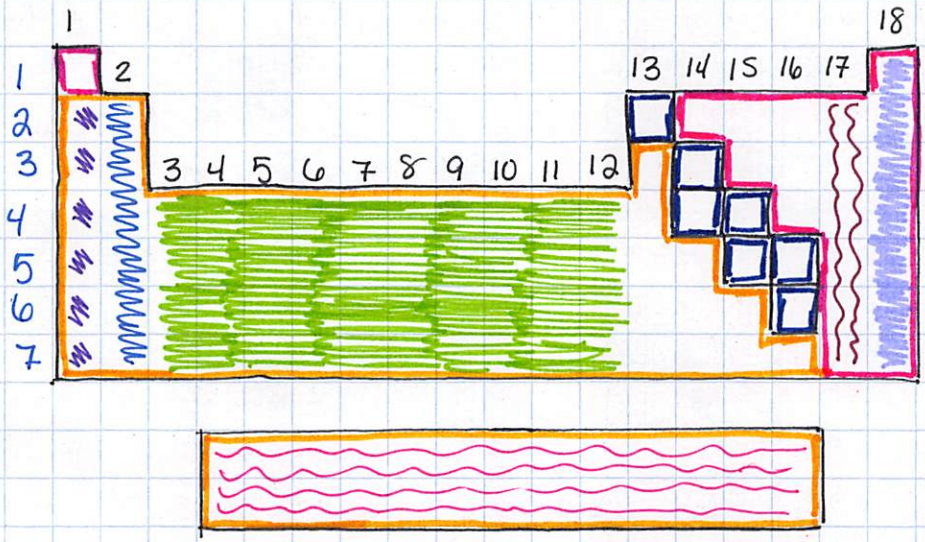
$E = ?$
$h = 6.626 \times 10^{-34} \text{ J} \cdot \text{s}$
$\nu = 7.00 \times 10^{14} \text{ 1/s}$

$E = 6.626 \times 10^{-34} \text{ J} \cdot \text{s} \cdot 7.00 \times 10^{14} \text{ 1/s}$
$E = 4.64 \times 10^{-19} \text{ J}$

7. Nuclear chemistry

Elements between hydrogen and iron were formed by nuclear fusion in stars. Elements heavier than iron are formed by nuclear fusion in supernovas when stars explode when dying.

The Periodic Table



8. group - vertical columns
9. period - horizontal rows

10. metals metalloids nonmetals
11. a) transition metals
    b) noble gases
    c) inner transition metals (rare earth metals)
    d) halogens
    e) alkaline earth metals
    f) alkali metals

12. The Periodic Table is arranged in order of increasing atomic #

13.

	atomic radius	ionization energy	electronegativity
down a group	increases	decreases	decreases
across a period	decreases	increases	increases

14. a) Cr is larger than Cu (atomic radius)

b) W has a larger ionization energy

c) i) Si → Pb → Fl
ii) Sb → Ag → Mo

d) i) Si → Pb → Fl
ii) Sb → Ag → Mo

e) i) Fl → Pb → Si
ii) Mo → Ag → Sb