Physics Unit Test - Review

- 1.1 What are the properties of energy

- What is Energy:

  _____

- **Everything** has energy
- Energy can **never** be **created or destroyed**
- Energy is **constantly** transferring and transforming
- What is System:

  _____

- What is Surrounding:

  _____

- **Universe** = _____ + _____

Question: Andrew is skiing downhill:

- System: _____
- Surroundings:_____
- When does energy added to the system from the surroundings

  _____

- When does the energy released from system to the surroundings

  _____

- 1.2 Different forms of energy

- **What is Kinetic energy:** _____
- **What is Potential energy:** _____
- Identify which types of energy they are.

  Example: Mechanical energy (Kinetic energy)

- Magnetic energy
- Thermal energy
- Chemical energy
- Gravitational energy
- Radiant energy
- Nuclear energy
- Electrical potential energy
- Sound energy
- Electrical kinetic energy
- Elastic energy

- 1.3 Energy transfer and transformation

- **What is the Law of Conservation of energy:**

  _____

- **Energy transfer** is

  _____

- **Energy transformations** are

  _____

- 1.4 Energy calculation（Potential energy & Kinetic energy）

- Definition of Physical quantities:

  _____

- Physical quantities must have both _____ and _____

- **Gravitational potential energy**

  Write down the formula of the E_p:_____

  - $W = mg$
  - $E_p = Gravitational\ Potential\ Energy\ (Joules)\ (J)$
  - $m = mass\ (Kilograms)\ (kg)$
  - $g = Gravitational\ Field\ Strength = 9.8\ m/s^2\ (field\ strength)$ we will use 10 instead

- $h = height\ (metres)\ (m)$: from reference position
- $W = Weight\ (Newton)(N)$

*Note: Weight and mass are different things.

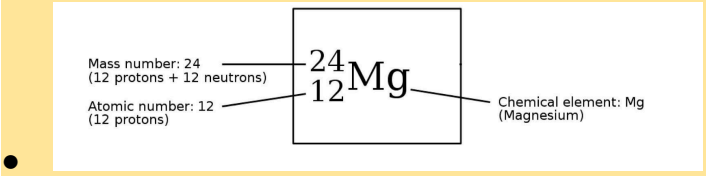
*Note: $Gravitational\ Field\ Strength$ is different on every plant

- **Formula of the Kinetic Energy**: E_k**=_____**
  - $E_k = Kinetic\ Energy\ (Joules)\ (J)$
  - $m = mass\ (Kilograms)\ (kg)$
  - $v = Velocity\ (Metres\ per\ Second)\ (m/s)$

Example 1: A ball is moving with a kinetic energy of 100J. If its mass is 2 Kg, what is its speed?

Example 2: A roller coaster car (mass = 500 kg) is at the top of a 30-meter-high hill. What is its speed when it reaches the bottom (assuming no friction)?

- 2.1 Chemistry review

- Atoms are made up of _____, _____ and _____.
- The nucleus is at the _____ of the _____ and made up of _____ and _____
- 

- Mass number is that total number of _____ and _____ together.
- Number of protons = number of _____

- 2.2 Chemical Reactions（Exothermic & Endothermic)

- **Chemical reactions:**

  _____

- **Exothermic:**
  - Energy is _____ during the reaction
  - Reactants are _____ in chemical potential energy than the products.

- **Endothermic**:
  - Energy is _____ during the reaction
  - Reactants are _____ in chemical potential energy than the products.

Indicate whether they are Exothermic or Endothermic

- $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + Energy$ _____
- $6CO_2 + 6H_2O + Energy \rightarrow C_6H_{12}O_6 + 6O_2$ _____

- 3.1 Isotopes, Radioactivity & Nuclear Equations（Alpha, Beta & Gamma)

- **Parts of an atom:**
  - All matter is made of tiny _____ called atoms
- **Isotopes** are _____

  _____
  - The number of _____ determines the mass of the isotope, because _____
  - Isotopes are commonly **named by their** _____
- **Standard Atomic Notation(SAN)**

$$\begin{matrix} Mass\ number \\ Atomic\ number = number\ of\ protons \end{matrix} Chemical\ element$$

  - Example:

Isotope	Standard Atomic Notation	Isotope	Standard Atomic Notation
Potassium - 39 ↑ ↑ Element Mass number		Potassium - 41 ↑ ↑ Element Mass number	

- **Nuclear Equations:**
  - **Parent isotope:**

    _____
  - **Daughter isotopes:**

    _____
  - In the nuclear equation:
    - **The sum of the _____ number cannot change**: the total atomic mass in the parent and daughter isotopes, and decay products must be **equal**.
    - **The sum of the _____ number cannot change**: the total atomic number(number of protons) in the parent and daughter isotopes, and decay products must be **equal**.

- **Alpha Particles**: Radiation created when an unstable atom decays and releases a helium nucleus.
    - $Represent$: ${}^{4}_{2}\alpha \;\; OR$ _____
    - Steps for Write an equations for Alpha Particles
    -

STEPS:

1. Write the parent isotope in SAN
2. Put an arrow after the parent isotope
3. Complete the daughter isotope as follows: **decrease** the **atomic number** of the parent isotope by **2** and the **decrease** the **atomic mass** by **4**. Then, find the new element that you have created on the periodic table (based on the atomic number), and add the symbol.
4. For the other product, add an alpha particle in SAN
5. Make sure that atomic masses and atomic numbers are balanced.

    - Example: Write an equation for the alpha decay of **uranium-238.**

      _____

- **Beta Particles**: Radiation created when a neutron in an unstable atom decays and releases an electron.
    - $Represent$: ${}^{0}_{-1}\beta \;\; OR$ _____
    - Steps for Write an equations for Beta Particles

STEPS:

1. Write the parent isotope in SAN
2. Put an arrow after the parent isotope
3. Complete the daughter isotope as follows: **increase** the **atomic number** of the parent isotope by **1**. Leave the **mass number** unchanged. Then, find the new element that you have created on the periodic table (based on the atomic number), and add the symbol.
4. For the other product, add a beta particle in SAN
5. Make sure that atomic masses and atomic numbers are balanced.

- Example: Write an equation for the beta decay of **mercury-201**.

_____

- **Gamma rays:** Radiation created when an unstable atom releases excess energy as high energy light.
  - *Represent*: _____
  - Steps for Write an equations for Gamma rays

STEPS:

1. Write the parent isotope in SAN. Use an asterisk to denote that it is high energy.
2. Put an arrow after the parent isotope
3. Complete the daughter isotope as follows: **keep it the same** as the parent isotope (but no asterisk).
4. For the other product, add a gamma particle in SAN
5. Make sure that atomic masses and atomic numbers are balanced.

  - Example: Write an equation for the gamma decay of **potassium-42**.

_____

- 3.2 Half-Life & Radioactive Dating

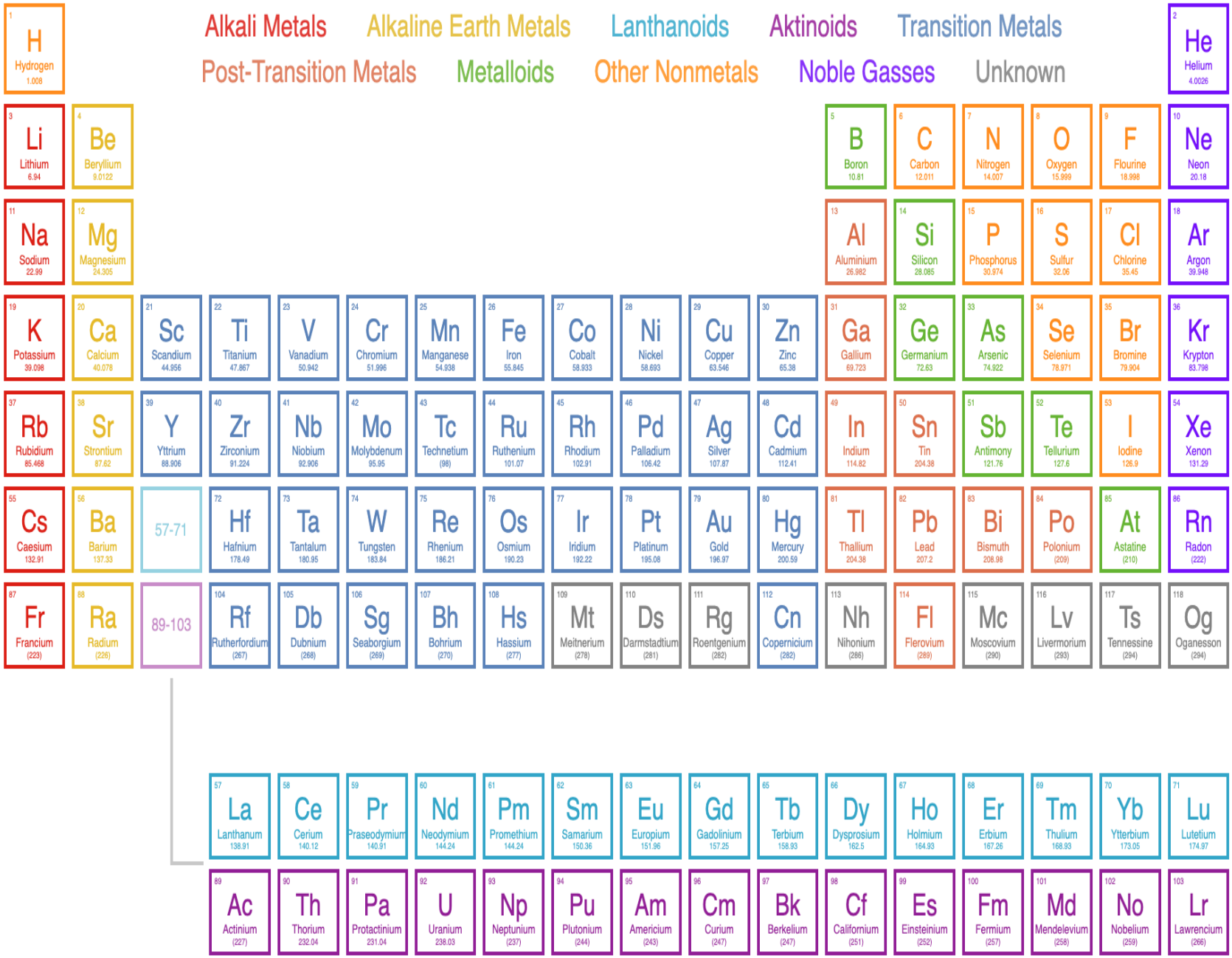
- The amount of time it takes for _____ of the radioactive nuclei in a sample to decay is called its half-life.
- % of the parent isotopes + % of the daughter isotopes = _____
- Make sure that you ALWAYS _____ for half life and time, and at _____ for the amount of the parent isotope

Half-life	Time	Amount
0	0	100%
1	1 Half-life	
2	2 half-lives	
3		
4		6.25%

Example 1: If 100 grams of uranium-238 were present in a sample of bone, state how many grams would be left after 18 billion years?

Example 2: A rock sample was dated using potassium-40. Measurement indicates that 1/16 of the original parent isotope is left in the rock sample. How old is the rock sample?

Isotope		Half-life of Parent (years)
Parent	*Daughter*	
Carbon-14	Nitrogen-14	5730
Uranium-235	Lead-207	710 million
Potassium-40	Argon-40	1.3 billion
Uranium-238	Lead-206	4.5 billion
Thorium-235	Lead-208	14 billion
Rubidium-87	Strontium-87	47 billion


Alkali Metals
Alkaline Earth Metals
Lanthanoids
Aktinoids
Transition Metals
Post-Transition Metals
Metalloids
Other Nonmetals
Noble Gasses
Unknown
1 H Hydrogen 1.008
2 He Helium 4.0026
3 Li Lithium 6.94
4 Be Beryllium 9.0122
5 B Boron 10.81
6 C Carbon 12.011
7 N Nitrogen 14.007
8 O Oxygen 15.999
9 F Flourine 18.998
10 Ne Neon 20.18
11 Na Sodium 22.99
12 Mg Magnesium 24.305
13 Al Aluminium 26.982
14 Si Silicon 28.085
15 P Phosphorus 30.974
16 S Sulfur 32.06
17 Cl Chlorine 35.45
18 Ar Argon 39.948
19 K Potassium 39.098
20 Ca Calcium 40.078
21 Sc Scandium 44.956
22 Ti Titanium 47.867
23 V Vanadium 50.942
24 Cr Chromium 51.996
25 Mn Manganese 54.938
26 Fe Iron 55.845
27 Co Cobalt 58.933
28 Ni Nickel 58.693
29 Cu Copper 63.546
30 Zn Zinc 65.38
31 Ga Gallium 69.723
32 Ge Germanium 72.63
33 As Arsenic 74.922
34 Se Selenium 78.971
35 Br Bromine 79.904
36 Kr Krypton 83.798
37 Rb Rubidium 85.468
38 Sr Strontium 87.62
39 Y Yttrium 88.906
40 Zr Zirconium 91.224
41 Nb Niobium 92.906
42 Mo Molybdenum 95.95
43 Tc Technetium (98)
44 Ru Ruthenium 101.07
45 Rh Rhodium 102.91
46 Pd Palladium 106.42
47 Ag Silver 107.87
48 Cd Cadmium 112.41
49 In Indium 114.82
50 Sn Tin 204.38
51 Sb Antimony 121.76
52 Te Tellurium 127.6
53 I Iodine 126.9
54 Xe Xenon 131.29
55 Cs Caesium 132.91
56 Ba Barium 137.33
57-71
72 Hf Hafnium 178.49
73 Ta Tantalum 180.95
74 W Tungsten 183.84
75 Re Rhenium 186.21
76 Os Osmium 190.23
77 Ir Iridium 192.22
78 Pt Platinum 195.08
79 Au Gold 196.97
80 Hg Mercury 200.59
81 Tl Thallium 204.38
82 Pb Lead 207.2
83 Bi Bismuth 208.98
84 Po Polonium (209)
85 At Astatine (210)
86 Rn Radon (222)
87 Fr Francium (223)
88 Ra Radium (226)
89-103
104 Rf Rutherfordium (267)
105 Db Dubnium (268)
106 Sg Seaborgium (269)
107 Bh Bohrium (270)
108 Hs Hassium (277)
109 Mt Meitnerium (278)
110 Ds Darmstadtium (281)
111 Rg Roentgenium (282)
112 Cn Copernicium (282)
113 Nh Nihonium (286)
114 Fl Flerovium (289)
115 Mc Moscovium (290)
116 Lv Livermorium (293)
117 Ts Tennessine (294)
118 Og Oganesson (294)
57 La Lanthanum 138.91
58 Ce Cerium 140.12
59 Pr Praseodymium 140.91
60 Nd Neodymium 144.24
61 Pm Promethium 144.24
62 Sm Samarium 150.36
63 Eu Europium 151.96
64 Gd Gadolinium 157.25
65 Tb Terbium 158.93
66 Dy Dysprosium 162.5
67 Ho Holmium 164.93
68 Er Erbium 167.26
69 Tm Thulium 168.93
70 Yb Ytterbium 173.05
71 Lu Lutetium 174.97
89 Ac Actinium (227)
90 Th Thorium 232.04
91 Pa Protactinium 231.04
92 U Uranium 238.03
93 Np Neptunium (237)
94 Pu Plutonium (244)
95 Am Americium (243)
96 Cm Curium (247)
97 Bk Berkelium (247)
98 Cf Californium (251)
99 Es Einsteinium (252)
100 Fm Fermium (257)
101 Md Mendelevium (258)
102 No Nobelium (259)
103 Lr Lawrencium (266)