CONCEPT: ATOMIC MASS (SIMPLIFIED)

- **Atomic Masses** of elements can be found by simply looking at the Periodic Table.
  - □ The atomic mass of an element is an average of all its isotopes that uses the units of _____, _____ or _____.
  - □ Recall that 1 amu = _____ kg.

	1A (1)	2A (2)	3B (3)	4B (4)	5B (5)	6B (6)	7B (7)	8B (8)	8B (9)	8B (10)	1B (11)	2B (12)	3A (13)	4A (14)	5A (15)	6A (16)	7A (17)	8A (18)
1	1 H 1.008																	2 He 4.003
2	3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
3	11 Na 22.99	12 Mg 24.31											13 Al 26.982	14 Si 28.085	15 P 30.974	16 S 32.06	17 Cl 35.45	18 Ar 39.948
4	19 K 39.10	20 Ca 40.08	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.38	31 Ga 69.723	32 Ge 72.630	33 As 74.922	34 Se 78.971	35 Br 79.904	36 Kr 83.798
5	37 Rb 85.47	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.95	43 Tc 98	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
6	55 Cs 132.91	56 Ba 137.33	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
7	87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (267)	105 Db (268)	106 Sg (269)	107 Bh (270)	108 Hs (270)	109 Mt (278)	110 Ds (281)	111 Rg (282)	112 Cn (285)	113 Nh (286)	114 Fl (289)	115 Mc (290)	116 Lv (293)	117 Ts (294)	118 Og (294)

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.05	71 Lu 174.97
90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (266)

EXAMPLE: Which of the following represents an element from the first column with the greatest atomic mass?

a) Ba b) Al c) Cs d) Li e) Na

PRACTICE: Which of the following choices has the greatest atomic mass?

a) Element A (0.283 kg)

b) Element B (3.20×10^{24} amu)

c) Element C (0.350 kg)

d) Element D (4.14×10^{26} Da)

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Calculating Atomic Mass

- The **Atomic Mass** of an element can be calculated if you know the **Isotopic Masses** and **Percent Abundances**.
  - **Isotopic Masses:** The masses for all the isotopes of a given element.
  - **Percent Abundances** (Natural Abundances): Percentages available for each of the isotopes of a given element.
    - Sometimes referred to as _____ abundances.
  - **Isotopic Abundance (Fractional Abundance):** The **percent abundance** of an isotope divided by _____.

Atomic Mass Formula

Atomic Mass = [(Isotope Mass __)•(Isotopic Abundance)] + [(Isotope Mass __)•(Isotopic Abundance)]

EXAMPLE: Calculate the atomic mass of gallium if gallium has 2 naturally occurring isotopes with the following masses and natural abundances:

Ga-69	68.9256 amu	60.11%
Ga-71	70.9247 amu	39.89%

a) 69.72 amu b) 69.93 amu c) 70.00 amu d) 69.80 amu e) 70.68 amu

STEP 1: If you are given **percent abundances** then divide them by _____ in order to isolate the **isotopic abundances**.

STEP 2: Plug your given variables into the atomic mass formula in order to isolate the missing variable.

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PRACTICE: Only three isotopes of magnesium exist on earth. ^{24}Mg is the most common form at 78.70% natural abundance with a mass of 23.98504 amu, ^{25}Mg has a 10.13% natural abundance, while ^{26}Mg has a natural abundance of 11.17% and a mass of 25.98259 amu. What is the mass of the ^{25}Mg isotope?

PRACTICE: Silver has an atomic mass of 107.868 amu. The Ag-109 isotope (108.905 amu) is 48.16%. What is the amu of the other isotope?

a) 106.905 amu b) 106.908 amu c) 106.903 amu d) 106.911 amu