Complete the following problems. Write your final answers in the blanks provided. You must show your work to receive full credit. Show your answers to the correct number of significant figures with the correct units.

1. The two naturally occurring isotopes of nitrogen have masses of 14.0031 amu and 15.0001 amu. Determine the percentage of nitrogen -15 (<sup>15</sup>N) in naturally occurring nitrogen (8 pts)

Since only two isotopes exist:

So

$$f_{14} + f_{15} = 1$$
 and  $14.0031f_{14} + 15.0001f_{15} = 14.0067$  (This is our definition of atomic mass) 
$$f_{14} = 1 - f_{15}$$
 
$$14.0031(1 - f_{15}) + 15.0001f_{15} = 14.0067$$
 
$$14.0031 - 14.0031f_{15} + 15.0001f_{15} = 14.0067$$

$$4.0031 - 14.0031_{15} + 15.0001_{15} = 14.006$$
  
 $(15.0001 - 14.0031)f_{15} = 14.0067 - 14.0031$   
 $0.997f_{15} = 0.0036$   
 $f_{15} = 0.0036_1$   
 $%^{15}N = 100\% \times 0.0036 = 0.36\%$ 

Answer\_\_\_\_\_0.36%\_\_\_\_\_

2. Complete the table below. (8 pts.)

Name	Symbol	# Protons	# Neutrons	# Electrons
chromium – 53	<sup>53</sup> Cr	24	29	24
magnesium-52 (I know this doesn't exist)	<sup>52</sup> Mg	12	40	12
sodium-23 ion	<sup>23</sup> Na <sup>+</sup>	11	12	10

3. How many atoms are present in a rectangular block of copper that is 22.0 mm long, 11.5 mm high and 4.3 mm wide? The density of copper is 8.92 g/cm<sup>3</sup>. (9 pts)

$$V = I \times W \times h = 2.20 \text{ cm} \times 1.15 \text{ cm} \times 0.43 \text{ cm} = 1.088 \text{ cm}^3$$

$$1.088 \frac{\text{cm}^3}{\text{cm}^3}$$
 x  $\frac{8.92 \frac{\text{g Cu}}{\text{cm}^3}}{\text{63.546 g Cu}}$  x  $\frac{1 \frac{\text{mol Cu}}{\text{cu}}}{\text{63.546 g Cu}}$  x  $\frac{6.022 \times 10^{23} \text{ atoms}}{1 \frac{\text{mol Cu}}{\text{cu}}} = 9.196 \times 10^{22} \text{ atoms}$ 

## **Possibly Useful Information**

% by mass = $\frac{\text{g component}}{1000}$	d m/v	y lywyh
$\frac{90 \text{ by mass}}{100 \text{ g sample}}$	d = m/v	v = I x w x h

18 8A 2 He 4.00260	10 Ne 20.1797	18 Ar 39.948	36 Kr 83.80	54 Xe 131.29	86 Rn (222)	
17 7A	9 F 18.9984	17 CI 35.4527	35 Br 79.904	53 I 126.904	85 <b>At</b> (210)	
16 6A	8 O 15.9994	16 S 32.066	34 Se 78.96	52 Te 127.60	84 Po (209)	
15 5A	7 N 14.0067	15 P 30.9738	33 As 74.9216	51 Sb 121.757	83 <b>Bi</b> 208.980	
14 4A	6 C 12.011	14 Si 28.0855	32 Ge 72.61	50 Sn 118.710	82 <b>Pb</b> 207.2	
13 3A	5 B 10.811	13 A1 26.9815	31 Ga 69.723	49 In 114.818	81 TI 204.383	
		12 2B	30 Zn 65.39	48 Cd 112.411	80 Hg 200.59	
		11 1B	29 Cu 63.546	47 Ag 107.868	79 Au 196.967	Rg (272)
		10	28 Ni 58.693	46 Pd 106.42	78 Pt 195.08	110 Ds (271)
		-8B	27 Co 58.9332	45 Rh 102.906	77 Ir 192.22	109 Mt (268)
		$\infty$	26 Fe 55.847	44 Ru 101.07	76 Os 190.23	108 Hs (277)
		7 7B	25 Mn 54.9381	43 Tc (98)	75 Re 186.207	107 Bh (264)
		6 6B	24 Cr 51.9961	42 Mo 95.94	74 W 183.84	106 Sg (266)
		5 5B	23 V 50.9415	41 Nb 92.9064	73 Ta 180.948	105 Db (262)
		4B	22 Ti 47.88	40 Zr 91.224	72 Hf 178.49	104 Rf (261)
		3 3B	21 Sc 44.9559	39 Y 88.9059	57 *La 138.906	89 † <b>Ac</b> 227.028
2 2A	4 Be 9.01218	12 Mg 24.3050	20 Ca 40.078	38 Sr 87.62	56 <b>Ba</b> 137.327	88 <b>Ra</b> 226.025
1 1A 1 H 1.00794	3 Li 6.941	11 Na 22.9898	19 K 39.0983	37 <b>Rb</b> 85.4678	55 Cs 132.905	87 Fr (223)

	58	59	09	61	62	63	64	65	99	29	89	69	20	71
*Lanthanide series	o O	Pr	Nd	Pm	Sm	Eu	PS	Tb	Dy	Ho	Er	Tm	Хb	Lu
	140.115	140.908	144.24	(145)	150.36	151.965	157.25	158.925	162.50	164.930	167.26	168.934	173.04	174.967
	06	91	92	93	94	95	96	46	86	66	100	101	102	103
<sup>†</sup> Actinide series	T	Pa	n	Np	Pu	Am	Cm	Bk	Ç	Es	Fm	Md	No	Ľ
	232.038	231.036	238.029	237.048	(244)	(243)	(247)	(247)	(251)	(252)	(257)	(258)	(523)	(292)

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