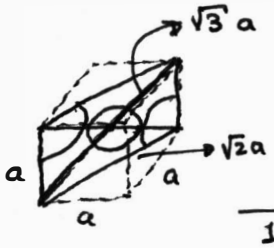
Assignment 1

1. a)

plane 1		
x	y	z
$-a/2$	$-a/2$	$a/2$
$-1/2$	$-1/2$	$1/2$
-2	-2	2
$(\bar{2}\bar{2}2)$		

plane 2		
x	y	z
∞	a	∞
∞	1	∞
0	1	0
(010)		

b)



$\sqrt{3}a = 2(r_{Cl^-} + r_{Cs^+})$

$\rightarrow a = \frac{6.96}{\sqrt{3}} = 4.02\ \text{Å}$

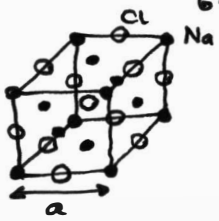
1 Cs^+, 1 Cl^-

% taken by atoms $= \frac{4/3\pi r_{Cl^-}^3 + 4/3\pi r_{Cs^+}^3}{a^3}$

$= 68\%$

c) density $= \frac{(133 + 35.5)}{6.02 \times 10^{23}} \times \frac{1}{a^3} = 4.31\ g/cm^3$

d)



$a = 2(r_{Cl} + r_{Na}) = 5.66\ \text{Å}$

2.

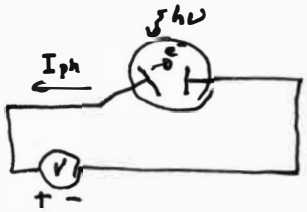
Al:	2.7	g/cm^3	FCC
Mg:	1.7	g/cm^3	HCP
Ti:	4.5	g/cm^3	HCP

All these materials have close packed crystal structure with a high packing density. Mg has the lightest atom so it is useful for building light weight structures. However, it is highly flammable. So Al ~~[illegible]~~ can be used for lightweight structures. Ti is heavier atom, but it is strong and ductile.

3. b)

λ (nm)	$\nu = c/\lambda$ (Hz)	$E = h\nu$ (eV)	V (V)
190	1.58×10^{15}	6.53	1.24
220	1.36×10^{15}	5.62	0.37
300	10^{15}	4.13	0
400	7.5×10^{14}	3.10	0
500	6×10^{14}	2.48	0

a)



c)

λ (nm)	V (V)
190	3.59
220	2.72
300	1.23
400	0.2
500	0

higher values for stopping voltage.

$E = q V_s + \phi$