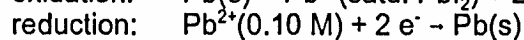
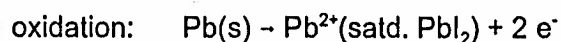
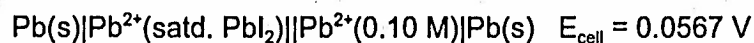


1. Calculate solubility product for  $\text{PbI}_2$  given the following concentration cell information:

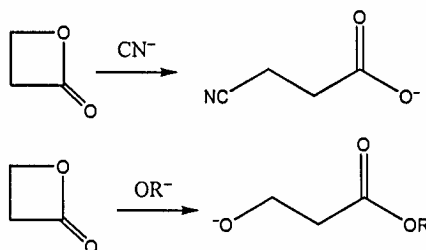


R is 8.314 J/mol and F= 96485 coulombs/mol

4

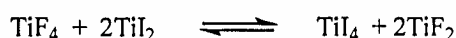
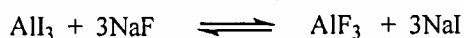
2. How do you explain the formation of the two different type of products using the given nucleophiles/bases?

2



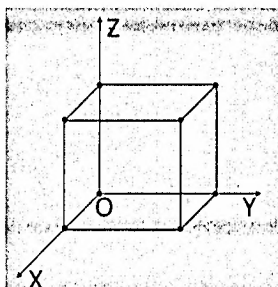
3. Predict which way the following reactions will go with reasons in bullet points

3



4. Write down the coordinates of the Tetrahedral and Octahedral holes in a Face centred cubic lattice. You must use the following coordinates with the given origin

3



5. You found a piece of charcoal from an old fireplace during an excavation. You analyzed and found that the piece gives 240 decays/min. How many years is the age of that piece of charcoal you found? Half life of  $^{14}\text{C}$  = 5730 y and the present atmospheric ratio of  $^{14}\text{C}/^{12}\text{C}$  =  $1.3 \times 10^{-12}$

4

6. Predict the principal rotation axis and the mirror planes in the following two molecules show with drawing. (You have to be neat get marks)

4

(a)  $\text{BH}_3$ (b)  $\text{NH}_3$ 

*Signature*  
29/9/18

### Standard Reduction Potentials in Aqueous Solutions at 25 °C

Oxidizing Agent		Reducing Agent	Reduction Potential (V)
$F_2$	+ $2e^-$	$2F^-$	2.87
$H_2O_2$	+ $2H^+ + 2e^-$	$2H_2O$	1.78
$MnO_4^-$	+ $8H^+ + 5e^-$	$Mn^{2+} + 4H_2O$	1.51
$Au^{3+}$	+ $3e^-$	$Au$	1.50
$Cl_2$	+ $2e^-$	$2Cl^-$	1.36
$O_2$	+ $4H^+ + 4e^-$	$2H_2O$	1.23
$Cr_2O_7^{2-}$	+ $14H^+ + 6e^-$	$2Cr^{3+} + 7H_2O$	1.23
$Br_2$	+ $2e^-$	$2Br^-$	1.07
$NO_3^-$	+ $4H^+ + 3e^-$	$NO + 2H_2O$	0.98
$Ag^+$	+ $e^-$	$Ag$	0.80
$I_2$	+ $2e^-$	$2I^-$	0.54
$Cu^+$	+ $e^-$	$Cu$	0.52
$O_2$	+ $2H_2O + 4e^-$	$4OH^-$	0.40
$Cu^{2+}$	+ $2e^-$	$Cu$	0.34
$2H_3O^+$	+ $2e^-$	$H_2 + 2H_2O$	0.00
$Pb^{2+}$	+ $2e^-$	$Pb$	-0.13
$Sn^{2+}$	+ $2e^-$	$Sn$	-0.14
$Ni^{2+}$	+ $2e^-$	$Ni$	-0.26
$Fe^{2+}$	+ $2e^-$	$Fe$	-0.45
$Cr^{3+}$	+ $3e^-$	$Cr$	-0.74
$Zn^{2+}$	+ $2e^-$	$Zn$	-0.76
$2H_2O$	+ $2e^-$	$H_2 + 2OH^-$	-0.83
$Mn^{2+}$	+ $2e^-$	$Mn$	-1.19
$Al^{3+}$	+ $3e^-$	$Al$	-1.66
$Mg^{2+}$	+ $2e^-$	$Mg$	-2.37
$Na^+$	+ $e^-$	$Na$	-2.71
$Ca^{2+}$	+ $2e^-$	$Ca$	-2.87
$Ba^{2+}$	+ $2e^-$	$Ba$	-2.91
$K^+$	+ $e^-$	$K$	-2.93
$Li^+$	+ $e^-$	$Li$	-3.04

Element	Atomic Radius (nm)	Crystal Structure	Electro-negativity	Valence
Cu	0.1278	FCC	1.9	2
C	0.071		2.5	
H	0.046			
O	0.060			
Ag	0.1445	FCC	1.9	1
Al	0.1431	FCC	1.5	3
Co	0.1253	HCP	1.8	2
Cr	0.1249	BCC	1.6	3
Fe	0.1241	BCC	1.8	2
Ni	0.1246	FCC	1.8	2
Pd	0.1376	FCC	2.2	2
Zn	0.1332	HCP	1.6	2