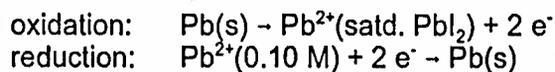
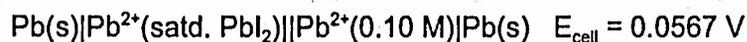
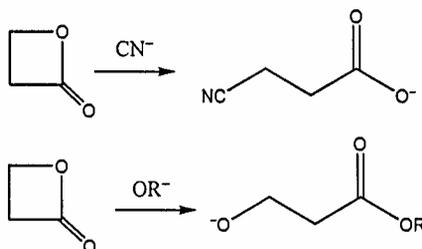


1. Calculate solubility product for  $\text{PbI}_2$  given the following concentration cell information:



$R$  is  $8.314 \text{ J/mol}$  and  $F = 96485 \text{ coulombs/mol}$  4

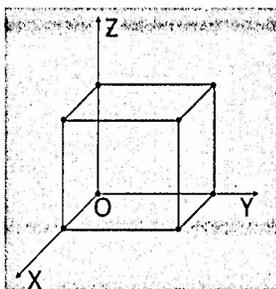
2. How do you explain the formation of the two different type of products using the given nucleophiles/bases? 2



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

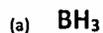


4. Write down the coordinates of the Tetrahedral and Octahedral holes in a Face centred cubic lattice. You must use the following coordinates with the given origin 3



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  $^{14}\text{C} = 5730 \text{ y}$  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



*[Signature]*  
29/9/18

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

Oxidizing Agent		Reducing Agent	Reduction Potential (V)
F <sub>2</sub>	+ 2e <sup>-</sup>	→ 2F <sup>-</sup>	2.87
H <sub>2</sub> O <sub>2</sub>	+ 2H <sup>+</sup> + 2e <sup>-</sup>	→ 2H <sub>2</sub> O	1.78
MnO <sub>4</sub> <sup>-</sup>	+ 8H <sup>+</sup> + 5e <sup>-</sup>	→ Mn <sup>2+</sup> + 4H <sub>2</sub> O	1.51
Au <sup>3+</sup>	+ 3e <sup>-</sup>	→ Au	1.50
Cl <sub>2</sub>	+ 2e <sup>-</sup>	→ 2Cl <sup>-</sup>	1.36
O <sub>2</sub>	+ 4H <sup>+</sup> + 4e <sup>-</sup>	→ 2H <sub>2</sub> O	1.23
Cr <sub>2</sub> O <sub>7</sub> <sup>2-</sup>	+ 14H <sup>+</sup> + 6e <sup>-</sup>	→ 2Cr <sup>3+</sup> + 7H <sub>2</sub> O	1.23
Br <sub>2</sub>	+ 2e <sup>-</sup>	→ 2Br <sup>-</sup>	1.07
NO <sub>3</sub> <sup>-</sup>	+ 4H <sup>+</sup> + 3e <sup>-</sup>	→ NO + 2H <sub>2</sub> O	0.98
Ag <sup>+</sup>	+ e <sup>-</sup>	→ Ag	0.80
I <sub>2</sub>	+ 2e <sup>-</sup>	→ 2I <sup>-</sup>	0.54
Cu <sup>+</sup>	+ e <sup>-</sup>	→ Cu	0.52
O <sub>2</sub>	+ 2H <sub>2</sub> O + 4e <sup>-</sup>	→ 4OH <sup>-</sup>	0.40
Cu <sup>2+</sup>	+ 2e <sup>-</sup>	→ Cu	0.34
2H <sub>3</sub> O <sup>+</sup>	+ 2e <sup>-</sup>	→ H <sub>2</sub> + 2H <sub>2</sub> O	0.00
Pb <sup>2+</sup>	+ 2e <sup>-</sup>	→ Pb	-0.13
Sn <sup>2+</sup>	+ 2e <sup>-</sup>	→ Sn	-0.14
Ni <sup>2+</sup>	+ 2e <sup>-</sup>	→ Ni	-0.26
Fe <sup>2+</sup>	+ 2e <sup>-</sup>	→ Fe	-0.45
Cr <sup>3+</sup>	+ 3e <sup>-</sup>	→ Cr	-0.74
Zn <sup>2+</sup>	+ 2e <sup>-</sup>	→ Zn	-0.76
2H <sub>2</sub> O	+ 2e <sup>-</sup>	→ H <sub>2</sub> + 2OH <sup>-</sup>	-0.83
Mn <sup>2+</sup>	+ 2e <sup>-</sup>	→ Mn	-1.19
Al <sup>3+</sup>	+ 3e <sup>-</sup>	→ Al	-1.66
Mg <sup>2+</sup>	+ 2e <sup>-</sup>	→ Mg	-2.37
Na <sup>+</sup>	+ e <sup>-</sup>	→ Na	-2.71
Ca <sup>2+</sup>	+ 2e <sup>-</sup>	→ Ca	-2.87
Ba <sup>2+</sup>	+ 2e <sup>-</sup>	→ Ba	-2.91
K <sup>+</sup>	+ e <sup>-</sup>	→ K	-2.93
Li <sup>+</sup>	+ e <sup>-</sup>	→ 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