CHEMISTRY – UNIT 5B HONORS STUDY GUIDE

When is it happening?	Wednesday May 6th
How long will it take?	35 minutes
What is the format?	multiple choice questions (5 points) 20 points worth of short answer questions You may use all of your notes and any other resources you find useful.
What is it worth?	9.4% of your Q4 grade
What will it cover?	See below
What resources will be useful?	Unit 5B Course Notes Lab Reports 5.6 – 5.7 Class Worksheets 5.6 – 5.11

UNIT 5B HONORS CHECKLIST

No.	Concept	☺ ☹
1	Know that oxidation is the loss of electrons and that reduction is the gain of electrons; know that oxidation and reduction processes can be represented by half-equations (electrons on RHS for oxidation and electrons on LHS for reduction); construct half-equations for oxidation and reduction processes, limited to the interconversion of monatomic ions, atoms and diatomic elemental molecules (eg Cl_2)	
2	Know that the oxidation number is equal to the charge on an atom (for ions) or the charge that would be on an atom if the bonding was ionic; be able to deduce the oxidation number of an atom in elements, ions and compounds; appreciate that oxidation results in an increase in oxidation number and that reduction results in a decrease in oxidation number; relate the change in oxidation number to the number of electrons in a half-equation; use changes in oxidation number to identify oxidation and reduction processes	
3	Know that a redox reaction involves the transfer of electrons and that the number of electrons lost is always equal to the number of electrons gained; be able to combine oxidation and reduction half-equations to construct and then simplify equations for redox reactions; appreciate that redox reactions always involve one increase in oxidation number and one decrease in oxidation number	
4	Know that the oxidizing agent is an electron acceptor and is the reactant containing the atom which gets reduced, hence oxidizing another atom; know that a reducing agent is an electron donor and is the reactant containing the atom which gets oxidised, hence reducing another atom; be able to identify the oxidizing agent and the reducing agent in a redox reaction	
5	Know that metallic elements react by losing electrons and that the more easily they lose electrons, the more reactive the element; explain why Group I metals are more reactive than Group II metals and why reactivity increases down both groups; know that d-block atoms are less reactive than atoms in Group I and Group II (no explanation needed); know that the elements carbon and hydrogen also usually react by losing electrons and that all metals, along with hydrogen and carbon, can be arranged in order of reactivity	
6	Know that the halogens and oxygen react by gaining electrons and that the more easily they gain electrons, the more reactive the element; explain why the reactivity of Group VII elements (halogens) decreases down a group	

7	Know that the reaction of a metal with a non-metal to make an ionic compound is a simple example of a redox reaction; know that metals (and carbon and hydrogen) can displace less reactive metals (and carbon and hydrogen) from their compounds and that halogens can displace less reactive halogens from their compounds; know that these reactions are called displacement reactions; appreciate that the reactions of metals with acids and water can be considered displacement reactions	
8	Appreciate that the relative reactivity of a metal can be deduced by the way it reacts with oxygen, water and acids; appreciate why metals react faster with acids than they do with water; recognize that the reaction of aluminium with acids, water and oxygen is anomalously slow and that this is due to its formation of a stable oxide layer	
9	Be able to use the reactivity series to predict whether a displacement reaction will take place between an metal and a metal compound, or a halogen and a halide, and predict the products of these reactions; appreciate that most metals below carbon in the reactivity series are extracted by heating their ores with carbon	
10	Know that a galvanic cell is a device designed to create electrical energy from redox reactions and an electrolytic cell is a device designed to use electricity to force redox reactions to take place; know that galvanic and electrolytic cells are the two types of electrochemical cell; know that both cells involve two electrodes immersed in an electrolyte; know that reduction takes place at the cathode and that oxidation takes place at the anode	
11	Know that galvanic cells consist of two electrodes immersed in separate electrolytes connected only by a salt bridge; know that the cathode is the positive electrode and that the anode is the negative electrode; be able to describe the design of simple galvanic cells limited to those in which both half-cells are M/M^{n+} half-reactions; be able to describe the movement of electrons and ions, the changes in concentration of electrolytes and the changes in mass of the electrodes as the chemical reaction in these cells takes place	
12	Know that the power in galvanic cells will run out when the chemical reaction finishes; know that the chemical reaction in galvanic cells can sometimes be reversed by connecting the electrodes to a power supply and forcing the electrons to move in the opposite direction to their natural inclination; know that in this situation the cell is behaving as an electrolytic cell; know that if the reverse reaction cannot take place then the cell is non-rechargeable; know that galvanic cells are the basis all of batteries and appreciate the advantages and disadvantages of lead-acid batteries, alkaline batteries and lithium-ion batteries	
13	Know that electrolytic cells consist of two electrodes immersed in the same electrolyte; that the cathode is the negative electrode and that the anode is the positive electrode; that cations move to the cathode where they are reduced and that anions move to the anode where they are oxidized	
14	Know that the electrolysis of molten binary ionic compounds always produces the metal at the cathode and the non-metal at the anode; be able to write half-equations for the reactions at each electrode; appreciate that this is the only way to extract reactive metals from their compounds and that the extraction of aluminium by the electrolysis of molten Al_2O_3 is of huge commercial importance	
15	Know that when aqueous ionic compounds are electrolysed there may be choice of ions to be oxidized or reduced; know that at the cathode, H^+ ions in the water are reduced ($2H_2O + 2e^- \rightarrow H_2 + 2OH^-$) to produce hydrogen unless the electrolyte contains the cation of a metal below hydrogen in the reactivity series (eg Cu^{2+}, Ag^+); know that at the anode, OH^- ions in the water are oxidized ($2H_2O \rightarrow O_2 + 4H^+ + 4e^-$) to produce oxygen unless the electrolyte contains I^-, Br^- or a concentrated solution of Cl^- ions; be able to write half-equations for the reactions at each electrode and combine them to give an overall reaction; hence predict whether a new substance is being produced in the electrolyte	
16	Know that applications of electrolysis include the extraction of reactive metals, electroplating, recharging batteries and the large-scale production of some useful substances such as Cl_2 and NaOH ; know that when electroplating, the material to be plated should be placed at the cathode in a solution containing the cation of the metal you wish to plate the material with, which must be below hydrogen in the reactivity series	