Review Package

Chemistry

1. Draw Lewis diagrams for the following:
   a) Lithium atom
   b) Oxygen atom
   c) Chloride ion

2. Determine the number of atoms of each element for the following compounds.
   a) $4CO$ b) $3MgCl_2$ c) $2(NH_4)_2SO_4$

3. Balance each of the following chemical equations.
   a) $Na(s) + O_2(g) \text{---> } Na_2O(s)$
   b) $KCl(s) \text{---> } K(s) + Cl_2(g)$
   c) $N_2(g) + O_2(g) \text{---> } NO_2(g)$
   d) $CuSO_4(aq) + Na(s) \text{---> } Cu(s) + Na_2SO_4(aq)$
   e) $Pb(NO_3)_2(aq) + KI(aq) \text{---> } PbI_2(s) + KNO_3(aq)$
   f) $Al(s) + Cl_2(g) \text{---> } AlCl_3(s)$

4. Indicate if each of the following is in an acidic, basic, or neutral solution.
   a) Lemon juice
   b) A solution with pH = 9
   c) An aqueous solution of sodium chloride, using water with a pH = 7

5. Bacteria are used to make cheese (pH = 5.5) and yogurt (pH 4.5) from milk (pH 6.5). Place these foods in the order of least acidic to most acidic.

6. The photo shows what happens when zinc metal is placed in a solution of hydrochloric acid:

   a) What evidence suggests that a chemical change is occurring?

   b) How does the mass of zinc metal change as the reaction proceeds?

   c) Name the gaseous product that forms bubbles in this reaction. How do you know?

   d) Write the balanced chemical equation for this reaction.

   e) What type of reaction is this? Explain your choice.

   f) After the reaction, the test tube feels warm. Describe the overall energy change for this reaction.

7. Represent these reactions using word, skeleton, and balanced chemical equations. Include the states of reactants and products.

   a) Freshly cut sodium reacts with oxygen gas in air and forms solid sodium oxide.

   b) When a piece of magnesium ribbon is placed into an aqueous solution of copper(II) chloride, copper metal and aqueous solution of magnesium chloride form.

   c) Solid magnesium oxide and carbon dioxide gas form when powdered magnesium carbonate is heated.

   d) When an aqueous solution of chromium(III) chloride and potassium hydroxide and mixed, a solution of potassium chloride and a precipitate of chromium (III) hydroxide form.

8. Identify the type of reaction for each part in question 7. Explain your reasoning.

9. For the following reactants, identify the type of reaction they will undergo, predict the products, and write the balanced chemical equations. (Do not include the states of the products.)

   a) $Au(NO_3)_3(aq) + Ag(s) \text{ --->}$
   b) $CuO(s) \text{ --->}$
   c) $BaCl_2(aq) + K_2SO_4(aq) \text{ --->}$
   d) $C(s) + O_2(g) \text{ --->}$
   e) $HBr(aq) + Al(OH)_3(aq) \text{ --->}$
   f) $AgCl(s) \text{ --->}$
   g) $Ca(s) + S_8(s) \text{ --->}$
   h) $Mg(s) + HCl(aq) \text{ --->}$
   i) $NaCl(aq) + AgNO_3(aq) \text{ --->}$
   j) $C_4H_{10}(l) + O_2(g) \text{ --->}$

10. Which graph represents an endothermic? An exothermic reaction? Explain how you know?
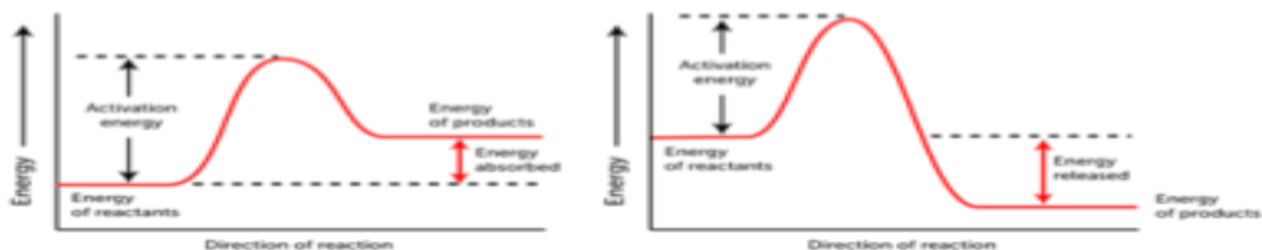
Energy

1. Use a Venn Diagram to compare kinetic and potential energy - include examples.

2. Explain why thermal energy is a form of kinetic energy.

3. Complete the following:
   a) Identify an energy transformation that occurs in your daily life.
   b) Identify an energy transfer you experience every day.
   c) Explain how the energy transformation described differs from energy transfer.

4. Why is no process of energy transformation 100 percent efficient?

5. Imagine that a referee tosses a basketball straight up and it falls to the floor.

   a) At what point in its journey would the ball's gravitational potential energy be at a maximum?
   b) At what point would the ball have no gravitational potential energy?
   c) At what point would the ball's mechanical kinetic energy be at a maximum?
   d) At what points would the ball have no mechanical kinetic energy? (Hint: This occurs at more than one point.)

Energy Calculations: $E_k = \dfrac{mv^2}{2}$ $E_g = mg\,\Delta h$

6. A 54 kg skier, including equipment, stands at the top of a black diamond ski run. The vertical distance to the bottom of the run is 420 m. What is the gravitational potential energy of the skier relative to the bottom of the ski run?

7. A satellite has a mass of 689 kg and travels at a speed of 7500 m/s. How much mechanical kinetic energy does the satellite have?

8. A bowling ball is rolling down the lane at 2.8 m/s. If it has a mechanical kinetic energy of 25.5 J, what is its mass?

9. A person who has a mass of 65 kg goes on the Sky Tower ride at an amusement park. The ride is simply a free fall from the top of a tower into a net below. If the person reaches a final velocity of 24.6 m/s just before hitting the net, from what height did the rider drop? Ignore friction with the air.

10. Recall your Global energy assignment: Describe 2 different sources of energy and the pros and cons associated with each.

Genetics

1. DNA: List all parts of the DNA molecule, use a drawing to describe the structure.

2. Describe the parts of protein synthesis. Use a drawing to describe the process.

3. What is a genetic mutation? How does this get passed down from one generation to the next?

4. Define the following terms: complete dominance, incomplete dominance, co-dominace, sex-linked traits, pedigree

5. In scientific ethic procedures involving humans, we discussed some of the thinking we had around some "rules" we, as a class, thought important.
   a. Is it important to have these ethics in place? Why/Why not?
   b. Using the documents created by the class- discuss 5 rules you think are the most important to help guide scientists in their research?

6. Complete the following Complete dominance Punnett squares below for each of the following crosses (determine all genotypes and phenotypes for all offspring for each question):
   a. Trait: Stem length. Tall stem (T); Short stem (t). Cross a homozygous dominant plant with a homozygous recessive plant. Track these crosses over 2 generations to find F2 offspring genotypes and phenotypes.
   b. Seed colour. Yellow seed (Y); green seed (y). Show the cross and the resulting offspring between two heterozygous plants.
   c. Trait: Flower colour. Purple(P); white (p). Show a cross between a heterozygous plant and a homozygous recessive plant.
   d. Trait: Seed shape. Round (R), wrinkled (r). Show the cross between a homozygous dominant plant and a heterozygous plant.

7. Complete the following incomplete dominance Punnett squares below for each of the following crosses (determine all genotypes and phenotypes for all offspring for each question):
   a. In cattle the roan colour is the result of a mixture of red hair (H^R) and white hair (H^W). The codominant roan is produced by the presence of both red and white hairs in the cost of the cattle.
      i. Show the cross between a roan bull and a roan cow.
      ii. Show the cross between a white bull and a roan cow

iii.   Show the cross between a roan bull and a red cow

b. Checkered feathers in chickens are a mixture of black feathers (F^B) and white feathers (F^W).
    i.   If a rooster with black feather mates with a hen with checkered feathers.
    ii.   If a rooster with white feathers mates with a hen with black feathers.
    iii. Rooster and hen both have checkered feathers.

c. In humans, blood type is determined by proteins on red blood cells. Type A blood has type A proteins, type B blood has type B proteins and O blood has no proteins.
    i.   Cross a person with AB blood to another with type O blood
    ii.   Cross a person with type BO blood to someone with type AO blood

8. Complete the following codominance Punnett squares below for each of the following crosses (determine all genotypes and phenotypes for all offspring for each question):
    a. In four o'clock flowers, the alleles for flower colour express incomplete dominance. Offspring with both alleles will have the intermediate trait.
        i.   Show the cross between a red flower (F^R) and a white flower (F^W). Then follow the cross to F2 to find the resulting offspring.
    b. The alleles for Guinea pig fur express incomplete dominance. Complete the cross between a black guinea pig (F^B) and a white guinea pig (F^W).

9. Complete the following sex linked Punnett squares below for each of the following crosses (determine all genotypes and phenotypes for all offspring for each question):
    a. Colour deficiency is a recessive X-linked trait.
        i.   A woman who is a carrier for colour blindness, has offspring with a man who is not colour blind. Determine the possible offspring from this cross.
        ii.   A woman who is a carrier for the trait uses a sperm donor who is color blind. Determine the offspring.
        iii. A same sex couple uses a surrogate to carry their child. The eggs were donated from a normal vision donor. The sperm were donated by the color blind parent. Determine the offspring.
    b. Hemophilia is an X-linked trait.

  i. Show the cross between a carrier and a person that suffers from hemophilia.

  ii. Show the cross resulting from a woman with normal blood clotting abilities and a man who suffers from the disease.

  iii. Show the cross resulting from a carrier and a man who does not have the disease.

Space

1. Explain the big bang theory. How long ago do scientists believe this occurred?

2. Below is a table of the 3 pieces of evidence for the big bang theory. Briefly explain each piece of evidence and the technology used to obtain this evidence.

Evidence for big bang	Description	Technology used
1. Redshift of galaxies		
2. Cosmic Microwave Background Radiation		
3. Elemental Composition of the Universe		