**Science 20F**

**Exam Review**

**January 2015 - key**



**Ecology Review**

1. Energy from the **SUN** is the major source for all living things.
2. The process of **PHOTOSYNTHESIS** traps it so it can be used by living organisms.
3. Plants are considered **PRODUCERS** since they carry out the process of photosynthesis. Since they make their own food they are also considered **AUTOTROPHS**.
4. The producers are eaten by organisms called **PRIMARY CONSUMERS** **OR** **HERBIVORES**.
5. All of these organisms are considered **CONSUMERS** since they cannot produce their own food.
6. Organisms living off of dead and decaying material are called **DECOMPOSERS**.
7. In food pyramids, the **BOTTOM** level contains the most abundant amount of stored mass.
8. **80%** of the earth's atmosphere contains nitrogen.
9. What are the two things that make gaseous nitrogen available to the living organisms in an ecosystem? **DENITRIFYING AND NITRIFYING BACTERIA AND** **DECAY**.
10. Using the diagram below answer the following questions:

a) What are the top carnivores in this food web?

**KILLER WHALE, BALD EAGLE, MARSH HAWK**

b) What are the producers in this food web?

**MARSH VEGITATION**

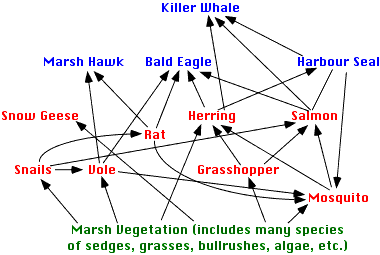
c) If the rat population became extinct, what organism(s) would lose a food source?

**HAWK, BALD EAGLE, MOSQUITO**

d) How many organisms depend on the Salmon as a food supply? **3**.

e) List the primary consumers: **SNAILS, VOLE, HERRING, GRASSHOPPER, MOSQUITO,** **SNOWGEESE**

f) List the secondary consumers: **RAT, SALMON, MARSH HAWK, EAGLE, SEAL, WHALE,** **HERRING, MOSQUITO *\*\*NOTE THE HERRING IS BOTH A PRIMARY AND SECONDARY CONSUMER***

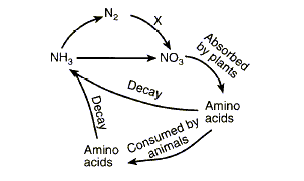


1. Density **DEPENDENT** Factors operate more strongly on large populations than on small ones.
2. When populations become crowded individuals **COMPETE** for the valuable resources.
3. Weather and natural disasters act to change a population. These factors are called density **INDEPENDENT** factors
4. Atmospheric nitrogen can only be used by most living things after it has been
5. **converted to nitrates with the help of nitrogen-fixing bacteria**
6. taken in by plants through the lenticels
7. converted to ammonia by bacteria of decay
8. combined with carbon dioxide to form protein
9. Which two factors are abiotic(not living) limiting factors that affect organisms in marine ecosystems?
10. amount of algae and wide temperature variations
11. amount of carbon dioxide and variety of producer organisms
12. amount of moisture and variety of consumer organisms
13. **amount of oxygen and concentration of dissolved salts**

Use the diagram below to answer 23 and 24

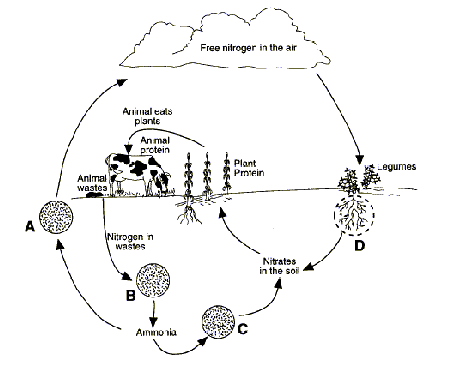
1. Which gas is released when the tissues of dead plants and animals are broken down by bacteria?

NO3 N2 **NH3**O2

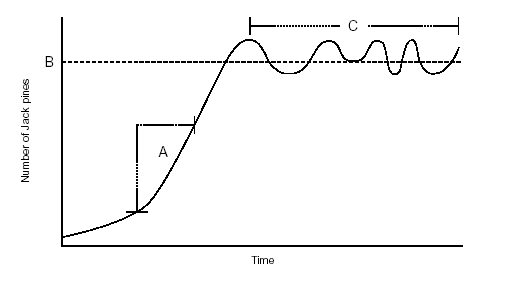


1. Bacteria responsible for process X are called
2. **photosynthesizers**
3. **nitrifying bacteria**
4. denitrifying bacteria
5. autotrophic bacteria
6. Bioaccumulation refers to the process
7. where living organisms retain certain substances
8. **here the concentrations of toxic substances increases as we move up the food chain**
9. where the concentrations of toxic substances decreases as we move up the food chain.
10. of accumulating important nutrients during the life of an organism
11. When biological magnification of toxic substances occurs, the most likely organisms to be adversely affected are
12. those that are at the lowest trophic level.
13. **those that are at the highest trophic level**
14. primary consumers
15. secondary consumers

Base your answers to questions 27 and 28 using the diagram of the cycle below



1. Decomposer bacteria are represented by the letter **B**
2. Denitrifying bacteria are represented by the letter **A**
3. Many years ago, a fire swept through the Boreal forest in an area of northern Manitoba. The trees, shrubs, and other plants perished in the fire. A team of wildlife biologists decided to study the regrowth of the forest over time. They chose to focus on the Jack pine population as these trees are some of the first to grow back after a fire. A graph of the results of their study is shown below.



**Questions:**

1. Why is the number of Jack pines increasing so rapidly in area A of the graph?
2. How do you account for the fluctuations in area C of the graph?
3. What does B represent?
4. What is your estimate of the average growth rate in area C?
5. Describe, in your own words, what is happening to the Jack pine population in the graph.
6. Predict how the graph would change if another forest fire swept through the region.
7. Predict how the graph would change if a forestry company began to log the area.

**Chemistry Review**

1. The elements whose symbols are P, C, and N are

(a) potassium, cadmium, and nickel.

(b) potassium, carbon, and nitrogen.

(c) phosphorus, calcium, and neon.

(d**) phosphorus, carbon, and nitrogen**.

2. Which of the following statements are true?

(a) The formula of hydrochloric acid is HCl.

(b) The formula of dinitrogen trioxide is N2O3.

(c) The formula of hypochlorous acid is HClO.

(d) The formula of phosphoric acid is H2PO3.

a) all of the b) a&b **c) a,b&c** d) a,b&d

above

3. Which of the following sets of elements are all in the same group of the periodic table?

(a) I, Br, F

(b) Na, Ca, Mg

(c) C, Si, N

(d) F, C, O

**a)** **a only** b) b,c&d c) b&c d) a&c

4. Compounds in which the negative ion is O-2 and the positive ion is either Fe+2 or Fe+3 can have the formulae

(a) O2Fe3 or Fe3O2

(b) FeO or FeO2

(c) Fe2O or Fe3O

**(d)** **Fe2O3 or FeO**

5. Sodium

(a) is an alkaline earth metal.

(b) forms ions with a +2 charge.

(c) can combine with iodine to form Na2I.

(d) is a nonmetal.

a) a,b&c b) d only c) b&d **d)none**

6. Which of the following ions are most likely to form?

(a) Ba+1 (b) Al+2 (c) Li+2 (d) S-2

a) a&c **b)b&d** c) c only d) a,b&c

7. The names of the polyatomic ions NH4+, SO3-2, and CO3-2 are:

(a) nitrite, sulfate, and carbonate

(b) nitrate, sulfoxylate, and carboxide

(c) nitrohydride, sulfotrioxylate, and oxocarbonium

**(d) ammonium, sulfite, and carbonate**

8. Which of the following contains 15 protons and 10 electrons?

(a) Mg+2

**(b) P+5**

(c) Al+3

(d) H2O

9. Which of the following are elements?

(a) water

(b) sugar

(c) table salt (NaCl)

(d) the atmosphere

a) a&d b) b&d c) b only **d) none**

10. The formula of the compound ammonium carbonate is

(A) NH4CO3  
(B) NH4CO4  
(C) NH4HCO3  
**(D) (NH4)2CO3**

11. Which element is *INCORRECTLY* matched with its symbol?

a) Cu / copper  
b) Pb / lead  
c) K / potassium  
d) Cr / chromium  
**e) B / bismuth**

a) a&c b) b&d c) c only d) a,b&c

12. Identify the compound below which is an ionic compound.

a) CH4  
b) H2O2  
**c) Na2CO3**  
d) NH3  
e) SO2

13. Identify the compound formula that is *INCORRECT*.

a) Ca3(PO4)2 for calcium phosphate  
b) NaNO3 for sodium nitrate  
c) K2CO3 for potassium carbonate  
**d) NH4SO4 for ammonium sulfate**  
e) KCl for potassium chloride

14. Identify the *INCORRECT* statement below:

**a) The atomic weight is the number of atoms in one mole of the element.**   
b) The electron and proton have charges of equal magnitude and opposite sign.   
c) The atomic number is the number of protons in the nucleus.   
d) An atom is the smallest particle of an element that maintains the chemical identity of that element.   
e) The number above the element symbol on the periodic chart is the atomic number.

15. Identify the *INCORRECT* statement below:

a) Atoms cannot be created, destroyed, or transformed into atoms of another element except by nuclear reactions.   
b) Some elements exist in pure form as polyatomic molecules.   
**c) All atoms of a given element have identical properties, which differ from those of other elements.**   
d) Compounds form when masses of different elements combine in small whole-number ratios.   
e) The relative numbers and kinds of atoms are constant in a given compound.

16. Balance the following chemical equation with the smallest *whole number* coefficient.

\_\_\_KOH + \_\_\_CO2 ---> \_\_\_K2CO3 + \_\_\_H2O

a) 2:1:1:4  
b) 1:1:1:1  
c) 2:1:1:2  
**d) 2:1:1:1**  
e) 2:2:1:4

17. Balance the following chemical equation with the smallest *whole number* coefficients. What is the value of the coefficient of CO2?

\_\_\_C4H10 + \_\_\_O2 ---> \_\_\_CO2 + \_\_\_H2O

a) 5  
b) 4  
c) 13  
d) 10  
**e) 8**

18. Identify the compound below which is a molecular (covalent) compound:

a) CaF2  
b) NaCl  
c) Na2CO3  
d) NH4NO3   
**e) SO3**

19. Identify the compound formula that is *INCORRECT*.

a) AgCl = silver chloride  
b) KNO3 = potassium nitrate  
**c) CuCO3 = copper(I) carbonate**  
d) NH4Cl = ammonium chloride  
e) ZnBr2 = zinc bromide

20. Which of the following is *NOT* a typical property of a metal?

a) forms ionic compounds with nonmetals  
b) tendency to lose electrons to form cations  
**c) outer electron shells contain 4 or more electrons**  
d) high electrical conductivity  
e) high heat conductivity

21. A negative ion, symbolized by X2-, forms a compound with a metal M, of the formula M2X. What is the charge on the metal, M?

**a) +1** c) +3  
b) +2 d) +4

22. Which of the following *unbalanced* processes best describes a neutralization reaction of an acid and a base?

(a) NaOH + Al --------------> NaAlO3 + H2

(b) Al(OH)3 + H2SO4 ---------------> Al(HSO4)3 + H2O

**(c) Al(OH)3 + H2SO4 ---------------> Al2(SO4)3 + H2O**

(d) NH3 + HCl -----------------> NH4Cl

(e) both 1 and 2;

(f) both 2 and 3;

(g) both 3 and 4.

23. In a solution with a pH of 3 the color of

**(1) litmus is red;** (2) litmus is blue;

(3) phenolphthalein is red; (4) phenolphthalein is blue.

24. The formula for sulfuric acid is (a) H2SO3 ; **(b) H2SO4** ; (c) H2S ; (d) HCl ; (e) H2PO3 ;

f) H2PO4 ; (g) H2PO5 ; (h) HC2H3O2 ; (i) HNO2 ; (j) HNO3 ; (k) H2SeO4 .

25. Which of the responses in question above is the correct formula for acetic acid? Phosphoric acid?

Acedic acid = h phosphoric = f

26. In a substance litmus is blue. The pH of the solution could be **(1) 10;** (2) 2; (3) 3;(4) 4.

27. What is the electron dot diagram for the nitrogen atom?

a) b) c) **d)** e)  
b

28. Atoms of element X, having two valence electrons each, combine with atoms of element Y, having six valence electrons each. The compound formed is expected to have the formula  
  
**A. XY**  
B. X3Y  
C. XY3  
D. X2Y  
E. XY2

29. If X represents any of the elements of the carbon family, then the general formula for the hydrogen compound of X is  
  
A. XH5  
B. X2H3  
C. XH  
D. XH2  
**E. XH4**

**Short and long answer**

# 1. Complete the chart below:

# Element Name Valence Lewis Structure Family

Potassium 1 Alkali Metals

Magnesium 2 Alkali Earth Metals

Argon 8 Nobel Gases

Oxygen 6 Chalcogens

Calcium 2 Alkali Earth Metals

**2. Define the following:**

1. Ionic bond**: metals and non-metal, involves ion (charges), trades electrons**

b. Covalent bond: **two non-metals, shares electrons**

**3. Using Lewis dot diagrams draw the following ionic molecules.**

K + F Be + S

Mg + Cl 2Na + O

**4. Using Lewis dot diagrams draw the following covalent molecules.**

H2  F2

O2  H2O

**5. Complete the chart**

Formula Name ionic/covalent

a. MgS **Magnesium Sulfide ionic**

b.**SO3** Sulfur trioxide **covalent**

c. Ba3N2 **barium nitride ionic**

d. P2O5 **diphosphorus pentaoxide covalent**

e**. Al203** Aluminum Oxide **ionic**

f. KNO3 **­potassiumnitrate ionic**

g. NaS04 Sodium Sulfate **ionic**

h. N2O **dinitrogen oxide covalent**

. i. CaCO3 **calcium carbonate** **ionic**

j. Mg(OH)2 **magnesium hydroxide** **ionic**

1. **Balance each of the following chemical reactions and determine the reaction type.**

a. \_\_\_ N2 +  **3** H2 🡪 **2** NH3 **synthesis**

b. **2** NaCl + \_\_\_ F2 🡪 **2** NaF + \_\_\_ Cl2 **single replacement**

c. \_\_\_ CH4 + **2** O2 🡪 ­­\_\_\_CO2 + **2** H2O **combustion**

1. \_\_\_ FeCl3 +**3** KOH 🡪 \_\_\_ Fe(OH)3 + **3** KCl **double replacement**
2. \_\_\_ N2O4 🡪 **2** O2 + ­\_\_ N2 **decomposition**
3. \_\_\_ BaNO3 +\_\_\_ LiSO4🡪 \_\_\_BaSO4 + \_\_\_LiNO3 **double replacement**

g.  **2** C2H6 + **7** O2 🡪 **4** CO2 + **6** H2O **combustion**

**7. For each of the following write and balance the chemical reactions.**

1. hydrogen + nitrogen monoxide 🡪 water + nitrogen gas

**2H2 + 2N0 🡪 2H20 + N2**

1. zinc + lead(II)nitrate 🡪 zinc nitrate + lead

**Zn + Pb (N03+)2 🡪 Zn (N03)2 + Pb**

1. silver nitrate + sodium chloride 🡪 silver chloride + sodium nitrate

**AgN03 + NaCl 🡪 AgCl + NaN03**

1. carbon dioxide 🡪 carbon monoxide + oxygen gas

**2C02 🡪2C0 + 02**

**8. Define the following terms:**

a) Acid: **Ph < 7, sour, gives away an H in neutralization**

b) Base: **Ph > 7, bitter, gives away an OH in neutralization**

c) Neutralization reaction: **an acid and a base combine to form salt and water**

d) pH : the potency of hydrogen

**9. Characteristics of ….**

Acids Bases

a. ph<7 a. ph> 7

b. sour b. bitter

c. corrosive c. slippery

d. turn litimus red d. turn litimus blue

example:Hcl /orange juice example: NaOH / soap

10. a) List 3 examples of acids found in your home.

**Vinegar**  **juices**  **fruits**

b) List 3 examples of bases found in your home.

**Shampoo**  **soap**  **bleach**

1. Neutralization reactions result in the formation of a salt (ionic compound) and

water. Given the following reactants, predict the products.

Hint: Neutralization reactions are a type of double displacement reaction.

a) HCl + KOH 🡪 **H20**  + **KCl**

b) NH4OH + H2SO4 🡪 **2H20 + (NH4)2S04**

c) NaOH + HNO3 🡪 **H20 + NaN03**

1. Rewrite the above reactions in their balanced form.

a) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**b) 2nH4OH + H2S04 🡪 2H20 + (Nh4) 2S04**

c) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Complete and balance the equation and give the reaction type.

**S = synthesis sr= single replacement dr= double replacement c = combustion**

**\*\*The *or* is because those elements have two possible charges**

**S** 1. S8 + **16**O2 🡪 **8S04**

**S**  2. **4**Al + **3**O2 🡪2Al203

**S** 3. Fe + Cl2 🡪**FeCl2 or Fe +3Cl2 🡪FeCl3**

**S** 4. **2**Al + N2 🡪**2AlN**

**S** 5. Cu + Br2 🡪**CuBr2 or 2Cu + Br2 🡪 2CuBr**

**S** 6. **2**Zn + O2 🡪**2Zn0**

**d** 7. MgCO3 🡪**Mg0 + C02**

**d** 8. **2**HgO 🡪**2Hg + 02**

**d** 9. **2**PCl5 🡪**2P + 5Cl2**

**d** 10. H2SO3 🡪 H2 + SO3

**d** 11. **2**NH3 🡪**N2 + 3H2**

**sr** 12. **2**NaBr + Cl2 🡪**2NaCl + Br2**

1. In one or two sentences explain these chemistry terms:

Element

Atom

Proton

Neutron

Electron

Atomic Number

Atomic Mass

Periods

Groups

Valence Shell

Metals

Non-metals

Ions

Ionic Compound

Covalent Compound

Law of Conservation of Mass

Coefficient

Subscript

Single Replacement

Double replacement

Synthesis

Decomposition

Combustion

Product

Reactant

Indicators

Neutral

**Physics Review**

1. A **scalor** quantity is completely described by its magnitude.
2. A **vector** quantity has both magnitude and direction.
3. The velocity of an object at any given point in time is called

**instantaneous** velocity.

1. The rate at which velocity changes is known as the **acceleration**.
2. An object at rest remains at rest and an **object in motion**

**remains in motion**, unless acted upon by an external **unbalanced** force. This is known as Newton’s First Law of Motion.

1. Memorize the following equations:

Explain what each means in the space beside.

∆d = d2 – d1 **displacement is the change in position**

∆t = t2 – t1 **change in time**

Slope = Rise/ Run **the steepness of a line, could be velocity or acceleration**

= ∆ / ∆t **velocity is the change in displacement over time**

= / ∆t **acceleration is the change in velocity over time**

1. Use the above equations, to solve the following problems. Be sure to show your work and include units.

a. Renatta Gass is traveling down Lake Avenue with a velocity of +20 m / s.

Misfortune occurs and Renatta’s engine stops running. Renatta comes to

Rest 40 seconds later. Calculate Renatta’s acceleration.

**= = 0.5 mls2**

b. Claire deRhoads accelerates her Mazda RX7 from 0 mi/ h East to

60 mi/ h East in 5.0 seconds. Determine the acceleration of the

Mazda RX7.

Note time units don’t match

**5 seconds x = 0.0014 hr a = = = 42857 mi/h2**

1. Two ants race across the entire length of the top of a Wheaties box at a constant speed. The box is 34.0 cm long. One ant travels 4.6 cm/ s and the other ant travels 3.5 cm / s. The fastest ant will cross the finish line first. How much time will pass between the time when the first ant crosses the finish line and when the second ant crosses the finish line

**Ant 1 speed 4.6 cm/s v=**

**Ant 2 speed 3.5 cm/s t =**

**Time (ant 1) =**

**= 7.4 s**

**= 2.3s**

**Time (ant 2) = 2.3 second will pass**

**= 97 s**

d. Consider the position vs. time graph below. The motion of five different people (A, B, C, D, and E) are shown on the graph. Study the graph and answer the following questions. Some questions may have more than or less than one answer.

A

B

D

C

d

E

t

1. Which person(s) is are moving with constant velocity

**A B**

1. Which person(s) is are moving in a positive direction

**A**

**C & D for part of the time**

1. Which person(s) has have negative acceleration

**None of them have acceleration**

1. Which person(s) change direction during the course of motion

**C & D**

1. A small bug and a large bus have a head-on collision. Which object

(bug or bus or both the same) experiences the greatest force

**Equal forces – trick question**

Explain your answer.

**Newton’s 3rd law**

1. An 800 kg car is moving 24.0 m/ s when it slams on the brakes. The

Wheels lock and the car skids across the asphalt for a distance of 34.0 m before it finally stops.

1. Calculate the rate of acceleration.
   1. How much time does it take to stop
2. What is Newton’s Second Law of Motion?
3. When forces are unbalanced, what affect does that have on motion?
4. **Definition and associated equation/s**
5. Scalar
6. Vector
7. Displacement
8. Distance
9. Velocity
10. Speed
11. Position-Time graph
12. Accelerating
13. Newton’s First Law
14. Newton’s Second Law
15. Newton’s Third Law
16. Force
17. Gravity
18. Friction