KEY

Science 10 - Year End Review

Instructions – proper review for previously covered material is always best undertaken by **FIRST** reading through the units notes to reactivate memories and remind you of information covered.

The following questions should be completed on a separate sheet of paper.

Biology

1.) What does DNA stand for?

Deoxyribonucleic acid

2.) What purpose does DNA exist for? That is, what is DNA for?

DNA is a unique language (or code) used by living organisms to copy or repair their parts.

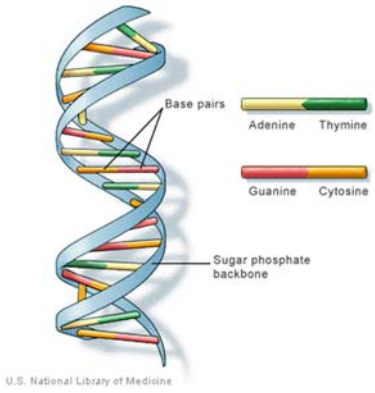
3.) What are the three main components of DNA?

DNA is composed of sugar and phosphate as the backbone, nitrogen bases as the "rungs", and a double helix twist to decrease the space used up by the DNA.

4.) List the 4 bases and which attaches to which?

Adenine and Thymine, Cytosine, and Guanine

5.) Draw and label a DNA molecule. Be detailed.



6.) What is the relationship between a trait, a gene, and a chromosome?

Genes code for traits, and are found in DNA which is stored as Chromosomes in the nucleus of cells.

7.) Circle the choices that are examples of each of those words.

a.) **Homozygous dominant** (AA) Gg (KK) mm uu Rr (TT)

b.) **Homozygous recessive** (ee) Ff HH Oo (qq) Uu (ww)

8.) a.) What is a mutation?

A mutation is a change in the nitrogen bases of DNA that may or may not cause a change to the protein that gene codes for.

b.) List the 3 types of mutations.

Deletion = one or more bases are deleted causing a change in the codon (three nitrogen bases sequence).

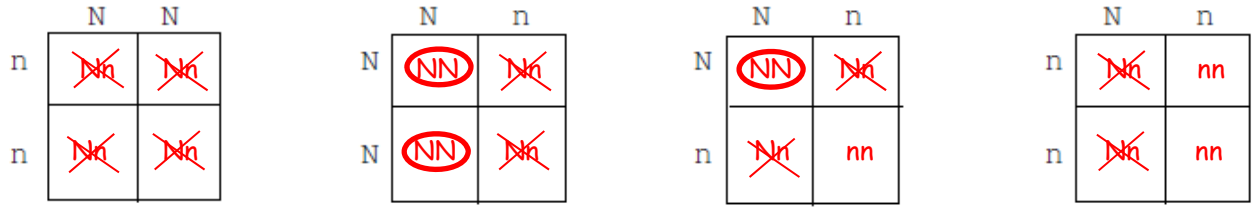
Insertion = one or more bases is inserted causing a change in the codon.

Substitution = one or more different bases are put into place of other bases causing codon changes.

c.) Describe the 3 potential outcomes of mutations.

See above.

9.) In corn plants, normal height, N, is dominant to short height, n. Complete these four Punnett squares showing different crosses. Then, circle all of the homozygous dominant offspring. Put an X through all the heterozygous offspring. Leave all the homozygous recessive offspring unshaded.



10.) In humans, being a tongue roller (R) is dominant over non-roller (r). A man who is a non-roller marries a woman who is heterozygous for tongue rolling.

Father's phenotype __non-roller__ Mother's phenotype __roller__

Father's genotype __rr__ Mother's genotype __Rr__

	r	r
R	Rr	Rr
r	rr	rr

What is the probability of this couple having a child who is a tongue roller? ___50%___

11.) Sickle Cell Anemia is condition that shows codominance. The genotype for normal blood cells is NN. Sickle cell trait is the heterozygous condition (NS) and contains both normal and sickle shaped blood cells. Sickle cell disease (SS) is when all of the blood cells are sickle-shaped and has lifelong medical implications. A man with sickle cell trait has a child with a woman with sickle cell trait.

i. Complete the Punnett Square.

ii. What is the probability of having a child with sickle cell trait?

50%

iii. What is the probability of having a normal offspring? 25%

iv. What is the probability of having a child with sickle cell disease?

25%

	N	S
N	NN	NS
S	NS	SS

12.) The Johnsons are married and their first child has just been born. Erin had a perfectly normal pregnancy and continued working until one week before the child's birth. Joseph and Erin's son appears perfectly normal at birth.

It is quite a shock when the doctor calls them a few days after they take him home to come back in for a few more tests of their son. The doctor asks that both attend, as he would like to talk to both of them. In his office, the doctor lets them know that a blood test was done on their son, as required by law. The blood test revealed their son may have a rare disease called Phenylketonurea (PKU). However, more tests are needed to confirm the diagnosis. The Johnsons are told not to worry as a treatment exists for the condition. But neither Joseph or Erin have ever heard of the condition nor has anyone in their family.

a.) If all newborns are going to be screened, should parents have the chance to refuse? Why or why not?

b.) Why might someone not want their child screened?

c.) Should screening for diseases or defects be allowed, if no treatment or cure exists? Why or why not.

Chemistry

1.) Name two metals and two non-metals and describe the general area that metals and non-metals are found on the periodic table.

- Metals _____ Sodium (Na) _____ and _____ Iron (Fe) _____
- Non-metals _____ Oxygen (O) _____ and _____ Iodine (I) _____

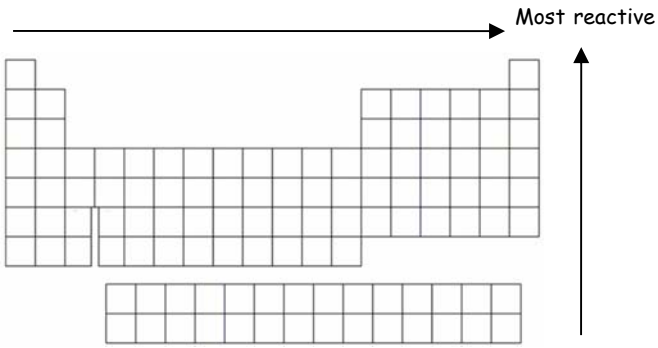
Metals are found to the left of the "steps" of the periodic table and non-metals are found to the right of the "steps".

2.) a.) What is the most reactive element on the periodic table (think most dangerous gas)?

Fluorine gas.

b.) Describe the general trend that occurs on the periodic table that describes where the most and least reactive elements are found.

As one goes from left to right and bottom to top the elements the general trend is to become more reactive.



3.) What indicates that a chemical is an acid or a base?

Compounds that start with an H are acids and compounds that end in an OH are bases.

4.) a.) What word describes what acids, bases, and salts do when put in water?

Dissociate.

b.) Name two properties of acids and bases.

Acids	Bases
Sour taste	Bitter taste
Conduct electricity	Conduct electricity
React with metals	Don't react with metals

c.) What is the name of the scale used to measure strength of acids and bases.

pH scale. pH stands for "the power of hydrogen".

d.) Which solution has more H^+ ions, and how much more, in a solution with a pH of 3 than a solution with a pH of 9?

pH of three has much more H^+ ions as it is the stronger acidic solution. There are 10x more H^+ ions for each digit that 3 is lower than 9. So . . . pH of 3 has 10^6 or 1 000 000 (million) times more H^+ ions in solution.

e.) Write the name and formula of two acids and two bases.

Acids = sulphuric acid (H_2SO_4), acetic acid (CH_3COOH), phosphoric acid (H_3PO_4), and hydrochloric acid (HCl) etc.
Bases = sodium hydroxide ($NaOH$), magnesium hydroxide ($Mg(OH)_2$), calcium hydroxide ($Ca(OH)_2$), aluminum hydroxide ($Al(OH)_3$) and iron (II) hydroxide ($Fe(OH)_2$) etc.

f.) What are the products when an acid and a base are mixed?

When an acid and base are mixed a salt (composed of the metal from the base and the non-metal from the acid) and water are always produced.

5.) Which subatomic particle is the largest and heaviest?

Neutron.

6.) Which particle is found in the large open space in an atom?

Electron.

7.) Which particle causes bonding to occur?

Electron.

8.) Which particle decides what element an atom is?

Proton.

9.) Describe how an ionic bond and a covalent bond are formed.

Ionic – ionic bonds are formed by the metal giving up its valence electrons to the non-metal so that it has a full outer shell.

Covalent – covalent bonds are formed between two non-metals sharing their valence electrons between them.

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10.) Label each of the following compounds as ionic or covalent depending on the type of bond forming them.

i.) $Fe_2(SO_4)_3$ ____ionic____

ii.) CO _____covalent_____

iii.) $Ag_2Cr_2O_7$ _____ionic____

iv.) NF_3 _____covalent_____

v.) $Zn(NO_3)_2$ _____ionic_____

vi.) SiO_2 _____covalent_____

11.) What is the definition of "valence electrons"?

Valence electrons are the electrons found in the outer shell of an atom that are used to form bonds by donating them or sharing them.

12.) Why do we care so much about valence electrons?

Valence electrons are used to form bonds.

13.) When do electrons pair?

Electrons pair only after the shell is half full. Then they spin pair to maximize the distance between each electron as they repel each other.

14.) Draw the following elements or compounds as Lewis structures.

Sodium

. Na

Sodium Chloride

$[Na]^{+1}$ $[:\ddot{C}l:]^{-1}$

Carbon Dioxide

:O::C::O:

Fluorine

:F:

15.) **A. Write correct formula for these compounds.**

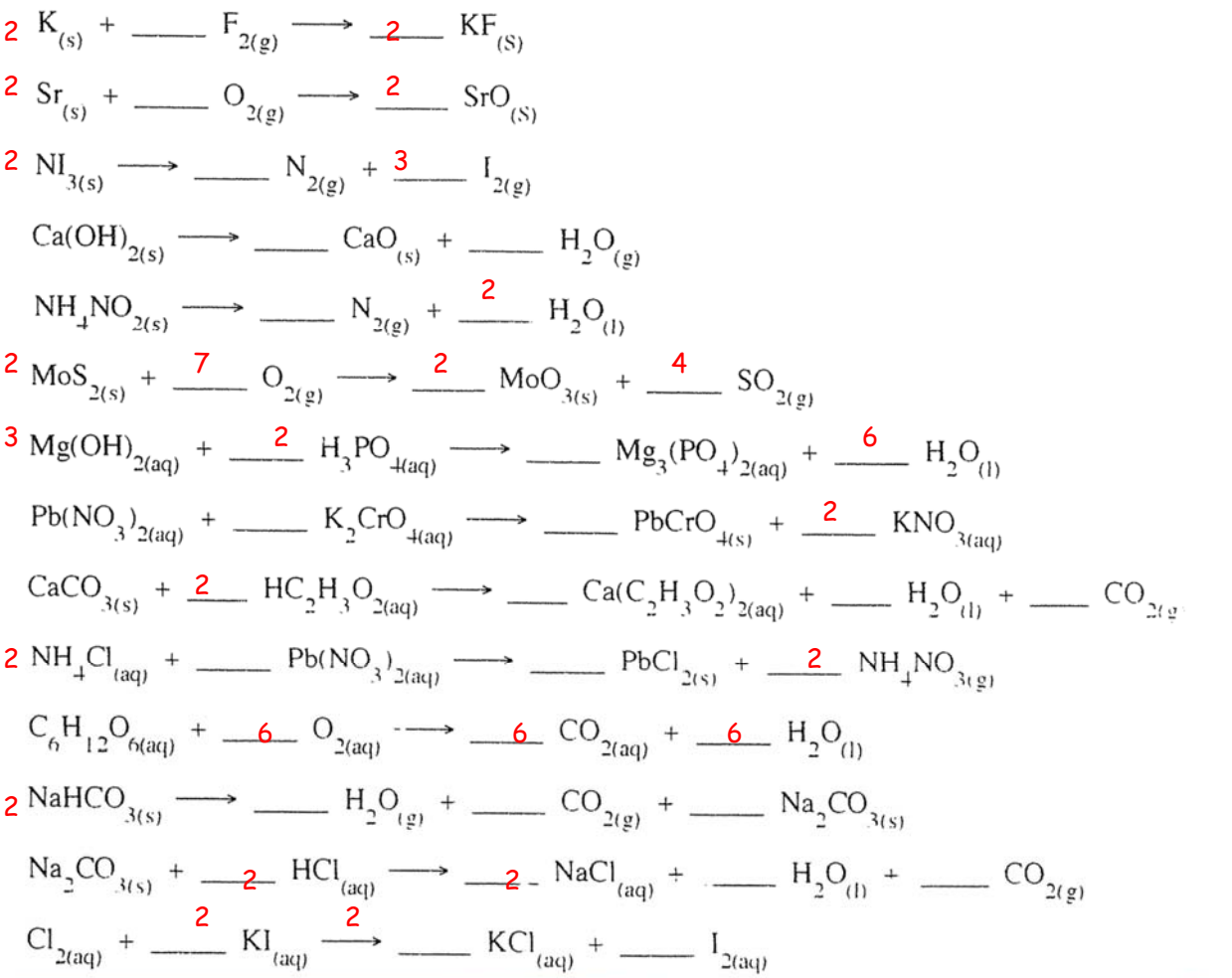
1. boron chloride BCl_3
2. aluminum hydroxide $Al(OH)_3$
3. silver sulphide Ag_2S
4. iron (II) iodide FeI_2
5. copper (I) oxide Cu_2O
6. tin (IV) nitrate $Sn(NO_3)_4$
7. zinc bromide $ZnBr_2$
8. nickel (III) oxide Ni_2O_3
9. ruthenium sulphide Ru_2S_3
10. titanic oxide Ti_2O_3
11. magnesium carbonate $MgCO_3$
12. calcium hydroxide $Ca(OH)_2$
13. cesium sulphide Ce_2S
14. carbon tetrachloride CCl_4
15. hydrogen gas H_2
16. carbon disulphide CS_2
17. beryllium nitrate $Be(NO_3)_2$
18. sodium hydrogen carbonate $NaHCO_3$
19. water H_2O
20. lanthanum oxide La_2O_3

KEY

B. Name the following compounds correctly.

1. H_2O Dihydrogen Oxide
2. PbI_2 Lead (II)iodide
3. $MgCl_2$ Magnesium chloride
4. Na_2O Sodium oxide
5. $HgCl_2$ Mercury (II) chloride
6. Ag_2O Silver oxide
7. Na_3PO_4 Sodium phosphate
8. $CaCO_3$ Calcium carbonate
9. $FeCO_3$ Iron (II) carbonate
10. YBr_3 Yttrium bromide
11. Al_2O_3 Aluminum oxide
12. CO_2 Carbon dioxide
13. SiO_2 Silicon dioxide
14. NO_2 nitrogen dioxide
15. H_2SO_4 Sulphuric acid
16. $NaClO_3$ Sodium chlorate
17. $AuCl_3$ Gold (III) chloride
18. $BiCl_5$ Bismuth (V) chloride
19. Rb_3N Rubidium nitride
20. $Ba(NO_3)_2$ Barium nitrate

16.) Balance the following reactions.



17.) Write the names of the products expected in each of the following reactions, and classify each reaction into one of the six types discussed in the chapter.

i) the reaction between magnesium and oxygen

magnesium oxide (synthesis)

ii) the conversion of calcium nitride into its elements

calcium + nitrogen (decomposition)

iii) the reaction between sodium and water

sodium hydroxide + hydrogen (single replacement)

iv) the reaction between nitric acid and magnesium hydroxide

magnesium nitrate + water (neutralization)

v) the reaction between potassium chromate and silver nitrate

silver chromate + potassium nitrate (double replacement)

18.) Assume that the formula for candle wax is $C_{26}H_{54}$. Write a balanced formula equation for the combustion reaction that occurs when a candle burns.

$$2\ C_{26}H_{54} + 79\ O_2 \rightarrow 52\ CO_2 + 54\ H_2O$$

19.) List four methods of increasing reaction rates, and indicate how each is thought to work.

1.) Increase reactant concentration(s): this increases the number of reactant collisions.

2.) Increase reactant concentration(s): this increases the number of reactant collisions.

3.) Increase reactant temperature: this increases the number and intensity of reactant collisions.

4.) Add a catalyst: this causes the reactants to align better with one another prior to collision.

20.) List 4 household substances, 2 of which are acidic and 2 of which are basic

Acidic – milk, citrus fruits, pop.

Basic – baking soda, eggs, bleach, soap.

21.) Pick two indicators from your data booklet or textbook. Describe how each indicator would identify whether the solution was acid or base.

1.) Methyl Orange – red for acids (below 4) and yellow above 4.

2.) Phenothphthalein – colorless for acids (up to 10) and vivid pink for bases.

22.) a.) Describe how you would identify an organic and inorganic compound.

Organic compounds always contain carbon and usually hydrogen. However, there are carbonates, carbides and carbon oxides that contain carbon and are not organic.

To identify organic look for the high carbon content with hydrogen and it can't be a carbide, carbonate or carbon oxides.

b.) Give three examples of common organic compounds, one of which is an acid, and two compounds containing carbon that are not organic.

Acetic acid – CH_3COOH is an organic acid. Carbonates – $CaCO_3$ and carbides – WC_3 are not organic but contain carbon.

Physics

1.) What does the word energy mean?

The ability to do work. That is the ability to cause a change to objects.

2.) List six different forms energy can be in and give examples of objects that have these forms of energy.

Nuclear = nuclear power plant Electrical = lightning Chemical = food

Elastic = rubber ball Mechanical = fan Sound = speaker

3.) List three common sources of energy in BC and include a positive and negative aspect of each form.

Coal - positive = cheap/negative = high pollution rate

Natural gas – positive = cheap/negative = produces global warming gases (CO_2)

Electricity – positive = minimal global warming gases/negative = damages ecosystems

4.) State the entire law of conservation of energy.

Energy cannot be created nor destroyed, only transformed.

5.) Write a short equation that embodies the answer of the statement you wrote in question 4.

$$E_p = E_k$$

6.) Write down the equation for stored energy and list what each variable stands for, with its unit.

Potential energy - $E_p = mgh$ where m is the mass (kg), g is the acceleration from gravity ($-9.81 \frac{m}{s^2}$), and h is the height (m) above the surface of the earth.

7.) Write down the equation for the energy of motion and list what each variable stands for, with its unit.

Kinetic energy - $E_k = \frac{1}{2}mv^2$ where m is the mass (kg), and v is the velocity ($\frac{m}{s}$).

8.) a.) A $3.0\ kg$ scrub jay is squawking in an oak tree in Mrs. Fifield's backyard. If the bird is on a branch located $20.0\ m$ from the ground, how much potential energy does it have?

$E_p = mgh$ $E_p = (3.0)(9.81)(20.0)$ $E_p = 588.6\ J$

b.) If a $6.0\ kg$ scrub jay were sitting on the same branch as the first jay, his E_p would be:

i. The same as the first jay.

ii. Two times the E_p of the first jay.

iii. Four times the E_p of the first jay.

iv. One-half the E_p of the first jay.

KEY

9.) A squirrel in a nearby tree drops an acorn and just misses Mrs. Sargent's dog, Caesar. If the acorn has $255.5\ J$ of potential energy and a mass of $1.0\ kg$, how high up is the branch from which the acorn fell?

$E_p = mgh$ $\quad 255.5 = (1.0)(9.81)(h)$ $\quad h = 26.0\ m$

10.) A gymnast exercises by jumping on a trampoline. At her highest point she is $4.3\ m$ off the ground and has a potential energy of $11466\ J$. What is the mass of the gymnast?

$E_p = mgh$ $\quad 11466 = (m)(9.81)(4.3)$ $\quad m = 271.82\ kg$

11.) a.) A boy is ready to drop a $1.6\ kg$ water balloon out of a window onto his sister below. The boy is holding the balloon $11.3\ m$ off the ground. How much potential energy does the balloon have just before the boy drops it?

$E_p = mgh$ $\quad E_p = (1.6)(9.81)(11.3)$ $\quad E_p = 177.36\ J$

b.) If the boy were holding the same balloon at a height of $33.9\ m$ off the ground, its E_p would be:

i.) The same as the balloon at the lower height.

ii.) Three times the E_p of the balloon at the lower height.

iii.) Nine times the E_p of the balloon at the lower height.

iv.) One-third the E_p of the balloon at the lower height.

c.) How much potential energy will the balloon have right before it hits the boy's sister? **Explain.**

Zero. The balloon no longer contains any height. The energy has been transformed completely into kinetic energy.

12.) A roller coaster is at the top of a $72\ m$ hill and weighs $966\ N$. The coaster (at this moment) has __potential_ energy. Calculate it. $E_p = mgh$ $\quad E_p = (\frac{966}{9.81})(9.81)(72)$ $\quad E_p = 96\,552\ J$

13.) A car is traveling with a velocity of $40.\frac{m}{s}$ and has a mass of $1120\ kg$. The car has _kinetic_ energy. Calculate it. $E_k = \frac{1}{2}mv^2$ $\quad E_k = 0.5(1120)(40)^2$ $\quad E_k = 996\,000\ J$

14.) Two objects were lifted by a machine. One object had a mass of $2.0\ kg$, and was lifted at a speed of $2.0\frac{m}{s}$. The other had a mass of $4.0\ kg$ and was lifted at a speed of $3.0\frac{m}{s}$.

a.) Which object had more kinetic energy while it was being lifted?

$E_k = \frac{1}{2}mv^2$ $\quad E_k = 0.5(2.0)(2.0)^2$ $\quad E_k = 4.0\ J$

$E_k = \frac{1}{2}mv^2$ $\quad E_k = 0.5(1120)(40)^2$ $\quad E_k = 18.0\ J$ $\quad$ *The second object had much more kinetic*

b.) Which object had more potential energy when it was lifted to a distance of $10.\ m$? Show your calculation. $E_p = mgh$ $\quad E_p = (2.0)(9.81)(10.)$ $\quad E_k = 196.2\ J$

$E_p = mgh$ $\quad E_p = (4.0)(9.81)(10.)$ $\quad E_k = 392.4\ J$ $\quad$ *The second object had much more potential*

KEY

Space Science

1.) What is the universe and how does this differ from what is called the "observable universe"?

The universe is everything that exists. The observable universe are the parts of the universe that light has travelled to and so are potentially possible to see and measure.

2.) Explain how the Big Bang theory explains the beginning of the universe.

The big bang theory says that the universe was once as small as a grain of snad that quickly expanded outwards and cooled to form all energy and matter (universe) as we know it today.

3.) What are three proofs that support the Big Bang theory.

1.) Universe is expanding causing galaxies to move apart (red shift)
2.) Cosmic microwave background radiation (CMB)
3.) Relative Elemental Abundances (75% Hydrogen, 25% Helium)

4.) What are three other competing theories and briefly explain how they describe the beginning of the universe.

1.) Steady State universe – matter continues to be created to cause the expansion of the universe. The universe had no beginning and will have no end.
2.) Eternal inflation – after initial inflation from the big bang that inflation never stopped and continues to day creating multiple universes (multiverse).
3.) Oscillating universe – The idea that the universe began with a big bang and then will have expansion slow and shrink (big crunch) until it is super small again and then start all over.

5.) What is a colour shift and how does a red shift support the Big bang theory?

Colour shift is the change of frequency of light rays as they are stretched by fast moving objects or compressed by slow moving objects. These compressions or stretching cause the colour of the light to change. When looking into deep space, astronomers only see light coming towards earth that is stretched to the red colour. This tells us that all objects are moving away from us (universe is expanding).

6.) How is the Doppler effect similar to a red shift.

Doppler is the compression and stretching of sound instead of light rays. This causes pitch changes instead of colour changes.

7.) How can the space between galaxies be expanding at a rate faster than light?

The space is not really moving faster than light. It appears to be because space (the universe) is expanding between the galaxies, while light is moving between the galaxy, stretching the diatnce light travels. This results, in light moving further than it could if space was not expanding.

8.) What is parallax and explain how this can be used to measure "relatively" close distances?

Parallax is the **apparent** shift in an objects position because of the difference in the viewers distance to that object. Astronomers use earth's orbit around the sun as the changing distance of the viewer to measure the apparent change. At six month intervals, the earth's orbit is on the otherside of the sun, allowing a large enough change is position of the viewer shift to allow for an apparent positional change of interstellar objects.

9.) How do astronomers measure distances to objects that are further than parallax can measure?

Cephid Variables

10.) Astronomers use many tools to study space. Choose an astronomical tool and explain what this tool has taught/shown us and explain how this tool is being was/is being used to discern this information.

LIGO

CANADARM

Various Probes

Various Telescopes

SETI

etc.