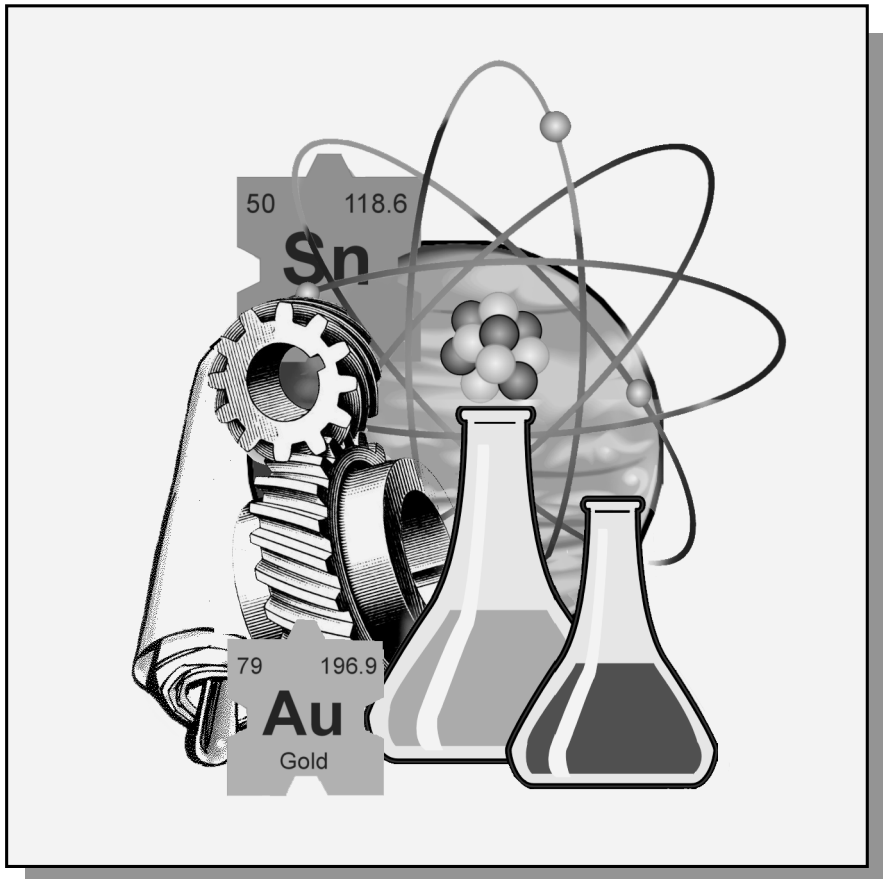
Integrated Physics & Chemistry

ACTIVITIES



Chapter 3

IPC 76175 Revision: 01-21-05-1

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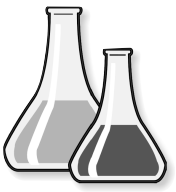
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ACTIVITIES
Lesson 1:
Compounds

Chemical Nomenclature

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Antoine Laurent Lavoisier became interested in science only after he retired.
   (a) True or (b) False

2. The French Academy of Science was started to promote _____.

3. The French Academy of Science was open to skilled _____.

4. _____was known as the Father of Modern Chemistry.

5. Lavoisier's book, *Elements of Chemistry*, was not published until after his death.
   (a) True or (b) False

6. Lavoisier's list of elements was entirely correct.
   (a) True or (b) False

7. *Light* and _____ are both examples of energy.

8. Lavoisier did not list any gaseous elements.
   (a) True or (b) False

Refer to the periodic table inside the back cover of this book to answer questions 9-19.

*9. Oxygen, nitrogen and hydrogen are examples of: _____.
   (a) metals (c) compounds
   (b) gases (d) elements that were known in ancient times

*10. Sulfur, phosphorus and carbon are examples of: _____
   (a) metals (c) compounds
   (b) nonmetals (d) elements that were known in ancient times

*11. The chemical symbol for fluorine is _____.

*12. The chemical symbol for boron is _____.

*13. Antimony, bismuth and platinum are examples of: _____.
   (a) metals (c) compounds
   (b) nonmetals (d) elements that were known in ancient times

*14. The chemical symbol for antimony is _____.

*15. The chemical symbol for bismuth is _____.

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*16. The chemical symbol for platinum is _____.

*17. The chemical symbol for arsenic is _____.

*18. The chemical symbol for zinc is _____.

19. *Arsenic* has properties between _____ and nonmetals.

*20. If the name for an element ends in the ***suffix*** *-ium*, it is most likely to be a: _____.
(a) metal (b) nonmetal (c) gas (d) liquid

21. _____was discovered in the sun before it was found on earth.

*22. If the name for an element ends in *-on*, *-en* or *-ine*, it is a _____.

23. The chemical formula for *sulfuric acid* is _____.

24. The name for the acid with a chemical formula of *HCl* is _____ acid.

25. A binary compound contains but two atoms.
(a) True or (b) False

*26. In the name of a binary compound, the most metallic element is given:
_____.
(a) first (c) once in a while
(b) last (d) a different name each time it is written

27. A binary compound that contains _____ is a carbide.

28. The ***prefix*** for one is _____.

29. The prefix for two is _____.

30. The prefix *penta-* means: _____.
(a) one (b) two (c) four (d) five

31. The symbol *CO* stands for: _____.
(a) carbon monoxide (b) chromium (c) chlorine (d) chloride

32. The number of chlorine atoms in carbon tetrachloride is: _____.
(a) one (b) two (c) four (d) five

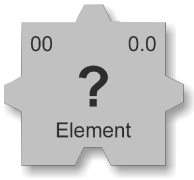
33. The number of atoms of arsenic in diarsenic pentasulfide is: _____.
(a) one (b) two (c) five (d) seven

34. Write the **Life Principle:** *"*_____
_____*."*

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Name: _____

Date: _____ Grade: _____



ACTIVITIES
Lesson 2:
Elements

Lavoisier's List of Elements

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Lavoisier's list of elements did not include any that were known in ancient times.
   (a) True or (b) False

*2. The chemical symbol for sulfur is _____.

3. Sulfur is a(n): _____
   (a) metal (b) nonmetal (c) compound (d) acid

4. Sulfur is a(n) _____ conductor of electricity.

5. Sulfur has been known since _____ times.

6. The person given credit for discovering sulfur was Robert Boyle.
   (a) True or (b) False

7. In ancient times, sulfur was known as: _____.
   (a) saltpeter (b) fool's gold (c) brimstone (d) Vulcan

*8. The chemical formula for sulfur dioxide is _____.

9. The sulfur compound hydrogen sulfide is: _____.
   (a) used to make gunpowder (c) toxic
   (b) no longer in existence (d) harmless

10. _____ can be found in areas of volcanic activity.

11. Rubber trees grow: _____.
   (a) on the slopes of volcanic mountains (c) out of rubber mountains
   (b) in the tropics (d) in the desert

12. The natives of South America used latex to make: _____.
   (a) cannonballs (b) boots (c) rainproof sheets (d) ice cream

13. In cold weather, the first Macintosh coats became: _____.
   (a) stiff (c) runny
   (b) soft-like pancakes (d) blue when worn too long

*14. The element added to latex to make ***vulcanized*** rubber is: _____.
   (a) gold (b) magnesium (c) carbon (d) sulfur

15. Vulcanized rubber is _____ when cold.

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16. In warm weather, vulcanized rubber remains _____.

17. Vulcanized rubber is: _____.
    (a) always hot to the touch (c) rigid
    (b) made from meteorites from the planet Vulcan (d) ***elastic***

18. At the end of his life, Goodyear was: _____.
    (a) a millionaire (b) in debt (c) debt-free (d) stark-raving mad

19. Starting in the 1900s, the chief use of vulcanized rubber was in: _____.
    (a) pencil erasers (c) weather-proof clothing
    (b) airships (d) automobile tires

20. Gunpowder is made of potassium nitrate, charcoal and _____.

21. Another name for sulfuric acid is: _____.
    (a) aqua regia (c) chlorine gas
    (b) *oil of vitriol* (d) carbon monoxide

*22. When sulfuric acid and water are mixed, the reaction generates: _____.
    (a) carbon monoxide (b) a smell like rotten eggs (c) chlorine gas (d) heat

*23. A sad, yet humorous, rhyme circulated in chemistry labs for beginners, which reads:
    Willie was a chemist,
    But Willie ain't no more;
    For what he thought was H_20 (water)
    Was _____ (sulfuric acid).

*24. The use of sulfuric acid in industry is slight.
    (a) True or (b) False

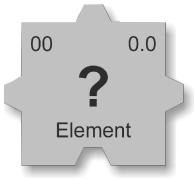
25. Sulfur is: _____.
    (a) a hard, brown nonmetal used in the production of chocolate and as a cleanser to remove the smell of rotten eggs
    (b) a soft, yellow metal whose most important uses are in making raincoats for the winter and for polishing the outside of school buses
    (c) a brittle, yellow nonmetal whose most important uses are in the vulcanization process of rubber and in the production of sulfuric acid
    (d) a soft, brown metal used in the manufacture of fertilizer for peat moss and for the production of vitriolic butter

26. Write the **Life Principle:** *"*_____
    _____*."*

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Date: _____ Grade: _____



Sulfur: Uses and Production

ACTIVITIES
Lesson 3:
Elements

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Sulfur is used in ***fertilizer***.
   (a) True or (b) False

*2. In the molecular formula $(NH_4)_2SO_4$, the NH_4 is known as a: _____.
   (a) benzene group (b) ***radical*** (c) hockey molecule (d) extremist

3. Sulfur will kill _____ and fungi.

4. The blood cells that fight infection are the: _____.
   (a) red cells (b) army cells (c) platelets (d) white cells

5. An ***antiseptic*** is usually applied: _____.
   (a) as an internal medicine
   (b) on the skin
   (c) to help fight lung cancer
   (d) to fight the smell of septic tanks

6. Gerhard Domagk never earned a medical degree.
   (a) True or (b) False

7. Gerhard Domagk worked for a company that made: _____.
   (a) industrial cleaners
   (b) pet products
   (c) dyes
   (d) medical instruments

8. *Staphylococcus* is a type of: _____.
   (a) German dye (b) dinosaur (c) infectious bacteria (d) viral infection

*9. Sulfa drugs were first found in nature.
   (a) True or (b) False

*10. The "wonder" part of wonder drugs is that they can kill one-celled bacteria without: _____.
   (a) anyone knowing how they work
   (b) killing human cells
   (c) killing every kind of bacteria
   (d) producing more kinds of human cells

11. Sulfa drugs were used during World War _____.

12. The amount of sulfur a country consumes can be used as a measure of the country's _____.

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13. Until the start of the 1900s, most sulfur came from: _____.
(a) Scandinavia (b) Louisiana (c) Sicily (d) Texas

*14. Sulfur can be found in the free state and not combined with any other element.
(a) True or (b) False

*15. The *Frasch Process* is a way of: _____.
(a) producing, cleaning and burning coal
(b) bringing sulfur to the surface through pipes
(c) eliminating sulfur from the atmosphere
(d) purifying sulfur from the oceans

16. Ice and liquid water are examples of changes in _____.

17. Tin has *allotropic* forms as a: _____.
(a) liquid (b) solid (c) gas (d) all of these

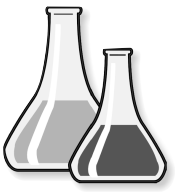
*18. Sulfur has allotropic forms as a liquid.
(a) True or (b) False

*19. Sulfur has allotropic forms as a solid.
(a) True or (b) False

20. The structure of a solid with a regular geometric pattern is: _____.
(a) ***crystalline*** (b) ***amorphous*** (c) diffused (d) chaotic

21. Write the **Life Principle:** *"*_____
_____
_____
_____*."*

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ACTIVITIES
Lesson 4:
Compounds

Chemists Make Diamonds

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

*1. *Carbon* is: _____
(a) metallic (b) nonmetallic (c) always hard (d) always soft

*2. Carbon has _____ forms.

*3. _____is the hardest substance known.

4. The atoms in diamonds have _____ structure.

5. Hardness is a: _____ property.
(a) chemical (b) physical (c) synthetic (d) private

6. On the ***Mohs' hardness scale***, talc has the _____ rating.
(a) hardest (b) toughest (c) softest (d) most brittle

7. If a mineral will scratch quartz of hardness 7 but is scratched by topaz with hardness 8, then the mineral has a hardness: _____.
(a) less than 7 (c) greater than 8
(b) between 7 and 8 (d) none of these

*8. Diamond is used in jewelry and: _____.
(a) talcum powder (b) dentist tools (c) sandpaper (d) rock drills

9. The measure of how strongly a clear substance bends light is known as the index of: _____.
(a) reflection (b) refrigeration (c) reference (d) ***refraction***

10. The sparkle of a diamond is due primarily to its ability to: _____.
(a) hide colors (c) separate white light into colors
(b) create new colors (d) combine white light together into sparkling light

*11. Diamond has the highest melting temperature of any element.
(a) True or (b) False

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12. Most nonmetals conduct electricity: _____.
    (a) perfectly (c) better than metals
    (b) pretty well (d) poorly

13. Diamond conducts electricity: _____.
    (a) perfectly (b) pretty well (c) better than metals (d) poorly

14. Most nonmetals conduct heat: _____.
    (a) perfectly (b) pretty well (c) better than metals (d) poorly

15. Diamond conducts heat: _____.
    (a) perfectly (b) well (c) poorly (d) not at all

16. A *carat* for measuring the weight of a diamond is the same as the carat that measures the amount of gold in an alloy.
    (a) True or (b) False

17. A carat for measuring the weight of a diamond is _____ of a gram.

18. A point is _____ of a carat.

*19. The greatest source of diamonds is in: _____.
    (a) Arkansas (b) Argentina (c) South Dakota (d) South Africa

20. Finish this conversion of 500 carats to grams: 500 carats * 0.2 grams/carat = _____ grams.

21. An imitation glass diamond will feel: _____.
    (a) burning hot (b) warm (c) cool (d) freezing cold to the touch

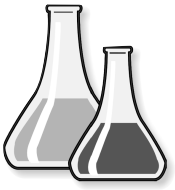
*22. Diamond is made of: _____.
    (a) carbon (b) silicon (c) sulfur (d) sparklite

23. Diamonds are made in the laboratory from _____.

24. *Synthetic diamonds* have no industrial use.
    (a) True or (b) False

25. Write the **Life Principle:** *"*_____
    _____
    _____*."*

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ACTIVITIES
Lesson 5:
Compounds

Graphite and Coal

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Diamond and graphite are nearly identical in their properties.
   (a) True or (b) False

2. ***Graphite*** is a(n) _____ substance.

*3. Graphite is used as a(n): _____.
   (a) dry *lubricant* (c) mild tranquilizer
   (b) abrasive for cutting and drilling (d) dietary supplement

4. Graphite is used in some applications because of its ability to _____ electricity and _____ high temperatures.

5. The cores of lead pencils are made of: _____.
   (a) graphite and lead (c) graphite and galena
   (b) graphite and sulfur (d) graphite and clay

6. Graphite does not exist in nature and has to be manufactured.
   (a) True or (b) False

*7. Soot, charcoal and coal are examples of _____ carbon.
   (a) structured (c) amorphous
   (b) mixed (d) crystalline

*8. Charcoal is made by baking: _____.
   (a) coal (b) wood (c) paper (d) peat

*9. *Coke* is made by baking: _____.
   (a) coal (b) wood (c) paper (d) peat

10. A gasoline substitute can be made from coal.
    (a) True or (b) False

11. The process of first heating a substance and then collecting and condensing the vapor given off is known as: _____.
    (a) cooking (c) chug-a-lugging
    (b) ***destructive distillation*** (d) burn-and-churning

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*12. The four most common elements in plants and animals are nitrogen, hydrogen, oxygen and _____.

13. *Peat* does not have enough carbon to be useful as a fuel.
(a) True or (b) False

14. Of wood, peat and lignite, the one that contains the greatest carbon content is _____.

15. The most abundant coal is _____.

16. Coal is no longer in widespread use.
(a) True or (b) False

17. Of lignite, bituminous and anthracite, the coal that contains the highest carbon content is _____.

*18. ***Organic chemistry*** is primarily the study of compounds of: _____.
(a) carbon (b) oxygen (c) organisms (d) coal

*19. Compared to the other elements, the number of carbon compounds is very _____.

20. The isotope of carbon known as carbon-12 is given an atomic weight of _____.

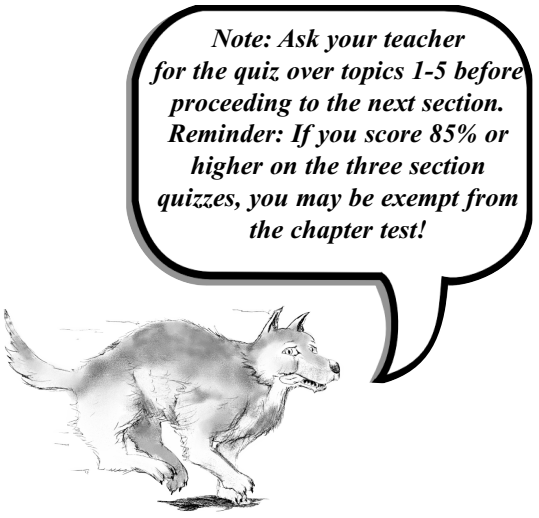
*21. Which carbon isotope is *radioactive*? _____

*22. The chemical name for CH_4 is _____.

*23. The chemical name for CO_2 is _____.

*24. The chemical name for *CO* is _____.

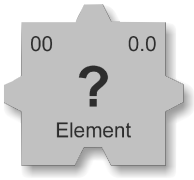
25. Write the **Life Principle:** *"*_____
_____
_____.*"*



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Date: _____ Grade: _____



ACTIVITIES
Lesson 6:
Elements

Medieval Metals

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Members of the same chemical family usually have similar _____ properties.
2. *De Re Metallica* was full of misinformation and proved to be nearly worthless.
   (a) True or (b) False
3. Lou Henry and Herbert Hoover attended Stanford to study: _____.
   (a) geology (b) political science (c) geography (d) geophysics

*4. The chemical symbol for arsenic is _____.

5. Arsenic is best described as a: _____.
   (a) metal (b) nonmetal (c) ***semimetallic*** element (d) gas
6. A metalloid is an element that: _____.
   (a) has both metallic and nonmetallic properties
   (b) falls from the sky
   (c) has neither metallic nor nonmetallic properties
   (d) was formed from cosmic rays
7. The two allotropic forms of arsenic have _____ ***specific gravity***.
8. Arsenic appears first in the formula for arsenic trisulfide because arsenic is:
   _____.
   (a) denser (b) less dense (c) more metallic (d) less metallic

*9. When people think of arsenic they usually think of _____.

10. *Forensic* results must withstand the examination of court proceedings.
    (a) True or (b) False
11. The *Marsh test* could be used as evidence in a court of law.
    (a) True or (b) False
12. The Marsh test is used to prove the presence of _____ in the tissue of a human body.
    (a) arsenic (b) lead (c) bismuth (d) antimony

*13. The chemical symbol for *antimony* is _____.

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14. In ancient times, one of antimony's compounds was used as a: _____.
(a) signal flare (b) fuel (c) lubricant (d) cosmetic

15. The chemical name for Sb_2S_3 is antimony _____.

16. When molten antimony hardens, it: _____.
(a) contracts
(b) expands
(c) maintains its density
(d) catches on fire

17. Antimony is used in alloys to make metal printer type.
(a) True or (b) False

18. Babbitt metal is used to make low friction: _____.
(a) ice skates
(b) polish
(c) bicycle gears
(d) bearings in machines

*19. The chemical symbol for *bismuth* is _____.

*20. The word ***fuse*** means to: _____.
(a) explode (b) ignite (c) melt (d) produce energy

21. A *fusible* alloy melts at temperatures in the range from room temperature to the boiling temperature of water.
(a) True or (b) False

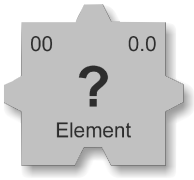
*22. Of arsenic, antimony and bismuth, the one most likely to be used in electrical fuses and fire protection sprinkler systems is _____.

23. Write the **Life Principle:** *"*_____
_____.*"*

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Name: _____

Date: _____ Grade: _____



ACTIVITIES
Lesson 7:
Elements

Platinum and Zinc

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

*1. The chemical symbol for *platinum* is _____.

2. Platinum was found in South America with the metal: _____.
(a) gold (b) copper (c) iron (d) tin

3. The substance known as *little silver* is: _____.
(a) platinum (b) zinc (c) quicksilver (d) tin

4. One location known as a source of platinum is: _____.
(a) Texas (b) ocean water (c) Russia (d) Japan

5. Platinum is one of the cheapest metals known.
(a) True or (b) False

*6. Platinum is twice as dense as: _____.
(a) gold (b) copper (c) lead (d) water

7. Platinum can be dissolved in a mixture of nitric acid and: _____.
(a) sulfuric acid (b) mercury (c) water (d) hydrochloric acid

*8. Chemists make laboratory equipment from platinum because it has a high melting temperature and is: _____.
(a) chemically active (c) relatively inert
(b) smooth to the touch (d) less expensive than most other materials

9. A substance that causes chemical reactions to go faster but is not affected itself is called a(n): _____.
(a) galvanometer (b) ***catalyst*** (c) active chemical (d) alloy

10. The purpose of a *catalytic converter* is to: _____.
(a) absorb pollutants
(b) complete the process of combustion
(c) put lead back into unleaded gasoline
(d) muffle the sound of the engine

*11. The chemical symbol for *zinc* is _____.

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12. Brass is an alloy of copper and: _____.
    (a) tin (b) zinc (c) iron (d) platinum

13. Brass is _____ than copper alone.

14. One alloy of copper and zinc has the same color as gold.
    (a) True or (b) False

15. After 1982, the United States began making one-cent coins composed almost entirely of: _____.
    (a) copper (b) silver (c) gold (d) zinc

16. During World War II, a United States one cent coin was made of: _____.
    (a) zinc and copper (c) copper and silver
    (b) zinc and steel (d) zinc and silver

*17. Coating zinc on a metal to prevent rust is known as: _____.
    (a) electrifying (b) ***galvanizing*** (c) oxidizing (d) magnetizing

*18. Zinc can be coated on steel by dipping the steel into _____zinc.

19. ***Galvanism*** was an early name for: _____.
    (a) electricity (c) milk jugs
    (b) the rumble of thunder (d) the process of separating gold and platinum

20. Lightning has the same properties as static _____.

21. When a cloth soaked in salt was touched with two different metals all electrical activity ceased.
    (a) True or (b) False

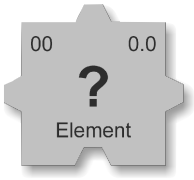
22. The *galvanometer* is named in honor of: _____.
    (a) Luigi Galvani (c) John Galoney
    (b) the discoverer of zinc (d) Vincent van Gogh

23. A large number of chemicals are found in a *dry cell* to prevent: _____.
    (a) air from cleaning the insides of the battery
    (b) the formation of nitrogen and carbon dioxide
    (c) the battery from leaking
    (d) the battery from igniting

24. Unlike carbon and tin, zinc has no allotropic forms.
    (a) True or (b) False

25. Write the **Life Principle:** *"*_____
    _____
    _____.*"*

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ACTIVITIES
Lesson 8:
Elements

Cobalt, Nickel, Manganese, Molybdenum and Tungsten

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

*1. The chemical symbol for *cobalt* is _____.

2. Cobalt was named after the German name for goblin.
(a) True or (b) False

*3. Glassmakers mixed in cobalt ore to color their glass: _____.
(a) blue (b) green (c) white (d) red

4. Cobalt has properties similar to those of: _____.
(a) copper (b) iron (c) carbon (d) platinum

5. One use of cobalt is with other metals to make powerful permanent magnets.
(a) True or (b) False

6. Cobalt alloys are often used in jet engines because they: _____.
(a) increase the speed of the plane (c) are frictionless
(b) reflect cosmic rays (d) resist heat

7. Cobalt chloride has the formula _____.

8. A piece of paper soaked with cobalt chloride changes color because of changes in: _____.
(a) air pressure (b) humidity (c) density (d) velocity

*9. The chemical symbol for *nickel* is _____.

10. Nickel has chemical properties similar to iron.
(a) True or (b) False

11. Nickel ore was confused with one of the ores of: _____..
(a) copper (b) iron (c) silver (d) platinum

12. Nickel easily rusts (corrodes) when exposed to the air.
(a) True or (b) False

13. The United States five-cent coin is about 75 percent: _____.
(a) copper (b) nickel (c) silver (d) tin

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*14. The three ferromagnetic elements are iron, cobalt and: _____.
(a) copper (b) nickel (c) silver (d) tin

*15. The chemical symbol for *manganese* is _____.

16. Manganese is added to glass to: _____.
(a) make it clear
(b) give it a green color
(c) give it a blue color
(d) give it a red color

*17. ***Damping*** the clang of railroad wheels against rail joints would be better achieved if the wheels and rails were made of: _____.
(a) aluminum alloy
(b) bell metal
(c) manganese alloy
(d) tin alloy

18. Manganese alloy get harder with use.
(a) True or (b) False

*19. The chemical symbol for *molybdenum* is _____.

20. One advantage of alloys is that they are not very sensitive to changes in their composition.
(a) True or (b) False

*21. *Tungsten* has the highest melting temperature of any: _____.
(a) element (b) metal (c) nonmetal (d) none of these

22. Tungsten is used as the _____ of electric light bulbs.

23. The first light bulb ***filaments*** were of: _____.
(a) carbon (b) tungsten (c) glass (d) platinum

24. An inert gas in a light bulb is used to: _____.
(a) prevent the filament from exploding
(b) enable the filament to expand
(c) make the filament glow
(d) keep the filament from boiling away

*25. *Pt* is the chemical symbol for _____.

*26. *Zn* is the chemical symbol for _____.

*27. *Co* is the chemical symbol for _____.

*28. *Ni* is the chemical symbol for _____.

*29. *Mn* is the chemical symbol for _____.

*30. *W* is the chemical symbol for _____.

31. Write the **Life Principle:** *"*_____
_____.*"*

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Name: _____

Date: _____ Grade: _____



ACTIVITIES
Lesson 9:
Atmosphere

Gases and the Atmosphere

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

*1. The three states of matter are ***solid***, ***liquid*** and _____.

2. Water can only exist as a solid and liquid.
(a) True or (b) False

3. Water changes from an ice to a liquid at a temperature of _____ºC.

4. The one with the highest *melting temperature* is: _____.
(a) mercury (b) tungsten (c) water (d) lead

5. Liquid water becomes steam at a temperature of _____ ºC.

6. The one that changes from a ***gas*** to a liquid at the coldest temperature is: _____.
(a) oxygen (b) helium (c) nitrogen (d) carbon dioxide

7. Most metals are solids at room _____.

8. At room temperature mercury is a: _____.
(a) solid (b) liquid (c) gas (d) none of these

9. When the temperature is above 5,000ºF, iron would be a: _____.
(a) solid (b) liquid (c) gas (d) none of these

10. All elements can change into gases at sufficiently high temperature.
(a) True or (b) False

*11. Standard pressure is average atmospheric pressure: _____.
(a) in Denver (c) at the bottom of the Pacific Ocean
(b) at sea level (d) at the top of Mt. Everest

*12. *Standard temperature* is _____ºC.

13. Air pressure has no effect upon *boiling temperature*.
(a) True or (b) False

14. In the mountains water boils at a _____ temperature than at sea level.

15. The number of gaseous elements is: _____.
(a) 3 (b) 7 (c) 11 (d) 92

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16. All members of the *helium family* are: _____.
(a) solids (b) liquids (c) gases (d) none of these

*17. *N* is the chemical symbol for _____.

*18. *Cl* is the chemical symbol for _____.

*19. *F* is the chemical symbol for _____.

20. _____ molecules in Earth's ***atmosphere*** travel fast enough to escape from Earth's gravitational attraction.

21. The three gases that make up 99.9 percent of the earth's atmosphere are argon, oxygen and: _____.
(a) carbon dioxide (b) water vapor (c) hydrogen (d) nitrogen

22. The Earth's atmosphere has weight.
(a) True or (b) False

23. *Atmospheric pressure* is the weight of all the _____.

24. Air can be compressed.
(a) True or (b) False

25. Air at the surface of the Earth is _____ dense than air higher in the atmosphere.

26. Clouds are found in the: _____.
(a) ***troposphere*** (b) mesosphere (c) ***ionosphere*** (d) ***stratosphere***

27. *Ozone* is found in the: _____.
(a) troposphere (b) mesosphere (c) ionosphere (d) stratosphere

*28. The chemical formula for ozone is _____.

*29. Ozone is believed to have a role in filtering harmful: _____.
(a) cosmic rays (b) ultraviolet rays (c) gamma rays (d) X-rays

30. Meteorites burn up because of the Earth's: _____.
(a) magnetic field (b) atmosphere (c) gravity (d) size

31. The ***aurora*** light displays occur in the: _____.
(a) stratosphere (b) mesosphere (c) ionosphere (d) rounded sphere

*32. The atmosphere abruptly ends 300 miles above the Earth.
(a) True or (b) False

33. Write the **Life Principle:** *"*_____
_____
_____.*"*

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ACTIVITIES
Lesson 10:
Atmosphere

Air Pressure and Humidity

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Evangelista Torricelli believed water came up a pipe because: _____.
   (a) of reverse gravity in water pumps
   (b) the humidity in the pump was lower than on the outside
   (c) the water pump formed a vacuum
   (d) of outside air pressure

*2. A column of water 34 feet high has the same ***pressure*** as a column of air extending: _____.
   (a) 34 feet (c) one mile
   (b) 1,000 feet (d) to the top of the atmosphere

3. A column of mercury in a ***barometer*** at sea level is about: _____.
   (a) 75 millimeters high (c) 34 feet high
   (b) 760 millimeters high (d) 20,000 ft high

4. A barometer is a device to measure the moisture content of the air.
   (a) True or (b) False

5. The column of mercury in a barometer _____ shortly before a storm.

6. When pressure is high the air is _____.

7. As one goes higher, the density of the atmosphere: _____.
   (a) grows less (c) stays the same
   (b) becomes greater (d) becomes impossible to calculate

8. The amount of Earth's atmosphere that falls below one mile is _____ percent.
   (a) 10 (b) 25 (c) 50 (d) 75

9. At an altitude of 20,000 feet you would expect each breath to contain _____ oxygen than at sea level.
   (a) more (c) less
   (b) the same amount of (d) none of these

*10. The gas that makes up 78 percent of the air is _____.

*11. The gas that makes up 21 percent of the air is _____.

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12. With time, the gases of Earth's atmosphere separate from one another.
(a) True or (b) False

*13. Hot air can hold more moisture than _____ air.

14. The location with the greatest rainfall is: _____.
(a) Barrow, Alaska (c) a tropical rain forest
(b) Mt. Rainier, Washington (d) West Texas

15. Evaporation is _____ likely to take place in air that is hot and dry than in air that is fully saturated.

16. Perspiration is a process to help the body lose _____.

17. ***Absolute humidity*** is a more useful measure than ***relative humidity***.
(a) True or (b) False

18. Weather forecasters who state the ***humidity*** are more likely to be talking about _____ humidity.
(a) absolute (b) relative (c) middle (d) dark

*19. Air that can accept no more moisture has a relative humidity of _____ percent.
(a) 0 (b) 25 (c) 50 (d) 100

20. Relative humidity is _____ on temperature.

21. Water condenses from the air when the temperature falls below the _____.

*22. Relative humidity can be found by comparing the temperature reading of a wet-bulb thermometer with: _____.
(a) a barometer
(b) the temperature of a dry-bulb thermometer
(c) a gyrometer
(d) the temperature of a block of ice

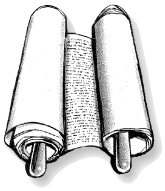
23. In _____ air, the readings of a wet-bulb and a dry-bulb thermometer would be the same.

24. Write the **Life Principle:** *"*_____
_____
_____
_____.*"*

Note: Ask your teacher for the quiz over topics 6-10 before proceeding to the next section. Reminder: If you score 85% or higher on the three section quizzes, you may be exempt from the chapter test!



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ACTIVITIES
Lesson 11:
Scientific Laws

Henry Cavendish and Hydrogen

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

*1. The force of attraction of gravity between two bodies is directly proportional to the: _____.
(a) product of their masses
(b) square of the distance separating them
(c) sum of their weights
(d) difference between their masses

2. Isaac Newton calculated the proportionality constant, *G*, by estimating the: _____.
(a) mass of the Moon
(b) volume of a mountain
(c) mass of the Earth
(d) distance to the Moon

3. The main difficulty with calculating *G* from the gravitational attraction of Earth upon a weight is that the Earth is not of uniform: _____.
(a) curvature (b) velocity (c) density (d) shape

4. The overall density of Earth is about _____ g/cc.
(a) 1.0 (b) 2.7 (c) 2.75 (d) 5.52

5. The main difficulty with calculating *G* from the gravitational attraction of a mountain upon a weight is that the mountain is not of uniform: _____.
(a) mass (b) composition (c) density (d) shape

6. The difficulty with calculating *G* from weights in the laboratory is that the force of gravity: _____.
(a) is too strong to be measured in a laboratory
(b) acts over distances too far to be accurately calculated
(c) is very weak
(d) acts only in space

*7. The first person to measure the force of gravity between two objects of ordinary size was: _____.
(a) Henry Cavendish (b) Isaac Newton (c) Robert Boyle (d) Galileo

8. Henry Cavendish's experiment measured the force of gravity by how much it: _____.
(a) caused a metal ball to rise in the air
(b) twisted a wire
(c) bent a string
(d) moved a mountain

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*9. Gravity is one of the _____ forces known in nature.

10. Henry Cavendish graduated with honors from Cambridge University.
(a) True or (b) False

11. Henry Cavendish was an outgoing person who served as president of the Royal Society.
(a) True or (b) False

12. Henry Cavendish was a spiteful person who refused to share his wealth.
(a) True or (b) False

13. Henry Cavendish did scientific experiments because _____.

14. Henry Cavendish discovered the gas: _____.
(a) hydrogen (b) oxygen (c) helium (d) carbon dioxide

15. All acids contain _____.

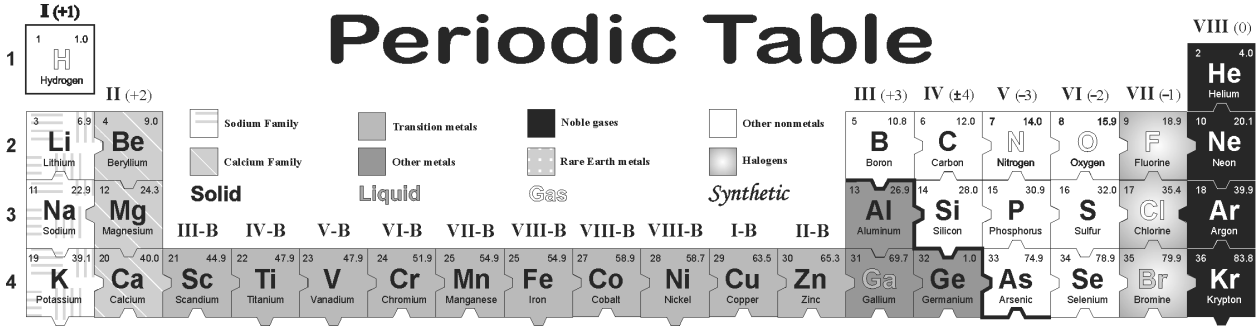
*16. The most common liquid on Earth is: _____.
(a) liquid hydrogen (b) mercury (c) petroleum (d) water

*17. A _____ is a compound containing only *hydrogen* and carbon.

18. Scientists believe the most common element in the universe is _____.

*19. Breaking the water molecule apart with electricity is known as: _____.
(a) ***electrolysis*** (c) hydro-oxide distillation
(b) ***hydrocarbons*** (d) nuclear fission

20. From the Periodic Table of the Elements the lightest element is _____.



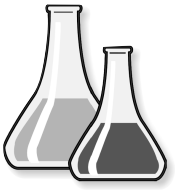
*21. A hydrogen atom contains one proton and one: _____.
(a) electron (b) neutron (c) 2-ton (d) meson

22. Liquid hydrogen is used with oxygen as a fuel.
(a) True or (b) False

23. The gas used to give lift to most airships today is _____.

24. Write the **Life Principle:** *"*_____
_____.*"*

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ACTIVITIES
Lesson 12:
Compounds

Joseph Priestley and Oxygen

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Joseph Priestley studied to be a: _____.
   (a) chemist (b) minister (c) mathematician (d) physicist

2. Benjamin Franklin came to London to: _____.
   (a) design a new clock tower (c) meet with the Royal Society
   (b) meet with Isaac Newton (d) help the colonists seek relief from taxes

3. Joseph Priestley showed that carbon will conduct electricity.
   (a) True or (b) False

4. The fixed air studied by Joseph Black appeared to be the same as the gas given off during ***combustion*** and _____.

5. Carbon dioxide will dissolve in water.
   (a) True or (b) False

6. The bubbles of gas released when soft drinks are opened are made of the gas _____.

7. One way to collect a gas is to let it fill a ***beaker*** and drive out the water.
   (a) True or (b) False

8. Joseph Priestley used mercury instead of water to collect those gases that are: _____.
   (a) solid at room temperature (c) water-soluble
   (b) liquid at room temperature (d) poisonous

9. A magnifying glass was used to: _____.
   (a) observe a white-hot flame (c) produce heat
   (b) ignite glass (d) light a Bunsen burner

10. The gas that Joseph Priestley released from the mercury compound was: _____.
    (a) nitrogen (b) helium (c) carbon dioxide (d) oxygen

11. The gas that Joseph Priestley released from a mercury compound caused an ember to: _____.
    (a) go out (b) explode (c) burst into flames (d) burn brightly

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*12. The gas that will smother a flame is: _____.
(a) carbon dioxide (b) oxygen (c) nitrogen (d) hydrogen

*13. The gas that supports combustion is: _____.
(a) carbon dioxide (b) oxygen (c) hydrogen (d) nitrogen

14. One of the products from burning is: _____.
(a) oxygen (b) carbon dioxide (c) hydrogen (d) nitrogen

15. Joseph Priestley left England because his popularity interfered with his work.
(a) True or (b) False

16. Joseph Priestley finished the last ten years of his life in: _____.
(a) England (b) Switzerland (c) France (d) the United States

*17. *Oxygen* is abundant on Earth.
(a) True or (b) False

*18. Oxygen is one of the most inert gases known.
(a) True or (b) False

19. Oxygen is replaced in the atmosphere by: _____.
(a) automobile exhaust (c) algae in the ocean
(b) humans' breath (d) forest fires

*20. Rusting and decay of organic matter is an example of _____ *oxidation*.

*21. Fire that begins from the heat of slow oxidation is _____ combustion.

*22. Burning is an example of _____ oxidation.

23. For improved health, a person with a respiratory disease should breath _____ oxygen.

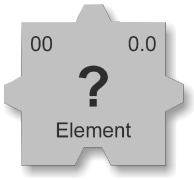
24. As ***fractional distillation*** separates oxygen from the air, the gas that boils away first is: _____.
(a) hydrogen (b) nitrogen (c) argon (d) helium

*25. As electrolysis separates oxygen from the water molecule, the other gas that is released is: _____.
(a) hydrogen (b) nitrogen (c) argon (d) helium

26. Potassium chlorate is used by chemists as a source of: _____.
(a) oxygen (b) potash (c) fluorine (d) nitrogen

27. Write the **Life Principle:** *"*_____
_____
_____*."*

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ACTIVITIES
Lesson 13:
Elements

Nitrogen

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Joseph Black seldom lectured because he wanted to keep his discoveries secret.
   (a) True or (b) False

*2. James Watt invented the: _____.
   (a) Dewar flask (c) 'wattaburger'
   (b) steam engine (d) Thermos bottle

3. Joseph Priestley is given credit for the discovery of _____.

4. Heat and temperature are the same.
   (a) True or (b) False

5. Equal masses of water and lead have _____ heat content.

*6. Latent heat of _____ of water is the amount of heat needed to change water as ice into water as a liquid.

*7. The amount of heat needed to change water into steam is the ***latent heat*** of: _____.
   (a) ***fusion*** (b) ***vaporization*** (c) fission (d) condensation

8. A lighted candle in a jar of oxygen will: _____.
   (a) shine with a green radiance (c) burn brightly
   (b) shine with a blue radiance (d) go out

9. A lighted candle in a jar of carbon dioxide will: _____.
   (a) shine with a green radiance (c) burn brightly
   (b) shine with a blue radiance (d) go out

10. Daniel Rutherford concluded that the atmosphere is made primarily of two gases, oxygen and: _____.
   (a) hydrogen (b) nitrogen (c) helium (d) carbon dioxide

*11. A flame in a container of *nitrogen* will: _____.
   (a) shine with a green radiance (c) burn brightly
   (b) shine with a blue radiance (d) go out

*12. The chemical symbol for nitrogen is _____.

*13. Nitrogen is a nonmetallic _____.

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*14. The flow of heat by air currents is an example of _____.

*15. The transfer of heat by contact is an example of _____.

*16. Heat can transfer from one place to another by ***convection***, ***conduction*** and _____.

17. A *Dewar flask* is used to store: _____.
(a) cold liquids (c) poisonous gases
(b) rays of sunlight (d) slow-burning substances

18. Liquid nitrogen has practically no commercial uses.
(a) True or (b) False

*19. The most common nitrogen compound is _____.

*20. The chemical formula for ammonia is _____.

*21. Nitrogen is: _____.
(a) a necessary ingredient for combustion
(b) highly active chemically
(c) relatively inert but easily combined with hydrogen
(d) inert

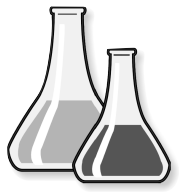
22. One way to increase the rate of a chemical reaction is to _____ the pressure.
(a) increase (b) decrease (c) blow up (d) cool down

23. The Haber Process uses finely ground iron particles as a _____.

24. The *Haber Process* is used to make: _____.
(a) nitrous oxide (b) sulfuric acid (c) ammonia (d) carbon dioxide

25. Write the **Life Principle:** *"*_____
_____
_____.*"*

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ACTIVITIES
Lesson 14:
Compounds

Nitrogen in Fertilizers and Explosives

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

*1. For living things, the four most abundant elements are carbon, hydrogen, oxygen and _____.

2. Essential elements found in small amounts in living organisms are known as: _____.
   (a) ***cellulose*** (c) little elements
   (b) ***trace elements*** (d) wispy elements

3. Most plants get their nitrogen from the: _____.
   (a) water (b) insects (c) air (d) soil

*4. *Nitrogen-fixing bacteria* can convert nitrogen from the atmosphere into chemical compounds.
   (a) True or (b) False

5. Nitrogen-fixing bacteria live around the roots of legumes such as: _____.
   (a) beans (b) squash (c) peanuts (d) corn

*6. Nitrogen is essential to: _____.
   (a) plant life only (c) both plant and animal life
   (b) animal life only (d) neither plant nor animal life

7. One way to keep nitrogen in the soil is to plant corn year after year in the same field.
   (a) True or (b) False

8. The three elements that disappear first from overworked soils are phosphorus, potassium and _____.

9. Potassium and _____ can be found in naturally occurring compounds.

*10. The formula for potassium nitrate is _____.

*11. Most nitrogen fertilizers are manufactured by: _____.
   (a) the Haber Process (c) reverse condensation
   (b) osmosis (d) high-temperature feeding

12. The force of an explosion is caused by the sudden expansion of a great volume of very hot _____.

13. Explosives have no use in peace time.
   (a) True or (b) False

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14. The first explosive was _____.

15. One problem with gunpowder is that it can fail to fire when: _____.
    (a) exposed to sunlight (c) damp
    (b) mixed with gasoline (d) stored in a dry place

16. *Gunpowder* produces great amounts of _____ when detonated.

*17. Cellulose is found: _____.
    (a) only in cork trees (c) in human flesh
    (b) in animal cells (d) in the walls of plant cells

18. *Guncotton* is a(n): _____.
    (a) material to make aprons
    (b) rag used to wipe the inside of a musket or rifle
    (c) explosive
    (d) kind of cloth that smells like gunpowder

19. The problem with guncotton is that it: _____.
    (a) smears the smoky residue from gunpowder
    (b) stinks too badly to be used
    (c) is less powerful than gunpowder
    (d) explodes too easily

20. Glycerin is an alcohol because it contains the: _____.
    (a) hydroxyl group (OH) (c) moisture group (H_2O)
    (b) nitrate group (NO_3) (d) explosive group ($BOOM_1$)

21. The destructive power of nitroglycerin frightened Ascanio Sobrero.
    (a) True or (b) False

*22. Nitroglycerin is a: _____.
    (a) gas (b) liquid (c) solid (d) jelly

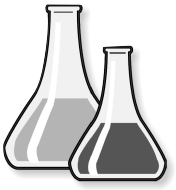
23. Within two years after its discovery, nitroglycerin became the most commonly used explosive.
    (a) True or (b) False

24. Write the **Life Principle:** *"*_____
    _____
    _____.*"*

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Name: _____

Date: _____ Grade: _____



ACTIVITIES
Lesson 15:
Compounds

Nitrogen in Dynamite and Laughing Gas

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. *Nitroglycerin* is one of the weakest explosives known.
   (a) True or (b) False

*2. The blast from nitroglycerin is caused by hot gases that expand with great _____.

3. The first ones to sell nitroglycerin as blasting oil were: _____.
   (a) Humphry Davy and Michael Faraday (c) the U.S. military
   (b) the Nobel family (d) Humphry Davy's children

4. Alfred Nobel believed nitroglycerin: _____.
   (a) would lead to world domination
   (b) would only be used for bombs
   (c) might be useful for construction projects
   (d) might be used to make cars go faster

5. Alfred Nobel stopped production of nitroglycerin because: _____.
   (a) he was killed in an explosion
   (b) he ran out of money
   (c) his own factory exploded and killed his brother
   (d) it was used by countries at war

*6. Dynamite is nitroglycerin absorbed into sticks of: _____.
   (a) peat moss (c) diatomaceous earth
   (b) peanut brittle (d) soda ash

7. Alfred Nobel made no money from his invention of dynamite.
   (a) True or (b) False

*8. Two of the fields that Nobel recognized with his prizes are chemistry and: _____.
   (a) physics (b) mathematics (c) gourmet cooking (d) music

9. Alfred Nobel wanted the prizes to go to people from _____.

10. Nobel Prizes must be awarded in the same year that the discovery is made.
    (a) True or (b) False

11. _____ can be used as a heart medicine.

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12. When Humphry Davy's father died, the son found he had been left with a huge: _____.
(a) debt (b) fortune (c) headache (d) mansion

*13. The chemical formula for *nitrous oxide* is _____.

14. Humphry Davy is given credit for discovering: _____.
(a) nitroglycerin (c) *angina pectoris*
(b) dynamite (d) *laughing gas*

15. Humphry Davy's habit of sniffing and tasting new chemicals left him physically _____.

16. Write the **Life Principle:** *"*_____
_____.*"*

Note: Ask your teacher for the quiz over topics 11-15 before proceeding to the next section. Reminder: If you score 85% or higher on the three section quizzes, you may be exempt from the chapter test!



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