Summary & Practice Sheets
Grade 8

Thermal Energy
Elements and Chemical Bonds
Chemical Reactions and Equations
Electricity and Magnetism

Answer Key

HOT OR COLD

WORD BANK

Temperature: the average kinetic energy of the particles

Heat: the transfer of energy from hot to cold

Thermal Energy: the sum of kinetic and potential energy of the particles

Thermal energy can be transferred by

conduction

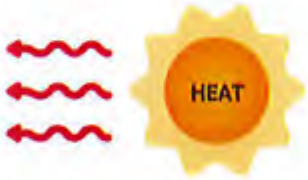
energy is transferred by direct contact

convection

energy is transferred by the motion of particles

radiation

energy is transferred by waves



thermal conductor
material that allows heat energy to be transferred

thermal insulator
material that does not allow heat energy to be transferred

Revision Sheets

Chapter 1 – Thermal Energy

Part A- True/False
Indicate whether the statement is true or false.

F 1. Potential energy is the energy of motion.

F 2. Thermal energy is the temperature of the particles in a material.

T 3. Temperature is a measure of the average kinetic energy of all the particles in an object.

T 4. Heat is the movement of kinetic energy from a warmer object to a cooler object.

F 5. The tool that is used for measuring temperature is called a ammeter.

F 6. The temperature at which all particle movement stops is 373 K.

Part B- Multiple Choice
Identify the choice that best completes the statement or answers the question.

C 7. Which of the following objects has kinetic energy?

a. a bicycle parked at the top of a hill
b. leaves on the ground beneath a tree
c. a football rolling across a field
d. a sunny windowsill

C 8. Which increases the kinetic energy of the particles in a bowl of soup?

a. dividing the soup in half
b. putting the soup in the refrigerator
c. heating the soup for one minute on the stove
d. decreasing the distance between the particles that make up the soup

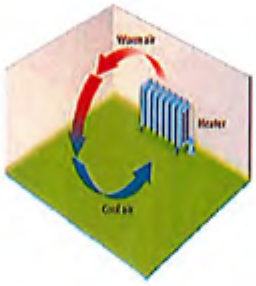
a 9. What do convection and conduction have in common?

a. they can both transfer thermal energy from one material to another.
b. they can both occur in solids, liquids, and gases.
c. they both produce currents
d. they both involve the movement of particles

C 10. Why is radiation the only way heat is transferred from the Sun to the Earth?

a. because particles cannot move in the sun
b. because particles cannot move on earth
c. because it is the only kind of heat transfer that can occur in a vacuum
d. because it is the only kind of heat transfer that can occur over a large distance

C 11. Which is the transfer of thermal energy by the motion of heated particles in a gas or liquid from one part of a material to another?



a. conduction
b. radiation
c. convection
d. collision

B 12. Which is an increase in the size of a substance when the temperature is increased?

a. diffusion
b. thermal expansion
c. thermal contraction
d. specific heat

B 13. Which energy conversion typically occurs in a heating appliance?

a. chemical energy to thermal energy
b. electric energy to thermal energy
c. thermal energy to chemical energy
d. thermal energy to mechanical energy

a 14. Which of the following statements about thermal energy transfer is true?

a. When heat is transferred by conduction, particles collide but remain in the same location.
b. Convection takes place most easily in solids.
c. The Sun is the only source of radiation.
d. Convection does not occur naturally.

Part C- Matching
Match each term with its correct description

a. thermal energy
b. temperature
c. heat
d. radiation
e conduction
f. convection
g. thermostat
h. thermal contraction
i. specific heat

b 15. The average kinetic energy of the particles that make up a material.

a 16. The sum of the kinetic energy and the potential energy of the particles that make up a material.

c 17. The movement of thermal energy from a warmer object to a cooler object.

i 18. The amount of thermal energy required to increase the temperature of 1kg of a material by 1° C.

h 19. A decrease in a material's volume when the temperature decreases.

f 20. The transfer of thermal energy by the movement of particles from one part of a material to another.

e 21. The transfer of thermal energy between materials by the collisions of particles.

d 22. The transfer of thermal energy from one material to another by electromagnetic waves.

g 23. A device that regulates the temperature of a system.

Part D- Short Answer
Write the correct answer for each of the following questions.

24. Explain how thermal energy and temperature differ.

Sum of KE and PE of the particles of a material → average KE of the particles

25. Identify one material that is a good thermal conductor and one material that is a good thermal insulator.

wood

metal

26. What is a thermostat? List three appliances that are equipped with thermostats.

Thermostat is a device that regulates the temperature of a system.
examples: refrigerator, toaster, oven

27. How does a refrigerator keep food cold?

Pipes that surround the refrigerator are filled with a fluid, called a coolant, that flows through the pipes. Thermal energy from inside the refrigerator transfers to the coolant, keeping the inside of the refrigerator cold.

28. What are the energy transformations in a car engine?

Chemical energy is transformed into mechanical energy. Also thermal energy is lost into the environment.

Part E- Organizing

Complete the table by writing each phrase or statement under the correct heading. Each phrase or statement is used only once. Some examples have been done for you.

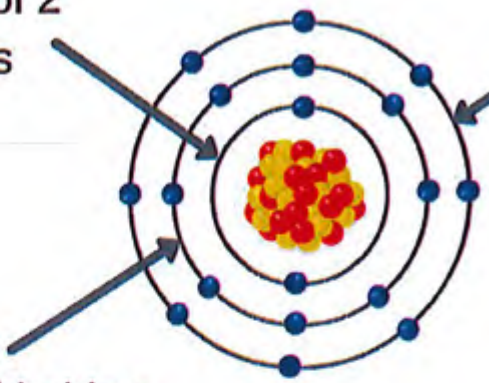
- All matter radiates thermal energy.
- involves the movement of thermal energy in a liquid
- occurs in fluids
- the transfer of thermal energy between materials because of collisions between the particles
- the transfer of thermal energy from one material to another by electromagnetic waves
- When particles with different kinetic energies collide, the particles with higher kinetic energy transfer energy to particles with lower kinetic energy

Radiation	Conduction	Convection
Meaning: • the transfer of thermal energy from one material to another by electromagnetic waves.	*Meaning:* The transfer of thermal energy between materials because of collisions between the particles.	*Meaning:* The transfer of thermal energy by the movement of particles from one part of a material to another.
• A car receives thermal energy from the sun through this. • All matter radiates thermal energy	• Continues until the thermal energy of all particles in contact is equal. • When particles with different kinetic energies collide, the particles with higher kinetic energy transfer energy to particles with lower kinetic energy	• occurs in fluids • involves the movement of thermal energy in a liquid

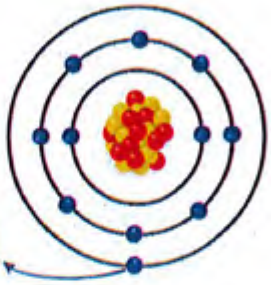
ATOMS: the unit of matter

first shell holds a maximum of 2 electrons

third shell holds a maximum of 8 electrons



second shell holds a maximum of 8 electrons

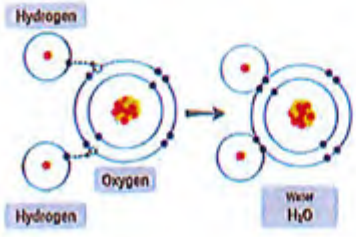


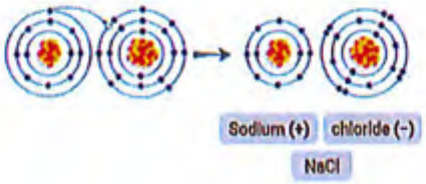
valence electron

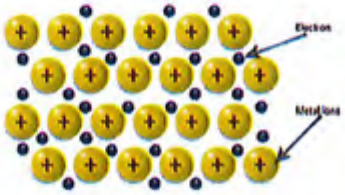
is an outermost electron

COMPOUNDS

covalent	ionic	metallic
two or more nonmetals share valence electrons	metal transfers valence electrons to a nonmetal	metals share pooled valence electrons

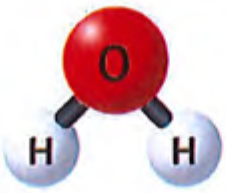






Representing Compounds

dot diagram



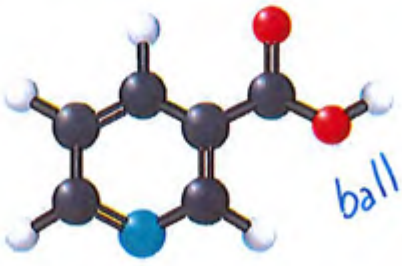
ball and stick model

structural model

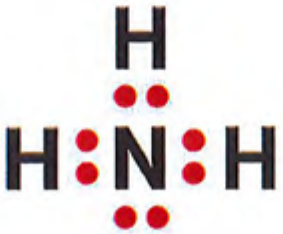
space filling model

PRACTICE-COMPOUNDS

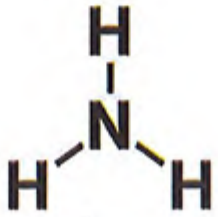
Label the following compounds with the correct model.



ball and stick model



dot diagram



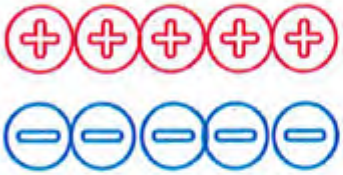
structural model

space filling model

CHARGING TIME!

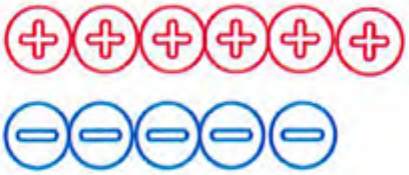
Electrons have a negative charge.

Protons have a positive charge.



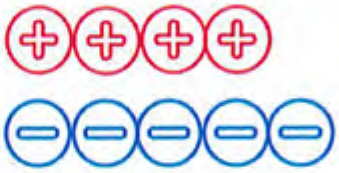
protons = electrons
NEUTRAL

5 + (-5) = 0



protons > electrons
POSITIVELY CHARGED

6 + (-5) = 1



protons < electrons
NEGATIVELY CHARGED

4 + (-5) = -1

PRACTICE-CALCULATING CHARGE

1. 4 - 10 = -6
2. (-8) + 15 = -7
3. 9 + (-10) = -1
4. 13 + (-10) = +3
5. 0 + (-15) = -15
6. 10 + (-10) = 0

7. Magnesium has 12 protons and 12 electrons. What will its charge be when it loses 2 electrons?

12 protons
10 electrons

12 + (-10) = +2

Revision Sheets

Chapter 2 – Elements and Chemical Bonds

Part A- True/False
Indicate whether the statement is true or false.

T 1. Chemical bonds that form between atoms involve electrons.

F 2. The atomic number of an element equals the number of neutrons in an atom of that element.

T 3. The exact position of electrons of an atom cannot be determined.

T 4. A compound is a substance that is composed of two or more different kinds of molecules.

T 5. A polar molecule has a slight positive end and a slight negative end because of the unequal sharing of electrons

T 6. An ionic bond forms when a nonmetal atom transfers one or more valence electrons to a metal atom.

F 7. An atom with seven valence electrons would most likely lose an electron to become stable.

T 8. The shiny appearance of metals is caused by valence electrons on the surface.

Part B- Multiple Choice
Identify the choice that best completes the statement or answers the question.

a 9. Which is a property of covalent compounds?

a. poor conductor
b. good conductor
c. high melting point
d. always solid at room temperature

C 10. How many valence electrons should an atom have to be stable?

a. 2
b. 6
c. 8
d. 7

C 11. An ionic bond forms when _____.

a. a metal and nonmetal atom share electrons.
b. a metal gains an electron and a nonmetal loses an electron.
c. a metal loses an electron and a nonmetal gains an electron.
d. a metal atom combines with a nonmetal atom to become one atom.

A 12. In the chemical formula H_2O, how many atoms of oxygen are represented?

a. one
b. four
c. two
d. zero

B 13. Which compound is an example of a polar molecule?

a. H_2
b. H_2O
c. CO_2
d. CH_4

C 14. A double covalent bond is formed when _____.

a. two atoms share one pair of valence electrons
b. two atoms share bonds with four other atoms
c. two atoms share two pairs of valence electrons
d. two atoms share three pairs of valence electrons

C 15. Which part of an atom participates in chemical bonding?

a. proton
b. neutron
c. electron
d. nucleus

A 16. What does an electron dot diagram show?

a. the number of valence electrons
b. the strength of electron energy fields
c. the spacing arrangement of electrons
d. the mass of the electrons

C 17. What makes an atom more stable when it is forming an ionic bond?

a. losing an electron
b. gaining an electron
c. gaining or losing an electron
d. the atom is not stable in an ionic bond

C 18. Which type of bond joins nonmetal atoms to nonmetal atoms?

a. ionic
b. metallic.
c. covalent
d. synthetic.

B 19. A metallic bond forms when valence electrons move freely around a metal atom that has become a

a. ionic
b. metallic
c. covalent
d. catalyst

A 20. Which type of covalent bond is the strongest?

a. triple covalent bond
b. double covalent bond
c. single covalent bond
d. they are all equally strong

Part C- Matching
Match each term with its correct description

a. metallic bond
b. ionic bond
c. chemical bond
d. valence electron
e. polar molecule
f. ion
g. electron dot diagram

b 21. a bond between positively and negatively charged atoms

c 22. a force that holds atoms together

a 23. a chemical bond formed when positively charged atoms share their electrons

f 24. an atom that is no longer electrically neutral

e 25. has a slight positive end and a slight negative end because of unequal sharing of electrons

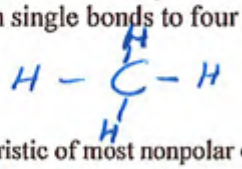
d 26. the part of an atom that participates in chemical bonding

Part D- Short Answer
Write the correct answer for each of the following questions.

27. Describe how metallic bonds form.
Metallic bonds form when many metal atoms share their pooled valence electrons.

28. Create an electron dot diagram for an atom of oxygen, atomic number 8, group 16.
Oxygen is in group 16. So the valence ~~elect~~ electrons of oxygen is 6. ·Ö:

29. Write a chemical formula to represent the compound methane, which is made up of a carbon atom with single bonds to four individual hydrogen atoms.



30. What is a characteristic of most nonpolar compounds?
The shared electrons are pulled equally between the atoms of a compound.

31. The atoms of noble gases do NOT bond easily with other atoms because their valence electrons are 8.

Balancing Chemical Reactions

NOT BALANCED CHEMICAL REACTION

$$N_2 + H_2 \rightarrow NH_3$$

Reactants
2 nitrogen (N) atoms
2 hydrogen (H) atoms

Product
1 nitrogen (N) atom
3 hydrogen (H) atoms

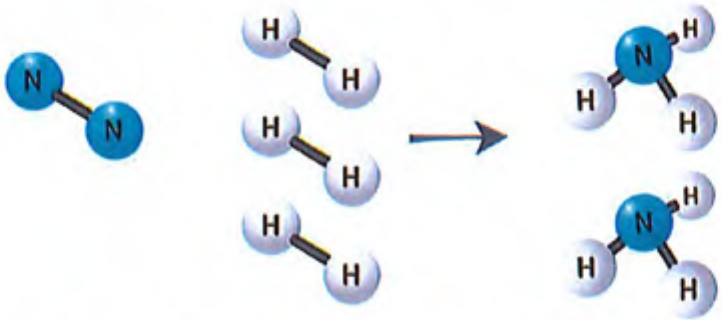
Step 1: Count the number of atoms on each side of the equation.
a. If the numbers are not equal, then the equation is not balanced.

Step 2: Add coefficients to the chemical formulas to balance the equation.

Step 3: Continue to add coefficients as needed until the equation is balanced.

Step 4: Write the balanced equation.

BALANCED CHEMICAL REACTION



$$N_2 + 3H_2 \rightarrow 2NH_3$$

Reactants
2 nitrogen (N) atoms
6 hydrogen (H) atoms

Product
2 nitrogen (N) atoms
6 hydrogen (H) atoms

PRACTICE-BALANCING

Balance the following chemical reactions.

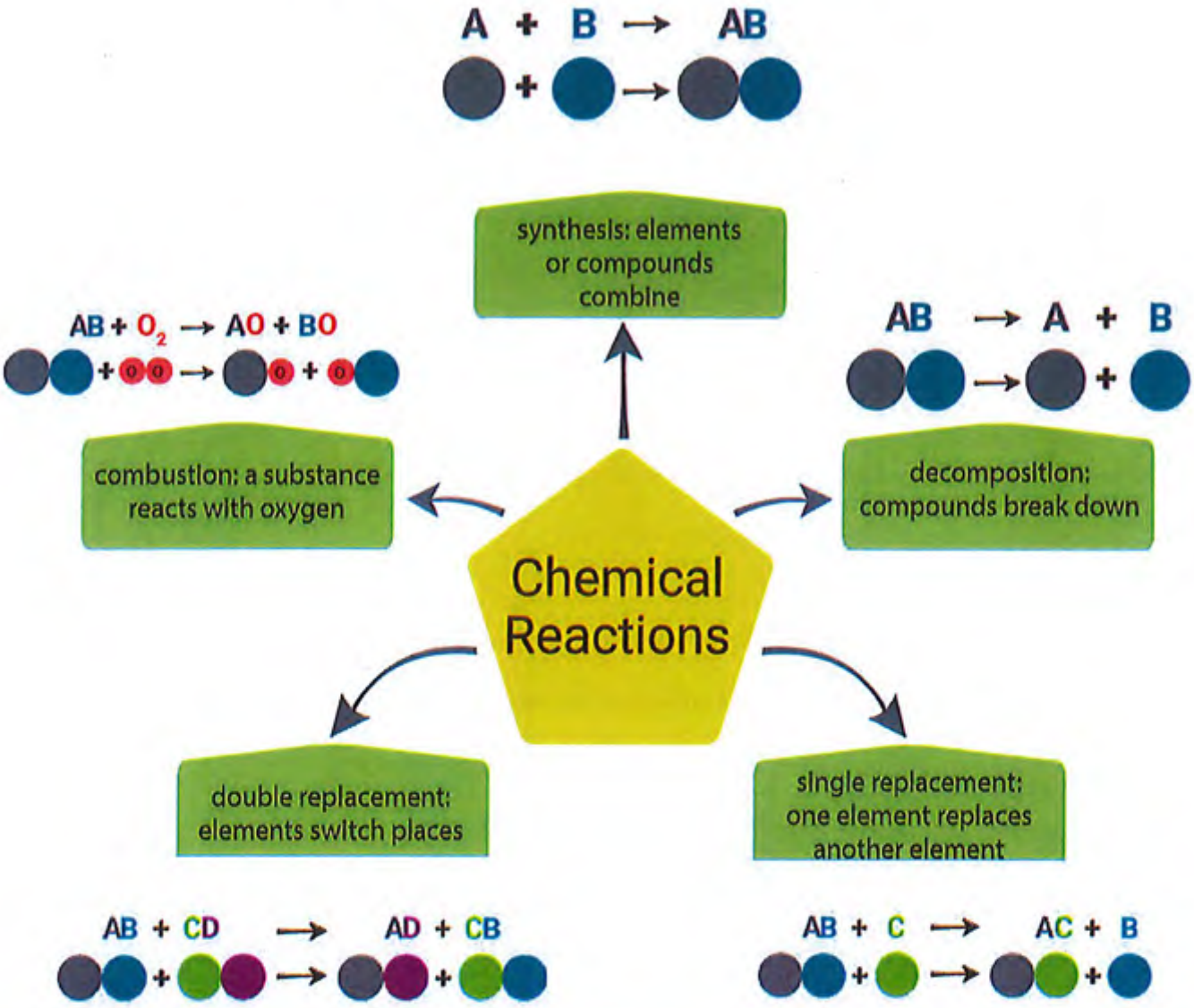
$$Xe + F_2 \longrightarrow XeF_6$$

$$Xe + 3F_2 \longrightarrow XeF_6$$

$$CaO + C \longrightarrow CaC_2 + CO$$

$$CaO + 3C \longrightarrow CaC_2 + CO$$

Types of Chemical Reactions



PRACTICE-TYPES OF CHEMICAL REACTIONS

Classify each type of chemical reaction.

$Xe + F_2 \longrightarrow XeF_6$ Synthesis

$CaO + C \longrightarrow CaC_2 + CO$ single replacement

Revision Sheets

Chapter 3 – Understanding Chemical Reactions

Part A- True/False
Indicate whether the statement is true or false.

F 1. Inhibitors are used to speed up chemical reactions in the body.

T 2. When a chemical equation contains the same number of atoms on both sides, the equation is balanced.

F 3. Catalysts slow down chemical reactions.

T 4. Exothermic reactions release energy.

F 5. A double-displacement reaction has only one reactant

F 6. Nitrogen is always present in combustion reactions.

Part B- Multiple Choice
Identify the choice that best completes the statement or answers the question.

B 7. How can you know for sure that a chemical reaction has occurred?

a. Check the temperature of the starting and ending substances.
b. Compare the chemical properties of the starting and ending substances.
c. Look for a change in state.
d. Look for bubbling of the starting substances.

C 8. The chemical equation below is unbalanced.

$$Zn + HCl \rightarrow ZnCl_2 + H_2$$

Which is the correct balanced chemical equation?

a. $Zn + H_2Cl_2 \rightarrow ZnCl_2 + H_2$
b. $Zn + HCl \rightarrow ZnCl + H$
c. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$
d. $Zn + 2HCl \rightarrow 2ZnCl_2 + H_2$

NOTE: question is incorrect remove 2 from option C

C 9. Which is an example of a chemical change?

a. a ball of clay is split in two
b. a piece of wood is splintered
c. a coin rusts
d. salt and pepper are mixed

B 10. Chopping a piece of wood and burning it demonstrates _____.

a. a chemical change followed by a physical change
b. a physical change followed by a chemical change
c. an endothermic reaction followed by an exothermic reaction
d. chemical energy converted into mechanical energy

B 11. What kind of reaction is shown in the formula $2AgCl + Pb \rightarrow PbCl_2 + 2Ag$?

a. synthesis reaction
b. replacement reaction
c. decomposition reaction
d. gaseous reaction

A 12. Sodium and chlorine join together to form sodium chloride, a new compound. This is an example of a _____.

a. synthesis reaction
b. compound reaction
c. replacement reaction
d. decomposition reaction

D 13. How do the reactants and products compare in a chemical reaction?

a. The reactants have more mass.
b. The products have more mass.
c. The products are much simpler substances.
d. The reactants and products have different physical and chemical properties.

C 14. When iron combines with oxygen gas and forms rust, the total mass of the products_____?

a. depends on the reaction conditions
b. is less than the mass of the reactants
c. is the same as the mass of the reactants
d. is greater than the mass of the reactants

B 15. Potassium nitrate forms potassium oxide, nitrogen, and oxygen in certain fireworks

$$4KNO_3 \rightarrow 2K_2O + 2N_2 + 5O_2$$

This reaction is classified as a _____.

a. combustion reaction
b. decomposition reaction
c. single-replacement reaction
d. synthesis reaction

B 16. Which of the following must occur before new bonds can form during a chemical reaction?

a. The atoms in the reactants are destroyed.
b. The bonds between atoms in the reactants are broken.
c. The atoms in the reactants are no longer moving.
d. The bonds between atoms in the reactants get stronger.

B 17. Each substance written to the right of the arrow in a chemical equation is a ____.

a. reactant
b. product
c. precipitate
d. catalyst

B 18. The following chemical reaction shows that there are _____ hydrogen in the reactants and _____ atoms of hydrogen in the products.

$$N_2 + 3H_2 \rightarrow 2NH_3$$

a. 2, 3
b. 6, 6
c. 3, 6
d. 6, 3

C 19. How many atoms of calcium are in a unit of calcium phosphate whose formula is $Ca_3(PO_4)_2$?

a. one
b. two
c. three
d. four

Part C- Matching
Match each term with its correct description

a. chemical change
b. chemical equation
c. chemical bond
d. endothermic
e. exothermic
f. product
g. reactant

C 20. Forces that hold atoms together.

b 21. A way to represent a chemical reaction by using symbols for the amounts of reactants and products in the change.

a 22. A change in matter that produces a new substance with different properties from the original.

d 23. A chemical reaction that absorbs heat energy.

e 24. A chemical reaction that gives off heat energy.

f 25. The new substance produced in a chemical reaction

g 26. An original substance at the beginning of a reaction.

Part D- Short Answer
Write the correct answer for each of the following questions.

27. In exothermic reactions, is heat given off or required in order to have the reaction occur?

heat is released

28. For the reaction described by the formula $H_2C0_3 \rightarrow CO_2 + H_2 0$, identify the type of reaction.

decomposition reaction

29. Synthesis, replacement, and decomposition reactions are types of _____ reactions.

chemical

30. What is the difference between a chemical change and a physical change?

In a chemical change, a new substance is formed. In a physical change, no new substance is formed.

31. Explain what is meant by a balanced chemical equation.

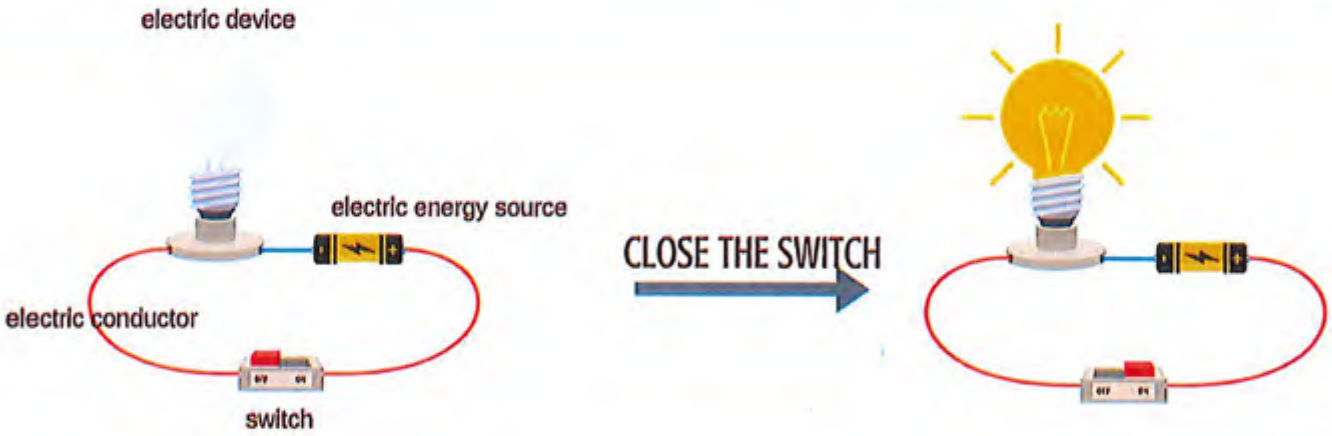
mass is neither created nor destroyed, only rearranged. The mass of reactants equals the mass of products.

ELECTRIC FORCES

Like charges REPEL

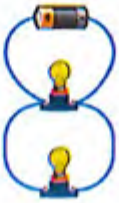
opposite charges ATTRACT

ELECTRIC CIRCUITS



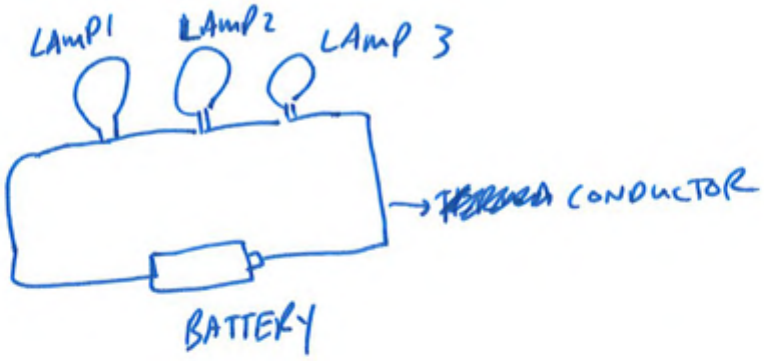
- In a series circuit, the electric devices are connected side by side. This means you can trace the full circuit without lifting your pencil.
- In a parallel circuit, the electric devices are connected in parallel to each other. This means you will not be abke to trace the whole circuit without lifting your pencil.

TRY IT YOURSELF!

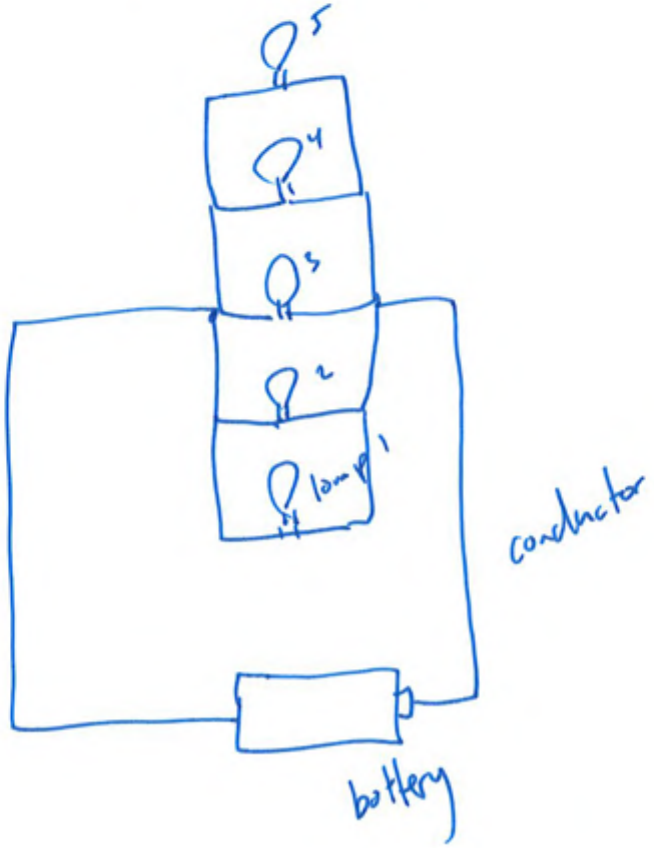


PRACTICE-CIRCUITS

1. Draw a series circuit with three lamps. Label your diagram.



2. Draw a parallel circuit with five lamps. Label your diagram.



WHAT WILL THE MAGNET PULL?

Magnets are objects that attract magnetic materials, like iron.

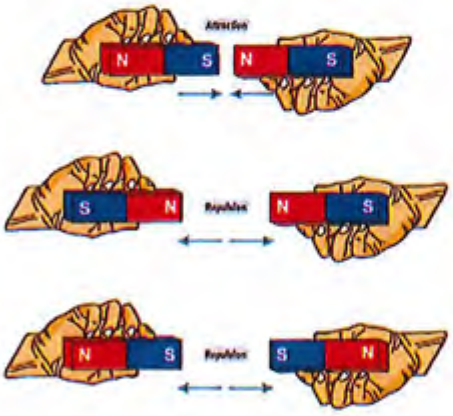
Magnets create invisible *magnetic fields*. They fill the area around a magnet where the *magnetic forces* work.

MAGNETIC POLES - ATTRACT OR REPEL?

Bar magnets have two poles:

- the north pole
- the south pole

Opposite poles attract and like poles repel.



MAGNETIC VS NONMAGNETIC MATERALS !

Magnetic materials have their atoms grouped in magnetic domains.

Nonmagnetic materials have their atoms not grouped in magnetic domains.

Revision Sheets

Chapter 4 – Electricity and Magnetism

Part A- True/False

Indicate whether the statement is true or false.

F 1. Electrons move around the protons of an atom.

F 2. When an atom's charge is balanced, the amount of negative charge equals the amount of neutral charge.

F 3. The basic parts of an electric circuit include the source of energy, electric devices, and parallel circuits.

T 4. Adding a fan and an electric light to a parallel circuit decreases the electriccurrent flowing in the circuit.

T 5. A device that has higher resistance transforms more electrical energy into other forms of energy.

F 6. Increasing the length of a conductor decreases electric resistance.

Part B- Multiple Choice

Identify the choice that best completes the statement or answers the question.

C 7. What kind of circuit has more than one path for current to flow?

a. open
b. series
c. parallel
d. conducting

B 8. What kind of circuit has only one path for current flow?

a. open
b. series
c. parallel
d. conducting

C 9. What flows in an electric circuit?

a. protons
b. neutrons
c. electrons
d. ions

C 10. Magnetic field lines are closest together in areas where _____.

a. there is no magnetic force
b. the magnetic force is the weakest
c. the magnetic force is the strongest
d. the magnetic force is equal

d 11. What is the role of the electromagnet in an electric motor?

a. supplies a current to the motor
b. supplies motion to parts of the motor
c. supplies current to the permanent magnet
d. supplies current to the temporary magnet

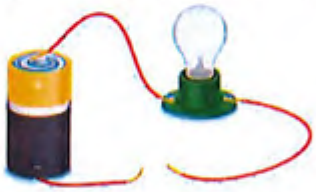
C 12. A magnet sticks to a refrigerator door. Therefore, the door must be _____.

a. a magnet
b. electrically charged
c. made of a magnetic material
d. probably not electrically grounded

B 13. An electric generator _____.

a. transforms chemical energy into motion
b. produces an electric current in a wire coil
c. uses two electromagnets to produce motion
d. uses conducting magnets to produce a current

C 14. Why is the lightbulb not on in this image?



a. the battery is used up
b. the bulb is burned out
c. the circuit is open
d. the circuit is closed

A 15. Why are parallel circuits used in the wiring of houses and other buildings, rather than series circuits?

a. because in a series circuit, all devices must be turned on in order for current to flow
b. because too much wire would be needed for a series circuit for an entire building
c. because in a series circuit, if you turn on one device, all of the devices turn on
d. Because power plants generate electricity that can flow in parallel circuits.

remove "un"

C 16. Which phrase best describes an electric current?

a. a force that repels
b. a force that attracts
c. a flow of uncharged particles
d. An unmoving charge on an object

B 17. Each substance written to the right of the arrow in a chemical equation is a ____.

a. reactant
b. product
c. precipitate
d. catalyst

C 18. A string of light bulbs does not light. How can you determine whether the bulbs are in series or parallel circuit?

a. Observe the material they are made of.
b. Count the number of wires connecting the
c. Change the bulbs one at a time to see if they all light.
d. Measure the amount of thermal energy produced by the lights.

D 19. Rana pulls a sock from the clothes dryer. It is electrically charged. What must be true of the sock?

a. It has lost all of its electrons.
b. It can never again become electrically neutrally.
c. It would not interact with other charged objects.
d. It has unequal amounts of positive and negative charges.

Part C- Matching
Match each term with its correct description

a. electromagnet
b. magnet
c. electric field
d. voltage
e. generator
f. electric circuit
g. electric current

C 20. The invisible region around any charged object where an electric force is applied.

g 21. The movement of electrically charged particles, such as electrons.

f 22. A closed, or complete, path in which an electric current flow.

d 23. The amount of energy used to move one coulomb of electrons through a circuit.

b 24. An object that attracts iron and other materials that have magnetic properties similar to iron.

a 25. A temporary magnet made with a current carrying- wire coil wrapped around a magnetic core.

e 26. A machine that transforms mechanical energy to electrical energy.

Part D- Short Answer
Write the correct answer for each of the following questions.

27. List the basic parts of a simple circuit.

energy source, electric device, conductor, switch

28. Explain the difference between voltage and electric resistance.

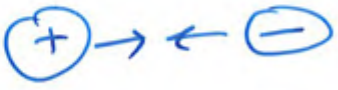
Voltage is the amount of energy needed to move 1 C of electrons. Resistance is the opposition of flow.

29. Explain what causes a magnetic force.

Magnetic force is caused by the magnetic field around a magnet.

30. What is the relationship between magnetic domains and magnetic materials?

Magnetic materials contain magnetic domains, where all the particles are oriented in the same direction.

31. Explain what happens when two charged objects have opposite charges.

They will attract.