Université de M’sila-Faculté des sciences- 12/09/2022

Département de physique 3éme théorique

**Text 01: Force and Motion**

There are many things that move in different directions. Some things move up and down, right to left, in circles, or in many other directions. There are objects that move slowly, quickly, or in between. Some objects move on their own, and there are other objects that need help to move. No matter how something moves, whether it is an object, person, or animal, this movement is called motion.

Motion is movement from one place to another. For example, when two people sit on a see-saw they cause it to move up and down. One person will be in the air; the other person will be on ground level, and then they will switch places or positions. Position is the place where a person or object is located. If the position changes, it is movement or motion. The different kinds of motion include back and forth, up and down, in a circle, zig-zag, or straight ahead. Singing on a swing is a back and forth motion and an up and down motion. Riding on a merry-go-round is going round and round in a circle. If a person is trying to avoid being tagged in a game, it might be a zig-zag motion or a straight-ahead motion.

In addition to different movements in motion, there is also something called speed. Speed is how fast a person or object moves. Speed can be very fast. For example, a train's speed moving on its tracks may be fast and straight ahead. Speed can also be very slow, like how a turtle moves from place to place. In addition, the speed of an object can be both slow and fast, like a car. Cars sometimes move slowly, but on a highway they move much faster. A car can also change direction, have different movements, and change its position very easily. Many things that move, though, cannot move on their own. The push or pull to get an object to move is called force. A force is needed to get something to move. Even a person uses force to move from place to place. A person uses their muscles to help them move. When a child moves a wagon, it is an example of pulling. When a person opens a door it can be an example of pulling or pushing. While pushing and pulling is usually easy to do, there is something that sometimes makes it more difficult. Friction is a force that acts on another force to slow it down or cause it to stop. For example, when riding a bike, a person pedals, the wheels move, and the tires move across the road or sidewalk. The tires rubbing along the concrete will eventually cause the bike to slow down and stop moving due to friction.

In summary, many objects everywhere can move, and the movement is called motion. It is the movement from one position to another and it can be fast or slow. This is called speed. The motion can also be back and forth, up and down, around in a circle, straight, or zig-zag. Pushing and pulling will cause an object to move. It is also possible to change the speed of motion by using a force. One example of a force is called friction. Friction is a rubbing between two things that act as a force on the moving object and slows it down.

**Questions:**

Haut du formulaire1) Which of the following is the movement of objects or people?

a: Position ; b: Motion ; c: Speed ; d: Friction

2) Which of the following is the place where a person or object is located?

a: Motion ; b: Force ; c: Friction ; d: Position

3) Which of the following is how fast or slow an object or person moves?

a: Force ; b: Position ; c: Speed ; d: Friction

4) Which of the following is the push or pull to get an object to move?

a: Force ; b: Position ; c: Motion ; d: Speed

5) Which of the following is a force that acts on another to slow it down or cause it to stop?

a: Speed ; b: Motion ; c: Position ; d: Friction

6) What is a force that opposes motion between two surfaces?

a: friction ; b:acceleration ; c:velocity ; d:motion

7) Straight ahead, back and forth, in a circle, and up and down are all examples of:

a: Speed ; b: Position ; c: Motion ; d: Friction

1. How is gravity affected by mass?

a: The larger the mass of the object, the greater the gravity; b: Small objects have no gravity

c: Gravity is not affected by mass of objects, whether large or small

1. What is the difference between mass and weight?

a: Mass is how much matter is in an object, and weight is the gravitational pull on that object

b: Mass and weight are the same ; c: Weight affects how much mass is in an object

d: Weight is determined by how many atoms make up an object

1. Without any force to change it, an object at rest stays at rest and an object in motion stays in motion:

a: Newton’s first law of motion ; b: Newton’s second law of motion ; c: Newton’s third law of motion

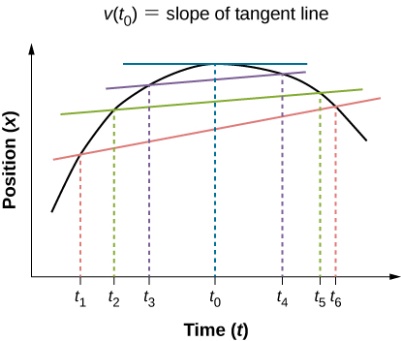
1. If a force of 30 N is exerted on two balls, one with a mass of 4.5 kg and the other with a mass of 12 kg, which ball will have the greater acceleration?  (F=ma)

a: The one with a mass of 12 kg will have the greatest acceleration.

b: The one with a mass of 4.5 kg will have the greatest acceleration.

c: They will both accelerate at the same rate.

1. An object at rest will \_\_\_\_\_\_\_ if no outside forces are applied.

a: Stay at rest ; b: Increase Velocity ; c: Decrease Mass

1. Acceleration is caused by a force acting on a mass.

a: Newton’s first law of motion ; b: Newton’s second law of motion ; c: Newton’s third law of motion

1. The picture of the position vs. time graph shows an object that is...

a: Accelerating/speeding up ; b: Moving at a constant speed  ; c: Not moving

d: Accelerating/slowing down. Bas du formulaireBas du formulaire

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1. Are the following sentences true or false?
2. Instantaneous speed is the total distance covered divided by time.
3. The speedometer on a car shows the Instantaneous speed.
4. An object is moving if its position relative to a fixed point is changing.
5. Momentum is related to Newton's first law.

**Text 02: Atoms and Molecules**

The tiny particles that make up elements are called atoms. An **atom** is the smallest unit of an element that retains or keeps the properties of that element. For example, the atoms that make up oxygen can never be changed.

The inside of an atom contains three different kinds of particles as well. They are called protons, neutrons, and electrons. Surprisingly, atoms are not solid, they are mostly empty space. There is a tiny, very dense body in the center of an atom called the **nucleus.** Inside the nucleus are the protons and neutrons. The electrons are in the space outside the nucleus.

A **proton** carries one unit of positive electric charge. An **electron** carries one unit of a negative electric charge. **Neutrons** have no electric charges. The number of protons in an atom determines what the element is. An oxygen atom, for example, has eight protons.

The **Periodic Table of Elements** shows the number of protons for each element. The element or substance called sodium has eleven protons. Sodium is a substance when combined with another substance makes salt. As in all kinds of matter, the different elements can be a solid, liquid, or gas.

The different kinds of atoms are then joined together to make a molecule. A molecule is a particle that contains more than one atom joined together. Basically, atoms come together in different ways to make molecules, and molecules come together in different ways to make different kinds of matter.

Water is an example of a molecule made up of different atoms. The atoms for water include hydrogen and oxygen. It takes two atoms of hydrogen and one atom of oxygen to make one molecule of water. This would be an extremely tiny drop of water a person could not see without a special microscope. Some elements are made up of single atoms and do not attach to any other kinds atoms. Neon is an example of an atom that does not attach to another atom.

However, there are certain atoms that attach to themselves to make different substances. For example, oxygen is usually made up of two-atom molecules. But, a three-atom molecule of oxygen will create ozone. Oxygen and ozone is very different from each other but both use oxygen atoms to be formed.

Most everyday substances people use are made up of a combination of different molecules. Table salt is made up of an element called sodium joined with an element called chloride. Sodium chloride is the scientific name for salt. The different atoms making up sodium and chloride are joined together to make a new substance and molecule called salt.

Sometimes the use of atoms and molecules can be very confusing but it sometimes can be thought of as a recipe. In summary, the particles (or ingredients) that make up an **atom** are **protons,** neutrons, and electrons. Atoms (another ingredient) are particles joined together in many different ways and methods to form **molecules.** Finally, the molecules (more ingredients) are joined together to make everything on Earth and in the universe.

**Questions:**

1. Which particles have approximately the same mass?

a:Alpha particle and beta particle.

b:Alpha particle and proton.

c:Neutron and positron.

d:Neutron and proton.

1. An atom in the ground state has two electrons in its first shell and six electrons in its second shell. What is the total number of protons in the nucleus of this atom?

a:5; b:2;c:7;d:8

1. The diagram below represents the nucleus of an atom.



What are the atomic number and mass number of this atom?

a: The atomic number is 9 and the mass number is 19.

b:The atomic number is 9 and the mass number is 20.

c:The atomic number is 11 and the mass number is 19.

d:The atomic number is 11 and the mass number is 20.

1. An atom of any element must contain

a:an equal number of protons and neutrons.

b:an equal number of protons and electrons.

c:more electrons than electrons than protons.

d:more electrons than protons.

1. The mass of 12 protons is approximately equal to

a:1 atomic mass unit.;b: 12 atomic mass unit.; c:The mass of 1 electron.;d:The mass of 12 electrons.

1. The smallest unit of an element that retains or keeps the properties of that element is called

**a:** A molecule **;b:** An atom**; c:** A proton**;**d**:** A neutron

1. Which of the following does not have an electrical charge?

a**:** Neutron; b**:** Electron; c**:** Neuron; d**:** Proton

1. The Periodic Table of Elements shows the number of \_\_\_\_\_\_\_\_\_\_ for each element.

a**:** Neutrons; b**:** Electrons; c**:** Atoms; d**:** Protons

1. How many more protons does sodium have than oxygen?

a**:** 8; b**:** 11; c**:** 3; d**:** 1

1. Protons, electrons, and neutrons make up atoms and atoms make up

a**:** Substances; b**:** Matter; c**:** Molecules; d**:** Solids

1. Sodium Chloride is the scientific name for which of the following substance?

a**:** Water; b**:** Sugar; c**:** Gas; d**:** Salt

1. Which of these is the smallest particle?

a : An atom; b :A molecule; c :A speck of dust

1. Which statement about atoms and molecules is correct?

a : Elements always exist as separate atoms

b : Elements always exist as pairs of atoms called molecules

c :Elements and compounds can exist as molecules

1. The central region of an atom where its neutrons and protons are is called the

a :nucleus

b :electron cloud

c:core

d:center

1. The salt (NaCI) is:

a :Compound

b :Element

1. How many protons are in this element ?

a:79

b :196

c:117

d:Cannot be determined

1. How many neutrons does a sodium atom have?

a:23 b:11 c:12 d:34

1. Which of the following parts of an atom have a negative charge?

a: Proton b: Electron c: Neutron d: Nucleus

1. The chemical combination of two or more different kinds of atoms in fixed amounts is called a(n)

a:Orbit; b:Compound; c:Mixture; d:Element

**Electric Current**

**Electric current** is a flow of electric charge carried by moving electrons in a wire. The electric current is created by electrons or charges continuously moving through a path called an **electric circuit**. It flows from a power source like a battery or power station.

A **closed circuit** has a complete path for current to flow allowing the electric charges or electrons to flow through the wires of the circuit. An **open circuit** will not allow the electric charges or electrons to flow through the wires of the circuit. A **switch** can be used to open and close a circuit.

In a **series circuit**, the same current flows through each of the components. In a series circuit, each bulb will receive the same electrical charge, but if one goes out, all will go out. An example of a series circuit may be a string of Christmas lights. If any one of the bulbs is missing or burned out, no current will flow and none of the lights will go on.

**Batteries** are also a source of electric current usually used with a series circuit. The electric current from the battery flows in one direction to the component such as a radio, flashlight, or a toy.

**Parallel circuits** will have different amounts of current flowing through them. The same voltage is applied to parallel circuits, but different amounts of current will flow through the wires. **Voltage** is a kind of electrical force that makes electricity move through a wire and it is measured it in volts. The higher the voltage, the more current will tend to flow. A 12-volt car battery will normally produce more electric current than a 1.5-volt flashlight battery.

A parallel circuit example is the wiring of a house. There is a single power source supplying all the lights and appliances with the same voltage. However, if one of the lights burns out, the current will still flow through the rest of the house.

There are power plants that produce electricity for homes and businesses. Most power plants use coal to generate electricity, but some use wind, water, or natural gas. The **power grid** is the system connecting all of the power plants across the country. All the poles and wires along the highway and roads are a part of the power grid. A **transformer** can help in decreasing or increasing the voltage as the electricity travels to homes and businesses through **transmissions lines**. A **meter** is used to measure the amount of electricity used.

The electricity goes through wires to the service panel in a basement or garage, where breakers or fuses protect the wires inside a house from being overloaded. The electricity then travels through wires inside the walls to outlets and switches all over the house.

**Conductors** are made of materials that electricity can flow through easily. A material that is a good conductor gives very little resistance to the flow of electricity. The electricity can flow through a conductor very easily. Examples of conductors include water, trees, aluminum, copper, people, and animals.

**Insulators** prevent or block the flow of electricity. Insulators do not allow the flow of electricity and blocks the electricity from moving along its path. Examples of insulators are glass, rubber, porcelain, and plastic. Wires that carry electricity are covered with an insulator.

There are many steps involved when electric current flows from its source to its use.

**Questions:**

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1. Which of the following best defines a closed circuit?

a**:** Does not allow the electricity or electrons to flow through the wires, a switch is off.

b**:** Does not allow the electricity or electrons to flow through the wires, a switch is on.

c**:** Does allow the electricity or electrons to flow through the wires, a switch is on.

d**:** Does allow the electricity or electrons to flow through the wires, a switch is off.

1. Which of the following circuits have different amounts of electricity flowing through them?

a**:** Parallel circuits

b**:** Closed circuits

c**:** Open circuits

d**:** Series circuits

1. Which of the following is the system connecting power plants across the country?

a**:** Transformer

b**:** Power grid

c**:** Meter

d**:** Transmission line

1. Which of the following is used to measure electricity used by a home or business?

a**:** Voltage

b**:** Meter

c**:** Battery

d**:** Conductor

1. The tendency for a material to oppose the flow of electrons, changing electrical energy into heat energy and light.

a:Voltage

b:Current

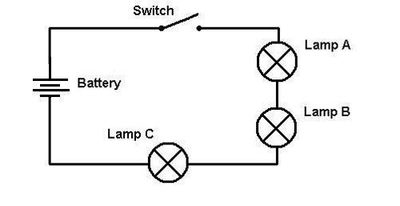
c:Resistance

d:Circuit

1. Homes are wired in \_\_\_\_\_\_\_\_\_\_.

a:series circuit; b:parallel circuit; c:kilowatt-hour; d:negative, positive

1. When you remove a bulb from a three bulb circuit, and the other two bulbs go off, then the bulbs must have been connected in \_\_\_\_\_\_\_\_\_\_.

a:parallel; b:series; c:open; d:closed

1. Electricity moves only in a \_\_\_\_\_\_\_\_\_\_ circuit.

a:circuit; b:square; c:closed; d:open

1. Current carrying wires must be insulated because it is dangerous for anyone to touch  current carrying wires if they are not insulated.

a:True; b:False

1. An example of a conductor is :

a:a glass paperweigh; b:a plastic cap; c:a metal screw; d:a wooden handle

1. An example of an insulator is:

a:iron; b:silver; c:copper wire; d:rubber

1. What is a circuit?

a:A pathway that electricity flows in. It has a load, wire, and a puppy.

b:A pathway that protons flow in. It has a load, wire, and a power source.

c:A pathway that electricity flows in. It has a resistor, wire, and a power source.

d:A pathway that electricity flows in. It has a load and wire.

1. Which of the following is the transfer of electrons from one atom to another?

a**:** Electricity; b**:** Static electricity; c**:** Both a and b; d**:** Neither a nor b

1. Which of the following flows through electrical wires and powers electronics items, from light bulbs to televisions?

a : Static electricity; b**:** Neutron current; c**:** Nucleus charges ;d**:** Electric current

1. Which of the following causes the crackling sound heard from the electrons being pulled away from each other when the clothes from a dryer are separated?

a**:** Static electricity; b**:** Neutron current; c**:** Nucleus charges; d**:** Electric current