**ELIAS INTERNATIONAL SCHOOLS**

E-NOTE FOR BASIC SCIENCE JSS2

SCHEME OF WORK FOR SECOND TERM

WEEKS TOPICS

1. WORK, ENERGY, AND POWER
2. CONCEPT OF WORK, ENERGY AND POWER
3. POTENTIAL AND KINETIC ENERGY
4. CALCULATION INVOLVING WORKDONE: ENERGY TRANSFER WHEN WORK IS DONE
5. FAMILY LIFE EDUCATION I
6. FAMILY LIFE EDUCATIO N II
7. KINETIC THEORY AND ASSUMPTION
8. KINETIC THEORY AND ASSUMPTION
9. EXPLANATION OF SOME PHENOMENA USING THE KINETIC THEORY

10. EXPLANATION OF SOME PHENOMENA USING THE KINETIC THEORY

**WEEK 1**

**WORK, ENERGY AND POWER**

Energy is used up when work is done. The energy stored up in our muscular system is made available when we are to do work. The stored up energy (potential energy) is converted to kinetic energy as work is being done.

**MEANING OF WORK, ENERGY AND POWER**

**Work**

Work is done whenever a force is applied to cause a body to move. For instance when you lift a bucket from the ground to your head and stand at a point for several hours ; you have only done work by lifting the bucket of water from the ground to your head ,you have done no work in carrying the bucket of water as long as you remain on the spot.

**Energy**

Energy is the ability to work by exerting a force to move an object through a distance. Anything that is capable of doing work has energy. For instance,a boy running a race of 100 meter has energy because he is able to move some distance. Work and energy are measured in the same unit as the JOULE.

**Power**

Power is defined as the time rate of doing work. If two boys of the same weight are to climb a flight of stairs of the same height, the boy that gets to the top first is said to have the greater power. This is because he has done the work of moving his weight through that height at a shorter time.

Hence, in mathematical terms, power is expressed as: power= workdone or energy expended/time taken.

If the workdone is in joules and the time is in seconds, then the power is watts.

1 watt=1 joule per second

Power can also be commonly expressed in kilowatts(KW), megawatt(MW) and horse power(h.p)

1 KW=1,000W

1MW=1,00 0,000W

1 h.p=746W

EVALUATION

1. Which of the following is not a source of energy? A. Coke b. Coal c. Smoke d .Water

2. ------------- is done when a force moves some things through distance.

a. Work b. Energy c. Movement d. Effort

3. The energy obtained is cassava is ----------------------

a. Mechanical b. Chemical c. Heat d. Power

4. Abody which exerts force has --------------------

a. Strenght b.pressure c.Energy d.Power

5. The light energy from the sun is called--------------

6.The unit of energy is-----------------------------

SECTION B

1.Define the following

i.Work ii Energy iii.Power

2.Give the unit of measurement of the following.

i.Work ii Energy iii Power

**WEEK 2**

**CONCEPT OF WORK,ENERGY AND POWER.**

**Work** is the product of force and distance moved in a given direction,and the quantity of workdone is always equal to the quantity of energy put in.

In science ,work is said to be done when a force can produce movement in a measured direction ,i.e work=force(f)x distance(d) moved in the direction of the force(fxd).

Work can simply be defined as the product of distance moved and the force applied in the direction of movement.

Generally for any workdone, there must be energy input since energy is the capacity of any system or a body to do work. Both work and energy are measured in units called joules,named after a Scientist P.joules who carried out early studies on energy.

**Force** is that which changes a body’s state of rest or uniform motion in a straight line.It can be expressed as:

Force=Mass x acceleration

i.e F=m x a

where F =force,m =mass and a =acceleration.The unit of force is Newton (N)

If force=mass x acceleration

Work=mass x acceleration xdistance

**SUN AS THE PRIMARY SOURCE OF ENERGY**

The sun is the primary source of energy available for man. It does not deplete, and cannot be used up.

The sun transmits solar energy to the earth in the form of light and heat and this solar energy can be transformed to other forms.

Solar energy is used by green plants to manufacture their food through the process of photosynthesis. The energy stored up in green plants is made available to man and animals when they eat plant products like yam, rice ,cassava, beans grasses and so on.

In addition, solar energy can be converted to other energies such as to chemical and electrical energy for heating in homes, boiling water and for lighting our homes and streets.

Hence, the sun is the primary source of energy for life, all other sources are secondary as they are obtained from the sun.

Examples of secondary sources are

1. Food
2. Petrol
3. Wood,
4. Water

5.Chemical,

6.Magnet and

7.Battery.

**FORMS OF ENERGY**

There are many forms of energy which can be converted from one form to the other.These are some of the forms of energy.

1.Mechanical Energy

2.Kinetic Energy

3.potential energy

4.chemical energy

5.Atomic energy

6.sound energy

7.Electrical energy

8.Light energy

9.Heat energy and

10.Magnetic energy

EVALUATION

1.Mathematical expression of power is ------------------

a.Newton/Distance b.Force/Time c.Workdone/Time d.Mass/Density

2.Energy obtained in food is --------------------

a.Power b.Food c.Chemical d.Solar e.Nuclear

3.Mathematical expression for work done by a body is represented below as --------a.W =fxd b.W=n xt c.S=d xt d.W=m xv e.W=f Xj

4.The S.I unit of force is ------------

a.N b.NM c.M d.G

SECTION B

1.Name five different sources of energy.

2.Explain why the sun is the primary source of energy?

3.Name the different forms of Energy.

**WEEK 3**

**POTENTIAL AND KINETIC ENERGY**

Potential energy is the type of energy possessed by a body due to its position.A stone on the ground does not have energy so long as it is lying on the ground.The stone cannot be seen doing any work.However,if a stone is n a table and it placed on a table and it falls off,it can break a lamp on which it falls,the stone has done some work by virtue of its position.Therefore,when the stone is on the table,it has energy stored up as a result of its position.This energy increases as the height of the table increases and it decreases as it falls towards the ground.When it reaches the ground ,it has zero potential energy.

**KINETIC ENERGY**

This is the energy possessed by a moving body.For example,a moving car, a man running, a falling orange, a fired bullet,a rolling ball and so on all possess kinetic energy.Both forms of energy are examples of a more general forms of energy called MECHANICAL ENERGY.

**KINETIC ENERGY**

Kinetic energy(K.E) is the energy possessed by an object due to its motion i.e movement energy √K.E=1/2mv2

Where M is the mass of the moving object

V is the velocity of the object.

Potential energy is the energy possessed by an obect by virtue of its position at rest ( its height).Potential energy is stored energy.

P.E=m.g.h

M is mass of the object;

g is acceleration due to gravity; and

h is the height of the object from the ground.

**Example1**

If the mass of an object is 6kg and the height is 5m.Calculate the potential energy .(Assuming g=10m/s2)

Solution

P.E=m.g.h

M=6k.g

h=5m

g=10m/s2

P.E=6x5x10

=300J

**Example 11**

If the kinetic energy of a ball moving at a velocity of 10m/s2 is 50KJ.What is the mass of the ball?

**Solution**

K.E=1/2mv2

K.E=50KJ=50,000J

Velocity=10m/s2

50,000=1/2x mx102

i.e 50,000=1/2x 100m

=1/2x100m

50,000=50m

50m==50,000

M=50,000/50

=1000Kg

EVALUATION

1.Energy is measured in --------------- while distance is measured in ----------

2.Mgh is a mathematical formula in basic science that is used to calculate -----------in a body

3.The energy possessed by a body by virtue of its position is called

a.potential b.Kinetic c.Food d.Muscular

SECTION B

1.Explain the meaning of the following.

i.Potential Energy ii. Kinetic Energy.

2.What type of energy does the sun transmit to the earth?

b.If a force of 50N is used to move an object through 20metres within 5seconds,Calculate the power of the object.

2c. A man of mass 90kg is moving at a constant velocity.He has kinetic energy of 2205J.Calculate the velocity at which he moves.

**WEEK 4**

**Energy Transfer When Work Is Done**

When an object is dropped from above the ground, work is done as the object is pulled to the ground .As the object is falling and work is done, the potential energy of the body is changed to kinectic energy. In principle ,the quantity of potential energy stored in a body is always equal to kinetic energy produced when the body is released to do work. In other words, when energy changes ,for example from potential to kinetic, there is always an accompanying workdone.

**EXAMPLE**

What work is done when a mass of 6kg is raised through a vertical height of 3.5m(acceleration due to gravity is 10m/s2)

Mass=6kg

Acceleration( due to gravity)=10m/s2

Workdone W=Mass x acceleration x distance

= 6kgx10x 3.5

=210 joules.

**POWER**

Power is also related to the concepts of energy and work. Power is defined as the rate of doing work, i.e workdone divided by time.

Power=Workdone/Time taken

The unit of power is Watt(w)

**Example 1**

What is the power of a child that has done work of 60 J in 20 seconds.

**Solution**

Power P=Work/Time

=60/2=3 watts

**Example 2**

Calculate the power of a pump which can lift 500kg of water through a vertical height of 12m in 0.3 minutes. Assuming g=9.8m/s2

Force=mass x acceleration(g)

Force=500kg x9.8N

Distance=12m

Workdone=500 x9.8 x12m

Time taken= 0.3minutes x60

=18 secs

Workdone=mass x acceleration x distance

Workdone=Force x distance

Since force= mass x acceleration

Workdone=500kg x 9.8N x12m

=58800J

**Power**=workdone/Time taken

=58800/18

Power=3266.67 watts

Convert this to kilowatts by dividing by 1000

=3266.67/1000

=3.27kilowatts

EVALUATION

1.If the kinetic energy of a ball moving at a velocity of 5m/s is 60kj.What is the mass of the ball?

2.The mass of a ball is 10g and the height is 4m.Calculate the velocity of the ball just before it touches the ground.(g=10m/s)

3.If the mass of an object is 6kg,and the height is 5m.Calculate the potential energy.(assuming=10m/s).

4.If a force of 10Newton is applied by a car over a distance of 4metres,calculate the workdone by the car.

5.Calculate the work done by a ball of mass 40g which falls freely from a height 0.8m above the ground.(g-10m/s)

6.Calculate the power of a pump which can lift 500kg of water through a vertical height of 12m in 0.3minutes .Assuming g-9.8m/s2

**WEEK 5.**

**FAMILY LIFE EDUCATION**

(**1). Communication Techniques:**

Communication is the process of giving, receiving and understanding messages.

It involves exchanging ideas, understanding, listening, expressing oneself, talking and using body language, facial expression and a host of other behaviours.

**Types of communication**:

**1.Verbal Communication;** This is one of the most common ways of c communication which involves sending or receiving information through talking, singing story telling etc.

**2. Non-verbal Communication**; This type of communication sends and receives information through pictures, facial expression, acting and use of body language.

**Communication Skills:**

Communication skills could be leant so as to be able to communicate effectively. This could be done through:

1. Active listening skills
2. Using the ‘I’ statement so that one can express how he or she feels.
3. Paraphrasing what the speaker is saying to ensure understanding.
4. Boldness; avoiding being shying or soft spoken.
5. Knowledge; having relevant facts in issues to be discussed.
6. Expressing feeling honestly and clearly without putting the other person down
7. Offering possible non-verbal message such as a smile or touch.

**Importance of Honest Communication about Pubertal concerns to responsible parents**.

When we communicate about pubertal concerns to our parents, we stand to gain the following:

1. It help us to learn about ourselves as males and females
2. It gives us opportunity to know how our parents feel about us.
3. It enhance healthy relationship within our family
4. It help us to make good decision and increase our self esteem
5. It boost our knowledge and understanding about pubertal health (hygiene during puberty) month and facts about puberty and give us a level of acceptance of ourselves.

EVALUATION

1.Which one of the following is not the importance of honest communication about pubertal concerns toresponsible parents.

a.it helps to learn more about self

b.it enhances healthy relationship with family

c.it destroys self esteem

d.it boosts knowledge and understanding ab out pubertal changes.

2.Sending and receiving information through pictures,facial expression,action and code language is -------

a.direct communication b.indirect communication c.verbal communication d.non verbal communication

3.Characteristics of good communication are these except---

a.active listening b.simple language c.eye contact d.noise making

4.Conversation fillers that must be avoided during conversation include---

a.eye contact b.body language c.write down d.putting hands into pocket

1.Define communication and state the two types of communication.

2. What are the communication skills for effective communication.

3.Explain five importance of honest communications about pubertal concern to parents

**WEEK 6.**

**FAMILY LIFE EDUCATION**

**Life Span Continuum**:

Life Span continuum refers to series of similar events that takes place throughout the length of time a person is likely to live. These events could be categorized into those that are emotional or developmental and those that are biological or reproductive.

Some of these events may be different within different cultures and from individual;

* Emotional Development: Body exploration including genitals (from a few months through adolescence)
* Altitude Development; (either positive or negative) towards own body begin from a few months through ages(5-10)
* Have a sense of being male or female (from 18 months on)
* Enjoy touch (throughout life)
* Becomes aware or curious about gender or body differences (ages 2 into young adulthood)
* Mimic adult sexual behavior (age 3 through adolescence)
* Able to have child (11-12 until 45+)
* Show strong interest in male/female gender roles that are often stereo typed (5-6 through adolescence)
* Many experiment with different sexual behavior (as young as 3-5 till death)
* Ready to have a child (22+ for girls, 25 to boys)
* Can no longer bear a child (menopause 45+ for women)
* Have basic sexual orientation 18months and older.
* Ready to marry.
* Have friends of both sexes.
* Face decision making about sexual activity.
* Feel awkward and wonder Am I normal? Puberty into young adulthood.
* Strongly influenced by peer group.
* Can get a sexually transmitted disease.
* More stable in commitment and giving.
* Go to work and take on responsibilities.

**Biological Reproductive**

Luenced by the

* Wet dreams (10-15yrs)
* Male begins to produce sperm and semen 10-15yrs
* Female able to get pregnant (10-13yrs)
* Girls begin to menstruate (10-15yrs)
* Female body shape changes (10-15yrs)
* Male develop muscles (12-15yrs)
* Menopause (45-55yrs)
* Able to get sexually transmitted diseases STI (Sexual transmitted infections including HIV – birth and infancy).

**Factors that influence individual sense of self worth (Body image).**

Body image means the way a person feels about his or her physical appearance.There are differences in the physical appearance of people which can be influenced by the following factors:

i.Accepting one’s weakness and strength;

ii.Culture and tradition;

iii.Mass media

iv.Religious teaching;

v.Environment;

vi.Gender;

vii.Societal norms;

viii.Individual achievements;

ix.Economic background;and

x.Individual’s family

EVALUATION

1. Series of similar events that takes place throughout the length of time a person is likely to live is ------

2. Which of the following is not an expression of feeling,desire and fantasies in lifetime?

a. attitude development b.enjoy touch c.curiosity about gender d.no internet for opposite sex

3. Self worth can be influenced by the following factors except

a.Family b.Environment c.Mass media d.Food

4. Which of the following is not part of the biological or reproductive events in lifetime--?

a.wet dream b.male producing sperm c.Girls menstruate d.Impossible to get sexually transmitted disease/HIV.

SECTION B

1. Explain the term Life span continuum.

2. Enumerate six factors that influence individual sense of self worth.

**WEEK 7**

**KINETIC ENERGY**

The Kinetic theory of matter assumes that matter is made up of tiny particles such as atoms,molecules and ions that are continually moving and therefore possess kinectic energy.

A British Scientist,Dalton,about 1806AD,expanded the idea of atoms.He made various statement about the nature of atoms.His ideas about atoms are stated below:

1.Matter is made up of minute indivisible particles called atoms.

2.Atoms cannot be created or destroyed.

3.All the atoms of an element are alike and different from the atoms of all other elements.

4.Atoms combine in small whole numbers to form new substances.

All these ideas collectively form Dalton’s atomic theory.Since Dalton’s atomic theory was proposed,scientists have accepted the idea that matter is made up of particles.

Kinetic energy is the energy a body has by virtue of its motion.The kinetic theory of matter assumes that the particles that make up matter have energy,and that these particles are in constant motion.

**Assumptions of the kinetic theory**

The basic assumptions of the kinetic theory deals with energy due to the movement of particles and it includes:

1.Matter is made up of tiny indivisible particles that are in constant motion and therefore possess kinetic energy.

2.Increase in heat supply or increase in temperature,causes increase in the motion of the particles and thus , increase in average kinetic energy of the particles.

3.Increase in kinetic energy of the particles due to increase in heat supply brings about change in state viz solid,liquid and gas.

EVALUATION

1.State the Kinetic theory of Matter.

2.What are the assumptions of the kinetic theory of matter?

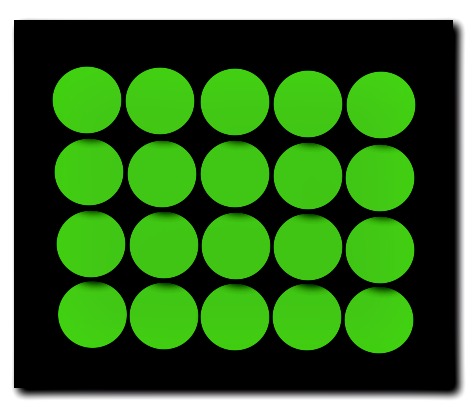
WEEK 8

EXPLANATION OF MOLECULAR STRUCTURES USING KINETIC THEORY

Kinetic molecular theory is useful in describing the properties of solids, liquids and gases at the molecular level.  Kinetic theory of matter assumes that matter is made up of tiny particles such as atoms , molecules and ions that are continually moving and therefore possess kinetic energy. The more heat you give these particles, the faster their movement will be. Hence, increase in temperature causes increase in the average kinetic energy of the particles. Matter exists in three states which are Solid, Liquid, Gas.

**Solids**

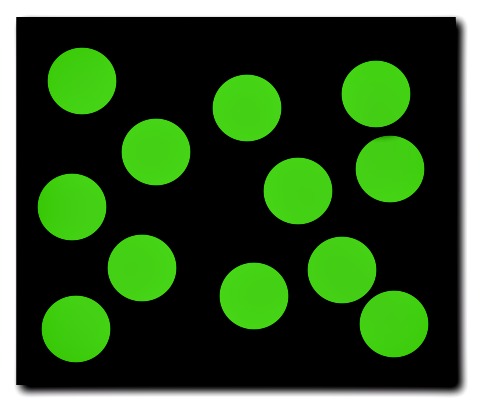
The particles of a solid will possess only a small amount of kinetic energy. The particles of a solid are always in motion, however, the motion will be so minuscule that we can say that they are simply vibrating in position. Thus, the particles of a solid will have a very ordered structure. **Solids have a definite shape, a definite volume and are not easily compressed.**

[](http://thescienceclassroom.org/wp-content/uploads/2013/03/solid-particle-theory.jpg)

The particles of a solid are vibrating in a very ordered arrangement

**Liquids**

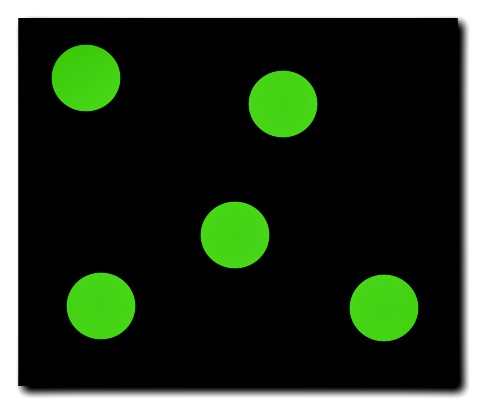
The particles of a liquid possess a greater amount of kinetic energy than the particles of a solid. Thus, the particles of liquid will not be in an ordered arrangement and will take on the shape of the container that they are placed in. These particles will possess enough energy to flow throughout a container and past one another. They do not have enough energy to escape the attraction they have for each other and as a result will remain loosely connected. **Liquids have an indefinite shape, a definite volume and are not easily compressed.**

[](http://thescienceclassroom.org/wp-content/uploads/2013/03/liquids-particle-theory.jpg)

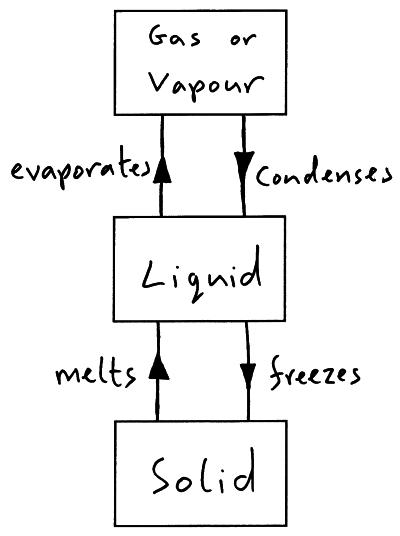
The particles of a liquid are flowing in a loosely connected arrangement

**Gases**

The particles of a gas possess a very large amount of kinetic energy and move very rapidly and randomly.  The particles of a gas are moving so fast that they have no attraction for one another. As a result of this kinetic energy, the particles of a gas will have large empty spaces between them. Just as with liquids, gases will take on the shape of the container that they are placed in. **Gases have an indefinite shape, an indefinite volume and are easily compressed (due to the large empty spaces between particles)**

[](http://thescienceclassroom.org/wp-content/uploads/2013/03/gases-particle-theory.jpg)

The particles of a gas are moving very rapidly and randomly

[](http://physicsnet.co.uk/wp-content/uploads/2010/06/changing-state.jpg)

EVALUATION

1. What is the name of the substance that can exist in the three states of matter.?

1.The smallest indivisible particle of an element is -------.

a. Atom b. Molecule c. Element d. Electron

2.The three fundamental particles of an atom are ------

a. Proton, neutron, electron b. Proton, nucleus, orbit c. Nucleus, proton, ion d. ion ,nucleus ,election

SECTION B

1.Describe the cyclic nature of water.

2.Using the kinetic theory of matter, describe these states of matter.

Solids, Liquids and Gases.

**WEEK 9**

**EXPLANATION OF SOME CHANGES IN STATES OF MATTER USING KINETIC THEORY**

**Melting**:When a solid is heated,the particles acquire more kinetic energy and vibrate more vigorously.Eventually,at a certain temperature called the meiting point of the solid,the force of the vibrations overcome the binding forces and solid structure collapses.The particles are no longer in fixed positions,but free to move.At this point,the solid is said to have melted or liquified.

**Condensation and freezing**:Condensation is a process whereby a vapour loses some of its kinetic energy when cooled and changes into liquid state.when a liquid cools,it loses heat energy causing its temperature to drop.if cooling is allowed to continue,the temperature of the liquid keeps on dropping,until it reaches the freezing point of the liquid.The liquid changes into the solid state at this temperature.The freezing point of a substance is the same as its melting point.

**Diffusion**:This is defined as the movement of solute particles through a medium, from a region of higher concentration to a region of lower concentration,that is,movement from a more crowded region to less crowded regionOnce the solute particles become evenly distributed throughout the medium,there will be net diffusion in any particular direction.Diffusion is fastest in gases because gas particles have more kinetic energy than particles in liquids and solids.

EVALUATION

1. When solids change into liquid at appropriate temperature, the process is called ---------

a. Evaporation b. Melting c. Diffusion d. Boiling

2. The temperature at which liquid turn to solid is called ------------- point.

a. Freezing point b. Cooling c. Boiling point d. Melting point

3. The process by which a gaseous matter comes back to a liquid matter is known as ---------

a. Boiling b. Freezing c. Sublimation d.Vapourisation e. Condensation.

4. The direct conversion of solid matter to gas is called -------

**WEEK 10**

**EXPLANATION OF SOME CHANGES IN STATES OF MATTER USING KINETIC THEORY**

**EVAPORATION AND BOILING**

**Evaporation**

Particles in a liquid are attracted by other neighbouring particles in all direction.When particles with sufficient come near the surface of the liquid,they can break away from the attractive forces of the other nearby molecules and escape into the space above and become vapour or gas.This phenomenon is called evaporation.Evaporation occurs at any temperature,though the rate of evaporation increases with increase in temperature.Evaporation increase with wind,surface area and lower relative humidity.

**Boiling**

When a liquid is heated,the rate of evaporation increases.The vapour pressure of the liquid also increases until a temperature is reached,at which the vapour pressure equals the atmospheric pressure.When this happens,bubbles of vapour form freely in the liquid and rise to the surface.This phenomenon is called boiling.The temperature at which boiling takes place is known as boiling point.

**Factors Affecting Evaporation**

i**.The temperature of the liquid**

In a liquid,the particles are in motion.When water is heated,the motion of the particles will become more rapid than before.Each particles that collides with another one will change direction.As the heating continues,the particles will gain more energy.Some particles will gain sufficient energy to break through the surface tension of the liquid and escape as gas.Evaporation of liquids occur at all temperatures but the rate of evaporation increases with increase in temperature.Since evaporation results in the escape of energetic particles from the liquid body,the average kinetic energy of the liquid is lowered.This results in a drop in temperature of the liquid body.Therefore evaporation results in drop in temperature.

ii**.The nature of the liquid substance**:Apart from the temperature,the rate of evaporation is also influenced by the type of liquid.For instance,the rate of evaporation of water is lower than that of petrol.

EVALUATION

1.The boiling point of pure water is ----------

a.0oC b.100oC c.250oC d.1000oC

2.The movement of solute particles through a medium, from a higher concentration to a lower concentration is called --------------

3.When a liquid is cooled, it ------------

a. Condense b. Evaporates c. Freezes d. Melts e. Sublimes

SECTION B

1. Explain the following

i. Melting

ii. Evaporation

iii Diffusion

2.State the factors affecting Evaporation.