Science Assessment Database

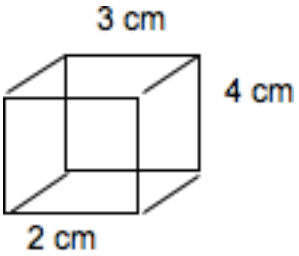
_____ Science Unified Processes - Constancy, Change, and Measurement

1. This can be used to measure the mass of an object.
A. Meter stick
B. Graduated cylinder
C. Submersing the object in water
*D. Triple beam balance

2. This can be used to measure a cube and determine its volume.
*A. Meter stick
B. Bathroom scale
C. Multiply the mass and density
D. Triple beam balance

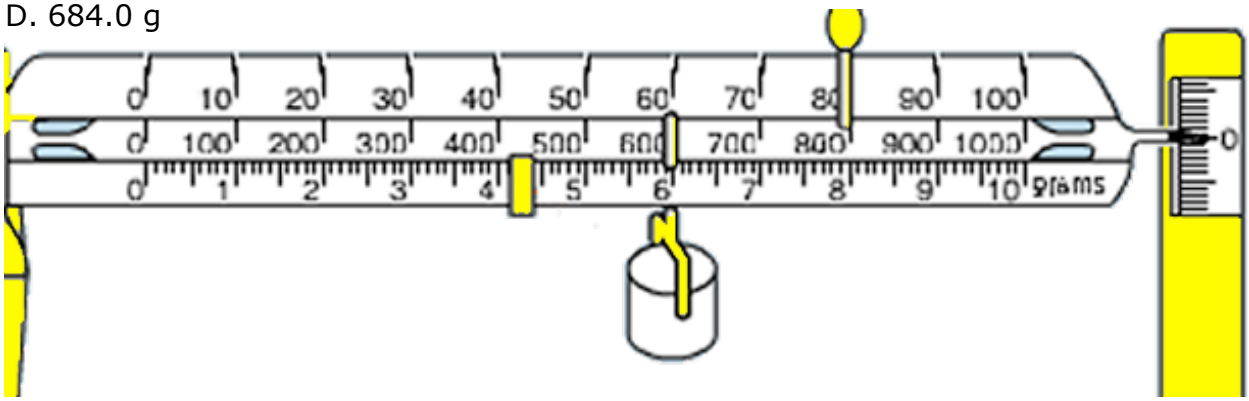
3. This can be used to measure the volume of an irregularly shaped rock.
A. length x width x height
*B. water displacement
C. direct measurement
D. a triple beam balance

4. The volume of this cube is.
A. 9 cm^2
B. 12 cm^3
*C. 24 cm^3
D. 36 cm^3



5. A rock is dropped into a graduated cylinder containing 40 mL of water. The new volume is 47 mL. This is the measured volume of the rock.
A. 4 mL
*B. 7 mL
C. 47 mL
D. 87 mL

6. This is the mass of the object measured with the balance.
A. 864 g
*B. 684.4 g
C. 684.8 g
D. 684.0 g



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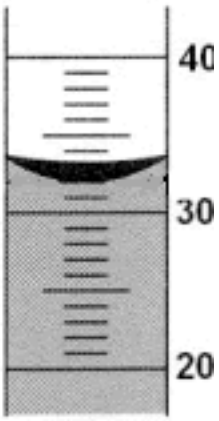
7. This is the volume of the liquid in the graduated cylinder.



A. 30 mL
*B. 32 mL
C. 34 g
D. 34 mL

8. Volume of an irregularly shaped piece of rock can be found with this.
A. length x width x height
B. place it on a triple beam balance
C. put it in a beaker
*D. use water displacement

9. A rock with the volume of is 8 cm^3 and a mass of 16 g has this density.
A. .5 g/ cm^3
B. 1.0 g/ cm^3
*C. 2 g/ cm^3
D. 128 g/ cm^3

10. Measuring the density of gasses is difficult because of this.
A. They cannot be trapped.
B. They are often poisonous .
C. They have a large mass.
*D. They have very changeable volumes.

11. A group of students measured the volume of .1 g of air as being 100 cm^3 . These measurements would suggest the density of this air as.
*A. .001 g/ cm^3
B. .01 g/cm
C. .1 g/cm^3
D. 1.0 g/cm^3

12. A rock dropped in a graduated cylinder raises the level of water from 20 to 35 mL. The rock has a mass of 45 g. This would suggest the rock has this density.
A. 1.3 g/ cm^3
B. 2.3 g/ cm^3
*C. 3.0 g cm^3
D. 4.5 g/ cm^3

13. When poured into a graduated cylinder the volume of a liquid is measured as 75 mL. When the liquid and graduated cylinder are placed on a balance, the mass is measured as 125 g. The empty graduated cylinder has a mass of 50 g. This suggests the density of the liquid as this.
A. .1 g/mL
*B. 1 g/mL
C. 2.2 g/mL
D. 22g/mL

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14. A liquid has a density of 1g/mL. If you have 50 mL of the liquid, its mass would be this.
A. 25 g
*B. 50 g
C. 75 g
D. 100g

15. A square chunk of plastic has a length of 5 cm, width of 5 cm and height of 5 cm. It has a mass of 200 g. This would suggest a density of this.
A. .12 g/cm^3
B. 1.0 g/cm^3
*C. 1.6 g/cm^3
D. 2.3 g/cm^3

_____ Science Unified Processes - evidence, models, explanations

1. All scientific evidence is based on this.
A. measurement
B. reasoning
*C. observation
D. experiment

2. Scientific evidence gains more acceptability with this.
*A. repeated verification of observations
B. logical reasoning
C. identification of additional variables
D. experiments

3. This is a representation of a real world object or event with explanatory features.
A. reasoning
B. observation
C. experiment
*D. model

4. This is a property or characteristic that changes.
*A. variable
B. observation
C. experiment
D. model

5. This is an explanation of how properties and variables change.
A. reasoning
B. observation
C. experiment
*D. operational definition

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6. In the models below each dot in the cube represents an atom or molecule with the same mass, each cube is depicted with the same size to represent the volume. This cube represents a model with the greatest density.

A. A, it has the fewest particles for the volume of the cube.
B. B, it has the most particles for the volume of the cube.
C. C, it has the greatest volume for the mass of the cube.
*D. D, it has the most particles for the volume of the cube.

7. A student lifts two soup cans that are the same size. She says one is heavier than the other. This can explain why one can is heavier than the other.
A. It has more volume than the lighter one.
*B. It has more mass per unit volume.
C. It has larger chunks of meat and stuff in it.
D. It is less dense than the lighter one.

Use the descriptions of two different experiments to answer the next three questions:
Experiment X - Students measure the mass of a test tube of water and a fizzing tablet. They add the tablet to the test tube of water and stopper it with a tube that allows the gas to flow into an inverted graduate cylinder filled with water so that the gas displaces the water. They measure the mass the water and what is left of the tablet in the test tube. They subtract it from the initial mass. Then they divide the change in mass by the volume of gas they collected in the graduated cylinder.
Experiment Y - Students measure the mass an empty balloon. Fill it with a gas and measure its mass again. They measure the filled balloon's volume by submerging it in a container full of water, catching the overflow, and measuring the volume of water the balloon displaced. They find the mass by subtracting the mass of the balloon empty from it's mass when it is full of gas. Then they divide the mass by the volume.

8. The best title for these experiments is this.
A. Foiled Again, the Gases Escaped
B. How to Measure a Gas
*C. Finding the Density of A Gas
D. What About Gasses?

9. This procedure used appropriate methods to measure the properties because of this.
A. X, because there were fewer steps
B. X, because it used more accurate equipment
C. Y, because it used the correct formulas
*D. X and Y both because each used appropriate methods

Science Assessment Database

10. The two measurements can be used to provide evidence to support this.
*A. The density of a gas is quite small.
B. Gases are very dense.
C. Gases cannot be measured.
D. One gas is a different color than the other

11. In an experiment, a student shakes jars of water with soil, sand, gravel, and rocks in them. What does the shaking model in nature?
A. A lake environment
*B. A stream current
C. Living things in an environment
D. A chemical change

12. A question that would focus observations on specific evidence to derive an explanation about how materials interact in a mixture is this.
A. Does lake water dry out in warm winters?
B. How many kinds of minerals form naturally?
*C. What happens to soil after a landslide?
D. How is a living thing organized?

13. The study of a watershed shows that an incoming stream deposits larger particles as it enters the lake and smaller ones in the center of the lake. These observations would support this inference.
*A. The particles are being sorted by size.
B. The particles are made of different materials.
C. The particles are different densities.
D. The particles are traveling at different speeds.

Use this information to answer the next two questions.
A student added a drop of red food coloring to 4 beakers of water. Each beaker contained 100 ml of different temperature water. She recorded how long it took each beaker to mix completely (without stirring). The following table shows her results:

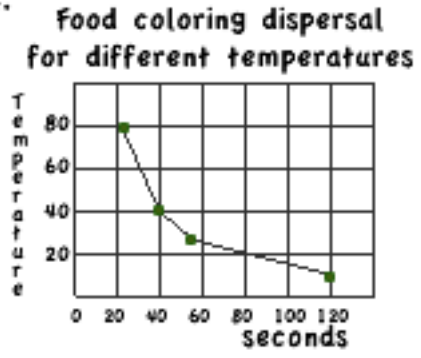
Container	Water temperature	Time till mixed
#1	10 C	120 sec
#2	25 C	55 sec
#3	40 C	40 sec
#4	80 C	23 sec

14. This inference explains the evidence from this experiment. Particles are moving
A. slowly in warm water so they mix faster.
B. slowly in warm water so they mix slowly.
C. faster in warm water so they mix slowly.
D. faster in warm water so they mix faster.

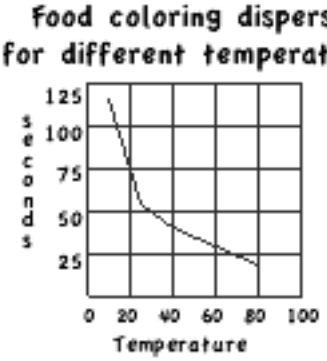
Science Assessment Database

15. This graph is the best representation of this data to explain the evidence

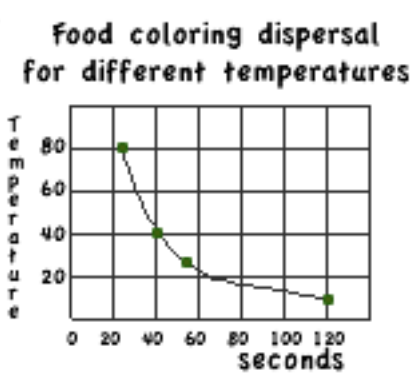
A.



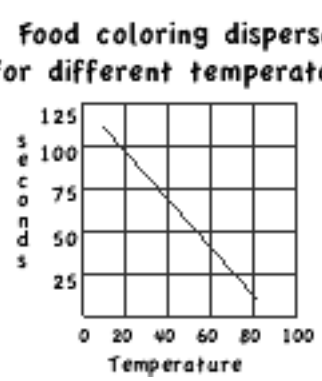
B.



C.



D.



A. B. *C. D.

_____ Science perspectives - history and nature of science

1. It took about this long to reach our present understanding of the structure of the atom.

A. Several weeks by physicists at the University of Chicago.
B. Four years with the Manhattan government project.
C. About a hundred years from Newton to to Einstein.
*D. Several hundred years with many scientists working on it.

2. Early chemists thought the parts of the atom were distributed evenly throughout the atom. That model has changed. We now think

A. it is shaped like a cube.
*B. it has most of it's mass in the center
C. most of the atoms' particles are in an outer layer.
D. atoms are stationary.

3. More than 2 000 years ago people thought matter was made of earth, wind and fire. Now we think matter is made of

A. electricity
B. nothing
C. air
*D. atoms

Science Assessment Database

_____ Physical science - matter - atoms

1. This is what scientists call the smallest unit of matter that has its own recognizable identity.

*A. atom
B. compound
C. electron
D. molecule

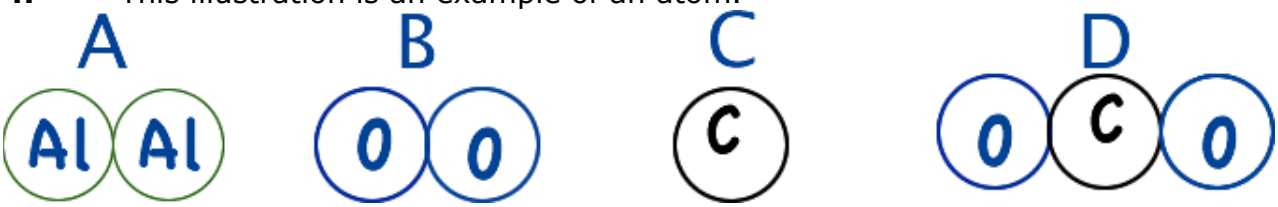
2. This is how people believe matter is made of particles.

A. They can see them.
*B. Experiments provide observable evidence that suggests explanations to support this idea, such as matter is super small particles in motion.
C. People have always known it.
D. A famous scientist decided it was true.

3. An ancient Greek scientist, Democratis, predicted that when matter was broken down into smaller and smaller pieces, you would come to a particle that could not be made smaller. This is what he was describing.

A. a mineral
B. a cell
C. a virus
D. an atom

4. This illustration is an example of an atom.



A. **B.** ***C.** **D.**

_____ Physical science - matter - elements and molecules

1. Scientists decided to call substances made of two or more atoms bonded together this.

A. atom
B. electron
*C. molecule
D. proton

2. Scientists decided to call substances made of more than one element this.

A. atom
*B. compound
C. element
D. nucleus

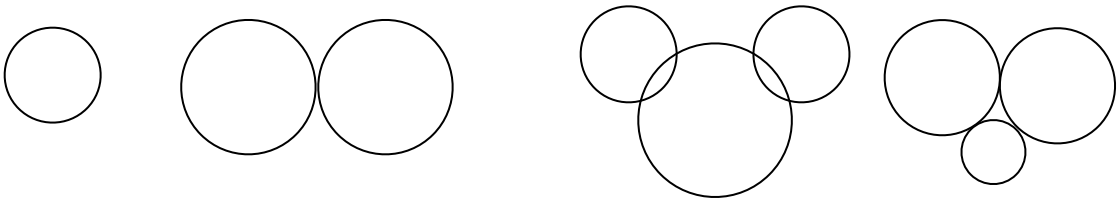
3. This is what a pure lump of the element gold is.

Science Assessment Database

A. gold and air atoms
*B. atoms of gold
C. compounds of gold
D. gold cells

4. This is what the compound "water" is.
*A. water molecules
B. atoms of water
C. water elements
D. water cells

Use these diagrams to answer the next three questions.
Each circle represents the smallest part of three different substances.
(Circles of the same size represent the same element).



A **B** **C** **D**

5. This represents an atom.
*A.
B.
C.
D.

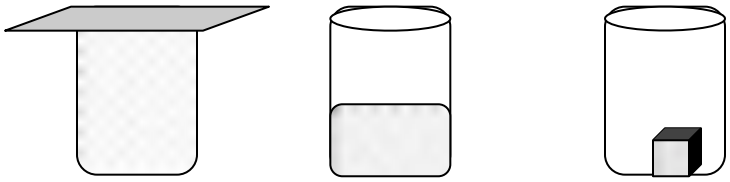
6. This represents elements.
*A. A and B
B. B and C
C. C and D
D. A and D

7. This represents molecules.
A. A and B
*B. B, C and D
C. A, B and C
D. B and D

Science Assessment Database

_____ Physical science - matter - states of matter

The containers represent particles of a substance in three states of matter. Use them to answer the next three questions.



A B C

1. This represents the substance in its' liquid state.
A. A
*B. B
C. C

2. This represents atoms with the least amount of movement.
A. A
B. B
*C. C

3. This represents states of matter taking the shape of their container?
A.
*B.
C.

4. This is the best model of molecules in a gas.
A. Marbles glued together in a ball
B. Marbles in a box
*C. Marbles being shaken in a box
D. Marbles frozen in a box

5. Imagine a model of an atom that has the nucleus the size of a pea. The rest of the model would have to be about this big.
A. the size of a basketball
B. the size of a house
*C. the size of a football stadium
D. the size of a planet

6. The two basic properties of matter are these.
*A. electrons and atoms
B. protons and neutrons
C. mass and volume
D. elements and compounds

Science Assessment Database
Essay

1. Describe how atoms and molecules are alike and different.

2. What about the particle theory of matter do you find most convincing.

3. Describe a historical idea about matter you believe is less accurate than the modern particle theory. Tell why.

4. List two common items that are made from one kind of element.

Essay Sample Answers:

1. Atoms are made up of protons, neutrons, and electrons. Different amounts of these subatomic particles make different kinds of atoms. Different kinds of atoms are elements. Atoms can be thought of as the building blocks of matter. Or different elements are the building blocks of matter. Atoms or elements combine to make molecules. Molecules are groups of one or more kinds of elements or atoms. Both a very small and make up matter.

2. One example is *when one substance mixes with another without being stirred. (diffusion) It convinces me matter must be moving or it wouldn't disperse or mix.*

3. *People used to think that everything was made of earth, wind or fire. We know that earth and air are made of atoms or elements. These elements or atoms can be alone or in combinations. The combinations can be chemical bonds or physical clumps. Fire is a form of energy.*

Or, they used to think that matter could be changed from one element to another by common methods. Alchemy lead to gold. We know now that atoms cannot be changed easily from one kind to another.

4. Item	*Element it is made of:*
Cookware	*copper bottom*
beverage cans	*aluminum*
cast iron skillet	*Iron*
wrought iron ...	*iron*
Coins	*copper, silver, gold*
Jewelry	silver, gold, carbon(diamond)

Science Assessment Database

_____ Physical science - matter - density

1. A log that that floats in a lake has this relative density.
A. less than air
*B. less than water
C. the same as water
D. more than water

2. A rock and a lead weight that both sink in a lake have these relative densities.
A. Both have equal densities.
B. Both have different densities.
*C. Both are denser than water.
D. Both are less dense than water.

3. Water has an approximate density of 1 g/mL. This is a density closest to a typical rock.
A. .005 g/cm^3
B. .5 g/cm^3
*C. 5 g/cm^3
D. 50 g/cm^3

Use this data to answer the next two questions:

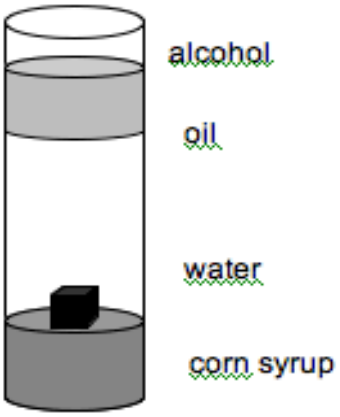
Substance	Density
Oil	.8 g/mL
Water	1.0 g/mL
Small Plastic Sphere	.9 g/ cm^3
Small Marble Chips	4.2 g/ cm^3
Aluminum Pellets	2.3 g/ cm^3

4. Equal amounts (200 ml) of these five materials were put into a container with a lid, shook into a soupy mixture, and then set down to let it settle. The order of the substances starting from the bottom of the container and going up is this.
*A. marble, aluminum, plastic, water, oil
B. marble, aluminum, water, plastic, oil
C. marble, plastic, oil, water, aluminum
D. marble, oil, aluminum, plastic, water

5. If a substance with a mass of 14 g and a volume of 20 mL was added, it would settle here.
A. at the bottom
B. between the marble chips and aluminum pellets
C. at the top
*D. directly below the water

Science Assessment Database
Use the illustration below and to the right for the next two questions. The black cube is made of plastic.

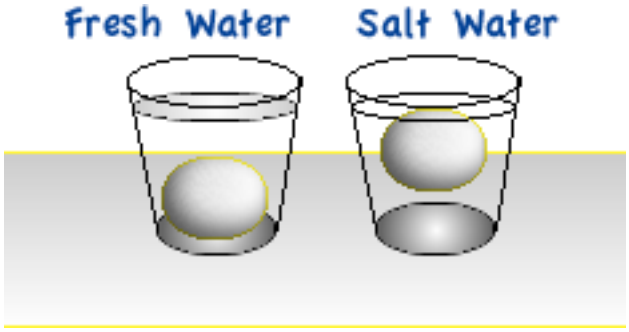
6. This substance is the most dense.
A. black cube
B. alcohol
C. water
*D. corn syrup



7. The evidence in the illustration can be used to explain this about the density of the black cube.
A. it is less dense than the alcohol
B. it is more dense than the corn syrup
*C. it is more dense than the water and less than the corn syrup.
D. it is more dense than the corn syrup and less dense than the alcohol.

Use the diagrams of eggs in fresh water and salt water for the next two questions.

8. The evidence in the illustrations can be used to explain the egg is
A. less dense than the fresh water.
*B. more dense than the fresh water.
C. more dense than the salt water.
D. the same density as both types of water.



9. Based on the eggs, this is why it is easier to float in salt water than in a fresh water lake.
*A. Salt water is more dense than fresh water.
B. Your body is more dense than fresh water.
C. Your body is the same density as the fresh water.
D. Your body is warmer than the lake water.

10. This explains why ice floats on water.
A. it is colder than water
*B. it is less dense than water
C. it is harder than water
D. it is lighter than water

11. This is a definition for density.
A. Volume times mass
B. Mass times weight
C. Volume divided by mass
*D. Mass divided by volume

Science Assessment Database

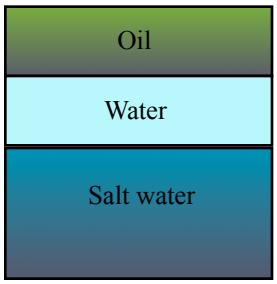
12. This is the density of a cube with a mass of 48 g, and a volume of 24 cm^3.
A. .5 g/ cm^3
*B. 2 g/ cm^3
C. 4 g/cm^3
D. 6 g/cm^3

13. The density of 90 mL of salt water with a mass of 120 g is close to this.
A. .75 g/mL
*B. 1.33 g/mL
C. 3.0 g/mL
D. 9.0 g/mL

14. Which of the following statements best summarizes the relationship between mass, volume and density.
*A. Density is the amount of mass a certain volume of matter has.
B. Density is the heaviness of an object for its weight.
C. Density is the size of an object for its volume.
D. Density is the mass added to the volume of an object.

Science Assessment Database
Essay

Look closely at the illustration. Use it to answer the next four questions. It shows the densities of some common substances. If this illustration represented a small portion of the ocean, what would happen if an oil tanker ran aground and spilled oil?



1. Why could the oil pose a danger?

2. Is the danger greater to birds and seals or to fish and other organisms that live on the ocean floor? Why?

3. If the clean up begins immediately, how is the density of the oil an advantage for the clean up crew?

4. The oil in a spill will combine with water in a few days and sink to the bottom. How has the water affected the density of the oil?

5. How would an oil that is denser than water and salt water affect the clean up?

Sample Answers:

1. It will stay on the surface and birds and seals will get covered with it and ingest (swallow or absorb) it as they move through it or try to clean their fur.
2. Because marine mammals and birds either live on the surface or they swim or move through the surface water. Therefore, they are more likely to be damaged than fish who live or swim below the surface.
3. With a density less than water and salt water the oil floats on the water. This makes it easier to access. Such as being able to skim it off the surface rather than having to collect if from the bottom or through out the water if it would disperse through out the water from the top to the bottom.
4. The oil has become more dense.
5. The oil would sink to the bottom. This would make it harder to reach to clean up.

Science Assessment Database

_____ Earth science and density - Earth materials and atmosphere

1. Water is added to a jar with soil (small dots) and gravel (large dots) in it, then the jar is shaken. This drawing shows what it will look like after it sits for a few minutes.

A. *B. C. D.

2. A student shakes a jar with a mixture of sand and gravel types. Instead of mixing, the sand grains separate into layers because of this property.
A. The grains are different colors.
B. The grains have different shapes.
*C. The grains have different sizes.
D. The jar has a round shape.

Use this information to answer the next two questions.
Students mixed sand, gravel, clay and humus in a jar with water and shake. The substances settle out in the jar as pictured below because of this property.

3. Why did the gravel settle first?
A. it has the smallest particle size
*B. it has the largest particle size
C. it contains the most water and air
D. it contains the least water and air

4. If this were a river, this sediment would wash away first.
A. sand
B. gravel
*C. clay
D. humus

5. In the spring, rivers in Utah are often brown in color because they contain very small particles of sediment called silt. Silt is suspended in water because of this.
A. Silt is in brown in color and contains mica.
B. The water is moving more slowly in spring.
*C. Silt has very small particles and low densities making it easy to move.
D. Water has a high density and large particle size.

6. In winter, a cold front (large mass of cold air) can settle in a valley and warm front (large mass of warm air) is found up in the mountains. This might account for this condition.
A. There is more warm air than cold air.
B. There is more cold air than warm air.
*C. Cold air is less dense than warm air.
D. Cold air is denser than warm air.

Science Assessment Database

7. A beach is composed of particles of sand the same size. This explains why.
A. The particles of sand come from the same place.
B. The particles of sand came to the beach at the same time.
C. The particles of sand were found in underwater canyons.
*D. The particles of sand were sorted by size and density.

8. A stream bed contains round rocks, all about the same size. This explains why there might not be any smaller particles of sand and clay.
A. They are more dense.
*B. They washed away.
C. They were never there.
D. They are too small to see.

9. A gold miner swirls a mixture of mud and water in a pan. He looks for gold at the bottom because of this.
*A. gold is very dense and sinks
B. gold dissolves in water and sinks
C. gold is hard to find because it can "hide"
D. gold is repelled by the other Earth materials

Essay

1. Describe the action of a stream on Earth materials as the stream flows through them.
*** The stream carries away the lighter, less dense materials first, leaving behind the heavier or more dense materials.

2. Describe how you would find the density of air, water, and rock.
***Gas: Mass an empty plastic baggie. Fill the baggie with air and mass again. Subtract to find mass. Fill the bag with water and measure the volume of the water. Divide the mass by the volume
Liquid: Mass a liquid in a graduated cylinder. Read the cylinder to get volume. Mass the graduate cylinder empty. Subtract the mass of the graduate from the mass of the volume and graduate. Divide the mass of the liquid by the volume.
Solid: Measure the volume using an overflow cup. Measure the mass on a balance. Divide the mass by the volume.

Science Assessment Database

_____ Physical science - matter and motion, heat energy, states, diffusion, expansion

1. This explains why the observation of a drop of food coloring, carefully dropped into a container of water, spreads and evenly colors all the water.
*A. particles in water are moving
B. water contains positive and negative ions
C. water flows inside containers just like water in a stream
D. water seeks its own level

2. This explains the observation of smelling perfume, shortly after it was opened, from a bottle across a room. Particles of perfume do this.
A. move slowly when they are cold
B. move towards a nose
*C. are always in motion
D. are lighter than air and float around the room

3. When the temperature of an object increases, the movement of the molecules will do this.
A. stay the same
*B. increase
C. decrease
D. Can tell, because it can not be measured.

4. When the temperature of an object increases the volume will do this.
A. stay the same
*B. increase
C. decrease
D. Can tell, because it can not be measured.

5. This explains how liquid molecules change state and become a gas.
*A. Particles moved fast enough to break out of the liquid.
B. Particles moved slow enough to break out of the liquid.
C. Particles bubble around in the container.
D. Particles move toward other molecules.

6. An increase in temperature of a liquid may cause it to change to this state.
A. solid
B. liquid
*C. gas

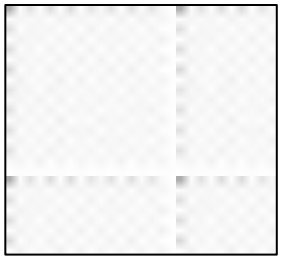
7. A decrease in temperature of a gas may cause it to change to this state first.
A. solid
*B. liquid
C. gas

8. Students want to know if sugar molecules diffuse in water. They put a sugar cube in the bottom of a container of water. They can tell if it diffuses
*A. if the water becomes sweet to the taste.
B. if the water changes color.
C. if the water move around in a current.

D. if the water evaporates from the cup.

9. Students carefully put equal amounts of food coloring into identical containers with equal amounts of water. One color (red, blue and green) in each container and time how long it takes the color to spread throughout. They are looking for evidence to explain this.
A. Which color looks the best in water?
B. Does food coloring dissolve in water?
C. Can water be used to make these colors easier to use?
*D. Do different colors diffuse at the same rate?

Use this diagram to answer the next two questions:
Before illustrates particles of a substance in a square balloon. After illustrates the same particles in the same balloon.

Before  **After** 

10. The change can be explained as the particles
A. becoming visible.
B. were cooled.
*C. were heated.
D. slowed down.

11. This explains the movement of particles before and after.
A. The particles movement is the same before and after.
*B. The particles movement increased from before to after.
C. The particles movement decreased from before to after.
D. The particles movement changed direction from before to after.

12. This explains what will happen to a ballon filled with air and put into a freezer for two hours.
A. the air in the balloon moves more expanding it.
B. the balloon will get colder, but will be the same size.
*C. the air in the balloon moves less shrinking it.
D. the air in the balloon moves more shrinking it.

13. Sidewalks have "cracks" which are about one meter or two apart. What is the purpose of these cracks?
A. It is tradition.
B. It is easier to make this way.
C. It makes the sidewalk look better.
*D. It provides room for the concrete to expand when it is heated so it doesn't crack.

14. This explains why a metal door could be hard to open in hot weather.

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*A. The door and the frame expanded.
B. The door and the frame contracted.
C. The door contracted and the door frame expanded.
D. The hinges are cooler than the air and moisture condenses on them.

15. This explains why window glass is made smaller than the frame in which it will be put.
A. The smaller the glass the less it will cost the factory so they can increase profit.
B. It makes it easier for a machine in the factory to put the glass into the frame without breaking it.
C. It is impossible to cut glass to size with less than a cm of error.
*D. The window glass can expand and contract with out breaking when the temperature changes.

Essay

Use this chart to complete the next four problems.

State	Distance between particles	Speed of particles	Shape
A	Close together	Vibrating in place	Holds its own shape
B	Farther apart	Moving more freely, faster	Takes the shape of its container
C	Farthest apart	Moving most freely, fastest	Fills the container

1. This state describes a liquid.

2. If this substance was carbon dioxide, this state would be dry ice.

3. This is what you would expect to happen to the temperature of a substance that changed from A to C.

4. This is what happens to the volume of most substances as they go from A to C.

OR MORE OPEN

Design a table to compare and contrast the solids, liquids and gasses. Your table should have at least 2 ways to describe the state.

State		
Solid		
Liquid		
Gas		

Pretend you are a particle of water that is being heated. Describe yourself as ice, water and water vapor. Be specific and scientifically accurate.

OR MORE OPEN

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Complete the following table with the appropriate state of matter.

Shape	Volume	State of Matter
Definite	Definite	
Not Definite	Definite	
Not Definite	Not Definite	

Describe an experiment to demonstrate diffusion of particles. Explain the expected results.

Illustrate before and after pictures to show the flow of particles from a sugar cube in water.