ELL Regents Earth Science – Mr. Romano
Course Expectations

1. Students should be on time and prepared for class every day with all of the following materials:

   Earth Science notes packets (I will provide), *Earth Science Reference Tables* (I will provide), sharpened pencils or pen, basic 4-function calculator, and charged Chromebook (bring charging cord).

2. Students are expected to arrive on time for class and Google meets and follow all class and school rules as per new student code of conduct and online class etiquette (these protocols are on the district website and also posted in my Google Classroom.)

3. Cell phones and other electronic devices have increasingly become a major distraction from the learning process and therefore must be put aside during all class periods, both in-class and online. The only electronic device that a student should be using during class time is their school-issued Chromebook.

4. Students must be responsible for handing in assignments. Some platforms we will use will allow for easy digital submission, other assignments may require that the student take a picture of the completed work that can be shared through the use of the Remind app or by email.

5. Lab work will be accomplished in a different manner than in the past. New York State mandates that labs be completed by students to receive Regents credit as part of their graduation requirements. To protect the safety of students, lab simulations and demonstration will replace typical hands-on scenarios until safety protocols allow for a return to normal laboratory procedures.

6. Each student's grade will be calculated based on a point system. The typical categories in Earth Science are tests/quizzes, laboratories, and "work" (classwork, homework, class participation). Tests and quizzes will be administered using the online platform Castle Learning or via a document or Google form shared with each student. Class notes can be used for each assessment. The point values for each assignment will vary based on criteria such as significance, time commitment, and length of assignment. Point values will always be shared with the student prior to the assignment given. Part of class participation will be taking notes. These notes may be checked as part of the classwork participation grade. Students need to stay attentive during class time, whether in-person or remote, and take appropriate notes that may be used on exams and quizzes and other assessments.

7. I can be reached during school hours at 364-5675 ext. 1264, or by e-mail at **cromano@syossetschools.org**
   I encourage all communication relating to each student's individual progress in Regents Earth Science.

   I also use the Remind app to keep students and parents (if they wish) informed and connected.
   To join my Remind, send a text to ***81010*** and text the message ***@ellearth***

   I ask that you please monitor your child's progress throughout the year by checking the parent portal.

Student's Name (please print) _____

Student's Signature _____ Date _____

Parent's Name (please print) _____

Parent's Signature _____ Date _____

Topic I

Measurement and Graphing

SYOSSET HIGH SCHOOL GRAPHING PROCEDURES

The Main Purposes of Graphing

1. A graph shows a picture of collected data that allows you to discover possible patterns.

2. A graph sometimes allows you to predict information that you didn't actually obtain in an investigation. This is called extrapolation. To **extrapolate** means to find information beyond the plotted data.

How to Construct a Graph

1. **Using a ruler, draw the horizontal (X) and vertical (Y) axes. Remember to leave space to the left and on the bottom of the page to be able to number and label your axes. (The graph paper we use, already has space for this)**

2. **Always put the independent variable on the X-axis and the dependent variable on the Y-axis. The independent variable is the one controlled by the investigator and is usually the first column on a data table.**

   Example: A student was conducting an experiment to see how the size of a pebble affected the speed as it fell from the surface of the lake to the bottom of a lake.

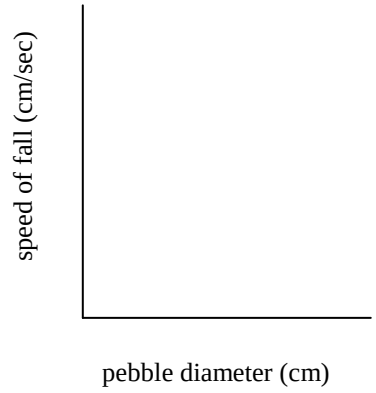
independent variable → **"CAUSE"**

pebble diameter (cm)	speed of fall (cm/sec)
2	3
5	7
8	10

dependent variable → **"EFFECT"**

Special Note: ** If "clock time" is one of the variables, it is always the independent variable and goes on the x-axis (bottom of graph). **

3. **Label the variable on each axis, followed by the units. Make sure to leave enough space to create a numerical scale on both axes.**



4. **Construct a numerical scale according to the following guidelines:**

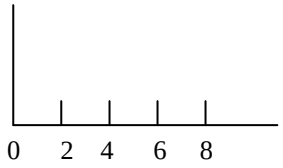
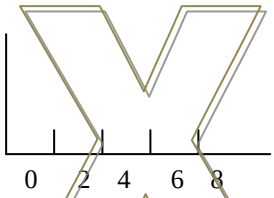
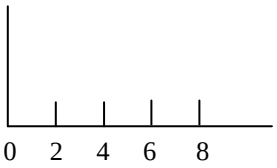
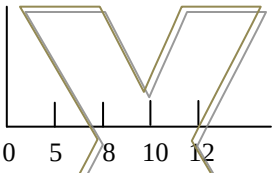
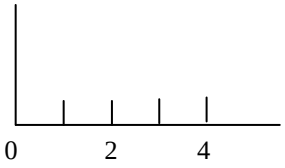
   a. Before you commit to a numerical scale, remember that you always have to follow the **"halfway rule".** This means that the graph should extend more than halfway across the page. Don't scrunch your graph into one small corner of the graphing area.

   b. Pick an interval to count by that will fit all the data (count by 2's, 5's etc..) Counting the boxes on the graph helps, and then trial and error works real well. **(The graph paper we usually use is a 40 x 50 grid)**

   c. Never use lightning bolts! If you can start with zero, do so. If not, start the scale with the lowest number, or close to the lowest number.

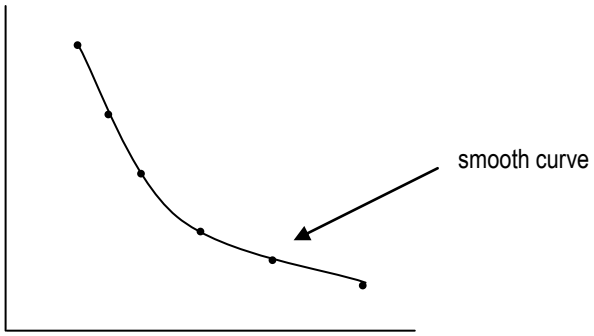
   d. Make sure to stick to the scale you decided upon and make sure your numbers are clearly written.

   Examples of correct versus incorrect labeling:

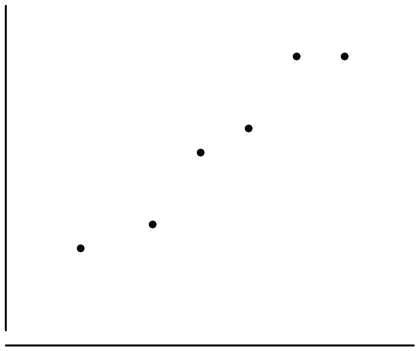
	Correct Way	Incorrect Way
1.	 Put numbers on the lines.	 DO NOT put the numbers in the spaces.
2.	 Make sure the numbers are evenly spaced (in this case, every box represents "2")	 DO NOT change the interval – the interval of this axis changes many times.
3.	 Know what you are counting by – even though this graph axis is labeled every other box – the interval of the axis is still counting by ones.	 This graph starts at "0", but then jumps to "2" and counts by ones for the rest of the axis. The "1" box was omitted.

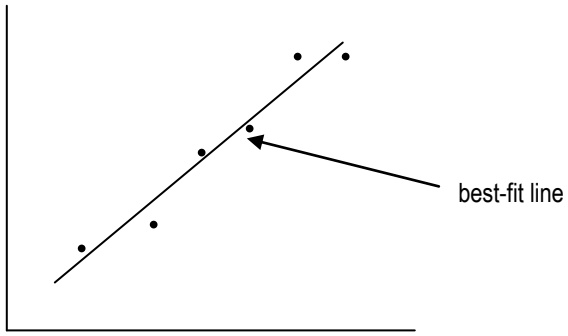
Most often seen mistake

5. Connect all the points to form a smooth curve. Do not extend the graph beyond the last point plotted.



Or when a scatterplot graph is constructed, a best-fit line or curve can be drawn to show the relationship between the two variables.





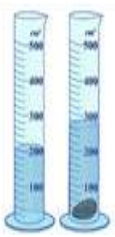
6. Place an appropriate title in an open space on the graph paper.
A good title includes the names of the two variables shown on the graph and clearly explains the experiment conducted.
"Time versus Temperature Graph" does not say much…
"The Temperature of Room E96 Measured for 24 Hours on 9/7/12" is so much more clear and specific.

FINAL GRAPHING CHECKLIST

- Appropriate scale for each axis – remember the "halfway rule"
- Both axes labeled with variables and units
- No lightning bolts
- Small dots for each point
- Appropriate Title
- Include a key when more than one line exists on graph

Date _____

Topic: Measurement and Graphing
Aim:

Measurement / Definition / Associated Information	Units	Instrument
1 DISTANCE	meter	metric ruler 
2 TIME	seconds	stopwatch 
3 TEMPERATURE	°Celsius	thermometer 
4 SPEED / VELOCITY / <u>RATE</u>	cm/sec , km/hr	metric ruler and stopwatch
5 MASS **a. MASS – the amount of matter (stuff) in a substance** **b. WEIGHT – the pull of gravity on an object** **- as the distance from a planet's core increases, the gravitational pull on an object decreases (object will have less weight).** **- the smaller the core, the less gravitational pull, the less the weight of objects on the surface**	grams	digital scale  triple-beam balance 
6 VOLUME **a. VOLUME – the amount of space a substance takes up** **b. rectangular objects: use the formula v = l x w x h (units will be cm^3)** **irregular-shaped objects: water displacement (units will be mL)**	cm^3 or mL (milliliters)	metric ruler or  graduated cylinder 

Determining the Volume of Solid Objects

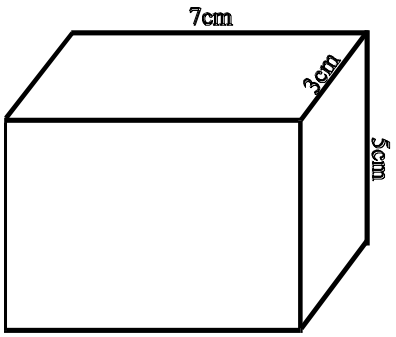
Whenever we make calculations, it is so important to show how we arrived at our result.
On this page, <u>and for the rest of the year</u>, whenever you make a calculation you must "show all work" by following these 3 steps:

1. Write out the formula
2. Substitute numbers into equation (plug in numbers)
3. Solve equation and label with correct units (round appropriately when asked)

1. What is the volume of an object that is 12.5 centimeters long, 3.0 centimeters wide, and 10.0 centimeters high?

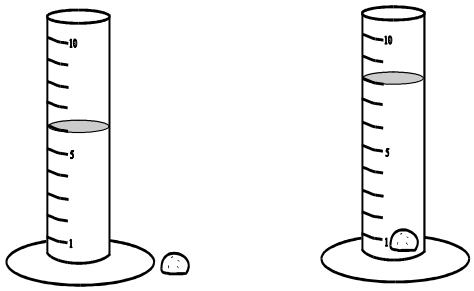
Calculations: (round your final answer to the nearest tenths place)

2. What is the volume of the object below?



Calculations: (round your final answer to the nearest whole number)

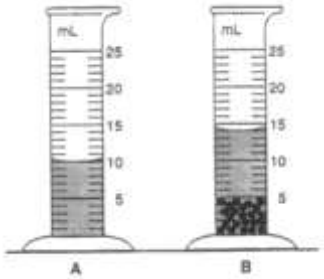
3. What is the volume of the irregular-shaped pebble? (no calculations necessary here)



4. What is the total volume of the lead pellets? (no calculations necessary here)

Remember to read the meniscus correctly!

FROM THE BOTTOM!!



Date _____

Topic: Measurement and Graphing
Aim:

1. What is the definition of density?

Density – the amount of mass in a given volume

Units: g/cm^3 or g/mL

(how packed the molecules are in a substance – more packed = more dense)

2. How is the density formula used?

a. Density Formula:

Density = mass / volume

D = m / V

b. Density Calculation for **PLASTIC**:

Mass = _____

Volume = _____

Substitutions:

Density = _____

c. Density Calculation for **ALUMINUM**:

Mass = _____

Volume = _____

Substitutions:

Density = _____

d. Manipulating the Density Formula and/or using the Density Triangle

Example 1:
The mass of a piece of oak is determined to be 5g. If the density of oak is known to be .75 g/cm^3, what would the volume of that piece of oak be?

Example 2:
The density of a chunk of iron is 7.9 g/mL. The chunk of iron was found to have a volume of 3mL. What would the mass of that chunk of iron be?

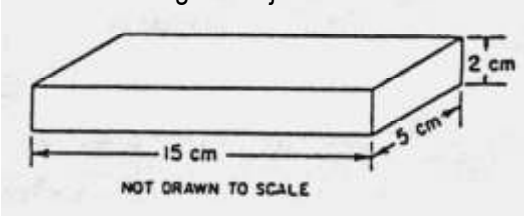
3. How can the relative densities of different substances be compared without doing any calculations?

When substances of two different densities are mixed together, the more dense substance sinks to the bottom while the less dense substance rises to the top.

Mass, Volume, and Density

1. A rock has a mass of 150.0 grams and a volume of 40.0 milliliters. What is the density of the rock?
   (1) 3.75 g/ml
   (2) 6.00 g/ml
   (3) 15.0 g/ml
   (4) 40.0 g/ml

2. The diagram below represents a rectangular object with a mass of 450 grams. What is the density of the object?



   1 1 gram per cubic centimeter
   2 2 grams per cubic centimeter
   (3) 3 grams per cubic centimeter
   (4) 4 grams per cubic centimeter

3. A pebble has a mass of 35 grams and a volume of 14 cubic centimeters. What is its density?
   (1) 0.4 g/cm^3
   (2) 2.5 g/cm^3
   (3) 490 g/cm^3
   (4) 4.0 g/cm^3

To solve questions 4-6, manipulate the density formula or use the density triangle.

4. The mineral quartz has a density of 2.7 g/cm^3. If a student had a piece of quartz that has a volume of 2 cm^3, what would the mass of the sample be? Show your work.

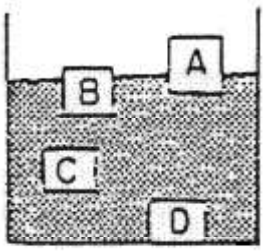
5. A sample of sphalerite has a mass of 176.0 grams. What is the volume of the sample? Show your work.

Mineral Property	Mineral			
	Smithsonite	Sphalerite	Willemite	Zincite
Composition	$ZnCO_3$	ZnS	Zn_2SiO_4	ZnO
Hardness	4–4.5	3.5–4	5.5	4
Density (g/cm^3)	4.4	4.0	4.0	5.6
Color	white, gray, green, blue, yellow	brown, yellow, red, green, black	white, yellow, green, reddish brown, black	deep red to orange yellow
Streak	white	white to yellow to brown	white	orange yellow

6. The mass of a sample of liquid water is 42 grams. What is the volume of the water? Show your work.
   Hint: Use page 1 of the *Earth Science Reference Tables* to find the density of liquid water.

Use the diagram to answer questions 7-8.

Substances A, B, C, and D are at rest in a container of liquid as shown by the diagram.



7. Which choice lists the substances in order of lowest to highest density?

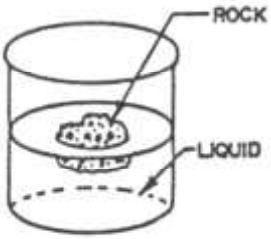
(1) A, B, C, D
(2) A, D, C, B
(3) D, C, B, A
(4) C, B, A, D

8. Which substance has the same density as the liquid?

(1) A
(2) B
(3) C
(4) D

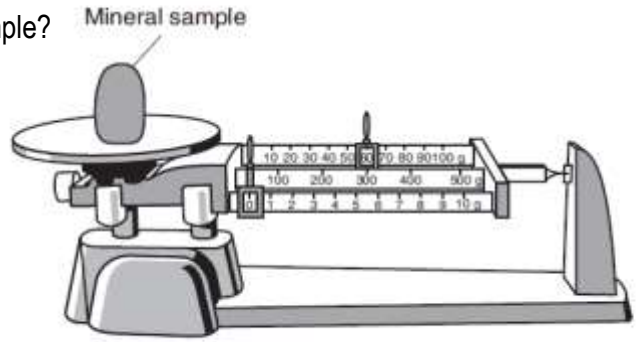
9. The diagram shows a glass jar containing a clear liquid and a floating rock. Which conclusion about the relative density of the rock and the liquid is true?

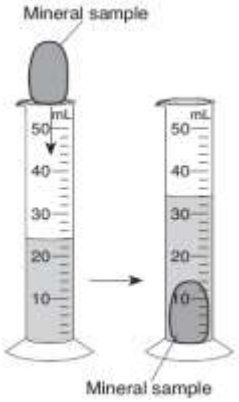
(1) The rock is less dense than the liquid.
(2) The rock is more dense than the liquid.
(3) The rock and the liquid have the same density.



10. The diagram below represents the mass and volume of a mineral sample being measured. These measurements were used to determine the density of the mineral sample.

What is the density of this mineral sample?
(1) 6 g/mL
(2) 24 g/mL
(3) 34 g/mL
(4) 60 g/mL





Skill Check: ROUNDING NUMBERS

11. Round 1.35 to the nearest tenth: _____

12. Round .06 to the nearest tenth: _____

13. Round 72.101 to the nearest hundredth: _____

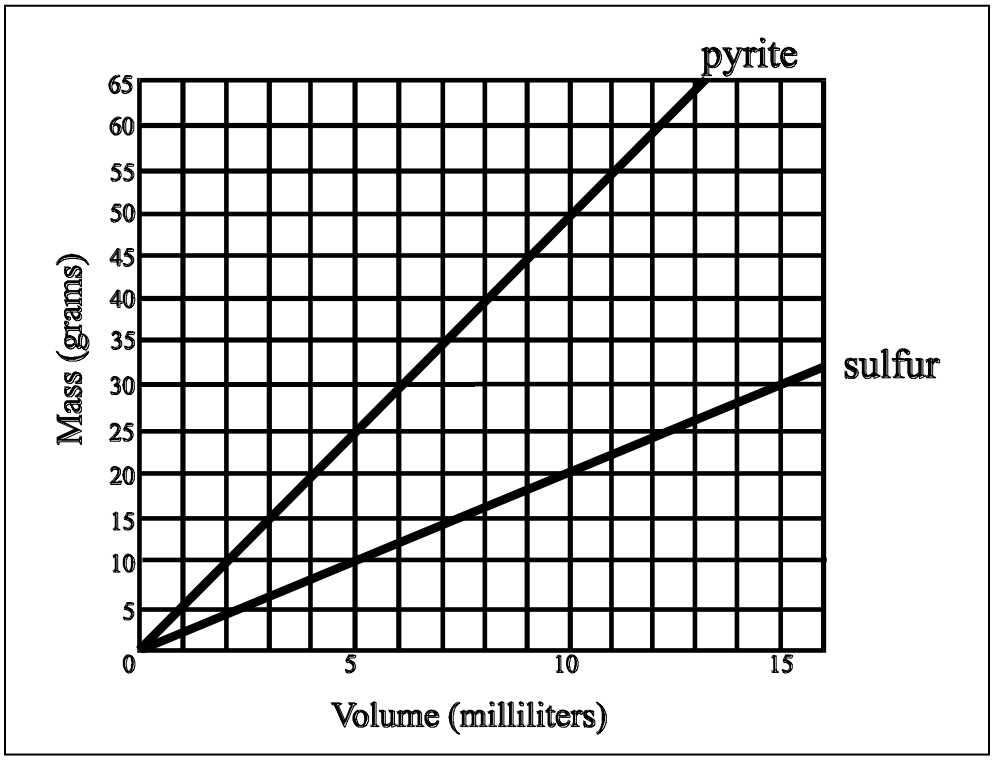
14. Round .0016 to the nearest thousandth: _____

15. Round 1.98 to the nearest tenth: _____

Date _____

Topic: Measurement and Graphing
Aim:

Directions: Use the graph below to answer the questions that follow.



1. If the volume of a sample of pyrite is 5 milliliters, what is the mass of the sample? _____

2. If the mass of a sample of sulfur is 30 grams, what is the volume of the sample? _____

3. What is the density of pyrite? (show all work) _____

4. What is the density of sulfur? (show all work) _____

5. If a sample of pyrite has a mass of 75 grams, and we already know what the density of pyrite is, what would be the volume of that sample? _____

Date _____

Topic: Measurement and Graphing

Important Fact about the Density of a Uniform Substance:

_____

_____

_____

2.

Aim:

1.

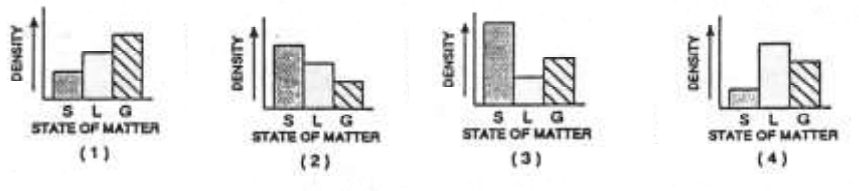
3.

Factors Affecting Density

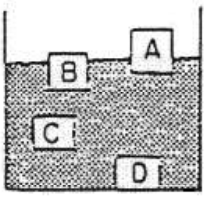
1. If a wooden block were cut into eight identical pieces, the density of each piece compared to the density of the original block would be
   (1) less (2) greater (3) the same

2. Heated air will
   (1) rise because it is higher in density than the air that surrounds it
   (2) rise because it is lower in density than the air that surrounds it
   (3) sink because it is lower in density than the air that surrounds it
   (4) sink because it is higher in density than the air that surrounds it

3. Which graph best represents the relationship between the density of a substance and its state of matter for most earth materials *excluding* water. [Key: S = solid, L = liquid, G = gas]

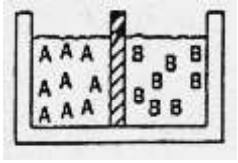


4. Substances A, B, C, and D are at rest in a container of liquid as shown by the diagram.

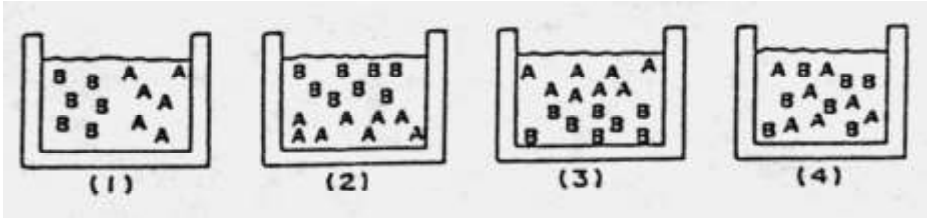


   Assuming that the liquid in the container is water, which substance would most likely illustrate the position of an ice cube after placed in the liquid?
   (1) A (3) C
   (2) B (4) D

5. Liquid A and Liquid B are placed on opposite sides of a barrier within the same container as shown below.



   If liquid A is considerably more dense than liquid B, which diagram best represents the positioning of the liquids a minute after the barrier is carefully lifted out of the container?



6. As the pressure on a gas increases, the density of the gas will
   (1) increase (2) decrease (3) remain the same

7. As air expands while being heated, its density
   (1) increases (2) decreases (3) remains the same

Answer **questions 8-11** using Tables I and II below. Tables I and II show the volume and mass of three samples of mineral A and three samples of mineral B.

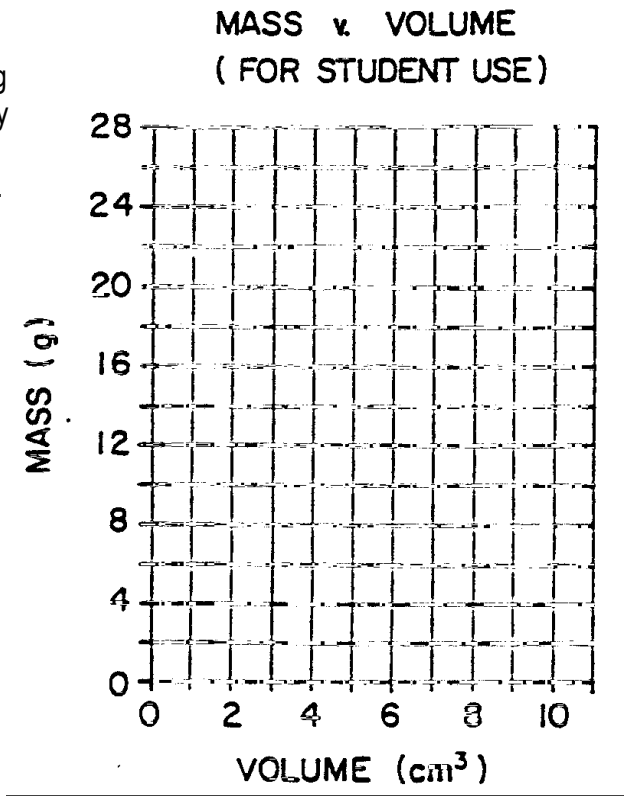
8. Use the data below to construct a line graph using the data in Tables I and II. Make sure to correctly label the lines "Mineral A" and "Mineral B" (or create a key to distinguish between the lines).

Table I: Mineral *A*

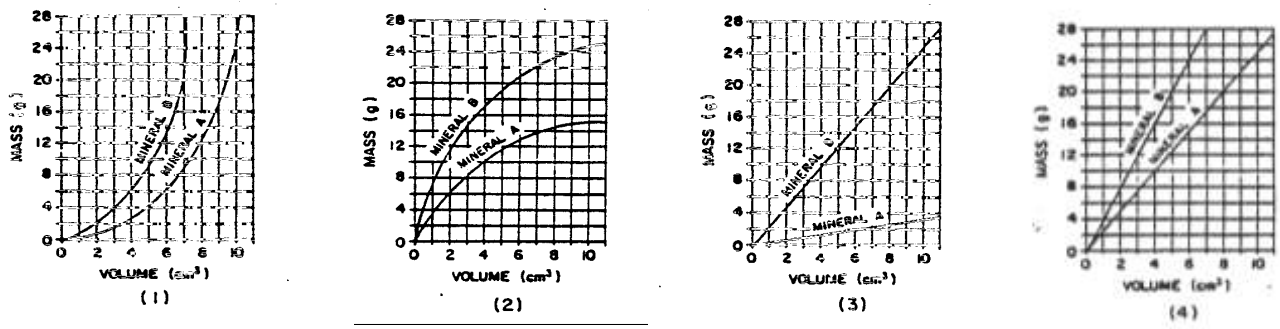
Sample No.	Volume	Mass
1	2.0 cm^3	5.0 g
2	5.0 cm^3	12.5 g
3	10.0 cm^3	25.0 g

Table II: Mineral *B*

Sample No.	Volume	Mass
1	3.0 cm^3	12.0 g
2	5.0 cm^3	20.0 g
3	7.0 cm^3	28.0 g



9. Using your constructed graph, which graph best represents the data for Minerals I and II?



10. What is the density of sample 3 of mineral A?
    (1) 2.5 g/cm^3 (3) 25.0 g/cm^3
    (2) 10.0 g/cm^3 (4) 4.0 g/cm^3

11. One sample of mineral B is heated until it melts. Compared to the density of the original sample, the density of the melted sample most likely will be
    (1) less (2) greater (3) the same

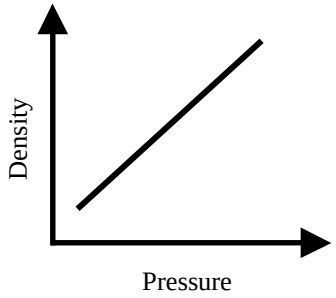
Date _____

Topic: Measurement and Graphing

Aim:

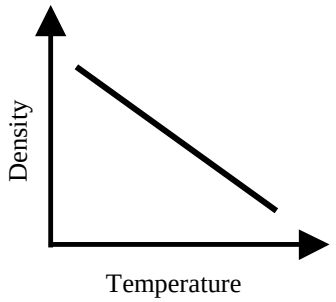
recall notes

1. What is a direct relationship?



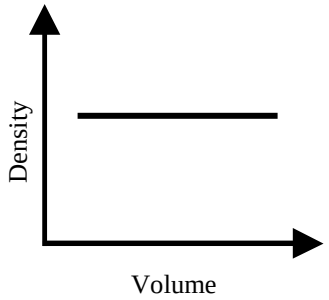
2. What is an inverse relationship?

also known as an indirect relationship

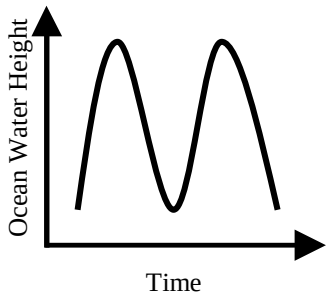


3. What is an unaffected relationship?

also known as a steady relationship



4. What is a cyclic relationship?



Date _____

Topic: Measurement and Graphing
Aim:

Rate of Change = how fast something occurs (speed)

Rate = $\frac{\text{change in value}}{\text{Time}}$ $\qquad$ $ROC = \frac{\Delta V}{T}$

The best way to learn about rate of change is to practice some problems ….

1. It is thought that in the last 100 years, the tectonic plates of the Earth have moved 100 centimeters. What is the rate of plate movement in centimeters/year?

2. The time it takes for the Earth to rotate (spin) a full 360^{o} on its axis is 24 hours. What is the Earth's rate of rotation in degrees per hour?

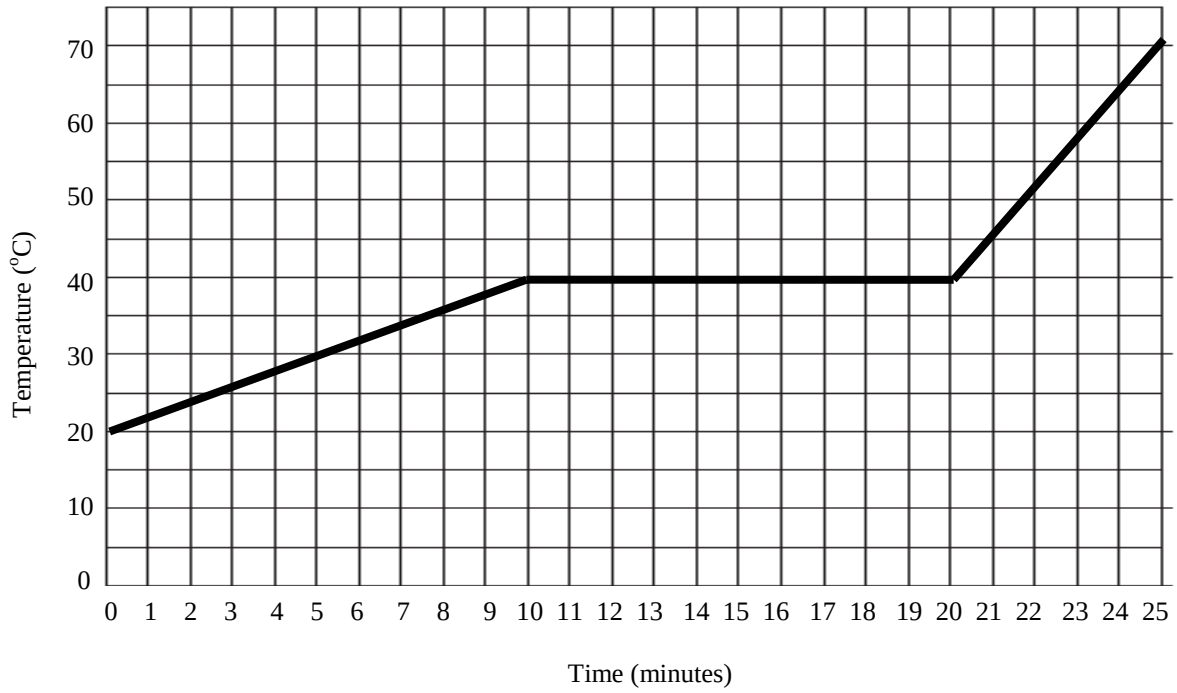
3. A marble tombstone has been sitting in a particular cemetery for between the years 1850 and 2010 If over that time, the marble's mass has decreased by 25 grams, what was the rate at which the marble is breaking down? Round your answer to the nearest tenths place.

Date _____

Topic: Measurement and Graphing
Aim:

Rate of Change and the Slope of a Line: The steeper the slope, the faster the rate.
The more gradual (flatter) the slope, the slower the rate.

Heating Curve of Unknown Substance X



Rate of Change during first 10 minutes: THIS FORMULA IS A DIFFERENT FORMAT FOR USE WITH A GRAPH:

Rate of Change = $\frac{V_2 - V_1}{T_2 - T_1}$ =

Rate of change between 10 and 20 minutes:

Rate of Change =

Rate of Change between 20 and 25 minutes:

Rate of Change =

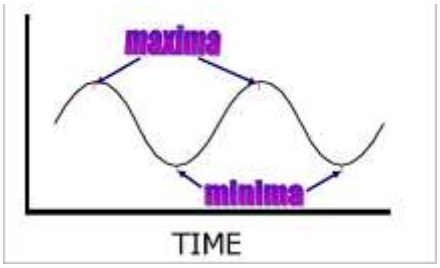
Date _____

Topic: Measurement and Graphing
Aim:

1. Cyclic Changes

- changes that repeat in a pattern

- occur in predictable time intervals



maxima – crests (all of the peaks on a cyclic graph)
minima – troughs (all of the low points on a cyclic graph)

EXAMPLES:

2. Non-Cyclic Changes

- random changes that do not repeat in a pattern

- unpredictable changes

EXAMPLES:

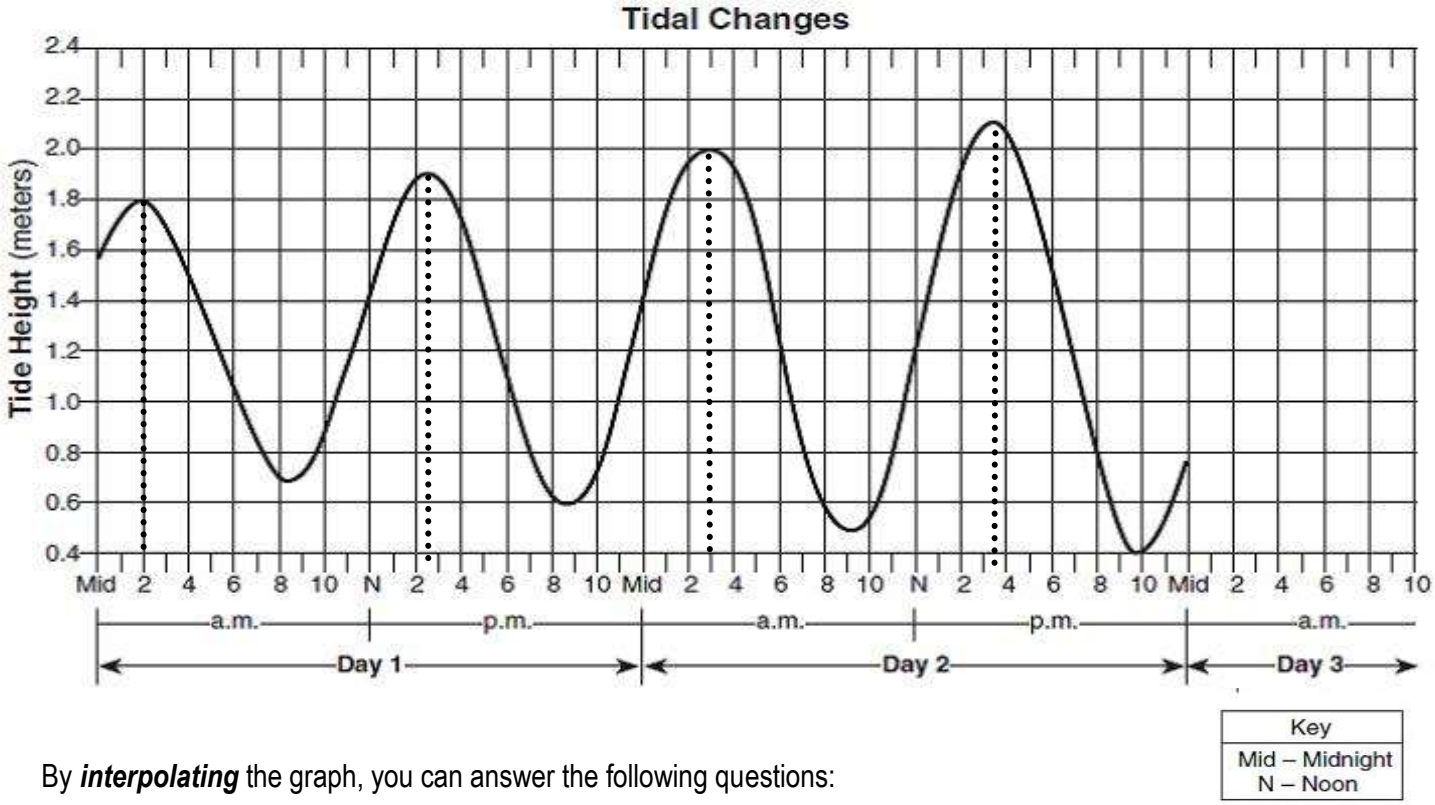
Special Note:

Sometimes a cyclic change may appear to be non-cyclic because the pattern takes a long time to repeat.

Interpreting and Analyzing Cyclic Change Graphs

Remember, cyclic changes are all about patterns: your job is usually to determine the pattern and then use it to help predict the upcoming maxima or minima. You will do two major tasks when analyzing a cyclic change graph:
First, you will have to ***interpolate*** – estimate a value within a given range of data.
Second, you will have to ***extrapolate*** – predict a value by projecting past the known data.

A good example to analyze would be the changes in the ocean water level because of high and low tides.



By ***interpolating*** the graph, you can answer the following questions:

1. How many high tides are illustrated? _____

2. What are the times of the high tides? _____

3. What is the time interval between high tides? _____

4. How many low tides are illustrated? _____

5. Approximately how much time exists between a high tide and the next low tide? _____

6. What is the approximate change in water height between the high tide and low tide the morning of day 2? _____

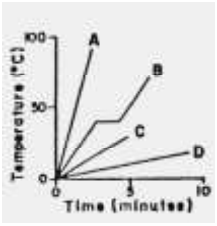
By ***extrapolating*** the graph, you can answer the following questions about day 3:

7. At what time will the next high tide occur? _____

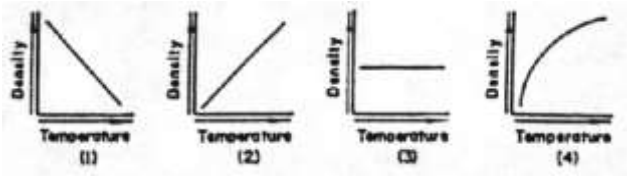
8. What will be the approximate height of the next high tide? _____

Graphing Relationships and Cyclic & Non-Cyclic Changes,

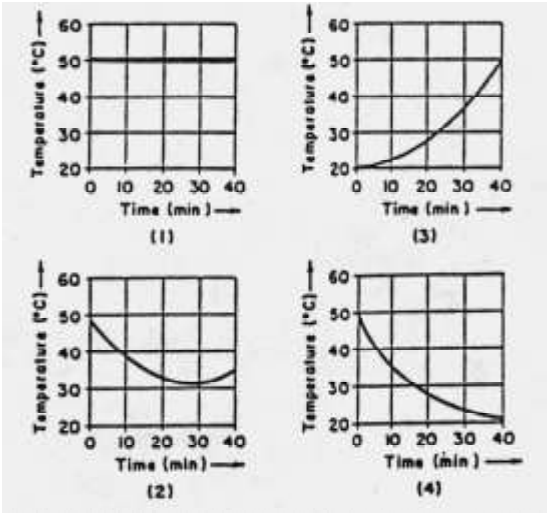
1. The graph to the right represents the relationships between temperature and time as heat is added at a constant rate to equal masses of four substances labeled A, B, C, and D. The temperature of which substance increased most rapidly?
   (1) A (3) C
   (2) B (4) D



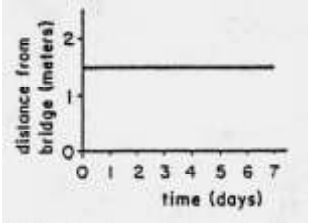
2. Which graph best represents the effect that heating has on air density in the atmosphere?



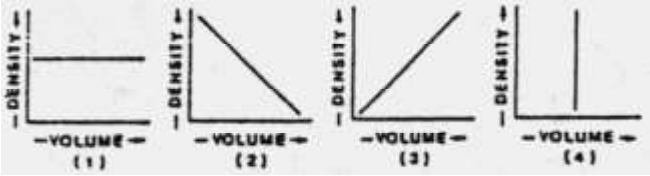
3. A beaker of water at 50°C is placed in a room where the air temperature is 20°C. Which graph best represents the change in the water temperature?



4. A student measures the distance from a bridge to a rock every day for a week. What is indicated by the graph of these measurements as shown below?
   (1) No change in time or distance took place.
   (2) As distance decreased, time increased.
   (3) As distance increased, time decreased.
   (4) As time increased, distance remained the same.



5. A student calculates the densities of five different pieces of aluminum, each having a different volume. Which graph best represents this relationship?



6. As viewed from the Earth, the Moon's phases have shown which type of changes over the past 50 years?
   (1) noncyclic and predictable
   (2) noncyclic and unpredictable
   (3) cyclic and predictable
   (4) cyclic and unpredictable

7. Future changes in the environment can best be predicted from data that is
   (1) highly variable and collected over short periods of time
   (2) highly variable and collected over long periods of time
   (3) cyclic and collected over short periods of time
   (4) cyclic and collected over long periods of time

8. During a ten-year period, which is a noncyclic change?
   (1) the Moon's phases as seen from Earth
   (2) the Earth's orbital velocity around the Sun
   (3) the apparent path of the Sun as seen from the Earth
   (4) the impact of a meteorite on the Earth

9. Which event would be the most predictable one year in advance of the event?
   (1) a hurricane in Florida
   (2) an earthquake in California
   (3) a volcanic eruption in Japan
   (4) an eclipse of the Sun

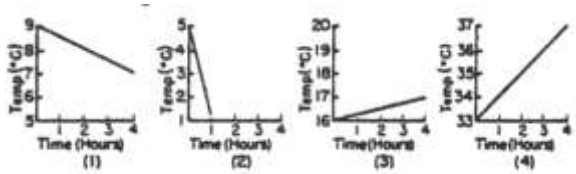
10. Ocean tides are examples of
   (1) noncyclic events
   (2) predictable changes
   (3) unrelated events
   (4) random events

11. Which factor can be predicted most accurately from day to day?
   (1) chance of precipitation
   (2) direction of wind
   (3) time of an earthquake occurring
   (4) time of sunrise

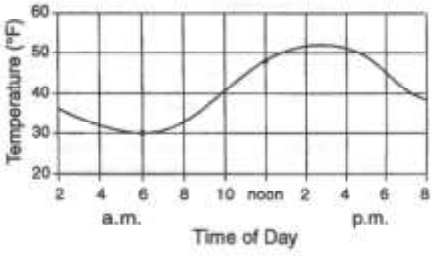
12. Which statement best explains why some cyclic Earth changes may *not* appear to be cyclic?
   (1) Most Earth changes are caused by human activities.
   (2) Most Earth changes are caused by the occurrence of a major catastrophe.
   (3) Many Earth changes occur over such a long period of time that they are difficult to measure.
   (4) No Earth changes can be observed because the Earth is always in equilibrium.

One Last Topic 1 Exam Practice …

1. Which graph represents the fastest rate of temperature change?



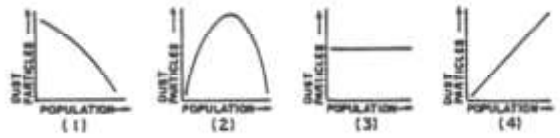
2. The rate of temperature change between 6 am and noon was
   (1) 6 °F/hr
   (2) 8 °F/hr
   (3) 3 °F/hr
   (4) 18°F/hr



3. The data table below shows the average dust concentrations in the air over many years for selected cities of different populations.

POPULATION IN MILLIONS	DUST PARTICLES/ METER³
less than 0.7	110
between 0.7 and 1.0	150
greater than 1.0	190

Based on this data table, which graph best represents the general relationship between population and concentration of dust particles?

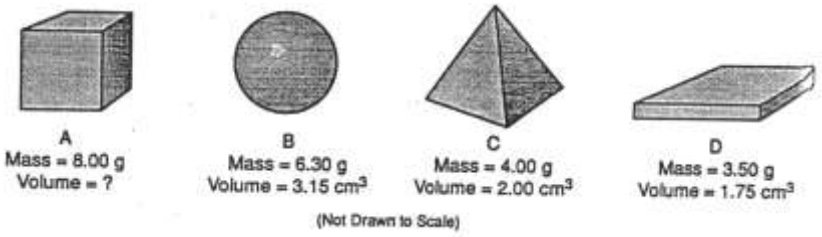


4. As water freezes and becomes ice, its density
   (1) decreases (2) increases (3) remains the same

5. Which list shows the phases of matter in order of increasing density for all Earth materials, excluding water?
   (1) gas, liquid, solid
   (2) solid, liquid, gas
   (3) solid, gas, liquid
   (4) gas, solid, liquid

6. As the pressure on a body of air increases, the density of the air will
   (1) increase (2) decrease (3) remain the same

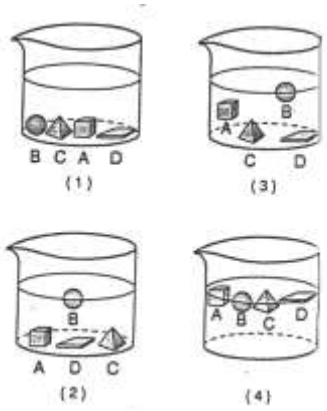
Base your answers to ***questions 7-9*** on your knowledge of Earth Science, the *Earth Science Reference Tables*, and the diagrams below. The diagrams represent four solid objects made of the same uniform material. The accepted values for the volume and mass of each object are given, except for the volume of object A.



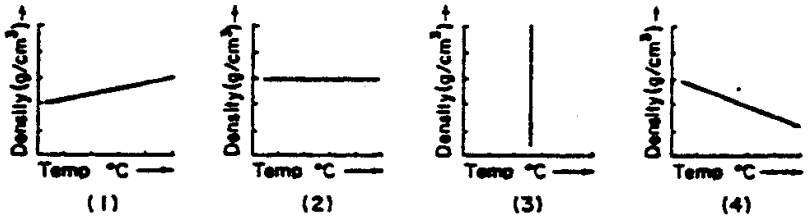
7. What is the density of object B?
   (1) 0.50 g/cm^3
   (2) 2.00 g/cm^3
   (3) 3.15 g/cm^3
   (4) 19.85 g/cm^3

8. What is the volume of object A?
   (1) 1.00 cm^3
   (2) 2.00 cm^3
   (3) 8.00 cm^3
   (4) 4.00 cm^3

9. Which diagram best shows what would happen if the four objects were placed in a large beaker of water at room temperature?



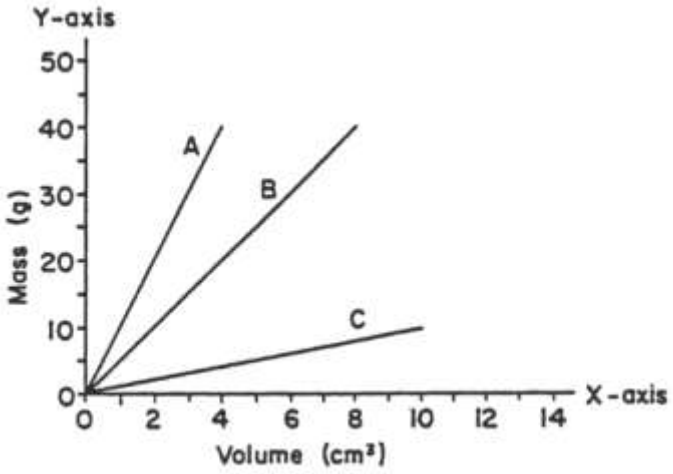
10. Object A expands when it is heated. Which graph best represents the relationship between the temperature and the density of object A?



11. A student calculates the densities of five different pieces of pure iron, each having a different volume. What is true of their densities?
   (1) The largest piece has the greatest density
   (2) The smallest piece has the greatest density
   (3) The smallest piece has the least density
   (4) All pieces have the same density

12. During a ten-year period, which is a non-cyclic change?
   (1) the Moon's phases as seen from the Earth
   (2) the seasons
   (3) the apparent daily path of the Sun as seen from the Earth
   (4) the impact of a meteorite on the Earth

Base your answers to ***questions 13-15*** on the graph below. The graph shows the relationship between mass and volume for three materials A, B, and C which are at a temperature of 20°C.

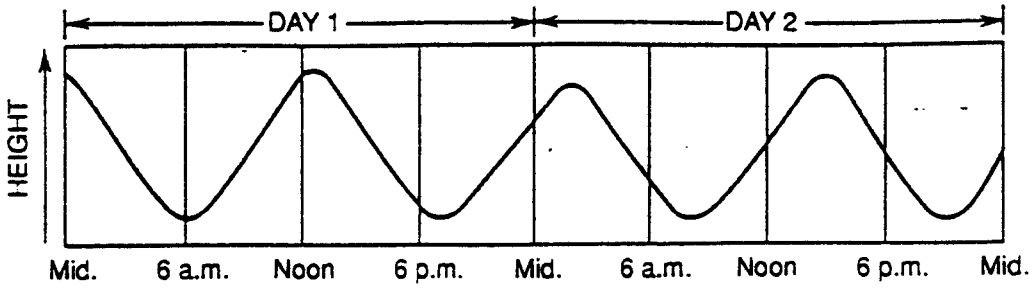


13. What is the volume of a 40g sample of material A?
    (1) 8 cm^3 (3) 3 cm^3
    (2) 10 cm^3 (4) 4 cm^3

14. What is the approximate density of material B?
    (1) 1.0 g/cm (3) 5.0 g/cm^3
    (2) 0.2 g/cm^3 (4) 10.0 g/cm^3

15. When the volume of material C is 14 cubic centimeters, its mass will be
    (1) 8 g (3) 14 g
    (2) 10 g (4) 16 g

16. The graph below shows the changes in height of ocean water over the course of 2 days at one Earth location.



Which statement concerning these changes is best supported by the graph?
(1) The changes are cyclic and occur at predictable time intervals.
(2) The changes are cyclic and occur at the same time every day
(3) The changes are non-cyclic and occur at sunrise and sunset.
(4) The changes are non-cyclic and may occur at any time.