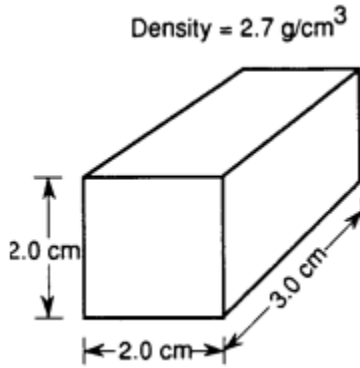


Use the following diagram to answer the questions



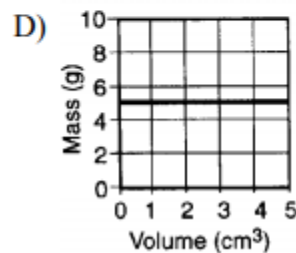
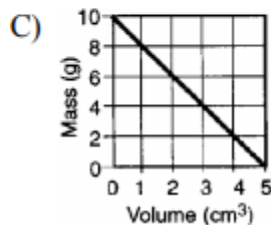
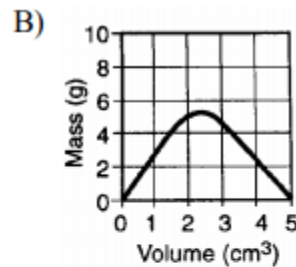
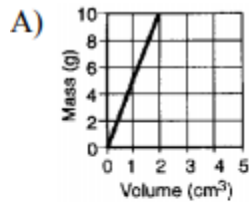
- 1.) What is the mass of this object? SHOW ALL WORK and give proper units.

- 2.) Will this cube **sink/float** in water? Explain how you know

- 3.) The cube above is broken into many irregularly shaped pieces. Compare the density of the pieces to the density of the whole cube.

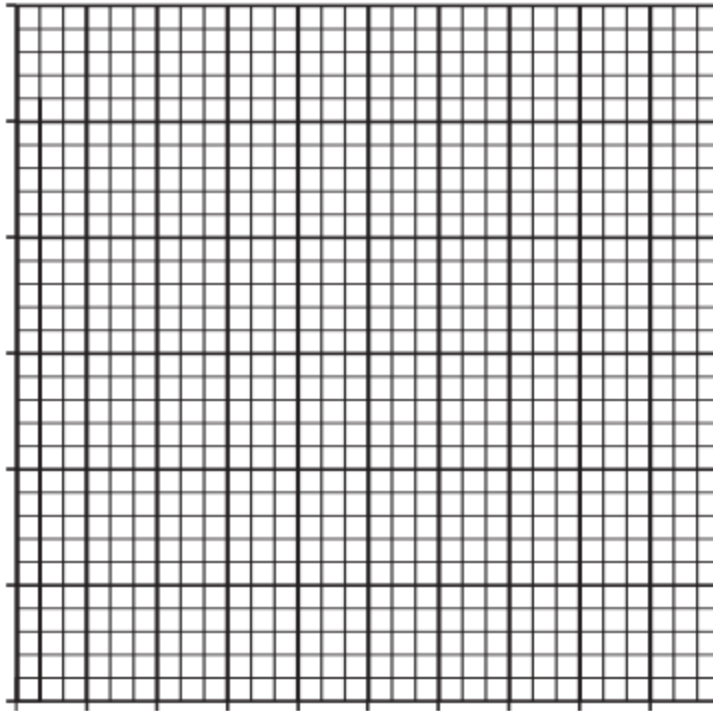
- 4.) A pebble has a mass of 35 grams and a volume of 14 cubic centimeters. What is its density?

- 5.) Which graph best represents the relationship between mass and volume of a material that has a density of 5 grams per cubic centimeter?



Heat was applied at a constant rate to a solid substance under controlled conditions. The temperature of the substance was recorded every 3 minutes. These data are recorded in the table below

Time (min)	0	3	6	9	12	15	18	21	24	27
Temperature (°C)	12°	14°	16°	16°	16°	20°	24°	28°	32°	36°



- 6.) Use the grid above to construct a graph from the data in the table.
- 7.) Label each axis and provide an appropriate title
- 8.) According to your graph, what would the temperature of the substance be at 23 minutes? _____°C
- 9.) What is the independent (manipulated) variable for this experiment? _____

The diagram below represents a portion of the Periodic Table of the Elements

- 10.) Based on the periodic table, at room temperature, cadmium is most likely a _____
- 11.) How many protons does Argon (Ar) have? _____
- 12.) How many neutrons does Argon (Ar) have? _____
- 13.) Draw the electron structure of Argon (Ar)
- 14.) What is a noble gas? _____
- 15.) Give an example of a noble gas from the table. _____

Portion of the Periodic Table of the Elements

KEY		Groups							
1	H	—	approximate atomic mass						
	Hydrogen	—	symbol						
1		—	name						
		—	atomic number						
		13	14	15	16	17	18		
		11	12	13	14	15	16	17	18
		5	6	7	8	9	10		
		27	28	31	32	35	40		
		13	14	15	16	17	18		
		64	65	70	73	75	79	80	84
		29	30	31	32	33	34	35	36
		108	112	115	119	122	128	127	131
		47	48	49	50	51	52	53	54

16.) Define polymer

17.) Which of the following are examples of synthetic polymers (you can choose more than one)

- a. Teflon b. Rubber c. Silk d. Plastic e. Cellulose f. Nylon g. Polyester

18.) The most common type of cement in the world is Portland cement, named after an area of England that has a lot of limestone. Limestone is made up mostly of calcium carbonate (CaCO_3). When calcium carbonate is heated it breaks down into carbon dioxide (CO_2) and calcium oxide (CaO), the main ingredient in Portland cement. During this reaction, thermal energy is taken in from the surroundings and converted to chemical energy.

During this chemical reaction the solution becomes **warmer/cooler**
The reaction is **exothermic/endothermic**

19.) A substance's physical and chemical properties are all determined by its **chemical structure**. Its chemical structure depends on the *number* and *types* of atoms in each of its molecules, as well as on how those atoms are *arranged*.

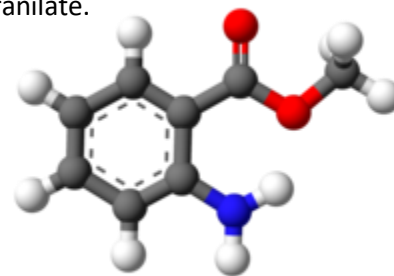
One property of a substance is its **flavor**, which is its odor and taste *combined*.

The chemical structure of a substance determines both the kind of flavor it has and the *strength* of that flavor.

Substances that have especially interesting and strong flavors are often added to food to change or enhance the food's flavor.

These substances are called **flavorants**. Flavorants can be found in nature, made in a chemical factory, or both.

One example of a flavorant is methyl anthranilate. This flavorant is often used to add a grape flavor to syrups, candy, and other sweets. Methyl anthranilate is found naturally in certain types of grapes, but it can also be made by workers in a chemical factory. The diagram shows the structure of methyl anthranilate.



Which of the following statements are true? Select all that apply

- a. A substance's chemical structure depends only on the number and types of atoms in each molecule of the substance
b. Both the smell and the taste of methyl anthranilate contribute to its grape flavor
c. A substance's chemical structure determines its flavor
d. A flavorant might be both found in nature and made in a chemical factory.

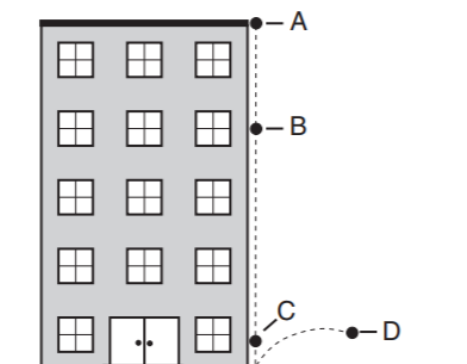
20.) As a candle burns, the energy transfer as it burns is as follows:

- a. Chemical energy (stored in the wax) \longrightarrow heat and light
b. Heat energy (stored in the wax) \longrightarrow chemical and light
c. Chemical energy (stored in the wax) \longrightarrow heat and magnetism
d. Heat energy (stored in the wax) \longrightarrow magnetism and light

21.) A ball is dropped from the roof of a building. Points A, B, C and D in the diagram below represent positions of the ball as it falls.

At which position will the ball have the greatest kinetic energy?

- a. A
b. B
c. C
d. D



Base your answers to questions 22 and 23 on the two tables below and on your knowledge of Earth science. Table 1 shows the composition, hardness, and average density of four minerals often used as gemstones. Table 2 lists the minerals in Moh's Scale of Hardness from 1 to 10.

- 22.) Part of a gemstone's value is based on the way the gemstone shines in reflected light. The way a mineral reflects light is described as the mineral's
- Fracture
 - Hardness
 - Luster
 - Streak

Table 1

Gemstone Mineral	Composition	Hardness	Average Density (g/cm ³)
emerald	Be ₃ Al ₂ (Si ₆ O ₁₈)	7.5–8	2.7
sapphire	Al ₂ O ₃	9	4.0
spinel	MgAl ₂ O ₄	8	3.8
zircon	ZrSiO ₄	7.5	4.7

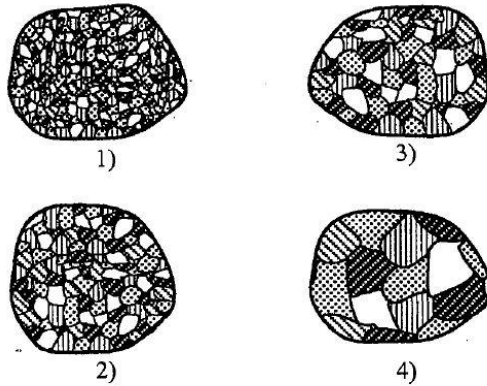
Table 2

Moh's Scale of Hardness
1 talc
2 gypsum
3 calcite
4 fluorite
5 apatite
6 feldspar
7 quartz
8 topaz
9 corundum
10 diamond

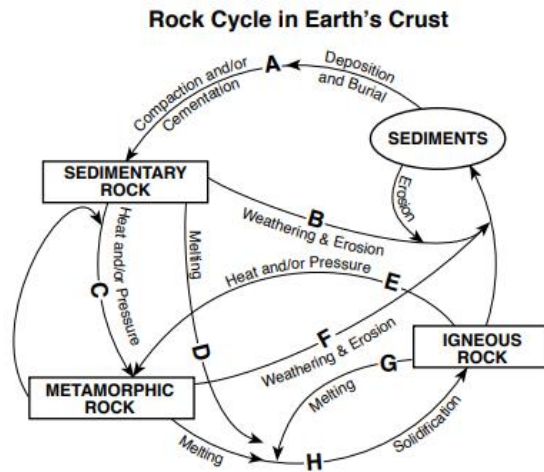
KEY	
Al = aluminum	O = oxygen
Be = beryllium	Si = silicon
Mg = magnesium	Zr = zirconium

- 23.) Sapphire is a gemstone variety of which mineral on Moh's scale of hardness?
- Corundum
 - Diamond
 - Fluorite
 - Topaz

24.) Which granite sample most likely form from magma that cooled and solidified at the slowest rate?



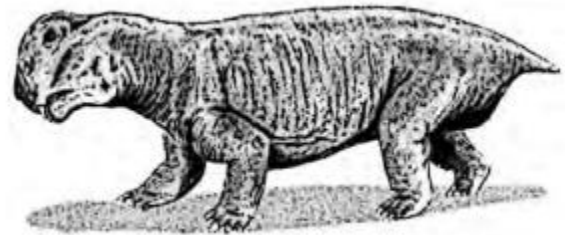
Base your answers to question 25 on the model of the rock cycle below and on your knowledge of science. The model represents the process involved in the formation of different types of rocks. Some of these processes are labeled A through H.



25.) Complete the table by writing the letter of the process from the rock cycle diagram that is being described by each statement in the table.

Rock Cycle Statement	Letter of Process from Rock Cycle Diagram
Pieces of igneous rock are compressed and glued together to form a sedimentary rock.	
Metamorphic rock becomes liquid and crystallizes to form igneous rock.	
Sedimentary rock is broken down into sediments and transported by a stream.	

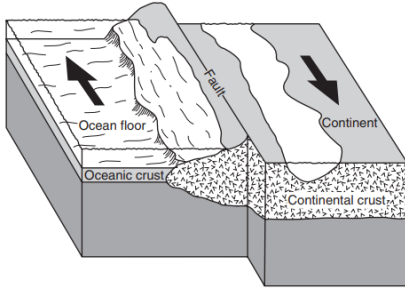
26.) The diagram below represents a *Lystrosaurus*. *Lystrosaurus* was an herbivore that lived on land about 250 million years ago. Fossils of this dinosaur have been discovered on the widely separated continents of Africa and South America.



Which statement best explains why *Lystrosaurus* fossils are found on these two continents?

- This dinosaur could fly to distant locations.
- Both continents were once joined together.
- Predators transported the remains of this dinosaur between continents.
- Glaciers transported the fossils to the two continents.

27.) Arrows in the block diagram below show the relative movement along a tectonic plate boundary.

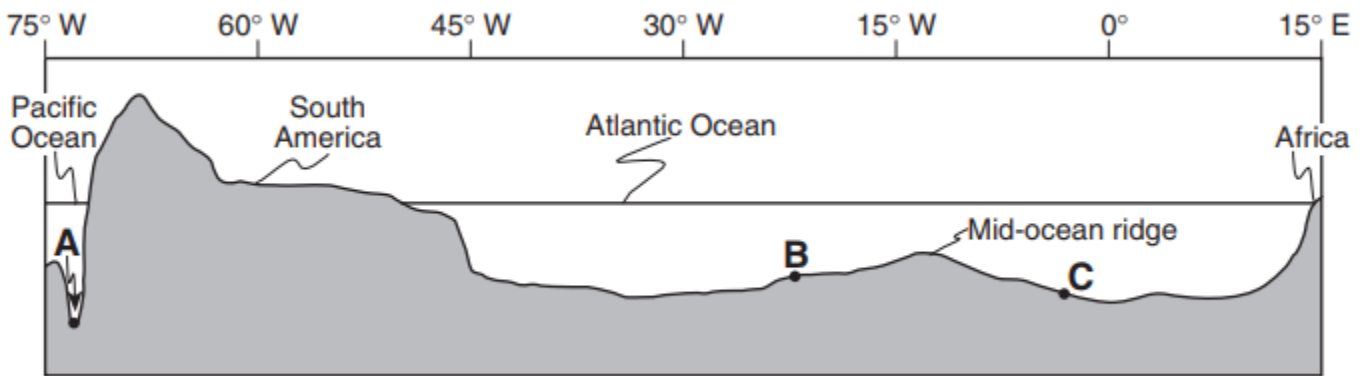


(Not drawn to scale)

What type of plate boundary is illustrated by the diagram?

- a. Divergent
- b. Convergent
- c. Complex
- d. Transform

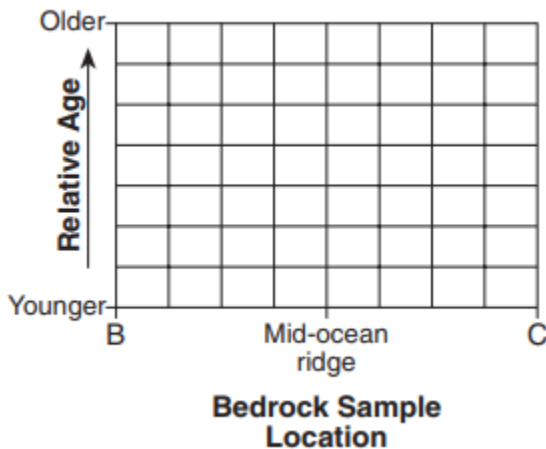
Base your answers to question 28 through 30 on the cross section below, which shows the major surface features of Earth along 25° S latitude between 75° W and 15° E longitude. Points A, B and C represent locations on Earth's crust.



(Not drawn to scale)

28.) Identify the tectonic plate motion that is causing an increase in the distance between South America and Africa.

29.) Bedrock samples were taken at the mid-ocean ridge and points B and C. On the grid below, draw a line to show the relative age of the bedrock samples between these locations.

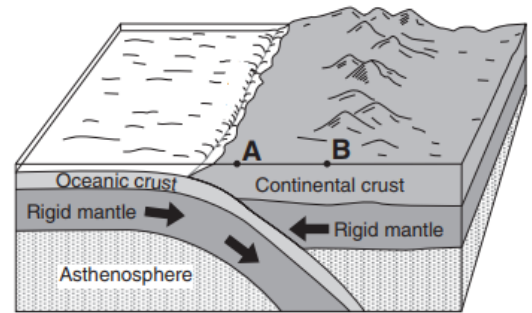


30.) On the diagram above, start at the mid-ocean ridge and draw the magnetic stripes that would be found in the oceanic crust.

Use the diagram to the right to answer questions 31 and 32

31.) What type of plate boundary is shown?

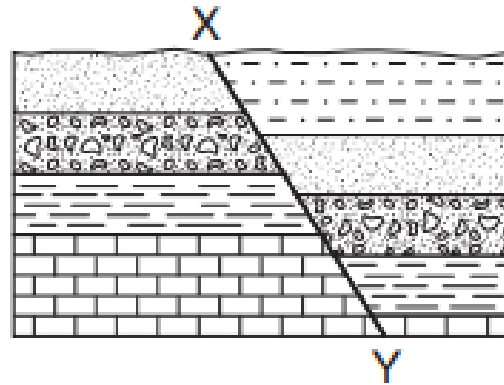
32.) What is the name of the land feature created where the continental crust and oceanic crust meet?



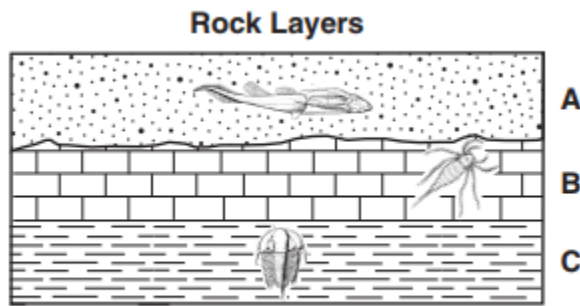
(Not drawn to scale)

33.) Complete each letter using the diagram to the right

- Shade the oldest layer yellow
- Shade the youngest layer green
- Explain what XY is and when it was created.



Base your answer to question 34 and 35 on the diagram below and on your knowledge of science. The diagram represents a cross section of rock layers A, B, and C and some fossils found within them. The rock layers have *not* been overturned.



(Not drawn to scale)

34.) Describe one piece of evidence in the diagram that shows rock layer A formed after rock layer B.

35.) Are the rock layers shown most likely igneous, metamorphic, or sedimentary? Circle your answer below

Circle one : **igneous** **metamorphic** **sedimentary**

Evidence:

36.) Thousands of years ago, giraffes with short necks were common within giraffe populations. Nearly all giraffe populations today have long necks. This difference could be due to

- Giraffes stretching their necks to keep their heads out of reach of predators
- A mutation in the genetic material controlling neck size occurring in some skin cells of a giraffe
- A mutation in genetic material controlling neck size occurring in the reproductive cells of a giraffe
- Giraffes stretching their necks so they could reach food higher in the trees.

37.) The drawings below represent three different birds. The beak shape makes it easy for each bird to obtain food in a different way.

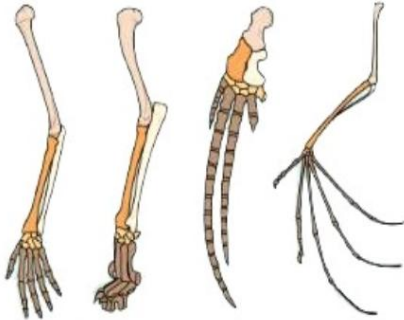
The differences in beak shape are examples of

- a. Camouflage
- b. Competition
- c. Dynamic equilibrium
- d. Biological adaptation



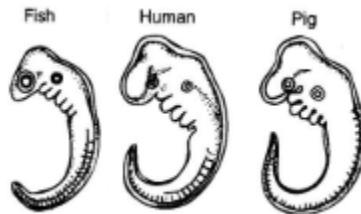
(Not drawn to scale)

38.) The image illustrates what evolutionary concept?



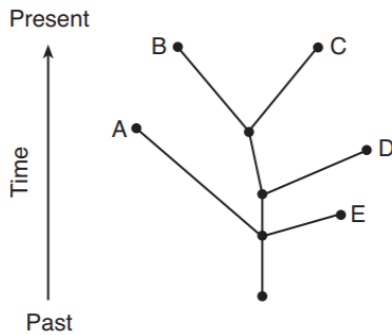
- a. Embryological similarities
- b. Variation among species
- c. Vestigial structures
- d. Homologous structures

39.) Early stages in the embryo of a fish are similar to the early stages of human and pig embryos. An explanation for this similarity is that the



- a. Pig and the human occupy the same habitat, while the fish occupies a different habitat
- b. Pig and the human are more closely related to each other than to the fish
- c. Pig, human, and fish evolved from a common ancestor
- d. Pig, human, and fish had no ancestral species in common

40.) Which statement concerning the evolution of species A, B, C, D and E is supported by the diagram below?



- a. Species B and C can be found in today's environments
- b. Species A and D evolved from E
- c. Species A and C can still interbreed
- d. Species A, B and E all evolved from a common ancestor and are all successful today