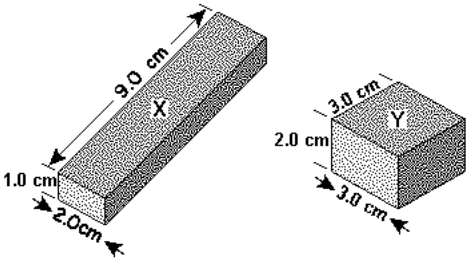
REVIEW FOR THE EARTH SCIENCE REFERENCE TABLES

Unit 1 Prologue

1. A cube is 3 cm on a side. It its mass is 67.5g, what is its density? (Show work)
   __2.5_____g/cm^3

2. 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

3. The two solid blocks represented in the diagram are made of the same material and are under the same temperature and pressure conditions.



If the mass of block *X* is 54 grams, what is the mass of block *Y*?

1) 18 g
2) 27 g
3) 54 g
4) 108 g

4. Base your answer to the question on the data table below, which lists some properties of four minerals that are used as ores of zinc (Zn).

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

A sample of sphalerite has a mass of 176.0 grams. What is the volume of the sample?

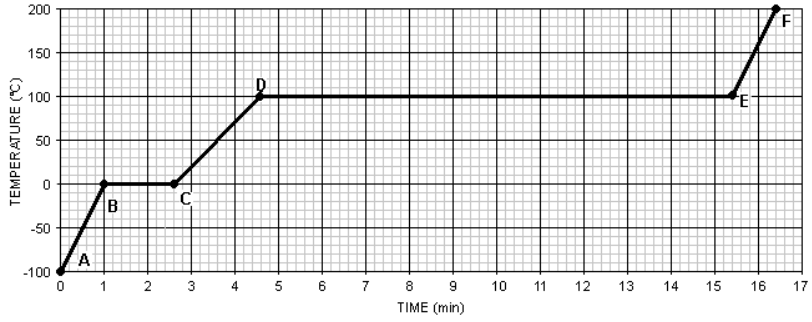
1) 22.7 cm^3
2) 31.4 cm^3
3) 40.0 cm^3
4) 44.0 cm^3

5. A thermometer held 2 meters above the floor shows a temperature of 30°C. The thermometer on the floor shows a temperature of 24°C.

   What is the temperature gradient between the two thermometers?

   1) 6°C/m 2) 2°C/m 3) 3°C/m 4) 4°C/m

6. The graph shows the temperatures recorded when a sample of water was heated from −100°C to +200°C. The water received the same amount of heat every minute.



What is the rate of temperature change between points *C* and *D*?

1) 10°C/min
2) 25°C/min
3) 50°C/min
4) 150°C/min

Unit 2 Mapping

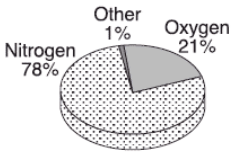
1. What is the most abundant element by volume in the troposphere? ___Nitrogen_____

2. What is the most common element by mass in the crust? _____Oxygen_____
3. Which element is most abundant in Earth's crust?
   1) nitrogen 2) hydrogen 3) oxygen 4) silicon

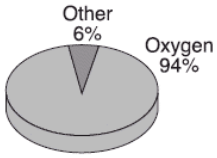
4. The two elements that make up the largest percentage by mass of Earth's crust are oxygen &
   1) silicon 2) potassium 3) hydrogen 4) nitrogen

5. Oxygen is the most abundant element by volume in Earth's
   1) inner core 2) troposphere 3) hydrosphere 4) crust

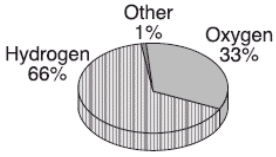
6. Which pie graph correctly shows the percentage of elements by volume in Earth's troposphere?



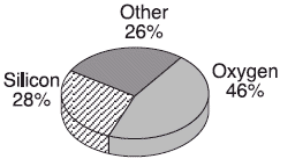
(1)



(2)



(3)



(4)

7. What is the altitude of the tropopause in kilometers? ____12_____ In miles? _____7_____

8. What is the temperature in degrees C at the tropospause? _____-55°C_____

9. As altitude increases, what happens to air pressure? _____Decreases_____

10. In which layer of the atmosphere is there the most water vapor? _____Troposphere_____

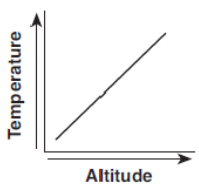
11. At 50 km above sea level what is the air pressure? _____0.1_____

12. An air temperature of 95°C most often exists in which layer of the atmosphere?
    1) troposphere 2) stratosphere 3) mesosphere 4) thermosphere

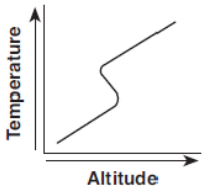
13. The altitude of the ozone layer near the South Pole is 20 kilometers above sea level. Which temperature zone of the atmosphere contains this ozone layer?
    1) troposphere 2) stratosphere 3) mesosphere 4) thermosphere

14. In which two temperature zones of the atmosphere does the temperature increase with increasing altitude?
    1) troposphere and stratosphere 3) stratosphere and thermosphere
    2) troposphere and mesosphere 4) mesosphere and thermosphere

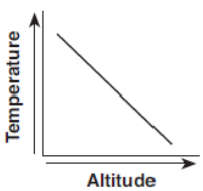
15. Which graph best shows the general relationship between altitude and temperature in the troposphere?



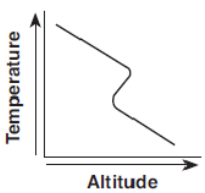
(1)



(2)



(3)



(4)

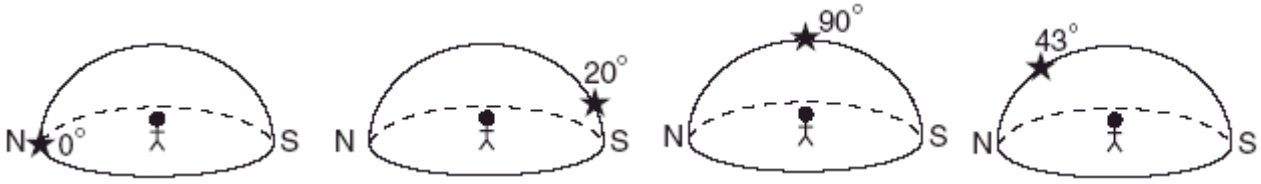
16. What is the longitude of Elmira? (to the nearest minute) _____76°50'W_____

17. What is the latitude of Oswego? (to the nearest minute) _____43°25'N_____

18. What is the approximate location of the Canary Islands Hot Spot?
1) 32° S 18° W 2) 32° S 18° E 3) 32° N 18° W 4) 32° N 18° E

19. At which New York State location will an observer most likely measure the altitude of *Polaris* as approximately 42°?
1) Jamestown 2) Plattsburgh 3) Oswego 4) New York City

20. Which diagram represents the approximate altitude of *Polaris* as seen by an observer located in Syracuse, New York?

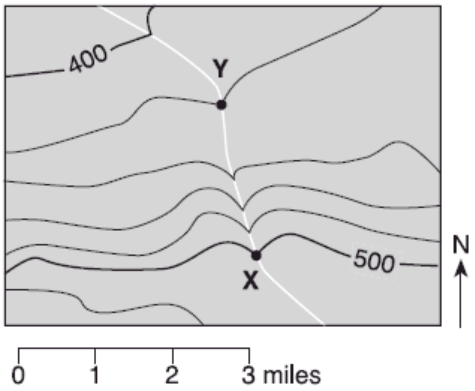


(1) (2) (3) (4)

21. At which location is the altitude of *Polaris* approximately 42°?
1) Niagara Falls 2) Elmira 3) Watertown 4) Massena

22. At which New York State location would an observer measure the highest altitude of *Polaris*?
1) New York City 2) Slide Mountain 3) Niagara Falls 4) Plattsburgh

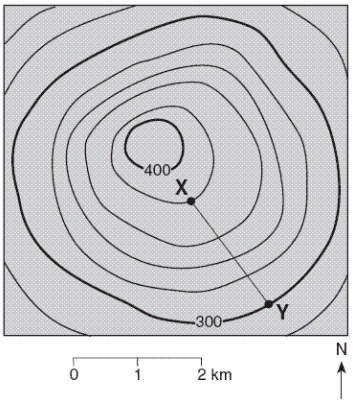
23. The topographic map below shows a stream crossing several contour lines and passing through points *X* and *Y*. Elevations are measured in feet.



What is the approximate gradient between point *X* and point *Y*?

1) 10 ft/mi
2) 20 ft/mi
3) 40 ft/mi
4) 80 ft/mi

24. What is the gradient between points *X* and *Y*?
1) 40 m/km
2) 80 m/km
3) 100 m/km
4) 120 m/km



Unit 3 Rocks and Minerals

Properties of Common Minerals

1. What are the two main types of luster? _____Metallic and Nonmetallic_____
2. What is the dominant form of breakage in graphite? _____Cleavage_____
3. What happens to Calcite when exposed to acid? _____Bubbles_____
4. What is the chemical composition of Halite? _____NaCl_____
5. What mineral has a nonmetallic luster, a hardness of 7, shows fracture, and is often dark red to green? _____Garnet_____
6. What is the color of the streak of Hematite? _____Red-Brown_____
7. Silicate minerals contain the elements silicon and oxygen. Which list contains only silicate minerals?
   1) graphite, talc, and selenite gypsum
   2) potassium feldspar, quartz, and amphibole
   3) calcite, dolomite, and pyroxene
   4) biotite mica, fluorite, and garnet
8. Which two minerals have cleavage planes at right angles?
   1) biotite mica and muscovite mica
   2) sulfur and amphibole
   3) quartz and calcite
   4) halite and pyroxene
9. The mineral graphite is often used as
   1) a lubricant 2) an abrasive 3) a source of iron 4) a cementing material

Rock Cycle

10. List the steps in the formation of sedimentary rocks. _____ _____Compaction and Cementation_____
11. List the steps in the formation of igneous rocks. _____ _____Melting and Solidification_____
12. List the steps in the formation of metamorphic rocks. _____ _____Heat and Pressure_____

Igneous Rocks

13. What is the environment of formation for granite? _____Intrusive_____
14. As a rock becomes more dense, its color usually becomes _____Darker_____
15. As the percent of iron in an igneous rock increases its density will ____Increase_____
16. Vesicular rocks have these. _____Gas Pockets_____
17. List the minerals that make up granite. _____Plag. Feldspar, Quartz, Potassium Feldspar, Biotite, Amphibole_____

18. What is the name of the rock that has medium color, a fine texture, and is vesicular (has gas pockets)? _____Vesicular Andesite_____

19. The three statements below are observations of the same rock sample:
- The rock has intergrown crystals from 2 to 3 millimeters in diameter.
- The minerals in the rock are gray feldspar, green olivine, green pyroxene, and black amphibole.
- There are no visible gas pockets in the rock.

This rock sample is most likely
1) sandstone 2) gabbro 3) granite 4) phyllite

20. Which common rock is formed from the solidification of molten material?
1) rock gypsum 2) slate 3) rhyolite 4) coal

21. What is the origin of fine-grained igneous rock?
1) lava that cooled slowly on Earth's surface
2) lava that cooled quickly on Earth's surface
3) silt that settled slowly in ocean water
4) silt that settled quickly in ocean water

22. Which igneous rock has a vesicular texture and contains the minerals potassium feldspar and quartz?
1) andesite 2) pegmatite 3) pumice 4) scoria

23. The photograph below shows an igneous rock.
What is the origin and rate of formation of this rock?
1) plutonic with slow cooling
2) plutonic with rapid cooling
3) volcanic with slow cooling
4) volcanic with rapid cooling

24. The basaltic bedrock of the oceanic crust is classified as:
1) felsic, with a density of 2.7 g/cm^3
2) felsic, with a density of 3.0 g/cm^3
3) mafic, with a density of 2.7 g/cm^3
4) mafic, with a density of 3.0 g/cm^3

25. Which igneous rock is dark colored, cooled rapidly on Earth's surface, and is composed mainly of plagioclase feldspar, olivine, and pyroxene?
1) obsidian 2) rhyolite 3) gabbro 4) scoria

Sedimentary Rocks

26. What grain sizes make up conglomerate rocks? _____Mixed_____

27. Which land derived sedimentary rock is made of the smallest sediments? _____Shale_____

28. Which two sedimentary rocks may form from biological activities? _____

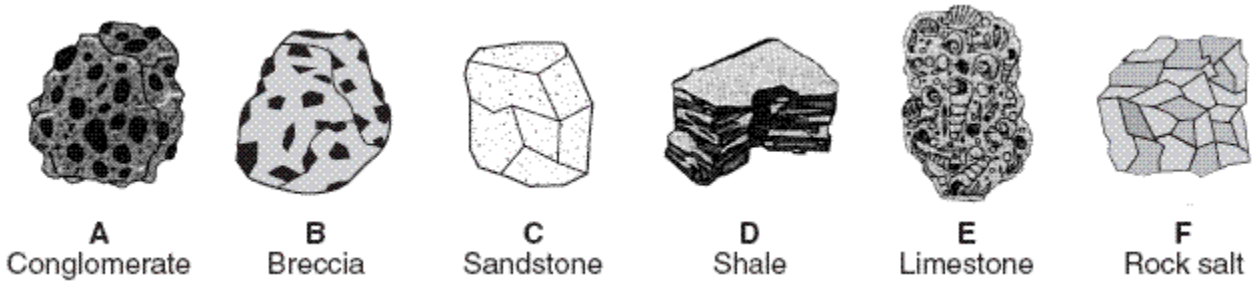
_____Limestone and Coal_____

29. Name the three sedimentary rocks that may form from the evaporation of seawater.

_____Rock Gypsum, Rock Salt, and Dolostone_____

30. What sedimentary rock is made of particles that are 0.003 cm in diameter? __Siltstone_____

Base your answer to the questions 31 and 32 on the drawings of six sedimentary rocks labeled *A* through *F*.



A Conglomerate | B Breccia | C Sandstone | D Shale | E Limestone | F Rock salt

31. Most of the rocks shown were formed by
    1) volcanic eruptions and crystallization
    2) compaction and/or cementation
    3) heat and pressure
    4) melting and/or solidification

32. Which two rocks are composed primarily of quartz, feldspar, and clay minerals?
    1) rock salt and conglomerate
    2) rock salt and breccia
    3) sandstone and shale
    4) sandstone and limestone

33. Most rock gypsum is formed by the
    1) heating of previously existing foliated bedrock
    2) cooling and solidification of lava
    3) compaction and cementation of shells and skeletal remains
    4) chemical precipitation of minerals from seawater

34. Which rock is sedimentary in origin and formed as a result of chemical processes?
    1) granite 2) shale 3) breccia 4) dolostone

35. Which two processes lead directly to the formation of both breccia and conglomerate?
    1) melting and solidification
    2) heat and pressure
    3) compaction and cementation
    4) evaporation and precipitation

Metamorphic Rocks

36. List the minerals found in gneiss? _Mica, Quartz, Feldspar, Amphibole, Garnet, Pyroxene___

37. What happens to heat and pressure as depth within the Earth increases? __Increases_____

38. What rock is formed from the low – grade metamorphism of shale? _____Slate_____

39. What happens to the grain sizes in a rock as it goes from low to high grade metamorphism?

    _____Grain size increases_____

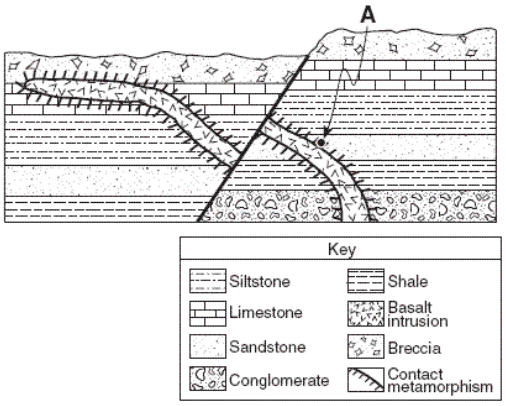
40. What are the two types of foliation? ___Banding and Mineral Alignment_____

41. Which metamorphic rock has shiny foliation surfaces from microscopic crystals of clay or feldspar? _____Phhyllite_____

42. Which two kinds of adjoining bedrock would most likely have a zone of contact metamorphism between them?
    1) shale and conglomerate
    2) shale and sandstone
    3) limestone and sandstone
    4) limestone and granite

43. Wavy bands of light and dark minerals visible in gneiss bedrock probably formed from the
    1) cementing together of individual mineral grains
    2) cooling and crystallization of magma
    3) evaporation of an ancient ocean
    4) heat and pressure during metamorphism

44. Base your answers to the questions on the geologic cross section below. The rock layers have not been overturned. Point *A* is located in the zone of contact metamorphism.



Which metamorphic rock most likely formed at point *A*?

Answer: _____Quartzite_____

What is the largest silt particle that could be found in the siltstone layer?

Answer: _____.006_____ cm

Unit 4 Weathering, Erosion, Deposition and Landscapes

1. How fast must a stream flow to carry a particle 10.0 cm in diameter? ____200_____ cm/sec
2. How would you classify a particle of 0.0073 cm? _____Sand_____
3. What is the size range of a cobble? ___6.4_____ cm to ____25.6_____ cm
4. What are the largest particles that a stream can transport when its velocity is 200 centimeters per second?
   1) silt 2) sand 3) pebbles 4) cobbles
5. Which of the following particle diameters best represents largest particles that a stream flowing with a water velocity equal to 0.2 cm/s can transport?
   1) 0.0004 cm 2) 0.003 cm 3) 0.1 cm 4) 1.3 cm
6. Which groups of particle sizes can be transported by a stream that has a velocity equal to 20 cm/s?
   1) only boulders and cobbles
   2) boulders, cobbles and pebbles larger than 0.4 cm
   3) only pebbles larger than 0.4 cm and sand
   4) pebbles smaller than 0.4 cm, sand, silt, and clay
7. The stream velocity at point in a river is 100 centimeters per second and the stream velocity at another point in this river is 40 centimeters per second. Identify *one* sediment particle most likely being deposited between points *C* and *D*. Answer: _____Pebbles_____

Landscaped Regions and Bedrock of NYS

8. In which landscape region is Long Island located? ____Atlantic Coastal Plain_____

9. The Catskills are considered part of which landscape region?

   _____Alleghany Plateau_____

10. The Erie – Ontario Lowlands border which two major lakes?

    _____Lake Ontario and Lake Erie_____

11. Which two New York State landscape regions are formed mostly of surface bedrock that is approximately the same geologic age?
    1) Manhattan Prong and Atlantic Coastal Plain
    2) Erie-Ontario Lowlands and Adirondack Mountains
    3) Adirondack Mountains and Allegheny Plateau
    4) Tug Hill Plateau and St. Lawrence Lowlands

12. Large garnet mineral crystals are found in the metamorphic surface bedrock in which New York State landscape region?
    1) Catskills 2) Adirondacks 3) Erie-Ontario Lowlands 4) Tug Hill Plateau

13. Buffalo, New York, and Plattsburgh, New York, are both located in landscape regions called
    1) mountains 2) highlands 3) plateaus 4) lowlands

14. Base your answer to the question on the map, which shows the generalized surface bedrock for a portion of New York State that appears in the *Earth Science Reference Tables*. The letters *A, B, C,* and *D* indicate four regions on the map.

    Which letter on the map properly represents a location in the Tug Hill Plateau landscape region?

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

15. Which two types of rock are most commonly found as outcrops in New York State's Newark Lowlands landscape region?
    1) rock salt and gypsum
    2) limestone and granite
    3) gneiss and quartzite
    4) conglomerate and sandstone

16. New York State's Catskills are classified as which type of landscape region?
    1) mountain 2) plateau 3) lowland 4) plain

17. The generalized landscape regions of New York State are classified according to
    1) bedrock structure and elevation
    2) bedrock type and index fossils
    3) latitude and longitude
    4) climate and topography

18. In New York State, the surface bedrock of the Catskills consists mainly of
    1) weakly consolidated gravels and sands
    2) quartzites, dolostones, marbles, and schists
    3) conglomerates, red sandstones, basalt, and diabase
    4) limestones, shales, sandstones, and conglomerates

Unit 5 Plate Tectonics

1. What feature is located at the interface (boundary) between the African and American plates?

   Mid-Ocean Ridge

2. Why does California have more serious and frequent earthquakes than New York State?

   California is on a plate boundary

3. What is happening to the Earth's crust along the Southeast – Indian Ridge?

   Divergence

4. Why does Iceland have so many earthquakes and volcanoes? Iceland is on a hotspot and a plate boundary

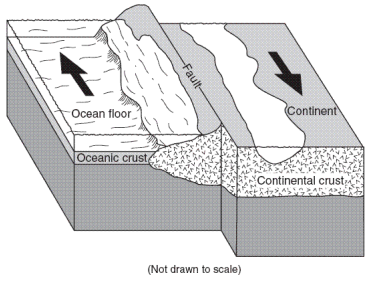
5. Mid-ocean ridges (rifts) normally form where tectonic plates are
   1) converging
   2) diverging
   3) stationary
   4) sliding past each other

6. According to the diagram, the deep trench along the west coast of South America is caused by movement of the oceanic crust that is
   1) sinking beneath the continental crust
   2) uplifting over the continental crust
   3) sinking at the Mid-Atlantic ridge
   4) colliding with the Atlantic oceanic crust

7. Which coastal area is most likely to experience a severe earthquake?
   1) east coast of North America
   2) east coast of Australia
   3) west coast of Africa
   4) west coast of South America

8. Convection currents in the plastic mantle are believed to cause divergence of lithospheric plates at the
   1) Peru-Chile Trench
   2) Mariana Trench
   3) Canary Islands Hot Spot
   4) Iceland Hot Spot

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



   Between which two tectonic plates does this type of plate boundary exist?

   1. Nazca Plate and South American Plate
   2. Eurasian Plate and Indian-Australian Plate
   3. North American Plate and Eurasian Plate
   4. Pacific Plate and North American Plate

10. The Mariana Trench was most likely created by the:
    1) convergence of the Pacific and Philippine Plates
    2) divergence of the Eurasian and Philippine Plates
    3) sliding of the Pacific Plate past the North American Plate
    4) movement of the Pacific Plate over the Hawaii Hot Spot

Earth's Interior

11. The Moho is the interface between which two layers? ___Crust and Rigid Mantle_____

12. What is the depth at the bottom of the mantle? _____2900_____ km

13. The pressure at the mantle/outer core boundary is _____1.5 million atm._____

14. The temperature at the center of the Earth is _____6700°C_____

15. The outer/inner core boundary is at depth of _____5100_____ km

16. As the depth below the surface increases, the pressure in the rocks ____Increases_____

17. Which statement correctly describes the density of Earth's mantle compared to the density of Earth's core and crust?
    1) The mantle is less dense than the core but more dense than the crust.
    2) The mantle is less dense than both the core and the crust.
    3) The mantle is more dense than the core but less dense than the crust.
    4) The mantle is more dense than both the core and the crust

18. In which Earth layer are most convection currents that cause seafloor spreading thought to be located?
    1) crust 2) asthenosphere 3) outer core 4) inner core

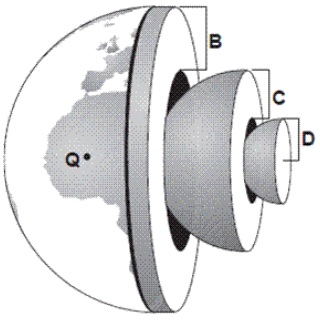
19. Which temperature is inferred to exist in Earth's plastic mantle?
    1) 2000°C 2) 4000°C 3) 5000°C 4) 6000°C

20. Which combination of temperature and pressure is inferred to occur within Earth's stiffer mantle?
    1) 3500°C and 0.4 million atmospheres
    2) 3500°C and 2.0 million atmospheres
    3) 5500°C and 0.4 million atmospheres
    4) 5500°C and 2.0 million atmospheres

21. The interior of Earth between a depth of 5200 kilometers and 6300 kilometers is inferred to be composed mostly of
    1) silicon and iron
    2) silicon and oxygen
    3) iron and lead
    4) iron and nickel

22. The inferred temperature at the interface between the stiffer mantle and the asthenosphere is closest to
    1) 1000°C 2) 2500°C 3) 4500°C 4) 5000°C

Base your answers to the questions on the diagram of Earth shown below. Letters *B*, *C*, and *D* represent layers of Earth. Letter *Q* represents a location on Earth's surface.



23. What is the probable density of the granitic bedrock at *Q*?
    1) 1.0 g/cm^3 2) 2.7 g/cm^3 3) 3.0 g/cm^3 4) 5.5 g/cm^3

24. Which letter best represents Earth's mantle?
    1) *Q* 2) *B* 3) *C* 4) *D*

P and S Wave Travel Time

25. How many kilometers will a P- wave travel in 9 minutes? _____5400_____ km

26. How long will it take an S – wave to travel 2500 km? _____8:40 minutes_____

27. If a P – wave arrives at your seismograph at 1:20:30 pm and the S – wave arrives at 1:27:00 pm, how many kilometers away was the epicenter of the earthquake? ___4800 km_____

28. If a P – wave arrives at your seismograph at 1:27:30 pm and the S – wave arrives at 1:29:30 pm, how many kilometers away was the epicenter of the earthquake? ____1100 km_____

29. A seismic station 4000 kilometers from the epicenter of an earthquake records the arrival time of the first *P*-wave at 10:00:00. At what time did the first *S*-wave arrive at this station?
    1) 9:55:00 2) 10:05:40 3) 10:07:05 4) 10:12:40

30. A *P*-wave takes 8 minutes and 20 seconds to travel from the epicenter of an earthquake to a seismic station. Approximately how long will an *S*-wave take to travel from the epicenter of the same earthquake to this seismic station?
    2) 6 min 40 sec 2) 9 min 40 sec 3) 15 min 00 sec 4) 19 min 00 sec

31. A seismic station is recording the seismic waves produced by an earthquake that occurred 4200 kilometers away. Approximately how long after the arrival of the first *P*-wave will the first *S*-wave arrive?
    1) 1 min 05 sec 2) 5 min 50 sec 3) 7 min 20 sec 4) 13 min 10 sec

Unit 6 Geologic History

1. In which portion of NYS would you find the oldest bedrock? _Adirondack Mts._____
2. Where would you find the youngest rock materials? _Atlantic Coastal Plain_____
3. The bedrock at Watertown was formed between __444_____ mya and __488_____ mya
4. Where might you expect to find dinosaur fossils? __Newark Lowlands_____
5. At which cities would you have the best chance of finding fossils of Eurypterids?

   ____Niagara Falls, Syracuse and Buffalo_____
6. What is the geologic age sequence of the surface bedrock from Ithaca, New York, to Watertown, New York?
   1) Ordovician, Taconic, Cambrian
   2) Ordovician, Tertiary, Pleistocene
   3) Devonian, Silurian, Cambrian
   4) Devonian, Silurian, Ordovician
7. Which index fossil may be found in the surface bedrock near Ithaca, New York?


Elliptocephala

(1)


Coelophysis

(2)


Bothriolepis

(3)


Maclurites

(4)

8. Which two landscape regions in New York State have the oldest surface bedrock?
   1) Allegheny Plateau and Newark Lowlands
   2) Tug Hill Plateau and Erie-Ontario Lowlands
   3) Taconic Mountains and the Catskills
   4) Adirondack Mountains and Hudson Highlands

9. What elevation and bedrock structure are generally found in the Catskills?
   1) low elevation and horizontal sedimentary bedrock structure
   2) high elevation and horizontal sedimentary bedrock structure
   3) low elevation and folded metamorphic bedrock structure
   4) high elevation and folded metamorphic bedrock structure

10. In which New York State landscape region have fossilized footprints of *Coelophysis* dinosaurs been found in the surface bedrock?
   1) Allegheny Plateau
   2) Tug Hill Plateau
   3) Hudson-Mohawk Lowlands
   4) Newark Lowlands

Geologic Time Scale

11. Dinosaurs first appeared at about _____230 - 240_____ mya

12. During which time period(s) did the intrusion Palisade Sills of New York formed?

    _____Jurassic and Triassic_____

13. Earliest land animals appeared about _____425_____ mya

14. During which time era were all the continents together? _____Paleozoic_____

15. Would you expect to find Permian fossils in New York State? _____No_____

    Why? ____No Permian age rocks in NYS an unconformity_____

16. Which mountain building period (orogeny) happened most recently? Alleghenian_____

17. What are the three eras that the Phanerzoic Eon is divided into? ___Cenozoic, Mesozoic,

    Paleozoic_____

18. What is the most recent geologic event to take place in NYS? __Glacial Retreat_____

19. When did the transition to an oxygen atmosphere occur? Early Proterozoic_____

20. Evidence indicates that 251 million years ago a mass extinction of many life-forms occurred on Earth. Which form of life became extinct at this time?
   1) trilobites 2) dinosaurs 3) mammoths 4) eurypterids

21. What is the inferred age of our solar system, in millions of years?
   1) 544 2) 1300 3) 4600 4) 10,000

22. During which two geologic time periods did most of the surface bedrock of the Taconic Mountains form?
   1) Cambrian and Ordovician
   2) Silurian and Devonian
   3) Pennsylvanian and Mississippian
   4) Triassic and Jurassic

23. Which geologic event occurred in New York State at approximately the same time that eurypterids first appeared?
    1) the opening of the Atlantic Ocean
    2) the uplift of the Appalachian Mountains
    3) the formation of the Queenston Delta
    4) the intrusion of the Palisades Sill

24. Which sequence correctly represents the evolution of life on Earth?
    1) fish → amphibians → mammals → soft-bodied organisms
    2) fish → soft-bodied organisms → mammals → amphibians
    3) soft-bodied organisms → amphibians → fish → mammals
    4) soft-bodied organisms → fish → amphibians → mammals

25. According to the fossil record, which group of organisms has existed for the greatest length of time?
    1) gastropods
    2) corals
    3) mammals
    4) vascular plants

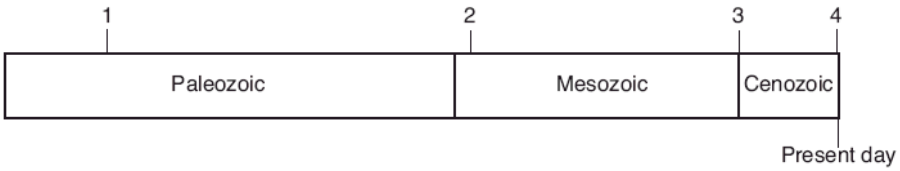
26. The division of Earth's geologic history into units of time called eons, eras, periods, and epochs is based on:
    1) absolute dating techniques
    2) fossil evidence
    3) climatic changes
    4) seismic data

27. Devonian-age fossils found in New York State bedrock, such as *Manticoceras* and *Mucrospirifer*, provide evidence that parts of New York State were once
    1) under a shallow sea containing tropical waters
    2) higher in elevation and eroded extensively by glaciers
    3) covered by extensive lava flows
    4) impacted by comets and asteroids

28. Which two types of organisms both survived the mass extinction that occurred at the end of the Permian Period?
    1) trilobites and nautiloids
    2) corals and vascular plants
    3) placoderm fish and graptolites
    4) gastropods and eurypterids

29. Earths Early Archean atmosphere was formed primarily by gases released from
    1) stream erosion
    2) chemical weathering
    3) volcanic eruptions
    4) plant transpiration

The geologic time line below represents the three most recent geologic eras. The numbers represent events in Earth's history.



30. Which number best represents when humans are inferred to have first appeared on Earth?
    1) 1
    2) 2
    3) 3
    4) 4

31. What is inferred to be the main source of the free oxygen that first entered Earth's atmosphere?
    1) meteorite impacts releasing oxygen
    2) oxygen-producing organisms
    3) melting of glacial ice into hydrogen and oxygen
    4) radioactive decay of rocks containing oxygen

Radioactive Decay

32. What does Carbon – 14 decay into? _____Nitrogen – 14_____

33. If you started out with 20g of Carbon – 14 and let it decay for 22,800 years, how many grams of C – 14 would you have left? ____1.25_____ g

34. How much of an 800-gram sample of potassium-40 will remain after 3.9×10^9 years of radioactive decay?
    1) 50 grams 2) 100 grams 3) 200 grams 4) 400 grams

35. A whale bone that originally contained 200 grams of radioactive carbon-14 now contains 25 grams of carbon-14. How many carbon-14 half-lives have passed since this whale was alive?
    1) 1 2) 2 3) 3 4) 4

36. Which radioactive element is used to determine the absolute age of late Pleistocene animal remains?
    1) rubidium-87 2) uranium-238 3) potassium-40 4) carbon-14

37. How old is a fossil that has radioactively decayed through 4 half-lives of carbon-14?
    1) 5,700 years 2) 17,100 years 3) 22,800 years 4) 28,500 years

Unit 7 Energy and Water Cycle

1. Which form of electromagnetic energy has the shortest wavelength? __Gamma_____

2. Energy is absorbed by the Earth's surface as sunlight (visible) and is changed into heat (infrared). During this change the wavelength increases/decreases (circle one).

3. What is the difference between all these forms of electromagnetic waves? Wavelength_____

4. Which form of electromagnetic radiation has the shortest wavelength?
    1) infrared 2) ultraviolet 3) radio waves 4) microwaves

5. Which part of the Sun's electromagnetic spectrum has the longest wavelength?
    1) radio wave radiation 3) visible light radiation
    2) infrared radiation 4) x-ray radiation

6. Scientists are concerned about the decrease in ozone in the upper atmosphere primarily because ozone protects life on Earth by absorbing certain wavelengths of
    1) x-ray radiation 3) infrared radiation
    2) ultraviolet radiation 4) microwave radiation

7. During nighttime cooling, most of the energy radiated by Earth's oceans into space is
    1) ultraviolet rays 2) gamma rays 3) visible light rays 4) infrared rays

8. Which color of the visible spectrum has the *shortest* wavelength?
    1) violet 2) blue 3) yellow 4) red

Properties of Water and Specific Heat

9. How much heat energy is gained during melting? _____344 J_____

   How much heat energy is lost during condensation? _____2260 J_____

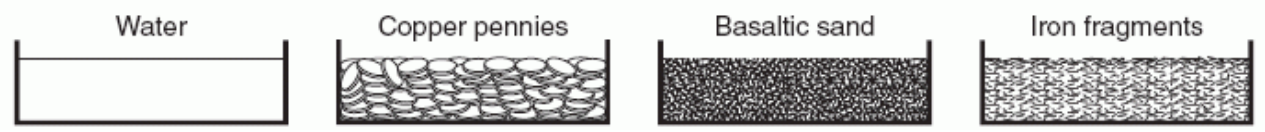
10. At what temperature is the density of water equal to 1.0g/ml? ____3.98°C_____

11. How many joules are required to evaporate 1 gram of boiling water?
    1) 1 2) 334 3) 2260 4) 6200

12. When 1 gram of liquid water at 0° Celsius freezes to form ice, how many total joules of heat are lost by the water?
    1) 1 2) 0.5 3) 334 4) 2260

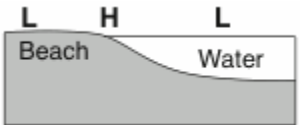
13. Which process requires water to gain 2260 joules of energy per gram?
    1) vaporization 2) condensation 3) melting 4) freezing

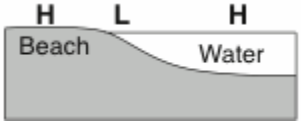
14. Equal volumes of the four samples shown below were placed outside and heated by energy from the Sun's rays for 30 minutes.

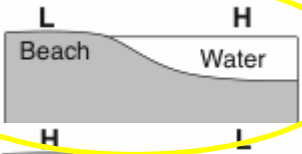


The surface temperature of which sample increased at the *slowest* rate?
    1) water 2) copper pennies 3) basaltic sand 4) iron fragments

15. Which cross section below best shows the locations of high air pressure and low air pressure near a beach on a hot, sunny, summer afternoon?

1)


2)


3)


4)


Key	
H	High air pressure
L	Low air pressure

16. A camper takes a 100-gram piece of basalt rock from a campfire and places it in a cup holding 250 milliliters of water. The temperature of the rock is 300°C and the temperature of the water is 20°C. Air temperature is also 20°C. In the process of heating the water with the basalt, the temperature of the basalt decreased more than the temperature of the water increased. This difference most likely occurred because
    1) water has a higher specific heat than basalt
    2) water has a higher density than basalt
    3) the basalt had a greater mass than the water did
    4) the basalt had a higher starting temperature than the water did

17. The diagrams show the steps used to determine the amount of heat held by equal masses of iron, copper, lead, and granite. Which substance has the highest specific heat?
    1) copper 2) granite 3) iron 4) lead

Unit 8 Weather

1. If the dry bulb temperature is 10°C and the wet bulb temperature is 6°C, what is the dew point temperature? _____1°C_____

2. If the dry bulb temperature is 5°C and the wet bulb temperature is 3°C, what is the relative humidity? _____71%_____

3. What happens to relative humidity as the difference between the wet bulb and dry bulb temperatures decreases? _____Increases_____

4. What is the relative humidity if the dry-bulb temperature is 22°C and the wet-bulb temperature is 17°C?
   1) 5% 2) 14% 3) 60% 4) 68%

5. What is the dewpoint when the dry-bulb temperature is 24°C and the wet-bulb temperature is 21°C?
   1) 16°C 2) 18°C 3) 20°C 4) 21°C

6. What is the dewpoint if the relative humidity is 100% and the air temperature is 20°C?
   1) 0°C 2) 10°C 3) 20°C 4) 100°C

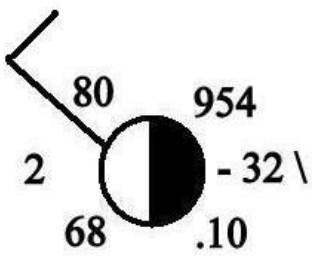
7. What is the dewpoint temperature when the relative humidity is 30% and the air temperature is 20°C?
   1) –28°C 2) 2°C 3) 6°C 4) 9°C

8. What is the dewpoint when the air temperature is 26°C and the relative humidity is 77%?
   1) 3°C 2) 20°C 3) 22°C 4) 23°C

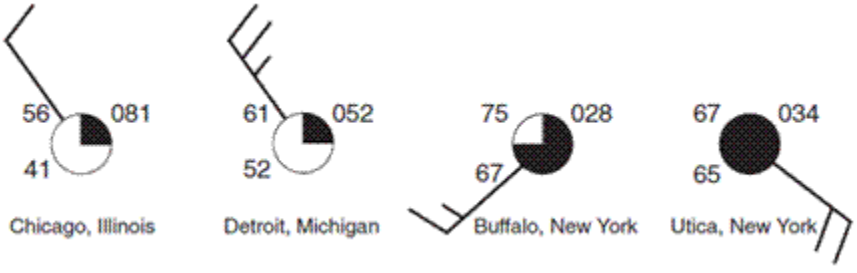
Station Models

Answer the next 10 questions by referring to the station model.

9. What is the air pressure? _____995.4_____
10. What is the air temperature? _____80_____
11. What is the dew point temperature? _____68_____
12. What is the amount of precipitation in the last 6 hours? _____.10___
13. What is the wind direction? _____Northwest_____
14. What is the wind speed? _____10 kts_____
15. What is the visibility? _____2 miles_____
16. What is the present weather? _____Clear or partly cloudy
17. What is the percent cloud cover? _____50%_____
18. Explain the barometric trend in words. __Decreased 3.2 mb in the past 3 hours_____

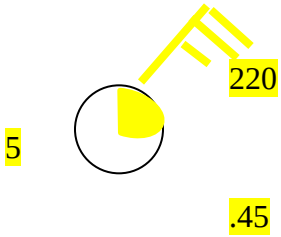


19. Which city had the lowest relative humidity?
    1) Chicago
    2) Detroit
    3) Buffalo
    4) Utica



20. Draw a weather station model correctly records the *six* weather conditions shown below:

Wind: from the northeast
Wind speed: 25 knots
Barometric pressure: 1022.0 mb
Cloud cover: 25%
Visibility: 5 mi
Precipitation (in the past 6 hours): .45 in



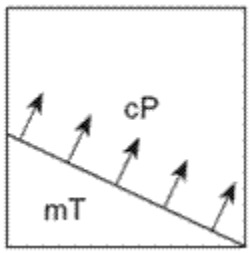
21. Describe each of the following air masses.

Map Symbol	Characteristics
a. Continental Polar __cP_____	__dry_____ and __cold____
b. Continental Tropical __cT_____	__dry_____ and __warm___
c. Maritime Polar _____mP_____	__wet_____ and __cold____
d. Maritime Tropical ___mT_____	__wet_____ and __warm___

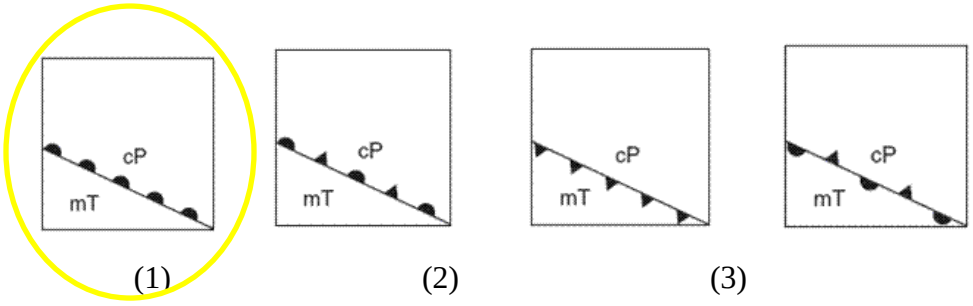
22. Which type of air mass is associated with warm, dry atmospheric conditions?
1) cP 2) cT 3) mP 4) mT

23. An air mass classified as cT usually forms over which type of Earth surface?
1) cool water 2) cool land 3) warm water 4) warm land

24. The map below shows the boundary between two air masses. The arrows show the direction in which the boundary is moving.



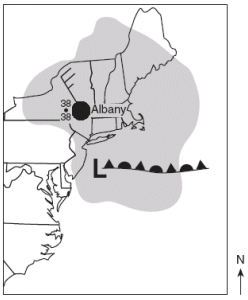
Which weather map uses the correct weather front symbol to illustrate this information?



(1) (2) (3)

25. What type of front extends eastward from the low-pressure center?

____Occluded_____ front



Temperature Chart

26. 60°C = ____333_____K = __140_____°F

27. The freezing point of water = ___0____°C = _____273_____K = _____32_____°F

Pressure Chart

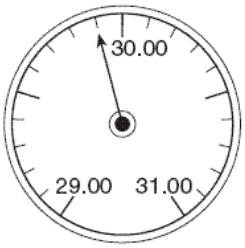
28. A pressure of 1017 mb = _____30.03_____ inches

29. A pressure of 29.5 inches = _____999.0_____ mb

30. If a barometer reads 1020 mb and a few hours later a storm passes over the area, give one possible reading of the barometer during the storm. __Any number less than 1020___ mb

31. A barometric pressure of 1021.0 millibars is equal to how many inches of mercury?
    1) 29.88 2) 30.15 3) 30.25 4) 30.50

32. The diagram below represents an aneroid barometer that shows the air pressure, in inches of mercury. When converted to millibars, this air pressure is equal to



    1) 1009.0 mb
    2) 1012.5 mb
    3) 1015.5 mb
    4) 1029.9 mb

Unit 9 Climate and Seasons

Ocean Currents

1. Which ocean current carries cool water toward Earth's equator?
    1) Alaska Current 3) Peru Current
    2) East Australia Current 4) North Atlantic Current

2. Which coastal location experiences a cooler summer climate due to ocean currents?
    1) southeast coast of North America 3) southwest coast of South America
    2) northeast coast of Australia 4) northwest coast of Europe

3. Which statement best summarizes the general effects of ocean currents at 20° S latitude on coastal regions of South America?
    1) The east coast and west coast are both warmed.
    2) The east coast and west coast are both cooled.
    3) The east coast is warmed and the west coast is cooled.
    4) The east coast is cooled and the west coast is warmed.

4. Which ocean current brings warm water to the western coast of Africa?
    1) Agulhas Current 3) Canary Current
    2) North Equatorial Current 4) Guinea Current

Planetary Winds

5. What are the latitudes of the converging winds? __0°, 60°N, 60°S_____

6. What type of moisture conditions do you find where the winds converge? __Wet_____

7. Long Island is at 41°N latitude. What is the direction of our planetary winds? ___SW_____

8. What are the moisture conditions at the poles? _____Dry_____

9. In what direction do the planetary wind belts shift during the summer in the northern hemisphere? _____Northward_____

10. At which latitudes do you find rising (ascending) air? ____0°, 60°N, 60°S_____

11. What are the latitudes of the jet streams? _____ 30°N, 30°S, 60°N, 60°S_____

12. Which wind belt has the greatest effect on the climate of New York State?
    1) prevailing northwesterlies
    2) prevailing southwesterlies
    3) northeast trades
    4) southeast trades

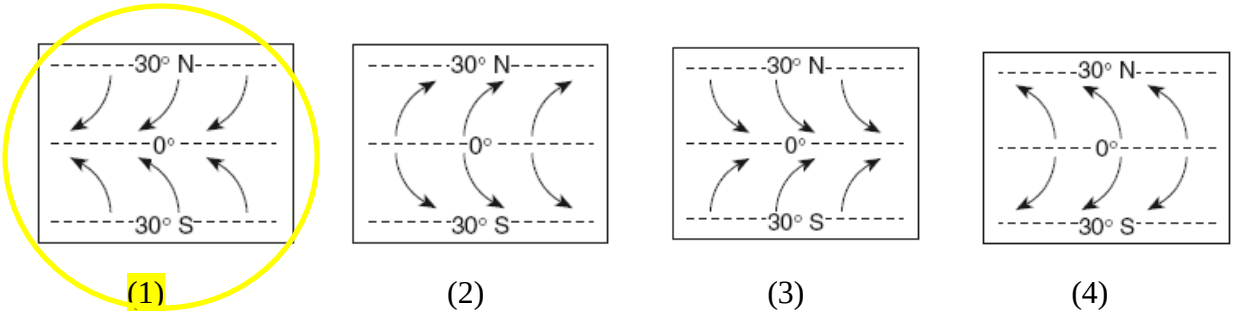
13. Which climatic conditions exist where the trade winds converge?
    1) cool and wet 2) cool and dry 3) warm and wet 4) warm and dry

14. Near which two latitudes are most of Earth's major deserts located?
    1) 0° and 90° N 2) 30° S and 60° S 3) 30° N and 30° S 4) 60° S and 60° N

15. If a low-pressure system follows a typical storm track across New York State, it will move toward the
    1) southeast 2) southwest 3) northeast 4) northwest

16. When the eye of this hurricane reaches 43° N latitude, this hurricane will most likely be pushed by planetary winds toward the
    1) Northwest 2) northeast 3) southwest 4) southeast

17. Which map best shows the surface movement of winds between 30°N and 30°S latitude?



(1) (2) (3) (4)

18. A high air-pressure, dry-climate belt is located at which Earth latitude?
    1) 0° 2) 15° N 3) 30° N 4) 60° N

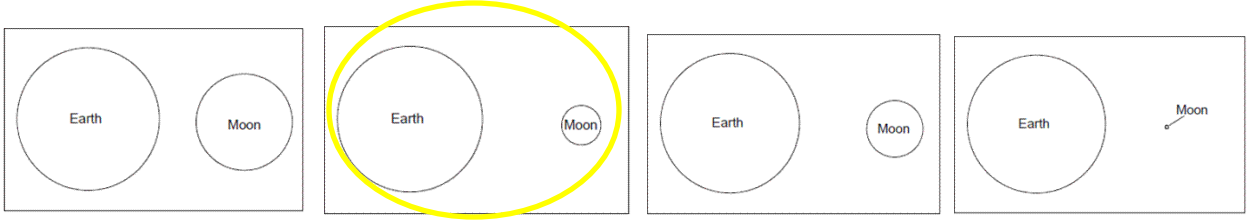
Unit 10 Astronomy

Solar System Data

1. Which planet has the *least* distance between the two foci of its elliptical orbit?
    1) Venus 2) Earth 3) Mars 4) Jupiter

2. What is the average distance, in millions of kilometers, from the Sun to the asteroid belt?
    1) 129 2) 189 3) 503 4) 857

3. Which diagram best represents the size of the Moon, compared to Earth, drawn to scale?



(1) (2) (3) (4)

4. What is the eccentricity of the Moon's orbit?
   1) 0.017 2) 0.055 3) 0.386 4) 0.723

5. Which event takes the most time?
   1) one revolution of Earth around the Sun
   2) one revolution of Venus around the Sun
   3) one rotation of the Moon on its axis
   4) one rotation of Venus on its axis

6. Compared to the Jovian planets in our solar system, Earth is
   1) less dense and closer to the Sun
   2) less dense and farther from the Sun
   3) more dense and closer to the Sun
   4) more dense and farther from the Sun

7. How long does it take the Moon to complete one revolution around Earth using a distant star as a reference point? Express your answer to the *nearest tenth of a day*.

   Answer: ____27.3_____ d

8. Which object in our solar system has the greatest density?
   1) Jupiter 2) Earth 3) the Moon 4) the Sun

HR Diagram

9. What is the luminosity of the Sun? ____1_____ Rigel? __100,000__ Polaris? __5,000_____

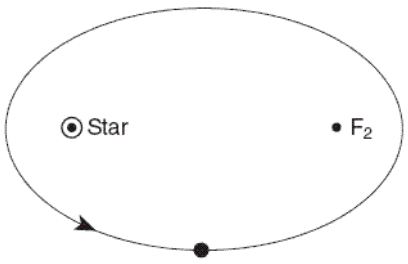
10. Which list shows stars in order of increasing surface temperature?
    1) *Barnard's Star, Polaris, Sirius, Rigel*
    2) *Aldebaran*, the *Sun, Rigel, Procyon B*
    3) *Rigel, Polaris, Aldebaran, Barnard's Star*
    4) *Procyon B, Alpha Centauri, Polaris, Betelgeuse*

11. Compared with our Sun, the star *Betelgeuse* is
    1) smaller, hotter, and less luminous
    2) smaller, cooler, and more luminous
    3) larger, hotter, and less luminous
    4) larger, cooler, and more luminous

12. Compared to the surface temperature and luminosity of massive stars in the Main Sequence, the smaller stars in the Main Sequence are
    1) hotter and less luminous
    2) hotter and more luminous
    3) cooler and less luminous
    4) cooler and more luminous

13. The star *Algol* is estimated to have approximately the same luminosity as the star *Aldebaran* and approximately the same surface temperature as the star *Rigel*. *Algol* is best classified as a
    1) main sequence star 2) red giant star 3) white dwarf star 4) red dwarf star

14. The diagram below shows the elliptical orbit of a planet revolving around a star. The star and F_2 are the foci of this ellipse.



What is the approximate eccentricity of this ellipse?
   1) 0.22
   2) 0.47
   3) 0.68
   4) 1.47