

YOU SHOULD BE ABLE TO... (by Charles Burrows)

COMPOSITION OF THE EARTH'S CRUST

1. Identify the characteristics of matter.
2. Explain the importance of chemical bonds.
3. Identify the characteristics of minerals.
4. Explain how minerals form.
5. List the physical characteristics of minerals that are influenced by their crystalline structure.
6. Identify rock-forming minerals by physical and chemical properties.
7. List and describe different categories of minerals: silicates & carbonates.
8. Compare renewable & nonrenewable resources.
9. Determine the densities of known materials.
10. Compare/contrast the density of continental/oceanic rock
11. Explain the difference between a mineral and a rock.
12. Differentiate among the three major types of rocks.
13. Distinguish between intrusive and extrusive igneous rocks and how they form.
14. Explain the relationship between crystal size and cooling time.
15. Understand "interlocking" crystals.
16. Distinguish among the types of sedimentary rocks and how they form.
17. Discuss features typical of sedimentary rocks.
18. Explain the processes involved in the formation of metamorphic rocks.
19. Differentiate among different kinds of metamorphic rocks.
20. Learn how to use the ESRT chart for mineral and rock identification.
21. Compare/contrast the processes in the rock cycle. (Use ESRT)

THE DYNAMIC CRUST

1. List direct/indirect evidence of crustal movement
2. Describe evidence of continental drift
3. Define terms regarding earthquakes
4. Explain measurement of earthquake energy
5. Compare & contrast earthquake waves
6. Interpret inferred properties of earth's interior using earthquake time/travel chart
7. Explain the cause of plate tectonics
8. Describe the types and features of plate boundaries
9. Locate and identify plate boundaries and tectonic features

SURFACE PROCESSES – WEATHERING AND EROSION

1. Explain outgassing and the water cycle
2. Explain the movement of water through the ground
3. Compare and contrast methods of physical and chemical weathering
4. List the end products of weathering
5. Explain how different climates, particle sizes and composition & exposure affect weathering processes
6. Define and list the agents of erosion

7. Understand the importance of gravity in erosional/depositional systems and give examples
8. Explain the mechanism of wind erosion /deposition
9. Explain the mechanism of erosion & deposition by ocean waves and currents
10. Recognize features of erosional/depositional systems

SURFACE PROCESSES – EROSIONAL-DEPOSITIONAL SYSTEMS

1. Define and calculate gradient
2. Explain the factors that affect stream velocity and particle transport
3. Describe the stages of stream development
4. Compare & contrast factors which affect rates of deposition such as density, shape, size and energy loss
5. Describe horizontal and vertical sorting
6. Differentiate between deltas & alluvial fans
7. Explain glacier formation
8. Recognize types and parts of glaciers
9. Describe glacial motion
10. Understand the erosional & depositional effect of glaciation on landscapes
11. Recognize glacial erosional/depositional features
12. Explain the effect of the Ice Ages on NYS

LANDFORMS AND TOPOGRAPHIC MAPS

1. Understand how landscapes are classified
2. Identify NYS landscape regions
3. Interpret and apply isolines on topographic maps
4. Draw profiles of topographic maps, calculate gradient and draw isolines
5. Define uplift and leveling events
6. Compare/contrast bedrock structure for mountains, plateaus and plains
7. Explain the effect of climate on landscape development
8. Identify the main watersheds/drainage basins of NYS and the USA
9. How does human population growth affect pollution
10. Discuss efforts to restore the environment

EARTH'S HISTORY

1. Learn to sequence and correlate rocks using such rules as superposition, original horizontality, cross cutting relationships, included fragments, etc.
2. Recognize unconformities, their formation and significance.
3. Describe the processes of fossil formation.
4. Understand how to interpret paleoclimate and environment from fossil evidence.
5. Locate and interpret the fossil record and geologic history of New York State using the ESRT.
6. Understand that geologic time is determined by the fossil record.
7. Understand that fossils reveal the process of evolution.
8. Explain the significance of index fossils and volcanic ash in correlation.
9. Understand that unconformities reveal an incomplete rock record.

10. Understand that subsidence/ submergence leads to deposition; uplift/emergence leads to erosion.
11. Explain how radioactive decay causes heating in the earth's interior.
12. Using the ESRT, understand half-life as a tool for measuring actual age.
13. Explain how the age of the earth has been determined.
14. Know the evidence of past tectonic activity and interpret the sequence of plate motions using the ESRT.

METEOROLOGY – ATMOSPHERIC VARIABLES

1. Explain how outgassing formed the earth's original atmosphere and how it evolved through time.
2. Describe the various temperature zones of the atmosphere and be able to interpret the ESRT chart/graph on the atmosphere.
3. Understand and interpret the various temperature scales using the ESRT.
4. Understand that the sun is the earth's main energy source.
5. Understand how a barometer measures air pressure.
6. Describe how temperature, humidity and altitude affect air pressure.
7. Explain the relationship between uneven heating, density differences and convection.
8. Explain that winds blow from high to low pressure and how the earth's rotation/ coriolis effect affects the motion of winds.
9. Explain how pressure gradient affects wind speed.
10. Explain the function of an anemometer and a wind vane.
11. Explain how evaporating water affects humidity.
12. Use a sling psychrometer and the ESRT to determine relative humidity and dew point.
13. Explain how changes in humidity affect air pressure.
14. Define condensation and understand the concept of saturation.
15. Explain the factors cloud formation.
16. Compare and contrast the formation of clouds, fog, dew and frost.
17. Construct and interpret isotherms, isobars and station models.

METEOROLOGY – WEATHER MAPS, ENERGY EXCHANGES, FORECASTS

1. Explain how source regions influence air mass characteristics.
2. Identify air mass symbols on a weather map using the ESRT and explain how air masses move.
3. Understand that fronts form where air masses meet.
4. Compare and contrast the characteristics of cold, warm, stationary and occluded fronts.
5. Compare and contrast movement of air in regions of high and low pressure.
6. Recognize the patterns of isobars and isotherms in highs and lows.
7. Describe the arrangement of fronts and air masses in a typical low pressure system.
8. Describe the frontal weather and patterns of movement.
9. Predict future weather for any location within a mid-latitude cyclone.
10. Explain the seasonal nature of hurricane formation.
11. Explain the role of condensation/latent heat in hurricane sustenance.
12. Explain how hurricanes lose and gain energy.
13. Understand storm tracks of hurricanes.
14. Compare and contrast hurricanes and tornadoes.

CLIMATE AND INSOLATION

1. Define climate.
2. Understand that global wind circulation is the result of uneven heating, density differences and the coriolis effect.
3. Identify convergent and divergent belts and planetary winds using the ESRT.
4. Define specific heat and explain the moderating effect of a nearby large body of water.
5. Explain how land breezes, sea breezes and monsoons affect climate.
6. Understand that density differences, wind and the coriolis effect cause ocean currents.
7. Explain the climate affects of warm/cold currents (El Nino, Gulf Stream).
8. Compare/contrast climate changes with altitude and latitude.
9. Explain the differences between windward and leeward climate.
10. Compare/contrast inland and coastal climates at the same latitude.
11. Define insolation and explain how its intensity and duration affects temperature.
12. Describe how daily/seasonal temperature cycles are affected by insolational variations.
13. Understand that insolation variations change with latitude.
14. Compare/contrast conduction, convection and radiation.
15. Explain why cloudy days are cool and cloudy nights are warm.
16. Compare/ contrast surfaces that absorb or reflect insolation.
17. Understand that good absorbers are good radiators.
18. Interpret the electromagnetic spectrum in the ESRT/
19. Understand that visible light is the most intense form of energy radiated by the sun.
20. List the greenhouse gases and explain their affect on global warming.
21. Understand the greenhouse affect of the absorption, conversion and reflection of insolation.

THE EARTH IN SPACE – THE SOLAR SYSTEM

1. Identify the seasonal changes in the Sun's noon altitude, positions of sunrise/sunset, and amount of daylight.
2. Recognize the path of the sun during each season at different latitudes.
3. Explain the annual migration of the sun's vertical ray as a result of revolution, tilt, and parallelism.
4. Compare and contrast the evidences of revolution and rotation.
5. Relate Earth's rate of rotation to time keeping and longitude.
6. Locate zenith, horizon, and compass directions on a celestial sphere model.
7. Locate Polaris using the Big Dipper.
8. Use the angle of Polaris to determine the observer's latitude at different locations.
9. Explain how Polaris is used as a navigational tool.
10. Explain how the Moon's rotation and revolution affects its appearance.
11. Describe the changing phases of the moon.
12. Explain why eclipses are rare events.
13. Compare and contrast solar and lunar eclipses.
14. Describe how the Moon and the Sun cause the tides.
15. Understand the size, scale, and arrangement of the members of the solar system.
16. Compare/contrast the geocentric and heliocentric models.

17. Compare/contrast terrestrial and Jovian planets.
18. Explain Newton's Law of Gravitation with respect to mass and distance.
19. Explain how distance from the Sun affects a planet's orbital velocity (Kepler's Laws).
20. Diagram elliptical orbits and analyze their eccentricities (Kepler's Laws).
21. Understand that the apparent size of the Sun changes seasonally due to the Earth's elliptical orbit.
22. Describe meteors, their origin, and cratering as an early geologic activity.
23. Describe comets, the eccentricity of their orbits, and the Oort cloud.
24. Describe the location of the asteroids and their past influence on the Earth.
25. Describe other planetary satellites/rings

THE EARTH IN SPACE – STARS AND GALAXIES

1. Define and describe "galaxy".
2. Locate the sun's position in the Milky Way Galaxy
3. Understand why light years are used to measure distances in space.
4. Explain the composition of the sun and other stars and the process of fusion.
5. Explain the equilibrium between the inward pull of gravity and the outward pull of fusion.
6. Describe the structure, color and temperature of the sun and other stars.
7. Compare/contrast the temperature, color, mass and luminosity of the sun to other stars.
8. Explain the how stars are plotted on the Temperature/ Luminosity Diagram (H-R Diagram).
9. Locate the position and give characteristics of the Sun on the Temperature/ Luminosity Diagram.
10. Describe the evolution of the Sun and different kinds of stars.
11. Explain why larger/hotter stars burn their fuel faster and live shorter lives than the Sun.
12. Explain why stars are considered to be "factories" which create elements needed for future stellar generation.
13. Explain the importance of the electromagnetic spectrum in identifying some objects in the universe.
14. Describe the Big Bang theory of the origin of the universe.
15. Explain how red-shift (the Doppler Effect) and background radiation are evidence for an expanding universe.
16. Understand that scientists are searching for invisible mass that will explain continued expansion, implosion (Big Crunch), or oscillation of the universe.
17. Describe how the Sun/solar system formed 4.6 billion years ago from the gas and dust (nebula) left behind by a previous star's supernova.
18. Explain how the planets were formed by accretion.
19. Explain the theories of the origin of the moon.
20. Explain why astronomers say, "we are made of star dust."