I. PROLOGUE

1. Observation and Classification
   A. Observation
      i. Sensory Perception .......................................................... 1
      ii. Inferences ........................................................................... 1
   B. A System of Classification ..................................................... 2

2. Simple Measurements
   A. Measurements
      i. Dimensional Quantities/ Scientific Notation.......................... 3
      ii. Comparison ......................................................................... 4
         iii. Percent Deviation (Optional) ........................................... 4
   B. Density
      i. Qualitative Answers .............................................................. 7
      ii. Quantitative Answers .......................................................... 9

3. Nature of Change
   A. Rate of Change ....................................................................... 11
   B. Cycles and Noncycles .............................................................. 11
   C. Predictability of Change ......................................................... 12

GROUP QUESTIONS for Unit I ..................................................... 15

II. DESCRIBING THE EARTH

1. Earth Dimensions
   A. Shape ..................................................................................... 23
   B. Atmosphere, Hydrosphere, Lithosphere
      i. Atmosphere ........................................................................... 24
      ii. Hydrosphere ........................................................................ 26
      iii. Lithosphere ......................................................................... 27
   C. Size Measurement Techniques - Enrichment......................... 29

2. Positions on Earth
   A. Latitude / Longitude / Polaris ................................................ 29
   B. Position Description
      i. Field Quantities .................................................................... 36
      ii. Topographical Maps/Gradient ............................................. 37

GROUP QUESTIONS for Unit II .................................................. 43

3. Constructed Response ............................................................. 62
III. ASTRONOMY

1. Celestial Observations
   A. Sun and the Seasons ........................................ 91
   B. Earth’s Moon Phases/Eclipses/Tides ....................... 101
   C. Star Paths .................................................. 110
   D. Apparent Diameter - Enrichment ............................ 113

2. Terrestrial Observations
   A. Foucault Pendulum ........................................... 114
   B. Coriolis Effect .............................................. 115
   C. Earth Motions/Time .......................................... 117

3. Our Solar System
   A. Geocentric & Heliocentric Models
      i. Geocentric Model ......................................... 119
      ii. Heliocentric Model ..................................... 120
   B. The Nature of Orbits
      i. Geometry of Orbits / Eccentricity ................. 121
      ii. Gravity and Energy Transformations ............ 124
   C. Solar System Astronomy
      i. Planets .................................................... 129
      ii. Comets, Meteors and Asteroids ................... 132
      iii. Planetary Origins and Atmospheres ........... 133
   D. Planetary Motions ........................................... 133

4. Modern Astronomy
   A. Deep Space Astronomy
      i. Cosmology / Galaxies Etc. .............................. 135
      ii. Doppler Effect / Hubble’s Law ...................... 138
   B. Stellar Astronomy
      i. Our Sun .................................................. 141
      ii. HR Diagram ............................................. 142
      iii. Stellar Evolution and Classification .......... 144

GROUP QUESTIONS for Unit III ................................. 146

5. Constructed Response ......................................... 176
IV. ENERGY IN EARTH PROCESSES

1. Electromagnetic Energy/Energy Transfer
   A. Electromagnetic Energy
      i. Properties - Absorption, Radiation, Reflection, Refraction 223
      ii. Electromagnetic Spectrum 223
   B. Energy Transfer
      i. Thermodynamics 226
      ii. Conduction 228
      iii. Convection 229
      iv. Radiation 233

2. Energy Transformation
   A. Latent / Specific Heat (Qualitative) 233
   B. Latent / Specific Heat Calculations 235

3. Insolation at the Earth's Surface
   A. Angle/Shadow 235
   B. Duration 241
   C. Ozone 243
   D. Scattering and Reflection 244

4. Terrestrial Radiation
   A. Material Radiation 246
   B. Greenhouse Effect 247

GROUP QUESTIONS for Unit IV 250

5. Constructed Response 261

V. WEATHER AND THE ATMOSPHERE

1. Atmospheric Variables
   A. Weather Prediction 267
   B. Temperature Variations/ Conversions 268
   C. Pressure Variations/Wind 269
   D. Moisture Variations 272
   E. Air Movement 273
   F. Environmental Changes / Pollution 277

2. Synoptic Weather Data
   A. Airmass Characteristics/ Fronts 278
   B. Airmass Source Regions 283
   C. Airmass Tracks 286
   D. Station Models 287
3. Atmospheric Energy Exchanges
   A. Input of Moisture & Energy
      i. Evaporation and Transpiration .................. 290
      ii. Relative Humidity/Dew Point .................... 294
   B. Moisture and Energy Transfer ..................... 299
   C. Moisture in Atmosphere
      i. Condensation and Sublimation .................... 299
      ii. Cloud Formation .................................. 300
   D. Moisture from Atmosphere
      i. Precipitation ...................................... 301
      ii. Wind - Water Interaction/
           Sea-Land Breezes ............................... 301

4. Climate Pattern Factors
   A. Latitude .............................................. 304
   B. Elevation ............................................ 305
   C. Large Bodies Water / Ocean Current .............. 306
   D. Mountain Barriers .................................... 312
   E. Wind Belts ........................................... 316
   F. Storm Tracks/Emergency Preparation .............. 317

GROUP QUESTIONS for Unit V ............................. 318

5. Constructed Response ................................. 346

VI. GROUND WATER

1. Earth’s Water
   A. Ground Water
      i. Infiltration ........................................ 399
      ii. Permeability ...................................... 402
      iii. Porosity .......................................... 403
      iv. Capillary ........................................... 406
   B. Surface Water Runoff ............................... 408
   C. Water Pollution
      i. Types of Pollutants ................................. 409
      ii. Concentration of Pollutants ...................... 410

2. The Local Water Budget
   A. Stream Discharge and Water Budget ................ 412
   B. Climates and Local Water Budget .................. 413

GROUP QUESTIONS for Unit VI ............................ 414

3. Constructed Response ................................. 422
VII. THE EROSIONAL PROCESS

1. Weathering
   A. Weathering Processes
      i. Physical .................................................. 427
      ii. Chemical .................................................. 429
      iii. Climate/Bedrock Resistance ...................... 430
      B. Weathering Rates/Surface Area .................... 433
   C. Soil Formation ............................................. 435

2. Erosion
   A. Evidence of Erosion
      i. Transported Sediments ......................... 437
      ii. Properties of Transported Materials ........ 438
   B. Factors affecting Transportation
      i. Gravity .................................................. 438
      ii. Water Erosion/Stream Channel Shape ...... 440
      iii. Wind and Ice Erosion ......................... 448
      iv. Effect of Erosional Agents ................. 454
   C. Coastal Processes .................................... 455

GROUP QUESTIONS for Unit VII ......................... 458

3. Constructed Response .................................... 474

VIII. THE DEPOSITIONAL PROCESS

1. Deposition
   A. Size .......................................................... 483
   B. Shape ........................................................ 488
   C. Density ..................................................... 490
   D. Velocity ..................................................... 492

2. Erosional - Depositional System
   A. Erosional - Depositional Change ................ 495
   B. Dominant Process ....................................... 497
   C. Erosional-Depositional Interface .............. 499
   D. Dynamic Equilibrium .................................. 501

3. Landscape Characteristics
   A. General .................................................... 502
   B. Stream Patterns ......................................... 506
   C. Landscape Regions of New York State .......... 512
4. Landscape Development
   A. Uplifting and Leveling Force .................................. 520
   B. Climate ................................................................. 522
   C. Bedrock .................................................................. 524
   E. Man ..................................................................... 526

GROUP QUESTIONS for Unit VIII ................................. 527

5. Constructed Response ............................................. 538

IX. THE FORMATION OF ROCKS

1. Minerals
   A. Composition ............................................................. 551
   B. Characteristics
      i. Physical and Chemical Properties .................. 553
      ii. Chemical Composition ............................... 557
      iii. Structure ..................................................... 558

2. Rock Formation
   A. Sedimentary Rocks
      i. Evaporation, Cementation & Particle Size .... 562
      ii. Chemical Processes .................................. 565
      iii. Biological Processes ............................... 566
   B. Non-sedimentary Rocks
      i. Igneous Rocks ............................................. 569
      ii. Metamorphic Rocks .................................. 577
   C. Environment of Formation
      i. Inferred Characteristics ............................. 580
      ii. Distribution .................................................. 581
      iii. Internal Characteristics .......................... 582
   D. Rock Cycle ............................................................ 583

GROUP QUESTIONS for Unit IX ................................. 584

3. Constructed Response ............................................. 610

X. THE DYNAMIC CRUST

1. Earth’s Crust and Interior
   A. Solid and Liquid Zones ........................................ 633
   B. Crustal Thickness ............................................... 634
   C. Crustal Composition .......................................... 636
   D. Density, Temperature, and Pressure .................. 637
   E. Interior Composition .......................................... 639

2. Minor Crustal Changes
   A. Deformed Rock Strata ....................................... 640
   B. Displaced Fossils ............................................... 642
   C. Displaced Strata .................................................. 643
3. Earthquakes
   A. Wave Properties
      i. Types of Waves .............................. 645
      ii. Velocities/Travel Times ...................... 646
      iii. Transmission/Tsunamis ...................... 647
   B. Location of Epicenter
      i. Epicenter/Difference in Arrival Times ....... 650
      ii. Origin Time ................................. 657

4. Plate Tectonics
   A. Zones of Crustal Activity ...................... 658
   B. Ocean Floor Spreading ......................... 666
   C. Continental Drift ............................. 671
   D. Magnetic Poles .................................. 674

GROUP QUESTIONS for Unit X ............................ 676

5. Constructed Response ............................... 710

XI. INTERPRETING GEOLOGICAL HISTORY

1. Determining Geologic Ages
   A. Scale of Geologic Time ......................... 739
   B. Measuring Time / Radioactive Decay ............ 742
   C. Ancient Life Forms ............................. 751
   D. Evolutionary Development ........................ 756

2. Interpreting Geological Events
   A. Sequence of Geological Events ................. 759
   B. Correlation / Index Fossils ..................... 769
   C. Erosional Record / Unconformity ............... 775

3. Geologic History of New York State ............... 778

GROUP QUESTIONS for Unit XI .......................... 784

4. Constructed Response ............................... 819
A student determines the density of a mineral to be 1.5 grams per cubic centimeter. If the accepted value is 2.0 grams per cubic centimeter, what is the student’s percent deviation (percent error)?

(1) 25.0%  (3) 40.0%
(2) 33.3%  (4) 50.0%

A student incorrectly measured the volume of a mineral sample as 83 cubic centimeters when the actual volume was 89 cubic centimeters. What was the student’s approximate percent deviation (percentage of error)?

(1) 6.7%  (3) 9.3%
(2) 7.2%  (4) 14.8%

A student incorrectly measured the volume of a mineral sample as 63 cubic centimeters. The actual volume was 72 cubic centimeters. What was the student’s approximate percent deviation (percentage of error)?

(1) 9.0%  (3) 14.2%
(2) 12.5%  (4) 15.3%

A student measured the mass and volume of the mineral crystal below and recorded the data shown below. The student used these data to calculate the density of the crystal.

[Image of a mineral crystal]

Data
Mass = 80 g
Volume = 32 cm³
Density = ?

What will be the student's percent error using the recorded data if the actual density of the crystal is 2.7 grams per cubic centimeter?

(1) 0.4%  (3) 7.4%
(2) 5.0%  (4) 8.0%

A person incorrectly measured the length of a room as 13.0 meters when the actual length was 12.0 meters. What is the person's approximate percent deviation (percentage of error)?

(1) 1.0%  (3) 5.5%
(2) 2.5%  (4) 4.0%

A student finds the mass of an igneous rock sample to be 48.0 grams. Its actual mass is 52.0 grams. What is the student's approximate percent deviation (percent of error)?

(1) 9.2%  (3) 7.7%
(2) 8.3%  (4) 4.0%

The accepted value for the density of the mineral corundum is 4.0 grams per cubic centimeter. A student calculates the density as 4.1 grams per cubic centimeter. What is the percent deviation from the accepted value?

(1) 1.0%  (3) 5.5%
(2) 2.5%  (4) 4.0%

An observer incorrectly measured the mass of a rock as 428.7 grams. The actual mass was 450.0 grams. What was the observer's approximate percentage of error?

(1) 5.0%  (3) 4.3%
(2) 2.1%  (4) 4.7%

A person incorrectly measured the length of a room as 13.0 meters when the actual length was 12.0 meters. What is the person's approximate percent deviation (percentage of error)?

(1) 1.0%  (3) 7.7%
(2) 5.9%  (4) 8.3%
II. DESCRIBING THE EARTH  1. Earth Dimensions

A. Shape

4136 The Earth is slightly flattened from a perfect spherical shape because of
(1) its rotation
(2) the pull of the sun and moon
(3) storms on the sun's surface
(4) its molten core

3334 Which diagram most accurately shows the cross-sectional shape of the Earth?

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

3098 The diagrams below represent photographs of a large sailboat taken through a telescope over time as the boat sailed away from shore out to sea. Each diagram shows the magnification of the lenses and the time of day.

![Diagram of sailboat at different magnifications]

Which statement best explains the apparent sinking of this sailboat?

(1) The sailboat is moving around the curved surface of Earth.
(2) The sailboat appears smaller as it moves farther away.
(3) The change in density of the atmosphere is causing refraction of light rays.
(4) The tide is causing an increase in the depth of the ocean.

2578 Precise measurements of the Earth indicate that its polar diameter is

(1) shorter than its equatorial diameter
(2) longer than its equatorial diameter
(3) the same length as its equatorial diameter

1458 A gravity meter is used to measure the amount of gravitational pull at the Earth's North Pole and at the Earth's Equator. How would these readings of gravitational pull compare? [Assume both readings are taken at sea level.]

(1) The reading would be lower at the North Pole than at the Equator.
(2) The reading would be higher at the North Pole than at the Equator.
(3) The readings would be the same at the North Pole and at the Equator.

1286 The best evidence that the Earth has a spherical shape is provided by

(1) photographs of the Earth taken from space satellites
(2) the amount of daylight received at the North Pole on June 21
(3) the changing orbital speed of the Earth in its orbit around the Sun
(4) the cyclic change of seasons

1057 The table below shows the distance that an observer must travel on a north-south line along the surface of the Earth in order to change the observed altitude of Polaris by 5º.

<table>
<thead>
<tr>
<th>Latitude</th>
<th>Distance Traveled to Change the Observed Altitude of Polaris by 5º</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between 0º and 5º N</td>
<td>552.75 kilometers</td>
</tr>
<tr>
<td>Between 45º N and 50º N</td>
<td>555.78 kilometers</td>
</tr>
<tr>
<td>Between 85º N and 90º N</td>
<td>558.36 kilometers</td>
</tr>
</tbody>
</table>

The best inference about the Earth's shape that can be made from these observations is that the Earth

(1) is a perfect sphere
(2) is flattened at the Equator
(3) has a curved surface
(4) has a very smooth surface
II. DESCRIBING THE EARTH

2. Positions on Earth

A. Latitude/Longitude/Polaris

3433 Which diagram best shows the altitude of Polaris observed near Buffalo, New York?
(1)

(2)

(3)

(4)

3225 Which reference line passes through both the geographic North Pole and the geographic South Pole?
(1) 0° latitude
(2) 0° longitude
(3) Tropic of Cancer
(4) Tropic of Capricorn

2202 The angle of the star Polaris above the northern horizon can be used to determine an observer's
(1) latitude
(2) longitude
(3) solar time
(4) local time

1937 As a person travels due west across New York State, the altitude of Polaris will
(1) decrease
(2) increase
(3) remain the same

595 Cities located on the same meridian (longitude) must have the same
(1) altitude
(2) latitude
(3) length of daylight
(4) solar time

3335 The diagram below shows an instrument made from a drinking straw, protractor, string, and rock.

![Diagram of instrument]

This instrument was most likely used to measure the
(1) distance to a star
(2) altitude of a star
(3) mass of the Earth
(4) mass of the suspended weight

3233 The diagram below represents a Foucault pendulum swinging freely for 8 hours.

![Diagram of Foucault pendulum]

The pendulum appears to change its direction of swing because of Earth's
(1) tectonic plate movement
(2) force of gravity
(3) rotation
(4) revolution
The diagram below represents a plastic hemisphere upon which lines have been drawn to show the apparent paths of the Sun at a location in New York State on the first day of each season. Letters A through I represent points on the paths.

Which point represents the sunrise location on the first day of winter?
(1) G (2) F (3) E (4) D

The shaded portion of the map below indicates areas of night and the unshaded portion indicates areas of daylight.

What day of the year is best represented by the map?
(1) March 21 (2) June 21 (3) September 21 (4) December 21

The apparent daily path of the Sun changes with the seasons because
(1) Earth's axis is tilted
(2) Earth's distance from the Sun changes
(3) the Sun revolves
(4) the Sun rotates

Which observation is a direct result of the 23½° tilt of Earth's axis as Earth orbits the Sun?
(1) Locations on Earth's Equator receive 12 hours of daylight every day.
(2) The apparent diameter of the Sun shows predictable changes in size.
(3) A Foucault pendulum shows predictable shifts in its direction of swing.
(4) Winter occurs in the Southern Hemisphere at the same time that summer occurs in the Northern Hemisphere.
The diagram below shows a satellite in four different positions as it revolves around a planet.

Which graph best represents the changes in this satellite’s orbital velocity as it revolves around the planet?

![Graph Options]

In each diagram below, the mass of the star is the same. In which diagram is the force of gravity greatest between the star and the planet shown?

![Gravity Force Options]

One factor responsible for the strength of gravitational attraction between a planet and the Sun is the
1. degree of tilt of the planet’s axis
2. distance between the planet and the Sun
3. planet’s period of rotation
4. amount of insolation given off by the Sun

The speed of a planet in its orbit around the Sun depends primarily on the planet’s
1. direction of revolution
2. distance from the Sun
3. polar circumference
4. axial tilt

What is the main reason that the gravitational attraction between Earth and the Moon changes each day?
1. Earth’s axis is tilted at 23.5°.
2. Earth’s rotational speed varies with the seasons.
3. The Moon has an elliptical orbit.
4. The Moon has a spherical shape.
The map below shows four locations in a temperature field. The temperature of each location is given in degrees Celsius.

Heat energy will normally flow from

1. A to B
2. A to C
3. B to D
4. D to C

The data table below shows the temperatures of two similar objects for 10 minutes after the objects were placed near each other.

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Object A</td>
</tr>
<tr>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td>29</td>
</tr>
<tr>
<td>4</td>
<td>26</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>10</td>
<td>23</td>
</tr>
</tbody>
</table>

Which statement is best supported by the data?

1. Some of the heat energy lost by object B was gained by object A.
2. Most of the heat energy lost by object A was gained by the environment.
3. Both objects lost heat energy.
4. Both objects gained heat energy.

1851 Which statement best describes the pattern of energy flow in a closed system?

1. Energy flows out of the system.
2. Energy flow is cyclical, so that equilibrium is never reached.
3. Energy flows from energy sinks to energy sources.
4. Energy flows from energy sources to energy sinks.

1605 Which statement best describes the major heat flow associated with an iceberg as it drifts south from the Arctic Ocean into warmer water?

1. Heat flows from the water into the ice.
2. Heat flows from the ice into the water.
3. A state of equilibrium exists, with neither ice nor water gaining or losing energy.
4. Heat flows equally from the ice and the water into the surrounding air.

1507 Heat energy transfer will normally occur between two objects that are close to each other if the objects have different

1. specific heats
2. temperatures
3. masses
4. densities

1501 The diagram below shows a sealed container holding 250 milliliters of water at 80°C. The air above the water had an original temperature of 18°C.

Assuming that the container does not transfer heat, which statement most accurately describes the energy exchanges inside the container?

1. The air gains more heat energy than the water loses.
2. The air gains less heat energy than the water loses.
3. The air gains the same amount of heat energy that the water loses.
4. No energy is exchanged between the water and the air.

1411 As a lake's water temperature decreases on a cloudy night, what occurs at the interface between the lake's surface and the air above the lake?

1. Energy given up by the lake is lost directly to outer space.
2. More energy is gained by the lake than is gained by the air.
3. The temperature of the air remains constant.
4. Energy is gained by the air from the lake.
The graph below shows the change in carbon dioxide concentration in parts per million (ppm) in Earth’s atmosphere from 1960 to 1990.

The most likely cause of the overall change in the level of carbon dioxide from 1960 to 1990 is an increase in the

1) number of violent storms
2) number of volcanic eruptions
3) use of nuclear power
4) use of fossil fuels

Earth’s atmosphere is warmed when

1) ultraviolet radiation emitted by Earth is absorbed by nitrogen and carbon dioxide in the atmosphere
2) x-ray radiation emitted by Earth is absorbed by nitrogen and carbon dioxide in the atmosphere
3) infrared radiation emitted by Earth is absorbed by carbon dioxide and water vapor in the atmosphere
4) gamma radiation emitted by Earth is absorbed by carbon dioxide and water vapor in the atmosphere

Why are carbon dioxide and water vapor called the greenhouse gases?

1) They are found in varying amounts in Earth’s atmosphere.
2) They are found in fixed amounts in Earth’s bedrock.
3) They are good reflectors of infrared radiation.
4) They are good absorbers of infrared radiation.

This change in CO₂ concentration most likely caused

1) a decrease in the average wavelength of solar radiation
2) a decrease in the thickness of Earth’s atmosphere
3) an increase in the absorption of long-wave heat radiation by Earth’s atmosphere
4) an increase in the thickness of Earth’s glaciers

Which graph best shows the relationship between the amount of carbon dioxide contained in Earth’s atmosphere and the average atmospheric temperature?
Air pressure is usually highest when the air is
(1) cool and humid       (3) warm and humid
(2) cool and dry         (4) warm and dry

Which weather variable would most likely decrease ahead of an approaching storm system?
(1) wind speed           (3) cloud cover
(2) air pressure         (4) relative humidity

Which graph best represents the change in air pressure as air temperature increases at Earth's surface?

Which weather variable is measured by this instrument?
(1) wind direction       (3) wind speed
(2) air pressure         (4) amount of rainfall

The cross section below shows a sea breeze blowing from the ocean toward the land. The air pressure at the land surface is 1013 millibars.

The air pressure at the ocean surface a few miles from the shore is most likely
(1) 994 mb               (3) 1013 mb
(2) 1005 mb              (4) 1017 mb

Earth's surface winds generally blow from regions of higher
(1) air temperature toward regions of lower air temperature
(2) air pressure toward regions of lower air pressure
(3) latitudes toward regions of lower latitudes
(4) elevations toward regions of lower elevations

In the United States, most tornadoes are classified as intense
(1) low-pressure funnel clouds that spin clockwise
(2) low-pressure funnel clouds that spin counterclockwise
(3) high-pressure funnel clouds that spin clockwise
(4) high-pressure funnel clouds that spin counterclockwise

Which weather condition most directly determines wind speeds at Earth's surface?
(1) visibility changes  (3) air-pressure gradient
(2) amount of cloud cover (4) dewpoint differences

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

Adjacent water and landmasses are heated by the morning Sun on a clear, calm day. After a few hours, a surface wind develops. Which map best represents this wind's direction?

The surface winds generally blow from regions of higher
(1) air temperature toward regions of lower air temperature
(2) air pressure toward regions of lower air pressure
(3) latitudes toward regions of lower latitudes
(4) elevations toward regions of lower elevations

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6303 The arrows in the diagram below represent the movement of water in the water cycle.

Which arrow represents the process of transpiration?
(1) A  (3) C
(2) B  (4) D

5803 Under which atmospheric conditions will water most likely evaporate at the fastest rate?
(1) hot, humid, and calm  (3) cold, humid, and windy
(2) hot, dry, and windy  (4) cold, dry, and calm

4921 Most water vapor enters Earth’s atmosphere by the processes of
(1) condensation and precipitation
(2) radiation and cementation
(3) conduction and convection
(4) evaporation and transpiration

4768 A student uses a sling psychrometer outdoors on a clear day. The dry-bulb (air) temperature is 10°C. The water on the wet bulb will most likely
(1) condense, causing the wet-bulb temperature to be higher than the air temperature
(2) condense, causing the wet-bulb temperature to be equal to the air temperature
(3) evaporate, causing the wet-bulb temperature to be lower than the air temperature
(4) evaporate, causing the wet-bulb temperature to be equal to the air temperature

3943 A container of water is placed in an open outdoor area so that the evaporation rate can be observed. The water will most likely evaporate fastest when the weather is
(1) cool, humid, and windy  (3) warm, humid, and calm
(2) cool, dry, and calm  (4) warm, dry, and windy

3543 Which process occurs when water vapor moves out of the leaves of a tree into the atmosphere?
(1) condensation  (3) runoff
(2) infiltration  (4) transpiration

4040 The graph below is a computer-generated forecast of air temperature and dewpoint for a city during a period of 2 ½ days.

At which time during this period is the rate of evaporation expected to be highest?
(1) April 27 at 10 a.m.  (3) April 28 at 4 p.m.
(2) April 28 at 10 a.m.  (4) April 29 at 4 a.m.

3494 When would the water in a Georgia pond evaporate fastest?
(1) in January, when the pond is frozen
(2) in March, when the pond ice is melting
(3) in May on a calm, sunny day
(4) in July on a hot, windy day

3261 The flowchart below shows one process by which moisture enters the atmosphere.

![Flowchart: Soil → Roots → Stem → Leaves → Atmosphere]

The last step of this process is known as
(1) condensation  (3) radiation
(2) convection  (4) transpiration

3112 Under which set of atmospheric conditions does water usually evaporate at the fastest rate?
(1) warm temperatures, calm winds, and high humidity
(2) warm temperatures, high winds, and low humidity
(3) cold temperatures, calm winds, and low humidity
(4) cold temperatures, high winds, and high humidity

2931 What is the most effective method for increasing the rate of evaporation of a given amount of water?
(1) decreasing the water's temperature
(2) decreasing the air movement over the water's surface
(3) increasing the water's surface area
(4) increasing the air pressure over the water's surface

2046 When a person leaves the ocean after swimming on a windy day, the person usually feels cold because
(1) water evaporates from the skin
(2) water condenses on the skin
(3) salt is absorbed through the skin
(4) radiation is absorbed through the skin
VI. GROUND WATER
1. Earth’s Water
B. Surface Water Runoff

The cross section below represents a forested area in Vermont.

During heavy rainfall, the greatest amount of runoff should occur in which two sections of the forest?
(1) A and B  (2) B and D  (3) C and E  (4) D and E

During a heavy rainstorm, runoff is most likely to occur if the surface soil is
(1) firmly packed clay-sized particles
(2) loosely packed sand-sized particles
(3) covered by trees, shrubs, and grasses
(4) unsaturated and has a gentle slope

Which soil conditions normally result in the greatest amount of runoff?
(1) low permeability and gentle slope
(2) low permeability and steep slope
(3) high permeability and gentle slope
(4) high permeability and steep slope

When rainfall occurs, the rainwater will most likely become surface runoff if the land surface is
(1) sandy  (2) impermeable  (3) covered with grass  (4) nearly flat

Which set of conditions would produce the most runoff of precipitation?
(1) gentle slope and permeable surface
(2) gentle slope and impermeable surface
(3) steep slope and permeable surface
(4) steep slope and impermeable surface

During a rainfall, surface runoff will probably be greatest in an area that has a
(1) steep slope and a clay-covered surface
(2) steep slope and a gravel-covered surface
(3) gentle slope and a grass-covered surface
(4) gentle slope and a tree-covered surface

Which condition would cause surface runoff to increase in a particular location?
(1) covering a dirt road with pavement
(2) reducing the gradient of a steep hill
(3) planting grasses and shrubs on a hillside
(4) having a decrease in the annual rainfall

Which graph shows the effect of soil permeability on the amount of runoff in an area?

Which condition makes surface runoff of rainfall most likely?
(1) The gradient of the surface is low.
(2) Permeability rate exceeds the rate of rainfall.
(3) Surface soil pore spaces are filled.
(4) The porosity of the surface soil is high.
VI. GROUND WATER

GROUP QUESTIONS

Base your answers to questions 4481 through 4483 on the diagram below. Columns A, B, C, and D are partially filled with different sediments. Within each column, the sediment is uniform in size. A fine wire mesh screen covers the bottom of each column to prevent the sediment from falling out. The lower part of each column has just been placed in a beaker of water. Sediment sizes are not drawn to scale.

4481 Which column contains sediment with an average diameter closest to 0.1 centimeter?
(1) A  (2) B  (3) C  (4) D

4482 In which sediment will capillary action cause the water from the beaker to rise fastest in the column?
(1) small pebbles  (2) large sand  (3) medium sand  (4) large silt

4483 In an experiment, the beakers of water were removed and replaced with empty beakers. The sediments were allowed to dry. Then water was poured into each column to compare the permeability of the sediments. The permeability rate of the medium sand sample was shown to be
(1) less than the silt and pebble samples  (3) greater than the silt sample but less than the pebble sample
(2) less than the silt sample but more than the pebble sample  (4) greater than the silt and pebble samples

5262 Base your answer to the following question on the bedrock cross section below, which represents part of Earth’s crust where natural gas, oil, and water have moved upward through a layer of folded sandstone and filled the pore spaces at the top of the sandstone layer.

The natural gas, oil, and water are trapped within the top of the sandstone and do not move upward through the shale because, compared to the sandstone, the shale has
(1) lower permeability  (2) less foliation  (3) larger pore spaces  (4) larger particles
The diagram below shows four magnified block-shaped sandstone samples labeled A, B, C, and D. Each sandstone sample contains quartz grains of different shapes and sizes. The quartz grains are held together by hematite cement.

In which sample did the quartz grains undergo the most abrasion during erosional transport?
(1) A  
(2) B  
(3) C  
(4) D

The diagram below shows an outcrop of different layers of sandstone in a region receiving heavy rainfall.

Which sandstone layer appears to be the least resistant to weathering?
(1) A  
(2) B  
(3) C  
(4) D

Adding automobile exhaust gases to the atmosphere has had the greatest impact on landscape development by
(1) changing the position of crustal plates  
(2) changing Earth’s prevailing wind patterns  
(3) increasing the rate of chemical weathering  
(4) increasing the amount of ozone in ground water

Which long-term atmospheric changes would increase the rate of chemical weathering of surface bedrock?
(1) decreasing temperature and decreasing precipitation  
(2) decreasing temperature and increasing precipitation  
(3) increasing temperature and decreasing precipitation  
(4) increasing temperature and increasing precipitation

The demonstration shown in the diagram below indicates that powdered limestone reacts faster than a single large piece of limestone of equal mass when both are placed in acid.

The most likely reason powdered limestone reacts faster is that it has
(1) less total volume  
(2) more chemical bonds  
(3) more total surface area  
(4) lower density

In hot, wet climates, bedrock rapidly weathers into soil because water
(1) dissolves many minerals  
(2) expands when it freezes  
(3) is part of most chemical compounds  
(4) cools the surroundings when it evaporates
VII. THE EROSIONAL PROCESS
B. Factors affecting Transportation

ii. Wind and Ice Erosion

The diagram below represents a side view of a hill (drumlin) that was deposited by a glacier on the Atlantic coast.

Drumlin

This hill is most likely composed of
(1) cemented sediments
(2) unsorted sediments
(3) vertically layered sediments
(4) horizontally layered sediments

Which erosional agent typically deposits hills of unsorted sediments?
(1) glaciers
(2) streams
(3) winds
(4) ocean waves

Which landscape feature was most likely formed by glacial activity?
(1) an eroded plateau
(2) a flat floodplain
(3) a U-shaped valley
(4) a V-shaped valley

The diagram below represents the surface topography of a mountain valley.

Which agent of erosion most likely created the shape of the valley shown in the diagram?
(1) wind
(2) glaciers
(3) ocean waves
(4) running water

Many elongated hills, each having a long axis with a mostly north-south direction, are found scattered across New York State. These hills contain unsorted soils, pebbles, and boulders. Which process most likely formed these hills?
(1) stream deposition
(2) wind deposition
(3) wave deposition
(4) glacial deposition

Which process is primarily responsible for the shape of the surface shown in the diagram?
(1) crustal subsidence
(2) wave action
(3) glacial action
(4) stream erosion

Which is the best evidence that more than one glacial advance occurred in a region?
(1) ancient forests covered by glacial deposits
(2) river valleys buried deeply in glacial deposits
(3) scratches in bedrock that is buried by glacial deposits
(4) glacial deposits that overlay soils formed from glacial deposits

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Diagram I

Diagram II

Container of sediments

Which characteristic of the sedimentary particles most likely caused the pattern of deposition shown in diagram II?
(1) particle shape (2) particle size (3) particle composition (4) particle density

5811 Which property would best distinguish sediment deposited by a river from sediment deposited by a glacier?
(1) mineral composition of the sediment (2) amount of sediment sorting (3) thickness of sediment layers (4) age of fossils found in the sediment

5065 Which statement best describes sediments deposited by glaciers and rivers?
(1) Glacial deposits and river deposits are both sorted. (2) Glacial deposits are sorted, and river deposits are unsorted. (3) Glacial deposits are unsorted, and river deposits are sorted. (4) Glacial deposits and river deposits are both unsorted.

4488 The four particles shown in the table below are of equal volume and are dropped into a column filled with water.

<table>
<thead>
<tr>
<th>Particle</th>
<th>Shape</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>flat</td>
<td>2.5 g/cm³</td>
</tr>
<tr>
<td>B</td>
<td>flat</td>
<td>3.0 g/cm³</td>
</tr>
<tr>
<td>C</td>
<td>round</td>
<td>2.5 g/cm³</td>
</tr>
<tr>
<td>D</td>
<td>round</td>
<td>3.0 g/cm³</td>
</tr>
</tbody>
</table>

Which particle would usually settle most rapidly?
(1) A (2) B (3) C (4) D

3359 The velocity of a stream is decreasing. As the velocity approaches zero, which size particle will most likely remain in suspension?
(1) clay (2) pebble (3) sand (4) boulder

2452 When particles of uniform shape and density are dropped into a calm lake, silt will settle faster than
(1) sand (2) clay (3) cobbles (4) pebbles

1995 How are dissolved materials carried in a river?
(1) in solution (2) in suspension (3) by precipitation (4) by bouncing and rolling

723 Which rock particles will remain suspended in water for the longest time?
(1) pebbles (2) sand (3) silt (4) clay
4336 Which landscape region probably resulted from the erosion of faulted rock layers?

(1) 

(2) 

(3) 

(4) 

3975 Which characteristics best distinguish one landscape region from another?

(1) human population density and types of environmental pollutants
(2) composition of bedrock and variety of fossils
(3) bedrock structure and elevation of land surfaces
(4) stream gradients and soil types

3276 The boundaries of landscape regions are generally well defined by changes in

(1) vegetation and soil type
(2) stream size and drainage pattern
(3) latitude and longitude
(4) elevation and bedrock structure

3272 Which evidence best indicates that a landscape has been eroded primarily by streams?

(1) parallel sets of U-shaped valleys
(2) sand dunes
(3) thick residual soil
(4) sorted layers of cobbles and sand

2962 Which characteristics of Earth's surface can be determined by using a topographic map?

(1) hillslope and stream gradients
(2) bedrock erosion and stream velocity
(3) hilltop elevations and bedrock age
(4) soil thickness and benchmark movement

2683 Continents are divided into landscape regions on the basis of

(1) bedrock fossils and depositional patterns
(2) rainfall and temperature changes
(3) surface features and bedrock structure
(4) boundaries of the drainage basins of major rivers

2477 Landscape regions are best identified by their

(1) fossils and rock age
(2) latitude and climate
(3) elevation and bedrock structure
(4) soil composition and particle size
VIII. THE DEPOSITIONAL PROCESS

4. Landscape Development

C. Bedrock

5723 The cross section below shows sedimentary bedrock layers A, B, C, and D exposed at Earth's surface.

Which layer appears to be the least resistant to weathering?

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

3442 The diagram below shows a cross section of a portion of Earth's crust.

The hills of this area were formed primarily by

(1) bedrock folding  (3) stream erosion
(2) bedrock faulting  (4) volcanic activity

3277 The block diagrams below show cross sections of the crust in a landscape that has undergone gradual change.

A - Early Stage  B - Middle Stage  C - Late Stage

Upwelling lava fills the original volcano's central pipe and cools.

Erosion attacks the outer slopes.

Only the lava plug remains.

The hardened lava in this volcano's central pipe formed a mountain peak in the late stage because the lava plug was composed of

(1) soft igneous rock  (2) soft metamorphic rock
(3) igneous rock that is resistant to erosion  (4) metamorphic rock that is resistant to erosion

2871 Which bedrock characteristics most influence landscape development?

(1) composition and structure  (2) structure and age
(3) age and color  (4) color and composition

2577 A variety of soil types are found in Pennsylvania primarily because areas of the State differ in their

(1) amounts of insolation  (2) distances from the ocean
(3) underlying bedrock and sediments  (4) amounts of human activities

2476 The maps below represent four different stream drainage patterns.

Which factor most likely caused the differences in these patterns?

(1) time  (2) climate  (3) human activities  (4) bedrock structure

819 One characteristic used to classify landscape regions as plains, plateaus, or mountains is

(1) type of soil  (2) amount of stream discharge
(3) weathering rate  (4) underlying bedrock structure

692 The primary reason that several landscape regions have formed in New York State is that the various regions of the State have different

(1) climates  (2) latitudes  (3) soil characteristics  (4) bedrock characteristics
The diagram below shows four mineral samples, each having approximately the same mass.

Quartz  Amphibole  Pyroxene  Galena

If all four samples are placed together in a closed, dry container and shaken vigorously for 10 minutes, which mineral sample would experience the most abrasion?

1. quartz  2. amphibole  3. pyroxene  4. galena

Which mineral is commonly used as a food additive?

1. calcite  2. talc  3. halite  4. fluorite

The diagram below shows the index minerals of Mohs hardness scale compared with the hardness of some common objects.

<table>
<thead>
<tr>
<th>Index Minerals</th>
<th>Common Objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diamond</td>
<td>10</td>
</tr>
<tr>
<td>Corundum</td>
<td>9</td>
</tr>
<tr>
<td>Topaz</td>
<td>8</td>
</tr>
<tr>
<td>Quartz</td>
<td>7</td>
</tr>
<tr>
<td>Orthoclase</td>
<td>6</td>
</tr>
<tr>
<td>Apatite</td>
<td>5</td>
</tr>
<tr>
<td>Fluorite</td>
<td>4</td>
</tr>
<tr>
<td>Calcite</td>
<td>3</td>
</tr>
<tr>
<td>Gypsum</td>
<td>2</td>
</tr>
<tr>
<td>Talc</td>
<td>1</td>
</tr>
</tbody>
</table>

Steel file  Glass  Copper penny  Fingernail

Which statement is best supported by the diagram?

1. A fingernail will scratch calcite but not gypsum.
2. Calcite will be scratched by a copper penny.
3. The mineral apatite will scratch topaz.
4. A steel file has a hardness of about 7.5.

Which mineral has a metallic luster, a black streak, and is an ore of iron?

1. galena  2. magnetite  3. pyroxene  4. graphite

The mineral graphite is often used as

1. a lubricant  2. an abrasive  3. a source of iron  4. a cementing material

Which home-building material is made mostly from the mineral gypsum?

1. plastic pipes  2. window glass  3. drywall panels  4. iron nails

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IX. THE FORMATION OF ROCKS
A. Sedimentary Rocks
1. Evaporation, Cementation & Particle Size

4770 The profile below shows the average diameter of sediment that was sorted and deposited in specific areas A, B, C, and D by a stream entering an ocean.

![Diagram of sediment profile]

As compaction and cementation of these sediments eventually occur, which area will become siltstone?

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

6682 Soil that contains large quantities of calcium was most likely formed by the weathering of
(1) rock salt  (3) coal
(2) quartzite  (4) limestone

6398 Most sandstone bedrock is composed of sediment that was
(1) sorted by size and not layered
(2) sorted by size and layered
(3) unsorted and not layered
(4) unsorted and layered

6316 Which process led to the formation of thick salt deposits found in the bedrock at some locations in New York State?
(1) melting  (3) condensation
(2) runoff  (4) evaporation

5570 A student obtains a cup of quartz sand from a beach. A saltwater solution is poured into the sand and allowed to evaporate. The mineral residue from the saltwater solution cements the sand grains together, forming a material that is most similar in origin to
(1) an extrusive igneous rock
(2) an intrusive igneous rock
(3) a clastic sedimentary rock
(4) a foliated metamorphic rock

5236 Which type of rock most likely contains fossils?
(1) scoria  (3) schist
(2) gabbro  (4) shale

4334 Which type of rock is most likely to contain fossils?
(1) granite  (3) shale
(2) gneiss  (4) metaconglomerate

4317 Particles of sediment collected from a lake bottom averaged 1.2 centimeters in diameter. If left on the lake bottom to become buried by more sediment and compressed into rock, these particles would form
(1) sandstone  (3) quartzite
(2) conglomerate  (4) granite

5414 The diagram below shows a drill core of sediment that was taken from the bottom of a lake.

![Diagram of drill core]

Which types of rock would most likely form from compaction and cementation of these sediments?
(1) sandstone and limestone
(2) shale and coal
(3) breccia and rock salt
(4) conglomerate and siltstone

3664 A rock is composed of several large, rounded pebbles and sand grains cemented together. Which inference about the rock is best supported by this description?
(1) The rock is older than the pebbles.
(2) The rock is igneous.
(3) The rock is sedimentary.
(4) The rock resulted from evaporation of sea water.

3256 Which rock is made up of angular fragments of rock held together by a natural cement?
(1) breccia  (3) granite
(2) scoria  (4) quartzite
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

Which element is most abundant in Earth's crust?
(1) nitrogen
(2) hydrogen
(3) oxygen
(4) silicon

The basaltic bedrock of the oceanic crust is classified as
(1) felsic, with a density of 2.7 g/cm³
(2) felsic, with a density of 3.0 g/cm³
(3) mafic, with a density of 2.7 g/cm³
(4) mafic, with a density of 3.0 g/cm³

Which group of elements is listed in increasing order based on the percent by mass in Earth’s crust?
(1) aluminum, iron, calcium
(2) aluminum, silicon, magnesium
(3) magnesium, iron, aluminum
(4) magnesium, silicon, calcium

Compared to the continental crust, the oceanic crust is
(1) less dense and less felsic
(2) less dense and less mafic
(3) more dense and more felsic
(4) more dense and more mafic

The two most abundant elements by mass in Earth’s crust are oxygen and
(1) potassium
(2) hydrogen
(3) nitrogen
(4) silicon

The most abundant element in the Earth’s crust is
(1) nitrogen
(2) oxygen
(3) silicon
(4) hydrogen

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

Most of the oceanic crust is composed of rock material similar to
(1) basalt
(2) granite
(3) sandstone
(4) limestone

Compared to the continental crust of central North America, the oceanic crust of the Mid-Atlantic Ridge is
(1) younger
(2) thicker
(3) less dense
(4) more dense, more mafic, and thinner

Which element in the Earth’s crust makes up the largest volume of most minerals?
(1) oxygen
(2) nitrogen
(3) hydrogen
(4) iron

What is the approximate percentage by volume of oxygen in the crust of the Earth?
(1) 20%
(2) 30%
(3) 70%
(4) 90%

Which two elements make up the greatest volume of the Earth's crust?
(1) silicon and potassium
(2) silicon and iron
(3) iron and lead
(4) oxygen and potassium

Compared to the continental crust, the oceanic crust is
(1) thicker
(2) more dense
(3) more granitic
(4) more mafic

The most abundant element in the Earth's crust is
(1) nitrogen
(2) oxygen
(3) silicon
(4) hydrogen

In the diagram below, letters A and B represent locations near the edge of a continent.

A geologist who compares nonsedimentary rock samples from locations A and B would probably find that the samples from location A contain
(1) more granite
(2) more basalt
(3) more fossils
(4) the same minerals and fossils

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

Most of the oceanic crust is composed of rock material similar to
(1) basalt
(2) granite
(3) sandstone
(4) limestone

Compared to the continental crust of central North America, the oceanic crust of the Mid-Atlantic Ridge is
(1) younger
(2) thicker
(3) less dense
(4) more dense, more mafic, and thinner

How does the oceanic crust compare to the continental crust?
(1) The oceanic crust is thinner and contains less basalt.
(2) The oceanic crust is thinner and contains more basalt.
(3) The oceanic crust is thicker and contains less basalt.
(4) The oceanic crust is thicker and contains more basalt.

What are the four most abundant elements, by volume, in the Earth’s crust?
(1) oxygen, potassium, sodium, and calcium
(2) hydrogen, oxygen, nitrogen, and potassium
(3) aluminum, iron, silicon, and magnesium
(4) aluminum, calcium, hydrogen, and iron
XI. INTERPRETING GEOLOGICAL HISTORY

1. Determining Geologic Ages
D. Evolutionary Development

6234 The diagram below shows a process thought to have produced Earth’s early atmosphere.

Which major component is shown as gas X?
(1) helium
(2) ozone
(3) carbon dioxide
(4) hydrogen

5170 Earth's fossil record shows evidence that
(1) very few life-forms have become extinct
(2) life-forms existed on land before life-forms existed in water
(3) more complex life-forms probably have evolved from less complex life-forms
(4) older bedrock contains a great variety of lifeforms, while younger bedrock contains less variety of lifeforms

3271 The primitive lobe-finned fish shown below is thought to be an ancestor of early amphibians.

This evolutionary development from fish to amphibian is believed to have occurred during the
(1) Triassic Period
(2) Devonian Period
(3) Cretaceous Period
(4) Permian Period

2570 The changes observed in the fossil record from the Precambrian Era to the Cenozoic Era best provide evidence of
(1) sublimation
(2) radioactive decay
(3) evolution
(4) planetary motion

2233 Which life-form appeared first?
(1) trilobite
(2) human
(3) coelophysis
(4) stromatolite

2006 Theories of evolution suggest that variations between members of the same species give the species greater probability of
(1) remaining unchanged
(2) surviving environmental changes
(3) becoming fossilized
(4) becoming extinct

1377 The similarity of some fossil forms from different time periods suggests a gradual transition that may be the result of
(1) unconformities
(2) evolutionary development
(3) folding and faulting
(4) uplift and erosion

1037 Trilobite fossils from different time periods show small changes in appearance. These observations suggest that the changes may be the result of
(1) evolutionary development
(2) a variety of geologic processes
(3) periods of destruction of the geologic record
(4) the gradual disintegration of radioactive substances

950 Studies of the fossil record found in Utah indicate that
(1) variations within a species can be observed, measured, and described
(2) variations within a species have had little effect upon the survival of the species
(3) few of the species of plants and animals that existed have become extinct
(4) there is no evidence for evolutionary development among the different fossil species

679 Earth scientists studied fossils of a certain type of plant. They noted slight differences in the plant throughout geologic time. What inference is best made from this evidence?
(1) When the environment changed, this type of plant also changed, allowing it to survive.
(2) When uplifting occurred, the fossils of this type of plant were deformed.
(3) The processes which form fossils today differ from those of the past.
(4) The fossils have changed as a result of weathering and erosion.