1. In the diagram below, letters A through D represent the locations of four observers on the Earth's surface. Each observer has the same mass.

![Diagram of Earth's surface with observers A, B, C, D.]

The gravitational force is strongest between the center of the Earth and the observer at location

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

2. Which object best represents a true scale model of the shape of the Earth?

(1) a Ping-Pong ball  (2) a football  
(3) an egg  (4) a pear

3. The Earth's actual shape is most correctly described as

(1) a circle  (2) a perfect sphere  
(3) an oblate sphere  (4) an eccentric ellipse

4. The solid rock material that directly underlies the sediments on the ocean floor is part of the Earth's

(1) lithosphere  (2) hydrosphere  
(3) troposphere  (4) outer core

5. At which latitude will Polaris be overhead?

(1) 0°  (3) 90° S.  
(2) 23 ½°N.  (4) 90° N.

6. Cities located on the same meridian (longitude) must have the same

(1) altitude  (3) length of daylight  
(2) latitude  (4) solar time

7. 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.

![Photographs of sailboat at different times and 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.

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

![Diagrams of Earth's cross-sections.]

Due Date: _______
9. In the diagrams below, the dark zone at the surface of each wedge-shaped segment of the Earth represents average ocean depth. Which segment is drawn most nearly to scale?

(1) [Diagram of Earth with ocean and center visible]
(2) [Diagram of Earth with ocean and center visible]
(3) [Diagram of Earth with ocean and center visible]
(4) [Diagram of Earth with ocean and center visible]

11. Which graph best represents the relationship between the latitude of an observer and the observed altitude of Polaris above the northern horizon?

(1) [Graph with a flat line]
(2) [Graph with a curve]
(3) [Graph with a steep incline]
(4) [Graph with a flat line]

12. The diagram below shows the altitude of Polaris above the horizon at a certain location.

What is the latitude of the observer?

(1) 10° N
(2) 40° N
(3) 50° N
(4) 90° N

10. The diagram below represents a portion of a map of the Earth's grid system. What is the approximate latitude and longitude of point A?

(1) 15°N. 30°W.
(2) 15°S. 30°W.
(3) 15°N. 30°E.
(4) 15°S. 30°E.
13. 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

14. The diagram below shows a student in New York State observing Polaris.

The student is located nearest to which city in New York State?
   (1) Plattsburgh
   (2) Albany
   (3) New York City
   (4) Kingston

15. The North Star (Polaris) can be used for navigation in Earth’s Northern Hemisphere because
   (1) Polaris is located directly over the Tropic of Cancer
   (2) Polaris is the brightest and most easily located star
   (3) the altitude of Polaris is equal to the observer’s latitude
   (4) the position of Polaris changes with the seasons

16. As a ship crosses the Prime Meridian, the altitude of Polaris measured from the ship is 50°. What is the ship’s location?
   (1) 0° latitude 50° east longitude
   (2) 0° latitude 50° west longitude
   (3) 50° north latitude 0° longitude
   (4) 50° south latitude 0° longitude

17. The lines on which set of views best represent Earth’s latitude system?

(1)  

(2)  

(3)  

(4)  

Due Date: _______
18. Base your answer to the following question on the United States time zone map shown below. The dashed lines represent meridians (lines of longitude).

If the time in Buffalo, New York, is 5 a.m., what time would it be in San Francisco, California?
(1) 8 a.m. (2) 2 a.m. (3) 3 a.m. (4) 4 a.m.
19. Base your answer to the following question on the diagram in your answer booklet, which shows the latitude-longitude grid on a model of Earth. Point \( Y \) is a location on Earth’s surface.

What is Earth's rate of rotation at point \( Y \), in degrees per hour?

20. Base your answer to the following question on the map below, which shows the latitude and longitude of five observers, \( A, B, C, D, \) and \( E \), on Earth.

Which two observers would be experiencing the same apparent solar time?
(1) \( A \) and \( C \)  
(2) \( B \) and \( C \)  
(3) \( B \) and \( E \)  
(4) \( D \) and \( E \)