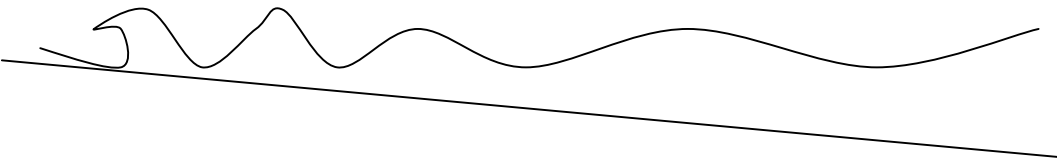


# Blue Heron Bowl Practice Questions

## Physical and Chemical Oceanography Concepts

1. Water is referred to as “the universal solvent.” The dissolving ability of water is related to its \_\_\_\_\_.
  - a. Ability to attract both positive and negative ions
  - b. Ability to exist in solid, liquid, and vapor phases
  - c. High boiling point
  - d. High heat capacity
2. If a sample of seawater has a pH of 8, it means \_\_\_\_\_.
  - a.  $H^+$  ions and  $OH^-$  ions are equal in number, and the seawater is neutral
  - b.  $H^+$  ions outnumber  $OH^-$  ions, and the seawater is acidic
  - c.  $OH^-$  ions outnumber  $H^+$  ions, and the seawater is alkaline or basic
  - d.  $OH^-$  ions outnumber  $H^+$  ions, and the seawater is acidic
3. The most accurate estimation of the age of the Earth is based on \_\_\_\_\_.
  - a. The calculation of the earth’s cooling history
  - b. The decay rate of radioactive isotopes in rocks
  - c. The salinity of seawater
  - d. The thickness of sediments in the ocean basins
4. If water only absorbed light and did not scatter it, what color would the sea appear when viewed from above?
  - a. Black
  - b. Blue
  - c. Red
  - d. White
5. Rich goes to school near the ocean, but his relatives live 100 miles inland. They complain about the cold and snowy weather while Rich has milder weather. Rich explains the property of water that helps moderate air temperatures causing coastal locations, such as the location of his school, to have milder climates than inland locations. The property of water he described is the \_\_\_\_\_.
  - a. High heat capacity
  - b. High latent heat of fusion
  - c. High surface tension
  - d. Solvent properties
6. All of the following describe what happens as the wave in the illustration approaches the shore EXCEPT \_\_\_\_\_.  

  - a. Wave height increases
  - b. Wavelength decreases
  - c. Wavelength increases
  - d. Wave steepness increases

7. Thermohaline circulation accounts for deep, slow currents in the major ocean basins that flow and mix seawater all over the globe. Based on your knowledge of buoyant and gravitational force, what characteristics of water would a sinking water mass have?

- a. Cold and fresh
- b. Cold and saline
- c. Warm and fresh
- d. Warm and saline

8. Which of the following has the smallest size?

- a. An atom
- b. An electron
- c. A green pea
- d. A molecule

9. What determines how atoms of elements in the same group or family of the Periodic Table will react with atoms of different elements?

- a. Neutrons
- b. Protons
- c. Outermost electrons
- d. Energy levels

10. The Earth's primary source of energy is heat and light from the sun. What generates the heat and light produced by the sun?

- a. Combustion of fossil fuels in the sun's core
- b. Strong magnetic fields around the sun
- c. The fusion of hydrogen into helium
- d. The gravitational pull between the Earth and the sun

11. The strength of the gravitational force between two masses is proportional to the masses and weakens with increasing distance between the masses. Which has a stronger effect on the Earth's tides based on this principle?

- a. The moon, because the moon has more mass than the sun
- b. The moon, because the moon is very close to Earth compared to the sun
- c. The sun, because it has more mass than the moon
- d. The sun, because it is closer to Earth

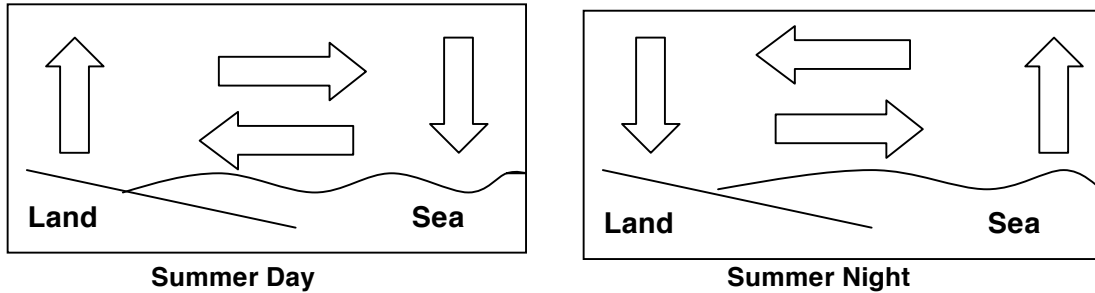
12. Which atom must be present in a living cell? This atom can bond to one another in chains and rings to form large and complex molecules.

- a. Carbon
- b. Hydrogen
- c. Oxygen
- d. Nitrogen

13. Marine archeologists discovered a shipwreck in the Bahamas. Using sonar, they sent a sound wave signal to the ocean floor. The total time it took for the signal to reach the bottom, reflect, and return to the ship was 0.5 seconds. The speed of sound in water is about 1,460 meters per second in average seawater. How deep is the shipwreck?

- a. 365 meters
- b. 730 meters
- c. 1,460 meters
- d. 2,920 meters

14. The direction of wind shown in these diagrams is probably due to air moving from areas of \_\_\_\_\_.



- a. High air pressure to areas of low air pressure
- b. High air temperature to areas of low air temperature
- c. Low air pressure to areas of high air pressure
- d. Low air humidity to areas of high air humidity

15. A squid can move by jet propulsion by ejecting seawater through its siphon. A squid can change directions of movement by changing the direction of its siphon. Which one of Newton's Laws explains this adaptation for movement of squids and other cephalopods?

- a. First – (Inertia)
- b. Second – (Acceleration)
- c. Third – (Action/Reaction)

16. When electromagnetic energy travels from air into water, the waves are bent due to the density differences between the air and water. This bending is called \_\_\_\_\_.

- a. Reflection
- b. Refraction
- c. Scattering
- d. Absorption

17. The air temperatures on the Earth's surface change less during cloudy nights than during clear nights because water vapor absorbs \_\_\_\_\_.

- a. Gamma radiation
- b. Infrared radiation
- c. Visible light
- d. Ultraviolet light

18. What is the correct order of electromagnetic waves from longest wavelength to the shortest?

- a. Infrared (radiant heat), microwaves, radio, visible light, ultraviolet radiation, and X rays
- b. Radio, microwaves, infrared (radiant heat), visible light, ultraviolet radiation, X rays
- c. Visible light, ultraviolet radiation, X rays, radio, microwaves, and infrared (radiant heat)
- d. X rays, ultraviolet radiation, visible light, infrared (radiant heat), microwaves, and radio

## **Biological Oceanography Concepts**

19. In addition to sunlight, which substances are needed by the leaf to carry out the process of photosynthesis?

- a. water and carbon dioxide
- b. carbon dioxide and oxygen
- c. glucose and carbon dioxide
- d. glucose and oxygen

20. What substances do organisms need for respiration?

- a. water and carbon dioxide
- b. carbon dioxide and oxygen
- c. glucose and carbon dioxide
- d. glucose and oxygen

21. Phytoplankton (microscopic plant-like organisms) play an important role in balancing Earth's climate by \_\_\_\_\_.

- a. Absorbing ozone from the atmosphere
- b. Using carbon dioxide and producing oxygen
- c. Using nitrogen and producing carbon dioxide
- d. Using oxygen and producing carbon dioxide

22. Which is the correct order of the simplest to most complex?

- a. Cells, organs, organisms, tissues, communities, populations
- b. Cells, tissues, organs, organisms, communities, populations
- c. Cells, tissues, organs, organisms, populations, communities
- d. Tissues, cells, organs, organisms, populations, communities

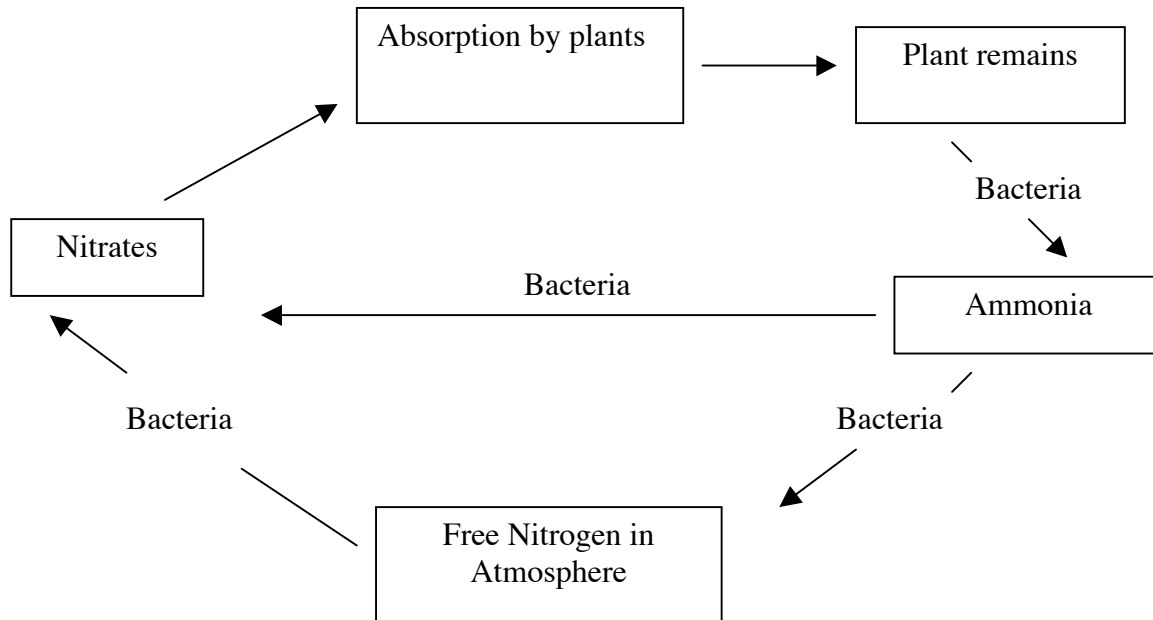
23. Which organelle in plants and certain algae converts sunlight into energy?

- a. Cell Wall
- b. Chloroplasts
- c. Mitochondria
- d. Nucleus

24. Which one of the following statements about DNA is false?

- a. DNA codes for the production of proteins.
- b. DNA is a nucleic acid that produces and stores energy in a cell.
- c. DNA transmits genetic information from one generation to the next.
- d. Genes are segments of DNA molecules.

25. Which information is best represented in the diagram?



- a. Decomposers release nutrients that are needed by other organisms.
- b. Predators and their prey are involved in many interactions.
- c. Respiration and photosynthesis are interrelated.
- d. Transpiration and condensation are interrelated.

26. Which areas of the oceans generally have the highest productivity (rate of biomass production)?

- a. The abyssal (deep sea) zone
- b. Stagnant (still) water
- c. Upwelling of cold, nutrient rich waters
- d. Warm water in tropical areas

27. Reef-building corals have a mutualistic relationship with zooxanthellae, which are unicellular algae within the tissues of corals. In this symbiotic relationship, corals provide carbon dioxide and waste products for the algae, and the algae provide an energy source for the corals. Because of this relationship, all of the following are conditions reef-building corals need EXCEPT \_\_\_\_\_.

- a. Abundant sunlight and clear water
- b. Average salinity seawater
- c. Moderately warm temperatures
- d. Nutrient-rich water

28. Which statement best explains why fewer organisms can be supported at the top trophic level of a biomass pyramid?

- a. More organisms die at higher levels than at lower levels, resulting in less mass at higher levels.
- b. When organisms die at higher levels, their remains sink to lower levels, increasing the mass at lower levels.
- c. Energy is lost to the environment at each level, so fewer organisms can be supported at higher levels.
- d. Organisms decay at each level, and thus less mass can be supported at succeeding higher levels.

29. Asexual reproduction leads to greater genetic diversity than sexual reproduction.

- a. True
- b. False
- c. There is no difference.

30. A shift from \_\_\_\_\_ to \_\_\_\_\_ was pivotal in the evolution of all vertebrates.

- a. The notochord; a backbone
- b. Filter feeding; jaws
- c. Gills; lungs
- d. All are correct.

31. All of the following characteristics distinguish chordates from invertebrates EXCEPT \_\_\_\_\_.

- a. A closed circulatory system
- b. A dorsal, hollow nerve cord
- c. A notochord
- d. Pharyngeal gill slits

32. The base of food webs in the hydrothermal vent communities are \_\_\_\_\_.

- a. Chemosynthetic bacteria
- b. Chemosynthetic crustaceans
- c. Giant tube worms
- d. Photosynthesizing phytoplankton

33. What theory provides a scientific explanation for the history of life on earth and the similarities between existing organisms?

- a. Chaos Theory
- b. Theory of Natural Selection
- c. Theory of Plate Tectonics
- d. The Big Bang Theory

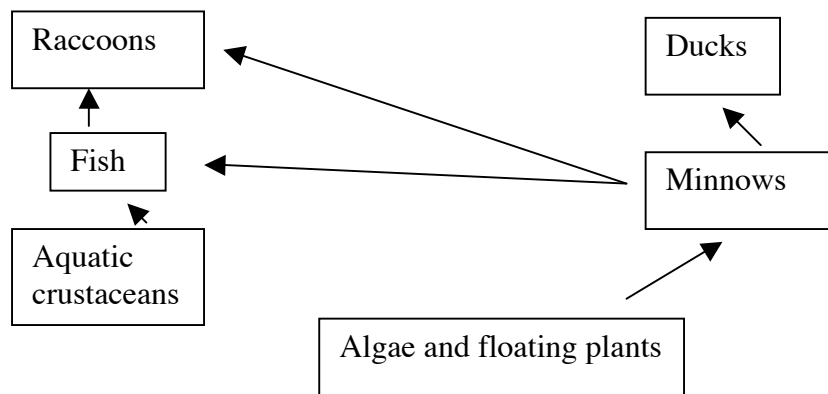
34. Two of the most important residents of the kelp community off of the west coast of the United States are sea urchins and sea otters. The kelp forest declined in the early part of the century due to hunting of the sea otters. Today sea otters are protected and their populations are increasing.

What effect would this protection of sea otters have on this food chain:

**Kelp -> Sea Urchins -> Sea Otters?**

- a. The sea urchin population would decrease and the kelp would increase.
- b. The sea urchin population would increase and kelp would decrease.
- c. The sea urchin population would decrease and the kelp would decrease.
- d. The sea urchin population and kelp would not be affected.

35. Which list of organisms represents the chronological order of appearance on Earth?
- Dinosaurs, simple (one-celled) organisms, plants, mammals, humans
  - Humans, dinosaurs, mammals, fish, simple (one-celled) organisms, plants
  - Plants, simple (one-celled) organisms, fish, dinosaurs, mammals, humans
  - Simple (one-celled) organisms, plants, fish, dinosaurs, mammals, humans
36. Which of the following groups of organisms would be more closely related?
- Fish, jellyfish, starfish, crayfish
  - Spider, crab, insect, mouse
  - Human, cat, dog, manatee
  - Alligator, shark, bony fish, pelican
37. In the current system for classifying organisms, biologists consider which characteristic to be the LEAST important?
- Behavior
  - DNA sequences
  - External structures
  - Internal structures
38. What is biodiversity?
- The number of species in an ecosystem
  - The number of individual organisms in an ecosystem
  - The amount of evolutionary change an organism goes through during its lifetime
  - The number of populations in a community
39. Darwin's studies of finches on the Galapagos Islands suggest that the finches' differences in beak structure were most directly due to \_\_\_\_\_.
- Acquired characteristics in the parent finches
  - Adaptations of the finches to different environments
  - Mating behaviors of the different finch species
  - The size of the island where the finches live
40. Which statement best describes some organisms in the food web shown below?



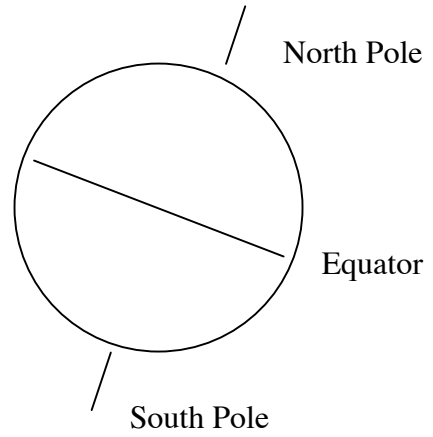
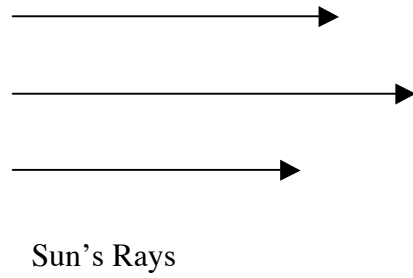
- Minnows and fish are primary consumers.
- Algae and floating plants are decomposers.
- Aquatic crustaceans are omnivores.
- Raccoon, fish, and ducks are secondary consumers.

## Geological Oceanography Concepts

41. Approximately, what percentage of Earth is covered by water?
- 50%
  - 70%
  - 80%
  - 90%
42. All of the following are evidence of the past existence of a supercontinent, known as Pangaea EXCEPT \_\_\_\_\_.
- Drawings found in caves by ancient man
  - Glacial deposits in tropical areas
  - Identical fossils on widely separated landmasses
  - The matching patterns of magnetism on each side of the midocean ridge
43. The theory of continental drift was widely criticized in the first half of the twentieth century. What later evidence discovered using new technologies after World War II supported Wegener's original theory of continental drift?
- Hot spot volcanoes
  - Hydrothermal vents
  - Patterns of magnetism in the ocean's crust
  - Upwelling along coasts of continents
44. Carbon is cycled through which of the following?
- Limestone rocks
  - The atmosphere and oceans
  - All organisms
  - All are correct.
45. All of the following changes in the Earth's crust happen very slowly EXCEPT \_\_\_\_\_.
- Mountain building
  - Plate movements
  - Volcanic eruptions and earthquakes
  - Weathering and erosion
46. Surface water runoff is most likely to be greatest when rainfall lands on a surface that is \_\_\_\_\_.
- Sandy and flat
  - Sandy and gently sloping
  - Concrete and flat
  - Concrete and gently sloping
47. What is the estimated age of Earth?
- 4600 years old
  - 46 million years old
  - 4.6 billion years old
  - 10 billion years old

48. Where do the vast majority of earthquakes occur?
- a. Around hot spots
  - b. Evenly distributed around the globe.
  - c. In the middle of crustal plates
  - d. Near the edges of plates
49. Which basic rock type may contain fossils and is most easily eroded by waves?
- a. Basaltic igneous rocks
  - b. Granitic igneous rocks
  - c. Metamorphic rocks
  - d. Sedimentary rocks
50. The Moon's cycle of phases can be observed from Earth because the Moon \_\_\_\_\_.
- a. Is closer to the sun
  - b. Is tilted on its axis
  - c. Rotates on its axis
  - d. Revolves around Earth
51. Today's sea level is \_\_\_\_\_ than sea level during a glacial period (Ice Ages).
- a. Higher
  - b. Lower
  - c. The same
52. The hottest climates on Earth are located near the Equator because this region \_\_\_\_\_.
- a. Is usually closest to the Sun
  - b. Reflects the greatest amount of incoming solar radiation
  - c. Receives the most hours of daylight
  - d. Receives the most nearly perpendicular incoming solar radiation
53. The changing seasons on Earth are caused by \_\_\_\_\_.
- a. The tilt of the Earth's spin axis as it orbits the sun
  - b. The unequal distribution of land and water on Earth
  - c. Variations in the amount of energy released by the sun
  - d. Variations in the distance of the Earth to the sun
54. The energy from the sun does all of the following EXCEPT \_\_\_\_\_.
- a. Provides a source of energy for the Earth's water cycle
  - b. Drives convection currents in the atmosphere and oceans
  - c. Provides a source of energy for photosynthesis
  - d. Provides a source of heat for the Earth's interior

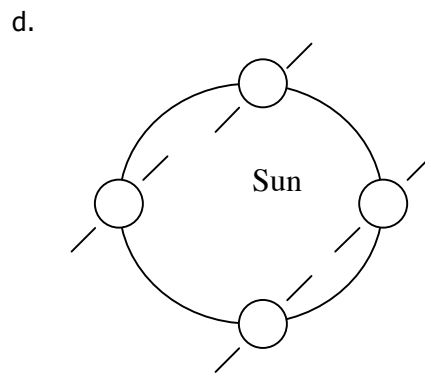
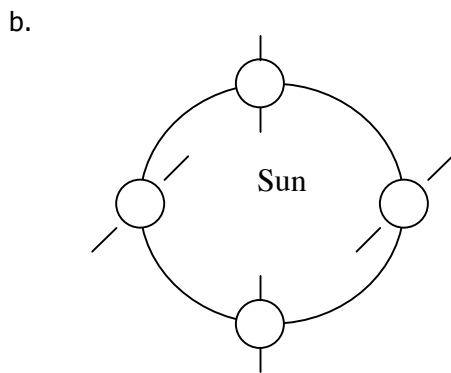
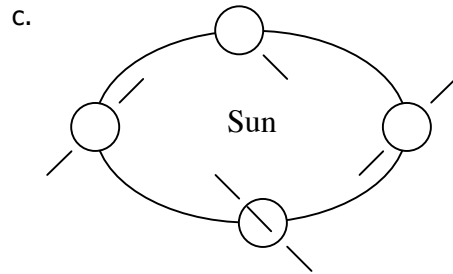
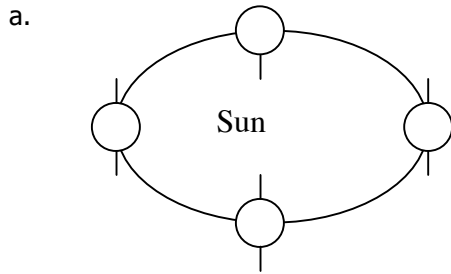
55. The diagram shows the Earth as viewed from space.



Based on the diagram, which hemisphere would be having summer?

- a. Eastern
- b. Western
- c. Northern
- d. Southern

56. Which of the following diagrams best explains the cause of the seasons.



57. Recent studies of gases in the atmosphere show that the amount of carbon dioxide has increased steadily over the past hundred years. All of the following release carbon dioxide into the atmosphere EXCEPT \_\_\_\_\_.

- a. Decomposition (decay) of organic matter
- b. Burning of fossil fuels and forest fires
- c. Photosynthesis by green plants on land and algae in water
- d. Respiration by plants and animals

58. El Niño can be described by a system of oceanic and atmospheric events resulting in a \_\_\_\_\_.

- a. Current that flows along the East Coast of the United States
- b. Tropical wave in the Pacific Ocean that is particularly destructive
- c. Upwelling of nutrient rich water off the coast of Peru
- d. Warm current that periodically flows eastward across the Pacific Ocean

59. Top predators in food chains are most severely affected by pesticides because

- a. Their systems are especially sensitive to chemicals
- b. The pesticides become concentrated in their prey
- c. Of their rapid reproductive rates
- d. They are directly exposed to pesticides in air

60. All of the following are scientific topics important for oceanographic research in the next century, EXCEPT

- a. Management of living and nonliving resources
- b. Biomedical uses of marine organisms
- c. The relationship between ocean circulation and climate change
- d. Mapping the Gulf Stream to speed shipping between the US and Europe