Marine Biology

Worksheet II: Selected Answers

Invertebrates and Algae
Chapter 4:  Taxonomy Section at End

1. What are some differences between Kingdom(Domain) Bacteria and Kingdom (Domain) Archaea?

   Prokaryotic bacteria were separated into these two Kingdoms (Domains) recently when new techniques to analyze DNA showed that there were two groups of prokaryotic bacteria that differed significantly in their genetic composition.

   Kingdom (Domain) Archaea were originally thought to be extremophiles - lovers of extreme environments such as hot springs and hydrothermal vents. However, new sampling techniques have shown Archaea to be very common in the marine environment.

   Kingdom (Domain) Bacteria includes common bacteria including species that cause strep throat and staph infections.

2. Plant and animals are in Domain Eukarya. How do the cells of plants and animals differ from the cells of organisms in Domain Bacteria and Domain Archaea?

   The cells of organisms in Domain Eukarya have a membrane bound nucleus and have membrane bound cellular organelles.

   Organisms in Domain Bacteria and Domain Archaea are prokaryotic. That means that their cells lack a nucleus.

3. Define the term “Biological Species”. What are some of the problems with this species definition?

   If two organisms belong to the same species they must be able to interbreed and produce fertile offspring.

   This definition is not useful if one is studying single celled organisms that reproduce asexually by simple cell division.

   This definition is not useful if one is a palaeontologist that studies fossils.

4. List the 7 taxonomic ranks form in order stating with Kingdom and ending with species.

   Kingdom  P_________  C________  O________  F_________  G________  Species
Chapter 5: The Microbial World

5. Define the term detritus:

6. What role do decay bacteria play in marine ecosystems?

7. Can cyanobacteria be considered primary producers? Explain.

8. What are stromatolites?

9. Photosynthetic bacteria use light as an energy source. What do chemosynthetic bacteria use as an energy source?

10. What is meant by the term “nitrogen fixation”? Give an example of a group of organisms that are capable of fixing nitrogen.

11. Describe the difference between the terms plankton and nekton. (See glossary in text)

| Plankton | Nekton |

12. Describe the difference between the terms phytoplankton and zooplankton. (See glossary in text)

| Phytoplankton | Zooplankton |
13. Diatoms and Dinoflagellates belong to Kingdom ____________________. Describe at least two differences between diatoms and dinoflagellates.

<table>
<thead>
<tr>
<th>Diatoms</th>
<th>Dinoflagellates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica or glass shell</td>
<td>Outer covering is cellulose</td>
</tr>
<tr>
<td>Maintains position close to</td>
<td>Maintains position close to</td>
</tr>
<tr>
<td>surface with an oil filled</td>
<td>surface with flagella</td>
</tr>
<tr>
<td>vacuole.</td>
<td></td>
</tr>
</tbody>
</table>

Both organisms are found in surface waters since they need light for photosynthesis
Both organisms are components of phytoplankton

14. Foraminiferans and Radiolarians are in Kingdom ____________________. Describe at least two differences between foraminiferans and radiolarians.

<table>
<thead>
<tr>
<th>Foraminiferans</th>
<th>Radiolarians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell is composed of limestone (Calcium carbonate)</td>
<td>Shell is composed of silica dioxide (glass)</td>
</tr>
<tr>
<td>Most species of foraminiferans live on the bottom</td>
<td>Radiolarians are planktonic</td>
</tr>
</tbody>
</table>

15. What does the term *bioluminescence* mean? Give an example of an organism that is bioluminescent.

16. What are red tides?
Massive blooms of phytoplankton. The organisms that cause red tides include dinoflagellates. Since only about half the organisms that are known to cause red tides are dinoflagellates a better name for red tides is *Harmful Algal Blooms (HAB’s)*.

17. What are zooxanthellae and why are they important to coral reefs?
Zooxanthellae are dinoflagellates (phytoplankton) that live inside the tissues of corals in a symbiotic relationship known as mutualism. This is a relationship where both organisms benefit by living together. The coral is a carnivore that grows in nutrient poor waters. Nitrogen is a major limiting factor for phytoplankton growth in nutrient poor waters. The coral supplies the dinoflagellate with nitrogenous waste products from protein metabolism. *(Remember carnivores eat meat which is protein).* The dinoflagellate (zooxanthellae) are capable of photosynthesis and feed the coral glucose which enables it to grow faster than would be possible without the zooxanthellae.

Corals expel their zooxanthellae when they are stressed. This phenomenon is called coral bleaching.
25. Discuss the **functions** of each of the following cell types or structures in Porifera

A. **Collar cells or choanocytes**
   These are the filter feeding cells of a sponge.

B. **Osculum**
   The opening through which water exits the sponge

C. **Ostium**
   The opening through which water enters the sponge

D. **Spongin**
   The protein fibers that make up the skeleton of a bath sponge

E. **Spicules**
   The structures that make up the skeleton of most sponges. They may be composed of calcium carbonate (limestone) or silica dioxide (glass)

F. **Pinacocytes**
   The thin flat cells that cover the surface of a sponge
26. Sponges belong to Kingdom___________ Phylum___________

27. Identify A through G on the diagram below:

A. Osculum
B. Pinacocytes
C. Spongocoel
D. Ostium
E. Spicule
F. Choanocyte
G. Porifera
28. List 4 characteristics of Phylum Cnidaria.

A. Have specialized stinging cells called cnidocytes that house a harpoon-like apparatus called a nematocyst

B. They are diploblastic which means they have two embryonic tissue layers. The Ectoderm, which develops into the epidermis and the endoderm which develops into the gastrodermis.

C. The have an incomplete digestive tract. Food enters the mouth and “poop” exits the mouth.

D. Most cnidarians are dimorphic. This means that they have two body forms in their life history; a planktonic medusa stage and a sessile polyp stage.

29. Discuss the relationship between cnidocytes and nematocysts.

30. Describe the difference between the terms Filter Feeder and Deposit Feeder.

<table>
<thead>
<tr>
<th>Filter Feeder</th>
<th>Deposit Feeder</th>
</tr>
</thead>
</table>

31. Give an example of an organism with:

A. Radial Symmetry

B. Bilateral Symmetry

32. Give two examples of Siphonophores. What class in Phylum Cnidaria do Siphonophores belong to?

A siphonophore is a colony of polyps. This means that a number of polyp individuals live together and function as one organism. The Portuguese man-of-war (*Physalia*) and the by-the-wind sailor (*Vellela*) are both examples of siphonophores.

33. Give an example of an organism in Class Scyphozoa. How do organisms in Class Scyphozoa differ from organisms in Class Anthozoa?
34. Name two types of organisms in Phylum Cnidaria Class Anthozoa.

35. What are the three classes in Phylum Cnidaria? How are these classes distinguished from each other?

<table>
<thead>
<tr>
<th>Class Hydrozoa</th>
<th>Class Scyphozoa</th>
<th>Class Anthozoa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyp stage emphasized</td>
<td>Medusa stage emphasized</td>
<td>Polyp stage only</td>
</tr>
<tr>
<td>Medusa reduced</td>
<td>Polyp stage reduced</td>
<td>No medusa stage</td>
</tr>
<tr>
<td>Siphonophores</td>
<td>The moon jelly</td>
<td>Corals and sea anemones</td>
</tr>
<tr>
<td>Gonionemus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obelia</td>
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</tbody>
</table>

36. What is the difference between A and B on the diagram below.

- A. Cnidocyte with discharged nematocyst
- B. Cnidocyte with undischarged nematocyst
- C. The cells represented by drawing A and B are called?

   Cnidocytes

38. The simplest animals that have bilateral symmetry belong to Phylum Platyhelminthes

39. Organisms the swim using 8 rows of ciliary combs belong to Phylum Ctenophora

40. The segmented worms belong to Phylum Annelida

41. Almost all marine annelids belong to Class Polychaeta

42. The group of marine worms that lacks a body cavity belongs to Phylum Platyhelminthes

43. Describe the difference between the terms Diploblastic and Triploblastic.

<table>
<thead>
<tr>
<th>Diploblastic</th>
<th>Triploblastic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two embryonic tissues layers</td>
<td>Three embryonic tissue layers</td>
</tr>
<tr>
<td>Ectoderm</td>
<td>Ectoderm</td>
</tr>
<tr>
<td>Endoderm</td>
<td>Endoderm</td>
</tr>
<tr>
<td>Mesoderm - between the ectoderm and endoderm</td>
<td></td>
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</tbody>
</table>


44. What is the only group of organisms within Phylum Mollusca that has a closed circulatory system? Why is a closed circulatory system as well as well developed sense organs necessary in this group?

Class Cephalopoda. This class includes the squid, octopus, nautilus, and the cuttlefish. The organisms in this class are predators. To be a good predator you need to be able to find your prey and catch you prey. Cephalopods have a well developed nervous system that allows them to see well, move fast, and have fine tuned muscular movement. They also have a closed circulatory system. This means that their blood is enclosed in blood vessels which enables them to transport blood quickly and efficiently to their muscles.

Remember that blood carries oxygen and the mitochondria in muscle cells needs oxygen to make ATP. ATP fuels muscle contraction. Thus a closed circulatory system enables them to move fast.