E.gorgonis’ Water Quality Test

Format:
10 stations, 12 questions per station, each station is 3 minutes long
MS = multiple select
Station 1

Match the ocean zone with the description

<table>
<thead>
<tr>
<th>1. infralittoral</th>
<th>a. Covers 60% of the earth's surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. mesopelagic</td>
<td>b. Maximum pressure of 680 kg per square cm</td>
</tr>
<tr>
<td>3. bathyalpelagic</td>
<td>c. Algae dominated</td>
</tr>
<tr>
<td>4. abyssal</td>
<td>d. Houses the thermocline</td>
</tr>
</tbody>
</table>

5.

6. Label the 3 clines of the ocean
   a. 
   b. 
   c. 

7. Based on the graph, guess the latitude
   a. 60-80°N
   b. 30-60° S
8. Based on the graph, what is the season?
   a. Spring
   b. Summer
   c. Fall
   d. Winter

9. The behavior of Foraminifera changes due to the seasonal change of this region, during this season, which change occurs?
   A. Switch from heterotrophic to phototrophic
   B. Expulsion of algal symbionts
   C. Abandonment of DVM motion
   D. Increased turnover rate

10. Draw the halocline of the ocean in the doldrums

11. Name the minimum ocean temperature of the area in question 6

12. Oceans in the trade winds are subject to what type of mixing?
   a. Thermal inversion
   b. Cabbeling
   c. Kelvin–Helmholtz instability
   d. Salt fingering
1. Label the landform features shown on the map (c shows the pointy thing):
   a.
   b.
   c.

2. What type of plate boundary is this depicting?

3. The magma forming feature C is likely to be oxidized or reduced?

4. Name the likely incline of the slope of landform a
   a. 10°
   b. 20°
   c. 30°
   d. 40°

5. Had coral kept a similar pace of growth on feature A, what type of reef would be formed?

6. Please draw a diagram of such a reef. Include igneous rock, coral debris, back reef, shore, cay, freshwater lens, lagoon, reef crest and fore reef.
7. What is the point at which CaCO$_3$ accretion is unable to keep up with rising sea level?

8. In which of these locations does upwelling NOT occur?
   a. ITCZ
   b. Luderitz
   c. Areas with Anti cyclonic winds
   d. Northern California
   e. Antarctica

9. Name whether Thermal or Haline forcing is dominant in this region of the ocean
   a. South Equator
   b. Norwegian sea
   c. Indonesian archipelago

10. Label these waters from most dense to least dense: NADW, AAIW, SAMW, AABW

11. Draw a diagram of the formation of AABW. Include: Latent heat polynya, brine rejection, Katabatic wind, Continental shelf and ocean ridge
12. Label these ocean currents

a.
b.
c.
d.
1. Observe a section of the abyssal plain. Here you can see a cusk eel (a), an abyssal sponge (c), and a marine isopod (b) and a Xenophyophore (d). Label each as demersal, infaunal, mobile epifaunal and fixed epifaunal:
   a. 
   b. 
   c. 
   d. 

2. Name 3 adaptations organisms use to adapt to the above ecosystem
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________

3. Benthos in the deep sea can be split into 3 levels based on size. Firstly, microfauna are defined as being able to pass through a __________ sieve. Meiofauna can pass through a mm __________ sieve but NOT a __________ sieve. Macrofauna are retained by a __________ sieve.

4. Order the steps of deep sea reef formation according to the hydraulic theory
| 1st | a. Tube worm dominated community with $\text{H}_2\text{S}$ symbionts and formation of Ikaite deposits |
| 2nd | b. Cold seep begins activity |
| 3rd | c. Mussel dominated community with $\text{CH}_4$ symbionts |
| 4th | d. Lophelia dominated communities dependent on seasonal algal blooms and die offs |

5. Please label the nematocyst
   a. __________________________
   b. __________________________
   c. __________________________
   d. __________________________
   e. __________________________

6. Name the size ranges of:
   Picoplankton
7. The concentration algae found in Chart A is typical of which areas of the ocean?
   a. Southern Ocean
   b. ITCZ
   c. South Atlantic gyre
   d. Persian gulf

8. The concentration algae found in Chart B is typical of which area of the ocean (MS)?
   a. Southern Ocean
   b. ITCZ
   c. South Atlantic gyre
   d. Persian gulf

9. Describe the effects of coccolithophorids (a type of phytoplankton) on the global sulfur cycle and the reduction of global warming.

10. The crest of a wave is 226 ft away from the shore. The crest of the next wave is 214 ft away from the shore.
a. For the wave to be considered a deep water wave, the sea would have to be deeper than __________ feet?

b. For the wave to be considered a shallow water wave, the sea would have to be shallower than __________ feet?

Suppose a food chain with 5 levels. The bottom level, the picoplankton, are preyed upon by protozoans which are in turn preyed on by rotifers which are preyed upon by krill which are preyed upon by baleen whales. In this plot of ocean, picoplankton produce $1.7 \times 10^9$ kcals of energy. The protozoan in turn produce $1.43 \times 10^8$ kcal of energy.

11. Calculate the TLTE between the protozoans and picoplankton

12. Let’s say that a whale requires $1.23 \times 10^2$ kcal to survive. If the TLTE for all the other transfers is 10%, and the MVP for the whales is 2300 individuals, are the whales in danger of extinction?
1. Order the steps for sludge digestion: dewatering, methanogenesis, acetogenesis, acidogenesis, hydrolysis

2. The drying of sludge through evapotranspiration is accomplished by which plants in Europe?
   a. Typha
   b. Pragmites
   c. Carex
   d. Juncus

3. When Nitrogen is removed in the process of air stripping, _______ is converted to _______ by raising the Ph of the water to ________

4. For reverse osmosis, pores of _______ size are used
   a. 1µm
   b. .00001 cm
   c. 10 nm
   d. .0001 µm

5. How much fresh water can be extracted by a Multi Stage Flash Distillation plant?
   a. 10%
   b. 15%
   c. 20%
   d. 50%

6. What is the MCL for Bromate?
   a. 1 mg/L
   b. 0.1 mg/L
   c. 0.01 mg/L
   d. 0.001 mg/L

7. Order the steps of salt panne formation:
   a. Death of marsh vegetation
   b. Water retention in depression
   c. Establishments of halophytes
   d. Solute concentration due to evaporation
   e. Formation of a slight depression

8. Red mangroves grow on the _______ side of a mangrove swamp and are salt ________, while white mangroves grown on the _______ side of a mangrove swamp and are salt ________
   a. Seaward, Extruder, landward, Excluder
   b. Landward, extruder, Seaward, Excluder
   c. Landward, excluder, Seaward, Extruder
   d. Seaward, Excluder, landward, Extruder
9. The above diagram represents a/an _________ estuary, where ____________ exceeds __________, forming very saline water.

10. Match each season to a development in a kelp forest

<table>
<thead>
<tr>
<th>Season</th>
<th>Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>spring</td>
<td>a. Upwelling stops, kelp weakens</td>
</tr>
<tr>
<td>summer</td>
<td>b. Strong waves prune and reduce canopy</td>
</tr>
<tr>
<td>fall</td>
<td>c. Red algal growth spurt, kelp sporophyte germination and propagation</td>
</tr>
<tr>
<td>winter</td>
<td>d. Canopy establishment and shading, growth slows due to phytoplankton bloom</td>
</tr>
</tbody>
</table>

11. Order the layers of kelp from deepest to shallowest: canopy kelp, benthic assemblage, prostate kelp, coralline algae, stimulate kelp

___________________________________________________________________________________________

___________________________________________________________________________________________

12. To keep the highest ratio of the most effective form of chloramine, aka ____________, a pH of _____ should be kept
   a. NH₂Cl₂, 6
   b. NHCl₂, 7
   c. NH₂Cl, 7
   d. NHCl₂, 6
1. Identify this organism

2. The size of this species territory is approximately
   a. 100 cm$^2$
   b. 1000 cm$^2$
   c. 10000 cm$^2$
   d. 100000 cm$^2$

3. T/F the larvae are teleplanic

4. How often do they molt?

5. Identify this organism
6. T/F mature fish are apex predators
7. T/F the species is protandrous
8. When a fish of this species wants to become lighter, they will _____________ their chromatophores.
   a. Destroy
   b. Contract
   c. Expand
   d. recolor

9. The above picture depicts the _____________ in the ___________ planktonic form.
10. T/F this species uses glycosidases to digest asterosaponins, allowing it to prey on echinoderms.
11. T/F this species larvae are directly released by the female into the water column
12. The pH of this species saliva is:
1. What is this species?, please also name the life stage

___________________________________________________________________________________________________

2. T/F These organisms are indicators of excessive nutrients
3. The channels leading through the body of the organism are called what?

___________________________________________________________________________________________________

4. Rank the body plans of the organism above from the lowest surface area to volume ratio to the highest: syconoid, asconoid, leuconoid

5. Identify this organism

___________________________________________________________________________________________________
6. Observe the above transect, assume each block is equal. the height of the green stuff is .8 meters. Calculate the FMI.

7. According to the above picture, did the reef you sampled meet the target? Did it meet the benchmark or is it a red flag?

8. Name 3 detrimental effects the organism mentioned in question 5 has on a coral ecosystem
Your data was mixed up. The diadema abundance of several sites was mixed up. Which of these measurements is likely to match the reef shown in #6? There may be multiple answers. NOTE: the transects below are 3 m long and 2 m wide.
1. ID this organism

2. T/F this fish is protogynous

3. T/F this species relies only on living reefs and is therefore an indicator of good quality

4. T/F this species is invasive in Florida and spreading rapidly

5. ID this organism

6. What type of mimicry does this species employ? Give a definition of that type of mimicry.

7. T/F this organism uses water to blow out burrowing prey

8. T/F this species “grunts” by inflating its swim bladders.
9. ID this organism

10. Circle the species that inhabit colonies of this species (MS)
    a. hydrozoa,
    b. Amphiprioninae
    c. bryozoa
    d. brittle stars

11. T/F this group is of interest to medicine because of the dipterpenes it produces

12. T/F this species forms tumors which contain dormant cysts in response to excess stress
Station 8

1. Please write out the Redfield Ratio and label each nutrient

2. Eutrophication of upstream rivers tends to decrease the availability of ________
   a. N
   b. P
   c. Fe
   d. Si

3. Warmer temperatures, decreased Si and increased CO₂ are likely to increase the dominance of what type of harmful algae?

4. How much of the nutrient load required by global NPP is supplied by upwelling?
   a. 5%
   b. 10%
   c. 15%
   d. 20%

5. T/F The Redfield ratio for C:P ratio increases with ocean depth

6. T/F The limiting nutrient for HNLC zones in the oceans in often N

7. T/F Bacteria in OMZs use Hydrazine oxidoreductase to reduce NO₂⁻ to NH₄⁺

8. Draw a nutrient profile describing the abundance of nutrient like N and P in relation to depth

Physo takes a 3 liter sample of seawater and splits it into 3 1 liter portions. He takes one sample and mixes it with Potassium persulfate and lets it sit out for an hour. Next, he takes the second sample and mixes it with sulfuric acid and heats it in an incubator for 30 minutes at 150 degrees celsius. Finally, he takes all 3 samples and adds ammonium molybdate, potassium antimonyl tartrate and finally ascorbic acid. The Potassium persulfate bottle shows 1 mg/L PO₄³⁻. The Sulfuric acid sample shows .5 mg/L PO₄³⁻. The final bottle shows .2 mg/L PO₄³⁻.

   a. Orthophosphate
   b. Condensed Phosphate
   c. Acid Hydrolyzable phosphate
   d. Organic phosphate
   e. Total phosphate concentrations

10. If the temperature of the ocean were to decrease, In which direction would the above equation shift?
11. If the pressure of the ocean were to decrease, in which direction would the above equation shift?

12. \( K_{sp} \) is 7.06, \([Ca^{2+}]\) is 1.79. What is the lowest concentration of \([CO_3^{2-}]\) for the water to be undersaturated?
Station 9
1. The Oxygen Minimum Zone is found in the _________ and _________ zones of the Ocean on the ________ coast of continents as Ekman transport upwells water and provides a constant influx of organic matter that decomposes and increases _______.
2. Hypoxic environments are defined as areas with ___ to ____ % saturation
3. A Diel cycling Hypoxia zone reaches its highest oxygen level during the
   a. Early morning
   b. Noon
   c. Late afternoon
   d. sunset
   e. midnight
4. Coral can no longer survive when the POH exceeds
   a. 6
   b. 6.4
   c. 6.8
   d. 7
5. According to the EPA, irritation due to Ph occurs as it drops below
   a. 5.5
   b. 5
   c. 4.5
   d. 4
6. 7.72% of the anions in the ocean are in the form of
   a. Cl⁻
   b. HCO₃⁻
   c. SO₄²⁻
   d. SO₃⁻
7. Name the 3 most common Cations in water
   ___________________________________________________________________________________
8. Most aquatic organisms are ________
   a. Poikilotherms
   b. homeotherm
   c. Stenotherms
   d. Eurytherms
9. Under a Ph of 6, _____________ is inhibited
   a. Denitrification
   b. Nitrification
   c. Ammonification
   d. Mineralization
10. The time it takes for rivers to discharge into the Ocean in Great Britain is usually how long?
    ___________________________________________________________________________________
Sally is measuring the CBOD5 of a sample of water. She takes 100 mL of seed water and places it in a 300 mL bottle. She measures the initial DO level at 8.2. When Sally comes back 5 days later she notices the DO is now 4.74.

11. Please find the BOD

12. Does this BOD match US EPA effluent standards?

13. Has Sally performed the test correctly? If not, specify why.
Station 10

1. According to the EPA, what is the maximum TDS concentration allowed for water to be classified as slightly saline?

___________________________________________________________________________________________

Paroman dredged 1 liter of seawater off the coast of Ecuador to his lab. He poured it through a 12g glass filter and let the filter dry. After it had totally dried, Paroman found that the filter weighed 12.051 grams.

2. Had Paroman been testing for TSS, what is the maximum size of the hole in his filter?

___________________________________________________________________________________________

3. Would the water that Paroman collected have likely been cloudy due to the TSS?

___________________________________________________________________________________________

Paroman heated his filter in an oven at 575 degrees celsius for 30 minutes. Afterwards he found it only weighed 12.012 grams.

4. What measurement was Paroman obtaining from his sample? Please give a full name and not an acronym. Please also provide the measurement in the correct units.

___________________________________________________________________________________________

5. Based on the facts you have heard, determine the likely cause for the TSS that Paroman obtained.

___________________________________________________________________________________________

6. Has Paroman followed procedure correctly? If not, specify what he did wrong

___________________________________________________________________________________________

___________________________________________________________________________________________

7. What instrument gave this reading?

___________________________________________________________________________________________

8. Using the instrument, give the specific density of seawater.

___________________________________________________________________________________________

9. Would this water be classified as Hyperhaline, Metahaline, Euhaline, Polyhaline, Mesohaline or Oligohaline?

___________________________________________________________________________________________

10. What bacteria are used as an indicator for fecal contamination of ocean water?

   a. E coli
   b. Streptococcus
   c. Mycobacterium
   d. enterococcus
11. Circle all the acceptable concentrations of mean -SEE ? 10- density allowed in beach water (geometric mean standard).
   a. 10 cfu/100mL
   b. 260cfu/L
   c. 3.5cfu/10mL
   d. 1400cfu/L
   e. 8cfu/100mL

12. Which Law sets national standards for recreational water testing and authorizes grants to pay for monitoring programs at state and federal levels?
   a. Water Quality Act of 1987
   b. Beaches Environmental Assessment and Coastal Health Act of 2000
   c. Resource Conservation and Recovery Act (RCRA) of 1976
   d. Federal Water Pollution Control Act of 1948