

**OCN 201 SPRING 2019 FINAL EXAM – GOETZE**

Name \_\_\_\_\_ ID# \_\_\_\_\_

Section \_\_\_\_\_

**OCN 201 Spring 2019 Final Exam (75 pts)**

**True or False (1 pt each). A = TRUE; B= FALSE**

1. Porifera (sponges) may have a skeleton that is calcareous, made of silica spicules, or made entirely of the protein collagen.
2. Lipids serve as important energy storage and structural molecules within cells.
3. In marine environments, the production from aquaculture now makes up ca 65% of the production from capture (wild caught) fisheries.
4. Eukaryotes appeared before prokaryotes in the history of life on Earth.
5. Transparency is a primary form of camouflage in the aphotic zone.
6. Missing links are important transitional fossils that document intermediate morphological states between ancestor and descendent groups.
7. Presence of a vertebral column is one defining characteristic of the phylum Chordata.
8. The compensation depth is the point at which the rates of coral growth and island subsidence are equal.
9. The 1% light level defines the base of the euphotic zone.
10. Barnacles are a good example of a mollusc that has a benthic adult stage and meroplanktonic larval stage.
11. The euphotic zone refers to the zone above the compensation depth.
12. Most primary production in the ocean is consumed by single-celled organisms.

**OCN 201 SPRING 2019 FINAL EXAM – GOETZE**

13. *Prochlorococcus* and *Synechococcus* are photoautotrophic bacteria.
14. Trophic cascades involve perturbations at multiple trophic levels in the food web.
15. Two of the three Domains of Life are Prokaryotes.
16. Coral bleaching occurs due to ocean acidification. The lower ocean pH bleaches out coral skeletons and makes them appear white.
17. The amoeboid protists all have calcium carbonate tests.
18. The lateral line system is an important sensory modality in cnidarians.
19. Most corals are broadcast spawners.
20. The ability to self replicate is one of the key defining features of life.

**Multiple Choice (1 pt each)**

21. In which part of the ocean is most of the biomass ?
  - A. aphotic zone
  - B. hadalpelagic
  - C. mesopelagic
  - D. epipelagic
  - E. bathypelagic
22. Using counterillumination, animals :
  - A. in the aphotic zone are trying to camouflage themselves from predators below.
  - B. Are using red bioluminescent searchlights to counteract the red-body camouflage that is common in deep sea animals.
  - C. Are producing bioluminescence along the ventral surface of the body to match the downwelling light from the surface ocean.
  - D. Are using bioluminescence as a decoy to startle and escape from predators.
  - E. Are using bioluminescence to communicate with and/or find potential mates.

**OCN 201 SPRING 2019 FINAL EXAM – GOETZE**

23. The seasonal cycle of primary productivity in subtropical/tropical ocean regions is:

- A. Persistently low production, limited by nutrients throughout the year.
- B. Persistently high production, fueled by continuous upwelling of nutrients.
- C. One strong summer bloom, with production light limited throughout much of the year.
- D. Both Fall and Spring blooms, with a transition from light limitation in wintertime to nutrient limitation during summertime. The blooms occur when both light and nutrients are available.
- E. One strong Fall bloom only, driven by the erosion of stratification in the water column during Fall, and the increasing availability of nutrients.

24. Of the groups below, which does not have any marine representatives:

- A. Sirenians
- B. Cephalochordates
- C. Reptiles
- D. Agnatha
- E. Amphibians

25. Which of the following is NOT true about abyssal plains:

- A. Low numbers of animals
- B. Seawater temperatures are cold
- C. Small areal proportion of the seafloor
- D. Food-limited habitat
- E. Scavenging and deposit feeding are common

26. What is a protist ?

- A. unicellular prokaryote
- B. heterotrophic animal
- C. single-celled eukaryote
- D. photoautotroph
- E. chemoautotroph

27. Autotrophs:

- A. Consume other organisms and/or detritus as their carbon source
- B. Can either fix carbon or consume other organisms as a carbon source

**OCN 201 SPRING 2019 FINAL EXAM – GOETZE**

- C. Always require light as an energy source
- D. Can use either chemical or light energy
- E. Do not occur in the deep sea

28. All of the following animals are in the Bilateria, except:

- A. Ctenophore
- B. Brittle star
- C. Polychaete
- D. Cephalopod
- E. Copepod

29. Pallium feeding enables:

- A. Mixotrophs to augment their nutrient uptake through heterotrophy.
- B. Heterotrophic protists to consume organisms larger than themselves.
- C. Cephalopods to reach prey hidden in cavities.
- D. Corals to survive bleaching events.
- E. Parasitic fish to suck blood and tissue from their hosts.

30. Zooxanthellae:

- A. fix carbon by chemosynthesis
- B. are symbionts of tubeworms at hydrothermal vents
- C. are symbionts of stony corals
- D. are typically passed by vertical transmission to offspring
- E. enable corals to secrete calcium carbonate

31. The fish species that supported the largest commercial fishery in the world changed between 2003-2012 and 2014. Currently, the top fishery targets a species that:

- A. is captured in the Humboldt Current
- B. is captured in the Bering Sea
- C. is captured in the longline fishery off Hawaii
- D. is likely to end up in fish meal
- E. is also raised in fish farms

32. Most of the primary production in the open ocean is conducted by:

- A. Picoeukaryotes
- B. Cyanobacteria

**OCN 201 SPRING 2019 FINAL EXAM – GOETZE**

- C. Sargassum
- D. Diatoms
- E. Dinoflagellates

33. At whale falls in the deep sea, the mobile scavenger phase:

- A. persists for several decades (up to ~100 years)
- B. removes the soft tissue from the carcass of the whale over time scales of months (to ~ 1.5 years)
- C. includes a variety of polychaetes, molluscs and crustaceans that occur in high abundance around the carcass due to enriched organic material in sediments
- D. is dominated by archaea and bacterial mats that may be chemosynthetic
- E. is dependent on the lipid contained within the bones of the whale skeleton

34. Plankton are defined by their:

- A. Diverse phylogenetic affinities.
- B. Small size.
- C. Weak swimming ability.
- D. Feeding mode.
- E. Carbon source.

35. The RNA World hypothesis:

- A. is not widely accepted
- B. states that most marine bacteria use RNA as an information storage molecule
- C. describes a community of micro-organisms present in the deep ocean that use RNA as an information storage molecule
- D. is based on the idea that RNA may have been the first self-replicating precursor to cellular life
- E. fails to take into account the self-replicating property of many proteins

36. Wild fish fishery catches (capture fisheries):

- A. Are increasing exponentially
- B. Are getting more efficient
- C. Have been declining for > 10 years (per capita)
- D. Are currently sustainable
- E. Are slowly increasing

**OCN 201 SPRING 2019 FINAL EXAM – GOETZE**

37. Hermatypic corals :

- A. Have symbiotic zooxanthellae
- B. Occur in the deep sea
- C. Are important reef building corals that secrete basal silica plates as they grow.
- D. Obtain most of their carbon from feeding on plankton.
- E. Are relatively unimportant to reef ecosystems.

38. What is a cephalochordate ?

- A. great white shark
- B. ascidian
- C. hagfish
- D. lancelet
- E. urochordate

39. The maximum sustainable yield is:

- A. The highest fish biomass that can be sustainably harvested from a fishery
- B. The highest profit (\$) that can be sustainably obtained from a fishery
- C. The highest fish biomass that can be obtained with little fishing effort
- D. A plan for the development of the most sustainable fisheries

40. Broadcast spawning in corals:

- A. Is common
- B. Occurs continuously during summer months
- C. Typically involves release of fertilized eggs
- D. Often limits the dispersal of larvae in ocean currents
- E. B & C

41. Under \_\_\_\_\_, individuals with favorable traits survive, reproduce, and contribute disproportionately to the next generation.

- A. heritability
- B. selection by genotype
- C. mutation
- D. selection by environment
- E. competition

42. The limiting nutrient is:

**OCN 201 SPRING 2019 FINAL EXAM – GOETZE**

- A. the nutrient that runs out first.
- B. typically phosphorous in marine systems.
- C. typically nitrogen in marine systems.
- D. A & B
- E. A & C

43. Phagocytosis is the process by which:

- A. Zooplankton consume phytoplankton
- B. Zooxanthellae interact with their coral hosts
- C. Protists typically ingest their prey
- D. Bacteria typically ingest their prey

44. Cnidarians:

- A. Use cnidocytes for prey capture or defense.
- B. Use colloblasts on their tentacles to capture prey.
- C. Are exclusively pelagic.
- D. Have many representatives that are nektonic.

45. The Miller-Urey Experiment:

- A. Replicated conditions on early Earth.
- B. Was important because it was the first demonstration of the origin of life from simple organic compounds
- C. Demonstrated the importance of oxygen in early Earth atmosphere to the origin of life by abiogenesis
- D. Was designed to test the hypothesis of panspermia

46. Which of the following feed on plankton:

- A. Whale shark
- B. Lamprey
- C. Manta ray
- D. Cookie cutter shark
- E. A & C

47. The Odontocetes:

- A. Include the beaked whales
- B. Include the baleen whales

**OCN 201 SPRING 2019 FINAL EXAM – GOETZE**

- C. Include the Sirenians
- D. Are only present in the northern hemisphere
- E. Characteristically have long, complex songs as their primary vocalization.

48. The Intergovernmental Panel on Climate Change (IPCC) is:

- A. An international scientific body whose purpose is to review and assess the relevant scientific, technical, socio-economic information relevant to climate change and make this information accessible to policy-makers.
- B. A UN-funded body that employs scientists to conduct studies on climate change
- C. A UN-coordinated international body consisting of government delegations that debate and prepare reports on climate change
- D. An international scientific body whose purpose is to conduct newly-funded research in climate science with a global focus.

49. In the past century, globally-average Earth surface temperature has increased:

- A. 0.01 °C
- B. 0.76 °C
- C. 3 °C
- D. 10 °C
- E. > 100 °C

50. Which group of marine vertebrates contains the largest number of species?

- A. Agnathans (jawless fishes)
- B. Cephalochordates (lancelets)
- C. Teleosts (bony fishes)
- D. Mammals
- E. Reptiles

51. The theory that describes the origin of eukaryotes as arising from the merger from multiple prokaryotic cell types is known as ?

- A. Phlogiston Theory
- B. Plastid Theory
- C. Unification theory
- D. Serial Endosymbiosis Theory
- E. Abiogenesis Theory

**OCN 201 SPRING 2019 FINAL EXAM – GOETZE**

52. In subtropical oceans, nutrient concentrations in the euphotic zone are low because:

- A. nutrients are broken down by sunlight in the upper ocean.
- B. nutrients are taken up by phytoplankton and used in the production of organic matter.
- C. upwelling moves nutrients into the deeper ocean, removing them from the euphotic zone.
- D. nutrients are negatively buoyant and sink into the midwater.
- E. microbes release nutrients as part of the remineralization process.

53. Stromatolites are important early fossils because they:

- A. Demonstrate that life evolved in the deep sea.
- B. Provide the first unambiguous evidence of prokaryotic life.
- C. were found in Australia, which was extremely cold in early Earth history.
- D. Typically contain organic compounds similar to those found in space (e.g., on meteorites).
- E. Provide the first evidence of eukaryotes.

54. Which of these organisms is not an mollusc ?

- A. squid
- B. octopus
- C. sea lilly
- D. oyster
- E. gastropod

55. Primary production is :

- A. Reported in units of  $g\ C\ m^{-2}$
- B. Primarily limited by nutrient and light availability in the ocean.
- C. A rate process (measured per unit time).
- D. The production of autotrophic biomass.
- E. B, C, & D.

**Short Answer (20 pts total):**

- (1) (5 pts) There is a relationship between organismal size and abundance in the ocean. (A) (2.5 pts) Order the organisms listed below from most abundant to least abundant and describe how their size changes across the ordered list. (B)

**OCN 201 SPRING 2019 FINAL EXAM – GOETZE**

(2.5 pts). Give 2 examples of the organisms in each of the 3 largest body size categories.

Nanoplankton

Viruses

Mesozooplankton

Picoplankton

Nekton

Bacteria

Microplankton

(2) (5 pts) The 'Deep Scattering Layer' refers to the aggregation of animals in the upper mesopelagic zone that reflect sound. (A) (2.5 pts) Why do many animals in this layer move to the surface at night? (B) (2.5 pts) And why do they return to deep water during the daytime?

(3) (5 pts) A. (3 pts) Draw a sketch that illustrates the mechanisms responsible for equatorial upwelling. B. (2 pts) Describe why these processes lead to high primary productivity in this ecosystem.

- (4) (5 pts) Define the Tragedy of the Commons, and explain how it leads to over-harvesting of fisheries resources. Describe one fisheries management approach that attempts to address the problem created by the Tragedy of the Commons in commercial fisheries.

**HAVE A GOOD SUMMER !**