

June Yin's Ocean Science Packet

basically if NOSB was pyramidal

1. Differences in this quantity are exploited by OTEC [OH-tek] to generate electricity. Profiles of this quantity are produced by ocean acoustic tomography [tuh-MAH-gruh-fee]. The depth range in which this quantity is mostly constant is called the (*) mixed layer. Deep-water circulation is driven by differences in salinity and this quantity. For 10 points, name this quantity that varies greatly with depth at the thermocline [THUR-moh-kline].
ANSWER: **temperature** [accept potential **temperature**; accept **thermal energy** or **heat** energy before “acoustic tomography”] <Physical>

1. [10] Most imitation crab is made from the meat of what species of “pollock” named for a U.S. state?
ANSWER: **Alaska** pollock [or **Alaskan** pollock; accept **walleye** pollock or **Norway** pollock or **Gadus chalcogrammus** or **Theragra chalcogramma**] <Biology>

2. These algae store energy using the polysaccharide laminarin. The food additive algin [AL-jin] is extracted from the cell walls of these algae. Gas-filled floats called pneumatocysts [noo-MAT-oh-sists] are present in some of these algae like (*) *Macrocystis* [macro-sis-tis] and *Sargassum*. The pigment fucoxanthin [fyoo-koh-ZAN-thin] gives these algae their characteristic color. For 10 points, name this class of algae that includes rockweeds and kelps.
ANSWER: **brown** algae [or **Phaeophyceae** or **Phaeophyta**; prompt on **kelps** or giant **kelps** before “kelps,” or **Macrocystis** before “*Macrocystis*”, by asking “what class of algae do they belong to?”] <Biology>

2. [10] Black smokers were first discovered along what mid-ocean ridge, which forms the western boundary of the Cocos and Nazca plates?
ANSWER: **East Pacific Rise** [or **EPR**] <Geology>

3. One type of this material dominates a strip along the equator due to equatorial upwelling. Another form of this material contains many coccoliths [COCK-uh-liths] and tests, and is only able to form above the CCD. By definition, this sediment is at least 30 percent (*) biogenous [bi-AH-jen-us] material. Sources of this sediment include radiolarians [radio-LAIR-ee-uns], diatoms [DYE-uh-tahms], and foraminifera [fur-AM-in-IF-uh-ruh]. For 10 points, name this gooey sediment with siliceous [sih-LIH-shuss] and calcareous [kal-KAIR-ee-us] types.
ANSWER: **ooze** [accept subtypes such as siliceous **ooze** or calcareous **ooze**] <Geology>

3. [10] Marine mammals tend to have large amounts of what protein in their muscles, which stores oxygen during long dives?
ANSWER: **myoglobin** [or **Mb**] <Biology>

4. Charles Perry developed a way to prevent this process using a copper sheath, which was employed by the Royal Navy until the advent of ironclads. This process can be countered by a slippery coating made of silicone, but that method is vulnerable to biofilms. Special (*) paints that contain biocides [bio-sides] prevent this process by killing its causative agents. For 10 points, name this process where marine organisms slow down ships by growing on their hulls.
ANSWER: (marine) **fouling** [rhymes with “howling”] [or marine **biofouling**; accept **antifouling** agents; prompt on answers indicating **unwanted growth** before “growing”] <Technology>

4. [10] What oceanographer and Confederate officer wrote *The Physical Geography of the Sea*, and was known as the “father of modern oceanography”?
ANSWER: Matthew Fontaine **Maury** [MOR-ee] <Social Science>

5. Transboundary stocks are fisheries spanning two or more of these regions. Out of all countries, France has the largest one of these regions. Countries have less jurisdiction in these regions than they do in their contiguous zones. Areas outside of these regions are defined as (*) international waters. These regions extend 200 nautical miles out from a country's coastline. For 10 points, name this "zone" of the ocean where a country has control over all natural resources.

ANSWER: **exclusive economic zone** or **EEZs** [or **maritime continental margins**; prompt on **territorial waters**; do NOT accept or prompt on "territorial sea(s)" or "contiguous zone(s)" or "continental shelf/ves"] <Social Science>

5. [10] A parasitic group of what animals grows root-like tendrils inside their crustacean hosts? Most of these animals filter-feed using feathery legs called cirri [SEAR-eye].

ANSWER: **barnacles** [or **Cirripedia**] <Biology>

6. A member of this taxonomic class, the giant triton, is being bred by Australia's government to control populations of crown-of-thorns starfish. Some species in this class perform photosynthesis using chloroplasts "stolen" from the algae they eat. Colorful members of this class known as (*) nudibranchs [NOO-dih-branks] unusually do not have a shell. Abalones, conchs [konks], and whelks belong to, for 10 points, what class of mollusks that includes snails and slugs?

ANSWER: **gastropods** or **Gastropoda** [prompt on **snails** or **slugs** by asking "what class do they belong to?"] <Biology>

6. [10] *Pencil and paper ready.* A shallow-water wave is traveling in water 40 meters deep. Assuming little g is 10 meters per second squared, what is the wave's velocity in meters per second?

ANSWER: **20 meters per second** ($v = \sqrt{(g * D)}$ for a shallow-water wave, so $\sqrt{(10 * 40)} = \sqrt{400} = 20.$) <Physical>

7. These ecosystems' relative stability may be explained by their association with gas hydrates. The Orca Basin belongs to a subtype of these ecosystems known as "brine pools." Slow-growing tube worms live in these ecosystems, which occur on the abyssal plain in places where (*) hydrocarbon-rich water leaks out of the seafloor. For 10 points, identify these deep-sea ecosystems named for having lower temperatures than hydrothermal vents.

ANSWER: **cold seeps** [or **cold seep** ecosystems; accept **oil seeps** or **petroleum seeps**; accept **hydrocarbon seeps** before "hydrocarbon"; accept **brine pools** before "brine"; prompt on **seeps**] <Chemistry>

7. [10] During mating, male sharks and rays inseminate females using what pair of structures that are extensions of the pelvic fins?

ANSWER: **claspers** <Biology>

8. After Albert Merz [mairts] died of pneumonia during this expedition, Georg Wüst [voost] took over as chief oceanographer. This expedition sailed over 67,000 miles as it zigzagged between Africa and South America, taking echo soundings along the way. This expedition found very low concentrations of (*) gold in seawater, discrediting Fritz Haber's proposal to pay off World War I reparations. For 10 points, name this expedition launched by Germany in 1925.

ANSWER: **Meteor** expedition [or **German Atlantic** expedition or **Deutsche Atlantik** expedition] <Social Science>

8. [10] What single-celled algae protect themselves with round, scale-like plates that can build up to form chalk?

ANSWER: **coccolithophores** [or **coccolithophorids**; prompt on **coccoliths**] <Biology>

9. Like the Pacific sleeper shark, the eyes of this species are often blinded by the parasitic copepod *O. elongata*. The 500-year lifespan of this fish is the longest of any vertebrate species. The meat of this fish contains toxic amounts of trimethylamine oxide and urea, which are removed through (*) fermentation to make the Icelandic food *hákarl*. For 10 points, name this large, deep-water shark species that lives in the Arctic.
ANSWER: **Greenland sharks** [or **gurry sharks** or **grey sharks** or **eqalussuaq** or **Somniosus microcephalus**; accept **Greenland** or **gurry** or **grey** after “shark”] <Biology>

9. [10] *Pencil and paper ready*. An ocean current has a flow rate of 12 sverdrups [SVAR-droops]. What is the equivalent flow rate in cubic meters per second?

ANSWER: **12 million** cubic meters per second (1 Sv = 10^6 m³/s, so 12 * 10^6 = 12 million.) <Physical>

10. High rates of this process lower the ocean’s magnesium-to-calcium ratio during periods of “calcite sea.” Vine, Matthews, and Morley believed that this process could be proven by finding parallel stripes of alternating (*) magnetic polarization. This mechanism proposed by Harry Hess explained the driving force behind Alfred Wegener’s theory of continental drift. For 10 points, name this process in which new oceanic crust is created at mid-ocean ridges.

ANSWER: **seafloor spreading** [accept answers indicating the **creation** of new **seafloor** before “created”; prompt on plate **tectonics** or plate **divergence** or **plate motion**] <Geology>

10. [10] What globe-spanning ocean surrounded the supercontinent Pangaea [pan-JEE-uh]?

ANSWER: **Panthalassa** [or **Panthalassic** or **Panthalassan** Ocean; prompt on **Paleo-Pacific** or **Proto-Pacific** Ocean] <Physical>

11. This is the third deepest-diving marine mammal behind the southern elephant seal and Cuvier’s [koo-vee-yay’s] beaked whale. Irritation from hard objects can induce the production of ambergris [amber-grease] in this animal’s intestines. This animal is the only natural predator of the (*) giant squid. A specialized organ filled with spermaceti is used by this animal to help with echolocation. For 10 points, name this largest species of toothed whale.

ANSWER: **sperm whale** [or **cachalot** or **Physeter macrocephalus**; accept **sperm** after “whale”] <Biology>

11. [10] What type of pelagic [puh-LAJ-ik] sediment in the deep sea results from slow deposition of wind-blown dust?

ANSWER: **red clay** [prompt on **clay** by itself] <Geology>

12. Instead of a swim bladder, these fish remain buoyant using a fat-filled vestigial lung. In 1938 Marjorie Courtenay-Latimer described the first living specimen of these fish. This oldest extant lineage of the clade Sarcopterygii [sar-kahp-TAIR-ih-jee] was once thought to have (*) gone extinct after the Cretaceous Period. Like lungfishes, these fish have lobed fins. For 10 points, name this order of fish often dubbed “living fossils.”

ANSWER: **coelacanth**s [SEE-luh-kanths] [or **Coelacanthiformes**; prompt on **lobe-finned** fishes before “lobed fins”; prompt on **Sarcopterygii** or **sarcopterygians** before “Sarcopterygii”] <Biology>

12. [10] A common way to quantify ocean acidification is to measure what mineral’s “saturation state” in seawater?

ANSWER: **aragonite** [accept **aragonite** saturation state; prompt on **calcium carbonate** or **CaCO₃²⁻**] <Chemical>

13. The Emperor group of these features is found north of a “kink” where a tectonic plate changed direction. Charles Darwin figured out that atolls are located on top of these features. Some of these features with flattened (*) tops due to wave erosion are known as guyots [gee-ohz]. Volcanic islands become these features once they subside below the surface. For 10 points, name these tall, underwater features that often occur in “chains.”
ANSWER: seamounts [accept seamount chains or tablemounts; prompt on (underwater) mounts or mountains or volcanoes] <Geology>

13. [10] Sound can travel long distances in the SOFAR channel due to what phenomenon, which directs sound waves back into the channel due to their higher speed outside of it?

ANSWER: refraction [accept answers indicating sound is refracted] <Physical>

14. Readings from this technology must account for DSLs, which consist of vertically migrating animals. The hardness and roughness of the seafloor can be measured by the “side-scan” form of this technology, while its “multibeam” form is used to profile seafloor (*) depth. Mid-ocean ridges and oceanic trenches were first discovered using, for 10 points, what technology that detects underwater features by reflecting sound waves?

ANSWER: active sonar [or sound navigation and ranging; accept side-scan sonar or multibeam sonar or echo sounders or echo sounding] <Technology>

14. [10] What objects typically have four alternating quadrants of black and white, with the depth at which they can no longer be seen being a measure of turbidity?

ANSWER: Secchi disks [SEH-kee disks] <Technology>

15. This element’s sulfides give black smokers their characteristic color; those sulfides’ surfaces might have catalyzed the beginning of life. This element and manganese are the two most common metals in polymetallic nodules. This element limits (*) phytoplankton growth in high nutrient, low chlorophyll zones, inspiring geoengineering proposals to seed the oceans with this element. For 10 points, name this metal found in magnetite and hematite.

ANSWER: iron [or Fe; accept iron sulfides or iron-sulfur world] <Chemistry>

15. [10] The RV *Atlantis* is the support ship of what manned submersible that, in 1977, made the first direct observation of hydrothermal vents?

ANSWER: *DSV Alvin* <Technology>

16. Alfred C. Redfield theorized that three values of this quantity have a roughly constant ratio throughout the oceans. Forchhammer’s principle holds that this quantity is the same across the oceans for conservative substances. Water is termed “euxinic” [yoo-SIN-ik] when this quantity is high for (*) hydrogen sulfide, and water is termed “hypoxic” if this quantity for oxygen falls below 2 or 3 of a certain unit. For 10 points, what quantity can be expressed in terms of molarity or milligrams per liter?

ANSWER: concentration [accept molarity before “(falls below) 2”; accept relative abundance or relative mass before “hydrogen”] <Chemistry>

16. [10] What Dutch thinker criticized Portugal’s monopoly on the spice trade in his book *Mare [MAR-ay] Liberum*, which introduced the concept of “freedom of the seas”?

ANSWER: Hugo Grotius [GROH-shee-us] [or Hugo de Groot or Huig de Groot] <Social Science>