

## CBGS ME II Pre-Test

*Multiple Choice: Place the letter corresponding to the best answer in each blank.*

- \_\_\_\_\_ 1. For a barrier island to migrate toward the mainland, sand must be transported from the ocean side to the sound side. Which of the following does not contribute to the movement of sand to the sound side?
- A. Overwash during storms
  - B. Migration of inlets north and south
  - C. Tidal deltas
  - D. Rip currents
- \_\_\_\_\_ 2. During which type of cellular division does much of the genotypic variation within a population arise?
- A. Mitosis
  - B. Meiosis
- \_\_\_\_\_ 3. The open ocean (the water column away from shorelines and seafloor) is the:
- A. Benthic Zone
  - B. Littoral Zone
  - C. Pelagic Zone
  - D. Twilight Zone
- \_\_\_\_\_ 4. Which of these reflects a pattern of Disruptive Selection?
- A. Venomous lionfish evolve ever longer, ever sharper spines.
  - B. Barnacles evolve both a conic and a bent morph, one better for feeding and the other better for defense against predatory snails.
  - C. Darwin's ground finches in the Galapagos evolve heavier beaks during a deadly drought.
  - D. Goldfish in a pond evolve a tail that is broad enough to propel them swiftly through the water, yet not so broad that it is too difficult to swing side-to-side
- \_\_\_\_\_ 5. True/False: If two wave trains of identical wavelength and frequency meet head on so that the crests of one align with the troughs of the other, they will cancel each other out (= "cancellation").
- A. True
  - B. False
- \_\_\_\_\_ 6. If graphical and statistical analysis of your data indicates that you should reject your null hypothesis, what does this say about the underlying Theory or Model?
- A. Supports it.
  - B. Discredits it.

- \_\_\_\_\_ 7. Brown pelicans have huge bills for scooping up fish. With bills open wide, they dive down onto schools of fish that swim near the surface, sometimes capturing more than one victim at a time. Pelicans evolved from ancient sea birds that lacked such huge bills. Why (probably) doesn't this line of birds possess small bills anymore?
- A. They no longer needed small bills
  - B. Small-billed birds kept mating with large-billed birds until no birds had small bills anymore
  - C. Those with slightly larger bills competed best for limited food and they alone lived long enough to breed
  - D. The genes for smaller bills were weeded out of the population because small bills were less attractive to potential mates than large bills
- \_\_\_\_\_ 8. The interaction between the sun and earth creates a pair of solar tidal bulges, one on the sunny side of the planet and the other on the dark side. Why is there a solar bulge on the dark side?
- A. Gravitational force ( $F_G$ ) exceeds centrifugal force ( $F_C$ )
  - B. Centrifugal force ( $F_C$ ) exceeds gravitational force ( $F_G$ )
  - C. Tide producing force (TPF) is greatest on the side furthest from the sun
  - D. Tide producing force (TPF) is greatest on the side nearest the sun
- \_\_\_\_\_ 9. Where, specifically, do sand bars form?
- A. Where turbulence from breaking waves churns sand off the bottom
  - B. Where backwash down the beach face meets incoming swash
  - C. Where high tide reaches its maximum elevation up the beach face
  - D. Where water under a trough retreats toward sea and loses energy
- \_\_\_\_\_ 10. Timothy is standing knee-deep near the river's edge, counting the number of small waves that pass him. Twenty wavelets pass his knees in one minute. Is this the wave train's frequency or its period?
- A. Frequency
  - B. Period
- \_\_\_\_\_ 11. Animals like fish, whales, and sea turtles that are strong enough to swim horizontally against ocean currents are:
- A. Benthos
  - B. Nekton
  - C. Zooplankton
  - D. Phytoplankton

*Questions 12 – 15 refer to the following scenario:*

The president of the Coalition to Rid Rap and Rock-n-Roll from Our Country's Kids (or CRRROCK) believes that prolonged exposure to heavy metal music causes nose warts. She has hired you to conduct scientific research to test her hypothesis that *if a person listens to loud heavy metal music for prolonged periods of time, he/she will be more prone to develop nose warts*. To test the validity of this hypothesis, you find 100 volunteers. For two months they all eat similar diets and use the same brands of facial tissues and soap. Fifty of these volunteers are not allowed to listen to any heavy metal for two months. The other fifty spend five hours daily wearing headphones with the volume turned up to 9 and playing Metallica, Alice in Chains, Korn, Tool, Filter, Soundgarden, White Zombie, and (of course) vintage Ozzy Osbourne. After two months, none of the volunteers shows any signs of developing nose warts.

- \_\_\_\_\_ 12. In the above example of scientific research, the development of nose warts is the:
- A. Control Group
  - B. Experimental Group
  - C. Independent Variable
  - D. Response Variable
- \_\_\_\_\_ 13. Which is a constant?
- A. Facial tissues
  - B. Alice in Chains
  - C. Nose warts
  - D. Headphones
- \_\_\_\_\_ 14. What's the control?
- A. Diet of the hundred volunteers
  - B. Two month duration of the study
  - C. Fifty volunteers listening to heavy metal
  - D. Fifty volunteers not listening to heavy metal
- \_\_\_\_\_ 15. Given the final results of the experiment, what should you conclude?
- A. Reject the actual (alternate) hypothesis
  - B. Reject the corresponding null hypothesis
  - C. Ozzy Osbourne has nose warts
  - D. Listening to Britney Spears causes inflamed hemorrhoids
- \_\_\_\_\_ 16. The primary flaw in Jean Lamarck's hypothesis of evolution was his idea that:

- A. The earth is millions of years old
  - B. Over many generations, numerous small changes in a species can add up to major evolutionary transformations
  - C. Through behavior, organisms can alter their traits or acquire new traits within their own lifetimes
  - D. Parents can pass such acquired or altered traits to their offspring
- \_\_\_\_\_ 17. In deep water ( $d > L/2$ ), as wave period increases, what also happens?
- A. Waves get shorter crest-to-crest and travel faster
  - B. Waves get longer crest-to-crest and travel faster
  - C. Waves get shorter crest-to-crest and travel slower
  - D. Waves get longer crest-to-crest and travel slower
- \_\_\_\_\_ 18. True/False: A single chromosome carries hundreds or thousands of individual genes.
- A. True
  - B. False
- \_\_\_\_\_ 19. Organisms which drift with the ocean's surface currents and are *heterotrophic* are:
- A. Benthos
  - B. Nekton
  - C. Zooplankton
  - D. Phytoplankton
- \_\_\_\_\_ 20. True/False: The highest high tides occur during a spring tide, and the lowest low tides occur during a neap tide.
- A. True
  - B. False
- \_\_\_\_\_ 21. Which is not one of the reasons for the existence of barrier islands along the southeast and mid-Atlantic coast?
- A. Falling sea level since the last ice age
  - B. Supply of sand from the continental shelf
  - C. A gently sloping coastal plain
  - D. Storm waves strong enough to redistribute sand
- \_\_\_\_\_ 22. Which of the following is not part of the modern idea of Evolution?
- A. Gene frequencies gradually change over time
  - B. Increasing adaptation to the prevailing environment
  - C. Organisms develop whatever traits they need to survive
  - D. All organisms on earth are akin, sharing a common ancestry
- \_\_\_\_\_ 23. Perhaps the most bizarre mechanism for generating genetic diversity within a population occurs when an individual's paternal and maternal

chromosomes exchange whole sections of DNA during sperm/egg production. Which of these makes this exchange possible?

- A. Random Mating
- B. Sexual Reproduction
- C. Mutation
- D. Independent Assortment
- E. Crossing Over

\_\_\_\_\_ 24. One trait of natural science is that it is strictly grounded in observation through the senses. Science restricts itself to the study of phenomena that are observable and testable. It does not ask questions about the purely conceptual or about the “supernatural.” In short, natural science is:

- A. Empirical
- B. Interpretative
- C. Subjective
- D. Methodical

\_\_\_\_\_ 25. In a wave train, the horizontal distance from one crest to the next crest is the:

- A. Celerity
- B. Wavelength
- C. Frequency
- D. Wave Height

\_\_\_\_\_ 26. Animals like oysters, coral, and barnacles that anchor themselves to some solid substrate and never move (or rarely move) are:

- A. Motile
- B. Nektonic
- C. Sessile
- D. Planktonic

\_\_\_\_\_ 27. When conducting a round of scientific research, which comes first?

- A. Interpretation
- B. Experiment
- C. Hypothesis
- D. Question

\_\_\_\_\_ 28. True/False: When turbulent water begins to lose energy, the smallest grains of sediment will settle out first.

- A. True
- B. False

\_\_\_\_\_ 29. Congress has decided to fund the construction of a series of tidal power stations along the east coast by carving out huge, dead-end canals (in effect, home-made estuaries), across each of which a dam will temporarily trap the

ebbing and flooding water in order to later release it to turn electricity-generating turbines. To maximize tidal range, each estuary should be built with a bottleneck shape and a natural resonant period of:

- A. 3 hours and 6 minutes
- B. 6 hours and 12 minutes
- C. 12 hours and 25 minutes
- D. 18 hours and 37 minutes

- \_\_\_\_\_ 30. The fossil record shows that modern day whales and dolphins evolved from four-legged, terrestrial carnivores that probably hunted fish in the shallows near the shoreline. Which type of evolution is this?
- A. Macroevolution
  - B. Microevolution
- \_\_\_\_\_ 31. Which of the following sounds more like Lamarck's hypothesis than Darwin's theory?
- A. Clams with stronger shells are more likely to survive
  - B. Flying fish evolved wings by stretching out their fins
  - C. In the open ocean, blue coloration is adaptive
  - D. Fewer slow squid will live to reproduce than fast squid
- \_\_\_\_\_ 32. In a wave train, the forward speed of the entire wave form is its:
- A. Frequency
  - B. Orbital velocity
  - C. Celerity
  - D. Period
- \_\_\_\_\_ 33. During a hurricane or Nor'easter, the local sea level may temporarily rise by as much as 20 feet. This is called:
- A. Surf
  - B. Surge
  - C. Swell
  - D. Seas
- \_\_\_\_\_ 34. In natural science, a general model of explanation that has made many successful predictions, that is supported by many observations and experiments, that has never been disproved, and that is accepted as valid by most (if not all) scientific experts is called a:
- A. Hypothesis
  - B. Fact
  - C. Conclusion
  - D. Theory
- \_\_\_\_\_ 35. As a wave shoals, it slows down and grows taller. At what point will it begin to break?

- A. When the orbital velocity in the crest exceeds the celerity of the wave form
- B. When the orbital velocity in the trough exceeds the celerity of the wave form
- C. When the celerity of the wave form exceeds the orbital velocity in the crest
- D. When the celerity of the wave form exceeds the orbital velocity in the trough

- \_\_\_\_\_ 36. Brackish water is typical of which habitat?
- A. Freshwater
  - B. Marine
  - C. Estuarine
  - D. Terrestrial
- \_\_\_\_\_ 37. In Northern Hemisphere storms, the winds are “cyclonic,” meaning they rotate:
- A. Clockwise
  - B. Counterclockwise
- \_\_\_\_\_ 38. Worms, clams, and other animals that burrow down into the seafloor make up the community of:
- A. Ectofauna
  - B. Epifauna
  - C. Infauna
  - D. Hotsaunafauna
- \_\_\_\_\_ 39. Which of the following is not one of the fundamental tenets of Darwin’s Theory of Natural Selection?
- A. Within any population there exists a variety of traits
  - B. Only the swiftest, strongest animals will survive
  - C. Adaptive traits increase in frequency over many generations
  - D. In each generation more offspring are produced than survive
- \_\_\_\_\_ 40. If a steady 30 knot wind blows for 24 straight hours out of the east across the state of Virginia, why will Virginia Beach see bigger waves than the shorelines of the Chesapeake Bay?
- A. Higher velocity
  - B. Longer duration
  - C. Shallower water
  - D. Longer fetch
- \_\_\_\_\_ 41. On the Outer Banks of North Carolina, high tide occurs almost an hour later every day. Which statement below best explains this fact?

- A. The moon orbits the earth with an angular velocity that is slower than that of the earth's spin on its axis
- B. The moon orbits the earth with an angular velocity that is faster than that of the earth's spin on its axis
- C. The earth orbits the sun with an angular velocity that is slower than it spins on its axis
- D. The earth orbits the sun with an angular velocity that is faster than it spins on its axis

- \_\_\_\_\_ 42. The shoreline region which is strongly influenced by the tides is the:
- A. Pelagic Zone
  - B. Benthic Zone
  - C. Littoral Zone
  - D. End Zone
- \_\_\_\_\_ 43. True/False: Spring tides occur due to alignment of the sun, earth, and moon during both new and full moons.
- A. True
  - B. False
- \_\_\_\_\_ 44. When a wave train shoals, which of the following changes does not occur?
- A. Wavelength increases
  - B. Wave Height increases
  - C. Wave Steepness increases
  - D. Celerity decreases
  - E. Orbital motion becomes elliptical
- \_\_\_\_\_ 45. Organisms that are able to manufacture their own food and flesh using sunlight and inorganic chemicals taken from the environment are:
- A. Aerobes
  - B. Anaerobes
  - C. Autotrophs
  - D. Heterotrophs
- \_\_\_\_\_ 46. In a low energy area, suspended sediments will settle out and build up on the seafloor. This is the process of:
- A. Stratification
  - B. Erosion
  - C. Diffusion
  - D. Deposition
- \_\_\_\_\_ 47. Although the sun exerts a far stronger gravitational force on the world's ocean's than does the moon, it is the lunar bulges that are bigger and create the high tides each day. How come?



- A. Because the moon is closer, it exerts a stronger gravitational pull on the oceans
- B. Because the moon orbits faster, it exerts a stronger centrifugal force on the oceans
- C. The sun's gravity weakens merely as a function of the distance cubed, while TPF weakens in proportion to the distance squared
- D. The sun's gravity weakens merely as a function of the distance squared, while TPF weakens in proportion to the distance cubed

- \_\_\_\_\_ 48. What causes a Longshore Current?
- A. Runoff from nearby rivers
  - B. Storm surge
  - C. Orbital motion exceeds celerity
  - D. Waves approaching at an angle
- \_\_\_\_\_ 49. In a controlled experiment, one group is the standard of comparison. It is the group of test subjects that is "normal" or goes untreated. Which group is this?
- A. Experimental
  - B. Control
  - C. Constant
  - D. ABBA, the Australian Supergroup
- \_\_\_\_\_ 50. Which of the following is not one of the factors that determines the size and power of a wind-generated wave?
- A. Duration...
  - B. Height...
  - C. Fetch...
  - D. Velocity...
- \_\_\_\_\_ 51. In an experiment, one reduces the risk "fluke" errors and the effects of chance by:
- A. Random Sampling
  - B. Establishing a Control
  - C. Recording Data
  - D. Replication
- \_\_\_\_\_ 52. Which of these features is closest to the water?
- A. Swale
  - B. Barrier dune
  - C. Secondary dune
  - D. Berm
- \_\_\_\_\_ 53. On a shoreline or beach, the area that lies between the low and high tide marks, and that is therefore alternately covered with water then exposed to air, is the \_\_\_\_\_ zone:

- A. Supratidal
- B. Subtidal
- C. Intertidal

- \_\_\_\_\_ 54. Microscopic, one-celled algae that grow in the upper, sunlit portion of the water column are:
- A. Phytoplankton
  - B. Zooplankton
  - C. Nekton
  - D. Benthos
- \_\_\_\_\_ 55. Ginger wants to go surfing this weekend, so she is checking the NOAA website to see what sort of wave periods are being reported by buoys in deep water far off the mid-Atlantic coast. One buoy is reporting eight second swell while another is reporting ten second swell. Their wave heights are identical. Which is going to be the more powerful wave when it arrives at Ginger's favorite break?
- A. The eight second swell
  - B. The ten second swell
- \_\_\_\_\_ 56. Which is correct?
- A. Theories/models spawn hypotheses/predictions.
  - B. Hypotheses/predictions spawn theories/models.
- \_\_\_\_\_ 57. A rogue wave is a short-lived but sometimes towering wave crest that suddenly leaps up from the sea as if from nowhere. What causes a rogue?
- A. Constructive Interference
  - B. Destructive Interference
- \_\_\_\_\_ 58. Evolution is a change in a population's *genotype*, yet natural selection can only work on individual *phenotypes*. Among members of a population, some phenotypic variations may stem not from genetic differences but from differences in nutrition, from quality of habitat, or from plasticity. The measure of the proportion of a species' phenotype that is actually rooted in its phenotype is:
- A. Fitness
  - B. Homozygosity
  - C. Heterozygosity
  - D. Heritability
- \_\_\_\_\_ 59. All along the southeast and mid-Atlantic coast we have barrier islands, but off the steeper, rockier coast of New England there are none. Which of these is probably not one of the reasons for the absence of barrier islands up north?

- A. Migrating barrier islands would collide into the mainland because the steep mainland shoreline wouldn't retreat very much as sea level rises
- B. Storm waves are strong enough to "straighten out" a sandy coast but not a rocky one
- C. Down south we have "drowned river valleys," broad estuaries that formed when rising sea level flooded over the banks of narrow coastal plain rivers; up north, the steeper coast did not become indented by such broad estuaries
- D. Up north they rarely feel the impact of severe storms and big waves

\_\_\_\_\_ 60. Listed below are five mechanisms by which genetic variety may arise within a species. Any of these may provide the variation that allows microevolution to occur. But for macroevolution to occur, which of these ultimately must occur?

- A. Random Mating
- B. Sexual Reproduction
- C. Mutation
- D. Independent Assortment
- E. Crossing Over

\_\_\_\_\_ 61. True/False: The formation of barrier islands is basically nature's way of straightening a crooked shoreline.

- A. True
- B. False

\_\_\_\_\_ 62. When Alec swirls a yo-yo round and round above his head, what kind of force prevents it from following a straight-line path?

- A. Tidal
- B. Inertial
- C. Centripetal
- D. Centrifugal

\_\_\_\_\_ 63. True/False: In shallow water ( $d < L/20$ ), longer waves travel faster than shorter waves.

- A. True
- B. False

\_\_\_\_\_ 64. Natural Selection from a range of traits in which both extremes are weeded out (leading to less variety within the species) is:

- A. Stabilizing Selection
- B. Directional Selection
- C. Disruptive Selection

- \_\_\_\_\_ 65. Off the east coast, Nor'easters can sometimes generate bigger waves than hurricanes. Which would not be one of the usual reasons for this?
- A. Longer duration
  - B. Broader fetch
  - C. Greater wind velocities
  - D. Sufficient time for seas to become "fully developed"
- \_\_\_\_\_ 66. Which of these is not a mere reshuffling of pre-existing genes and traits?
- A. Random Mating
  - B. Sexual Reproduction
  - C. Mutation
  - D. Independent Assortment
  - E. Crossing Over