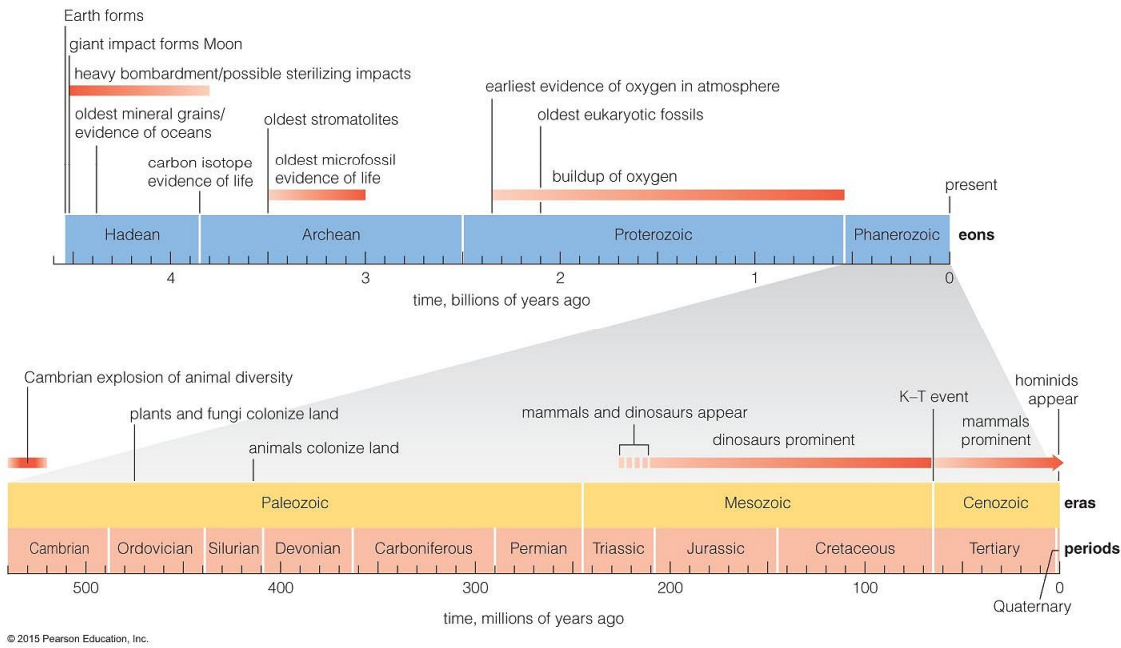


Name _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) What is the *acceleration of gravity* at the surface of Earth? 1) _____
A) 9.8 m/s downward
B) 9.8 m/s² downward
C) 9.8 km/s downward
D) 9.8 km/s² downward
E) 9.8 m²/s downward
- 2) According to the *universal law of gravitation*, the force due to gravity is 2) _____
A) inversely proportional to the square of the distance between objects.
B) directly proportional to the square of the distance between objects.
C) inversely proportional to the distance between objects.
D) not dependent on the distance between objects.
E) directly proportional to the distance between objects.
- 3) The ultimate source of energy that powers the Sun is 3) _____
A) gravitational potential energy of the contraction of the gas cloud that formed the Sun.
B) chemical potential energy of hydrogen burning into helium.
C) thermal energy of the hydrogen atoms in the Sun.
D) mass energy of hydrogen fusing into helium.
E) kinetic energy of the orbital motion of the Sun.
- 4) As long as an object is not gaining or losing mass, a net force on the object will cause a change in 4) _____
A) direction.
B) weight.
C) acceleration.
D) velocity.
E) speed.
- 5) How does the Space Shuttle take off? 5) _____
A) Hot gas shoots out from the rocket and, by conservation of momentum, the shuttle moves in the opposite direction.
B) The hot rocket exhaust expands the air beneath the shuttle, propelling it forward.
C) by converting mass-energy to kinetic energy
D) Its rocket engines push against the launch pad, propelling the shuttle upwards.
E) by achieving lift from its wings in the same way that airplanes do
- 6) Considering Einstein's famous equation, $E = mc^2$, which of the following statements is *true*? 6) _____
A) You can make mass into energy if you can accelerate the mass to the speed of light.
B) One kilogram of mass represents 1 joule of energy.
C) Mass can be turned into energy, but energy cannot be turned back into mass.
D) A small amount of mass can be turned into a large amount of energy.
E) It takes a large amount of mass to produce a small amount of energy.

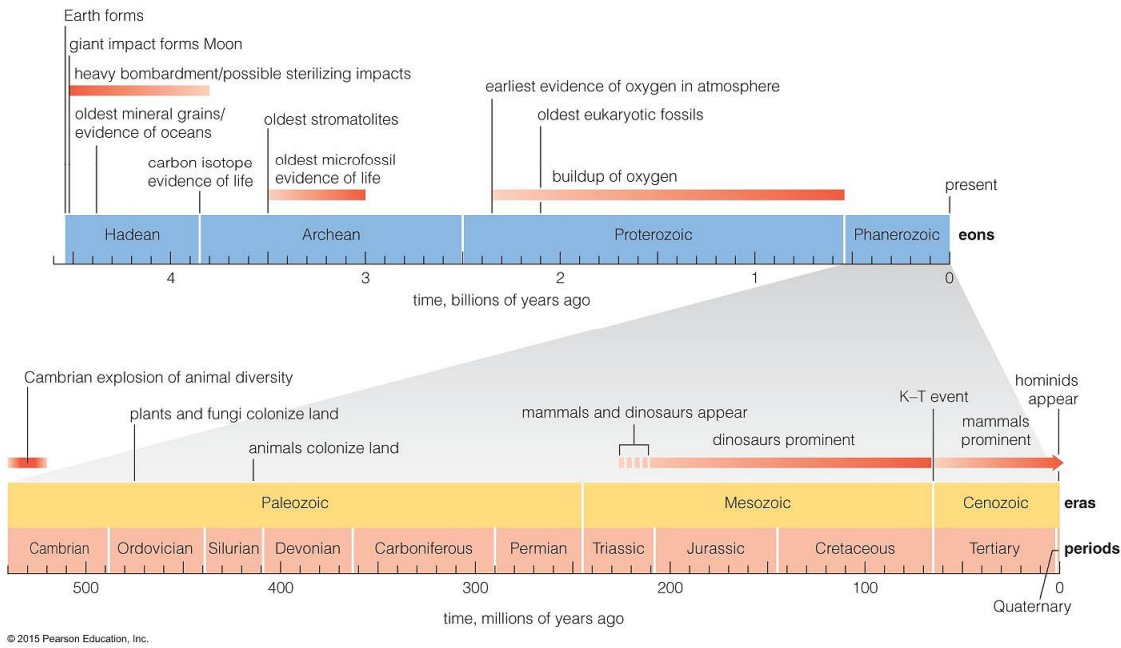
- 7) Which of the following statements correctly describes the *law of conservation of energy*? 7) _____
- A) The fact that you can fuse hydrogen into helium to produce energy means that helium can be turned into hydrogen to produce energy.
 - B) It is not really possible for an object to gain or lose potential energy because energy cannot be destroyed.
 - C) An object always has the same amount of energy.
 - D) Energy can change between many different forms, such as potential, kinetic, and thermal, but it is ultimately destroyed.
 - E) The total quantity of energy in the universe never changes.
- 8) The force of gravity is an inverse square law. This means that, if you double the distance between two large masses, the gravitational force between them 8) _____
- A) also doubles.
 - B) weakens by a factor of 2.
 - C) is unaffected.
 - D) weakens by a factor of 4.
 - E) strengthens by a factor of 4.
- 9) The *frequency* of a wave is 9) _____
- A) measured in hertz (Hz).
 - B) the number of peaks passing by any point each second.
 - C) equal to the speed of the wave divided by the wavelength of the wave.
 - D) measured in cycles per second.
 - E) all of the above
- 10) What are scientists' best guess(es) for the requirement(s) of life? 10) _____
- A) energy to fuel the activities of life
 - B) a source of materials (nutrients)
 - C) liquid water
 - D) all of the above



11) The figure above shows the geological times scale. Animals have been present on land for approximately _____ of the Earth's history. 11) _____
 A) 1/2 B) 3/4 C) 1/10 D) 1/5

12) Which process(es) lead(s) to the gradual evolution of life via natural selection? 12) _____
 A) Changes that organisms acquire during their lives are passed on to their offspring.
 B) Organisms tend to produce more offspring than the local environment can support.
 C) Individuals vary in many heritable traits, and some will be better able to compete for resources at the given time and place in which they live.
 D) A and B
 E) B and C
 F) A, B, and C

13) After Mars, the next most likely candidates for life in the solar system are 13) _____
 A) the atmospheres of the Jovian planets.
 B) the large moons of the Jovian planets.
 C) comets in the Oort cloud.
 D) comets in the Kuiper-belt.
 E) the largest asteroids.



14) The figure above shows the geological times scale. Humans have existed for approximately _____ of the Earth's history. 14) _____

A) 1 % B) 50% C) 10 % D) 0.1 %

15) Which of the following are the best candidates to search for planets that might harbor extraterrestrial life? 15) _____

A) halo stars, because planets can form in isolation from disruptive stellar encounters

B) binary stars, because they provide twice as much energy to promote biology

C) massive stars (greater than twice the mass of the Sun) because they provide more energy to promote biology

D) low mass stars (less than one-tenth of the mass of the Sun), because these are the most common stars in our galaxy

E) solar-mass stars, because they have both a large habitable zone and a long stellar lifetime.

16) How does the *Kepler* mission plan to detect Earth-like planets around other stars? 16) _____

A) by observing the spectrum of the planet

B) by measuring the Doppler shift in spectral lines as the central star is tugged to and fro by the planet

C) by directly imaging the planet in the infrared

D) by measuring the slight shift in position of the central star as it is tugged to and fro by the planet

E) by observing the slight dip in brightness of the central star as the planet transits

- 17) Why do some scientists think that Jupiter's existence may have been critical for life to evolve on Earth? 17) _____
- A) It prevented the Earth from migrating outward and thus ensured a stable climate.
 - B) It prevented the Earth from migrating inward and thus ensured a stable climate.
 - C) It stabilized the Earth's axis tilt and thus ensured a stable climate.
 - D) It kicked out many comets from the inner solar system through gravitational encounters, thus ending the heavy bombardment phase of the solar system.
 - E) Meteorites from Jupiter may have contained the bacteria that started life on Earth.
- 18) Why do some scientists say that the Moon may have been important for the evolution of life on the Earth? 18) _____
- A) It stabilized the earth's axis tilt, preventing large climate changes.
 - B) It shielded the Earth during the heavy-bombardment phase of the early solar system.
 - C) It created the ocean tides, and life most likely started in tide pools.
 - D) Meteorites from the Moon brought microscopic life to the Earth.
 - E) There is no known connection between the Moon and the evolution of life on the Earth.
- 19) What defines the *habitable zone* around a star? 19) _____
- A) the region around a star where rocky planets can form
 - B) the region around a star where liquid water can exist on planetary surfaces
 - C) the region around a star where its ultraviolet radiation is too weak to destroy biological organisms on a planetary surface
 - D) the region around a star outside of its hot, tenuous corona
 - E) the region around a star where humans can survive
- 20) What is the Fermi Paradox? 20) _____
- A) We would be unable to detect an Earth-like planet even at a distance of a few light years.
 - B) Interstellar travel is possible yet would take an infinite amount of time because of relativistic time-dilation.
 - C) The Drake equation predicts that there should be no intelligent life in the Milky Way. Yet, we exist.
 - D) Galactic civilizations, like ours, seem forbidden by the laws of physics.
 - E) Reasonable assumptions predict that a galactic civilization should have already arisen in the Milky Way. Yet, we have absolutely no evidence for it.
- 21) The *wavelength* of a wave is 21) _____
- A) the distance between a peak of the wave and the next trough.
 - B) equal to the speed of the wave times the wave's frequency.
 - C) how strong the wave is.
 - D) the distance between where the wave is emitted and where it is absorbed.
 - E) the distance between two adjacent peaks of the wave.
- 22) How are wavelength, frequency, and energy related for photons of light? 22) _____
- A) Longer wavelength means higher frequency and higher energy.
 - B) Longer wavelength means lower frequency and higher energy.
 - C) Longer wavelength means lower frequency and lower energy.
 - D) Longer wavelength means higher frequency and lower energy.
 - E) There is no simple relationship because different photons travel at different speeds.

- 23) From lowest energy to highest energy, which of the following correctly orders the different categories of electromagnetic radiation? 23) _____
- A) visible light, infrared, X-rays, ultraviolet, gamma rays, radio
 - B) radio, X-rays, visible light, ultraviolet, infrared, gamma rays
 - C) infrared, visible light, ultraviolet, X-rays, gamma rays, radio
 - D) gamma rays, X-rays, visible light, ultraviolet, infrared, radio
 - E) radio, infrared, visible light, ultraviolet, X-rays, gamma rays
- 24) When an atom loses an electron, it becomes 24) _____
- A) dissociated.
 - B) an isotope.
 - C) sublimated.
 - D) ionized.
 - E) a plasma.
- 25) How can an electron in an atom lose energy to go from a higher energy level to a lower energy level? 25) _____
- A) It loses kinetic energy.
 - B) It releases a photon equal in energy to its own energy drop.
 - C) It exchanges gravitational potential energy for kinetic energy.
 - D) It loses gravitational potential energy.
 - E) It absorbs a photon equal in energy to its own energy drop.
- 26) We can see each other in the classroom right now because we 26) _____
- A) reflect visible light.
 - B) emit thermal radiation.
 - C) emit infrared light.
 - D) reflect infrared light.
 - E) emit visible light.
- 27) A gas heated to millions of degrees would emit 27) _____
- A) an equal amount of all wavelengths of light.
 - B) no light, because it is too hot.
 - C) mostly X-rays.
 - D) mostly radio waves.
 - E) mostly ultraviolet light.
- 28) If we observe one edge of a planet to be redshifted and the opposite edge to be blueshifted, what can we conclude about the planet? 28) _____
- A) The planet is in the process of falling apart.
 - B) The planet is actually two bodies, one moving toward us, the other away from us.
 - C) The planet is rotating.
 - D) The planet is in the process of formation.
- 29) When an electron drops to a lower energy level in an atom, 29) _____
- A) light at a wavelength specific to the change in energy levels is emitted.
 - B) the electron becomes more massive.
 - C) the atom moves more slowly.
 - D) the extra energy disappears.

Answer Key

Testname: TEST2

- 1) B
- 2) A
- 3) D
- 4) D
- 5) A
- 6) D
- 7) E
- 8) D
- 9) E
- 10) D
- 11) C
- 12) E
- 13) B
- 14) D
- 15) E
- 16) E
- 17) D
- 18) A
- 19) B
- 20) E
- 21) E
- 22) C
- 23) E
- 24) D
- 25) B
- 26) A
- 27) C
- 28) C
- 29) A