

Astronomy and the Natural World

Astronomy · Answer Key · 12 Questions

1. Which species of dung beetle (Scarabaeidae) has been scientifically proven to use the Milky Way galaxy as a compass for navigation while rolling dung balls?

- A) *Scarabaeus sacer*
- B) *Scarabaeus satyrus*
- C) *Kheper lamarcki***
- D) *Onthophagus taurus*

2. What is the primary physiological mechanism by which the lunar cycle influences the reproductive spawning synchronization of the Great Barrier Reef corals?

- A) Photoperiodism via circadian rhythm
- B) Detection of lunar-induced changes in tidal pressure
- C) Sensitivity to specific moonlight spectra influencing cryptochrome proteins**
- D) Geomagnetic shifts caused by lunar gravity

3. Which nocturnal bird species utilizes the star patterns of the northern celestial hemisphere to orient itself during migration, as demonstrated by Emlen funnel experiments?

- A) *Passerina cyanea* (Indigo Bunting)**
- B) *Tyto alba* (Barn Owl)
- C) *Caprimulgus europaeus* (Nightjar)
- D) *Bubo virginianus* (Great Horned Owl)

4. How does the 'lunar tide' affect the foraging behavior of the intertidal crustacean *Eurydice pulchra*?

- A) It forces the species into deep-sea hibernation
- B) It triggers rhythmic swimming activity synced with high tide cycles**
- C) It suppresses melanin production
- D) It causes mass migration to freshwater estuaries

5. In extreme environments, which celestial phenomenon is the primary factor limiting the depth at which photosynthesis can occur in the oceans?

- A) Solar irradiance attenuation**
- B) The Earth's axial tilt
- C) The 11-year solar cycle
- D) Gravitational lensing of sunlight

6. The Dungeness crab (*Metacarcinus magister*) larvae use a specialized biological compass to navigate; which celestial reference point do they primarily utilize?

A) Polarized light patterns from the sun

- B) The position of the Moon
- C) The planet Venus
- D) The solar zenith angle

7. Which term describes the biological phenomenon where the activity patterns of nocturnal animals, such as certain species of bats, are suppressed during the full moon to avoid predation?

A) Lunar phobia

- B) Lunistice suppression
- C) Crepuscular shifting
- D) Photoperiodic dormancy

8. What role does the Earth's magnetosphere, influenced by solar wind, play in the migratory navigation of the European Robin (*Erithacus rubecula*)?

A) It provides a thermal map for flight

B) It interacts with cryptochromes in the eye to allow visual perception of magnetic fields

- C) It acts as a sound wave reflector for echolocation
- D) It ionizes the atmosphere to aid in wind speed detection

9. How do the periodic emissions from the Sun during solar maximums affect the terrestrial environment in a way that disrupts animal migration?

A) They cause atmospheric density changes affecting flight paths

B) They induce geomagnetically induced currents that scramble navigation

- C) They cause rapid cooling of surface waters
- D) They trigger hyper-oxygenation of the troposphere

10. Which specific biological clock mechanism in plants allows them to anticipate the sunrise, thereby maximizing their photosynthetic efficiency?

A) Circadian oscillator entrained by blue-light photoreceptors

- B) Lunar-gated metabolic surges
- C) Gravitational sensing of the Earth's orbit
- D) Ionization-based nutrient uptake

11. Research into the 'Zodiacal Light' suggests that dust within our solar system impacts terrestrial life by:

A) Scattering sunlight and altering the planetary albedo

- B) Introducing extraterrestrial organic compounds to the stratosphere
- C) Acting as a primary catalyst for ozone depletion
- D) Altering the intensity of UV radiation reaching the biosphere

12. The migration of the Arctic Tern (*Sterna paradisaea*) is unique because it follows the longest path of daylight of any animal; what celestial constraint dictates this?

A) They follow the Earth's axial tilt to remain in constant summer

B) They rely on the transit of the star Sirius

C) They navigate specifically via the Moon's orbital plane

D) They align their flight with the solar magnetic reversal