# The Hidden World of Bioluminescence

**Paragraph A** In the pitch-black depths of the ocean, where sunlight never reaches, many creatures have evolved a remarkable ability known as bioluminescence. This is the production of light through chemical reactions inside living organisms. Unlike ordinary light sources that generate heat, bioluminescence is often described as “cold light” because almost all the energy is released as visible light rather than heat. Scientists estimate that more than 75 percent of animals living in the open ocean’s water column can produce their own light.

**Paragraph B** The chemical process behind bioluminescence involves a light-producing molecule called luciferin and an enzyme known as luciferase. When luciferin reacts with oxygen in the presence of luciferase, it creates a new molecule called oxyluciferin and releases energy in the form of light. This reaction can occur inside the organism’s cells or, in some species, be released into the surrounding water. Different organisms use slightly different versions of luciferin, which explains the variety of colours observed — mostly blue and green in the deep sea, with occasional yellow or red hues in shallower waters.

**Paragraph C** Bioluminescence serves several important survival functions. Many deep-sea creatures use it to attract prey, much like an anglerfish dangling a glowing lure in front of its mouth. Others employ it for defence, emitting sudden bright flashes to startle or confuse predators. Some species use counter-illumination, producing light on their underside to blend in with the faint sunlight coming from above when viewed from below. This form of camouflage helps them avoid detection by predators swimming underneath.

**Paragraph D** Communication is another key role of bioluminescence. Fireflies on land use precise flashing patterns to attract mates, while certain squid and jellyfish create complex light displays to signal to others of their kind. In the deep ocean, where traditional vision is limited, these light signals may also help individuals recognise members of their own species or coordinate group behaviour. However, researchers admit that many aspects of how these signals are interpreted remain poorly understood.

**Paragraph E** Bioluminescence is not limited to animals. Certain bacteria and microscopic plankton also glow, sometimes causing entire stretches of ocean to light up at night — a phenomenon known as “sea sparkle.” In some cases, bacteria living symbiotically inside larger animals, such as certain squid, provide the light source for their host. This partnership benefits both organisms: the bacteria gain nutrients and protection, while the host gains the ability to produce light.

**Paragraph F** Despite decades of research, scientists have not yet discovered all the purposes of bioluminescence. Some light displays may serve no obvious function, or their role may have changed over evolutionary time. What is clear, however, is that this ability has evolved independently in many different groups of organisms, highlighting its importance for survival in dark environments. As exploration of the deep sea continues, new bioluminescent species and surprising uses for this natural light are still being uncovered.

**Section 1: True / False / Not Given (Questions 1–10)**

**Instructions:** Do the following statements agree with the **information** given in the reading passage? Write: **TRUE** if the statement agrees with the information **FALSE** if the statement contradicts the information **NOT GIVEN** if there is no information on this

1. More than 90 percent of animals living in the open ocean's water column can produce their own light.
2. Bioluminescence is often called "cold light" because it generates more heat than ordinary light sources.
3. Luciferin and luciferase are the only molecules involved in producing bioluminescent light.
4. Counter-illumination helps some deep-sea creatures avoid detection by predators swimming underneath.
5. Fireflies use bioluminescence exclusively to attract mates.
6. Bioluminescence occurs only in marine animals and never on land.
7. All light displays created by bioluminescent organisms serve a clear survival purpose.
8. The chemical reaction of bioluminescence can sometimes release light into the surrounding water.
9. Scientists have already discovered every possible purpose of bioluminescence.
10. Bioluminescence has evolved independently in many different groups of organisms.

**Section 2: Yes / No / Not Given (Questions 11–20)**

**Instructions:** Do the following statements agree with the **views** of the writer in the reading passage? Write: **YES** if the statement agrees with the views of the writer **NO** if the statement contradicts the views of the writer **NOT GIVEN** if it is impossible to know the writer's opinion on this

11. The writer believes that attracting prey is the most important function of bioluminescence.
12. The writer suggests that researchers fully understand how bioluminescent signals are interpreted by organisms.
13. The writer thinks that further exploration of the deep sea is unlikely to reveal new information about bioluminescence.
14. The writer views bioluminescence as a significant evolutionary adaptation for survival in dark ocean environments.
15. The writer claims that all bioluminescent bacteria live symbiotically inside larger host animals.
16. The writer accepts that some light displays produced by organisms may have no obvious function.
17. The writer believes that the symbiotic relationship between bacteria and squid provides no benefit to the bacteria.
18. The writer feels optimistic that continued deep-sea exploration will uncover more surprises about bioluminescence.

19. The writer considers communication to be the primary role of bioluminescence in the deep ocean.
20. The writer states that traditional vision is completely useless in the deep ocean.

**Answers with Detailed Explanations**

**TFNG Answers (1–10)**

1. **FALSE**

   **Location:** Paragraph A **Explanation:** The passage states “more than **75 percent**”, not 90 percent. This is a clear numerical contradiction. **Trap:** Changing the qualifier/figure. **Trick:** Always verify exact numbers and percentages.

2. **FALSE**

   **Location:** Paragraph A **Explanation:** It is described as “cold light” because “almost all the energy is released as visible light **rather than heat**”. This directly contradicts the statement. **Trap:** Ignoring the contrast with ordinary light sources. **Trick:** Pay attention to negative phrasing (“rather than”).

3. **NOT GIVEN**

   **Location:** Paragraph B **Explanation:** The passage mentions luciferin and luciferase but never claims they are the “only” molecules involved. **Trap:** Adding the absolute word “only”. **Trick:** If exclusivity is not stated, choose Not Given.

4. **TRUE**

   **Location:** Paragraph C **Explanation:** “Some species use counter-illumination … to blend in with the faint sunlight … This form of camouflage helps them avoid detection by predators swimming underneath.” Exact match via paraphrase. **Trick:** Recognise synonym (“avoid detection” = hide from predators).

5. **NOT GIVEN**

   **Location:** Paragraph D **Explanation:** Fireflies use “precise flashing patterns to attract mates”, but the passage does not say this is the **exclusive** use. **Trap:** Adding restrictive words like “exclusively”. **Trick:** The text must explicitly limit the function.

6. **FALSE**

   **Location:** Paragraphs D & E **Explanation:** Paragraph D mentions fireflies on land; Paragraph E states “Bioluminescence is **not limited to animals**” and includes bacteria and plankton. **Trap:** Over-restricting to “only in marine animals”. **Trick:** Look for direct contradictions with “not limited”.

7. **FALSE**

**Location:** Paragraph F **Explanation:** “Some light displays **may serve no obvious function**”. This contradicts “**all** light displays … clear survival purpose”. **Trap:** Absolute “all” vs hedging “some … may”. **Trick:** Watch for words like “may” or “some”.

8. **TRUE**

**Location:** Paragraph B **Explanation:** “This reaction can occur inside the organism’s cells or, in some species, **be released into the surrounding water**.” Direct support. **Trick:** Paraphrase recognition (“released into the surrounding water”).

9. **FALSE**

**Location:** Paragraphs D & F **Explanation:** “many aspects … **remain poorly understood**” and “scientists have **not yet discovered all the purposes**”. Clear contradiction. **Trap:** Absolute claim (“every possible purpose”). **Trick:** Qualifiers like “not yet” and “not all”.

10. **TRUE**

**Location:** Paragraph F **Explanation:** “this ability has evolved independently in **many different groups** of organisms.” Exact match. **Trick:** Recognise paraphrased quantity and process.

**Yes/No/Not Given Answers (11–20)**

11. **NO**

**Location:** Paragraph C **Explanation:** The writer lists **several** important survival functions (attract prey, defence, camouflage) without stating any one is “most important”. **Trap:** Assuming priority when none is given. **Trick:** No ranking opinion expressed.

12. **NO**

**Location:** Paragraph D **Explanation:** “researchers admit that **many aspects** of how these signals are interpreted **remain poorly understood**.” This contradicts “fully understand”. **Trap:** Contradicting the writer’s reported view. **Trick:** Opinion signal word “admit”.

13. **NO**

**Location:** Paragraph F **Explanation:** “As exploration of the deep sea **continues** … new bioluminescent species and surprising uses … **are still being uncovered**.” The writer implies ongoing value in exploration. **Trap:** Opposite implication of the final sentence.

14. **YES**

**Location:** Paragraph F **Explanation:** “highlighting **its importance for survival in dark environments**.” Direct agreement with the writer’s conclusion. **Trick:** Clear evaluative language (“importance”).

15. **NOT GIVEN**

**Location:** Paragraph E **Explanation:** The passage mentions bacteria living “symbiotically inside larger animals” in “some cases”, but does not claim this applies to **all** bioluminescent bacteria. No writer opinion on universality. **Trap:** Over-generalising from examples.

16. **YES**

**Location:** Paragraph F **Explanation:** “Some light displays **may serve no obvious function**.” The writer presents this as a realistic possibility. **Trick:** Hedging language (“may”) shows acceptance.

17. **NO**

**Location:** Paragraph E **Explanation:** “This partnership **benefits both organisms**: the bacteria gain nutrients and protection…” The statement contradicts the writer’s clear description of mutual benefit. **Trap:** Reversing the stated benefit.

18. **YES**

**Location:** Paragraph F **Explanation:** The positive tone in “new … species and **surprising uses** … **are still being uncovered**” shows optimism about future discoveries. **Trick:** Overall tone and word choice indicate the writer’s view.

19. **NOT GIVEN**

**Location:** Paragraphs C & D **Explanation:** Communication is called “**another** key role”, but the writer does not rank it as “primary” or most important compared to other functions. **Trap:** No comparative opinion is provided.

20. **NOT GIVEN**

**Location:** Paragraph D **Explanation:** The passage says “where **traditional vision is limited**”, but does not state it is “completely useless”. No strong writer opinion on this exact claim. **Trap:** Exaggerating “limited” to “completely useless”.