

Organic Chemistry in the Natural World

Organic Chemistry · Answer Key · 25 Questions

1. Which polyunsaturated fatty acid, synthesized by marine algae and crucial for the health of marine ecosystems, is the primary source of Omega-3 in the oceanic food web?

A) Docosahexaenoic acid (DHA)

- B) Oleic acid
- C) Palmitic acid
- D) Stearic acid

2. The bioluminescence in fireflies (*Photinus pyralis*) is produced by the oxidation of which organic substrate catalyzed by the enzyme luciferase?

A) Luciferin

- B) Aequorin
- C) Coelenterazine
- D) Chlorophyll

3. Which toxic organic compound is sequestered by the Monarch butterfly (*Danaus plexippus*) from milkweed plants to deter avian predators?

A) Cardiac glycosides

- B) Alkaloid nicotine
- C) Reserpine
- D) Cyanogenic glycosides

4. What is the primary organic component of the adhesive silk produced by orb-weaver spiders, which provides its unique elasticity and strength?

A) Fibroin proteins

- B) Chitin
- C) Keratin
- D) Cellulose

5. The characteristic 'petrichor' smell of rain hitting dry soil is primarily caused by the release of which volatile organic compound produced by *Streptomyces* bacteria?

A) Geosmin

- B) Isoprene
- C) Limonene
- D) Benzene

6. Which aromatic organic compound, found in the defensive spray of certain millipedes, is derived from the metabolic pathway involving mandelonitrile?

A) Hydrogen cyanide

- B) Formaldehyde
- C) Acetic acid
- D) Methanol

7. What class of organic pigments is responsible for the red, orange, and yellow coloration in flamingos, derived from their diet of crustaceans and algae?

A) Carotenoids

- B) Anthocyanins
- C) Porphyrins
- D) Flavonoids

8. The venom of the Platypus contains defensin-like peptides, but the primary organic chemical class causing intense localized pain in their victims is not yet fully elucidated; however, which toxic organic family is commonly associated with animal venoms?

A) Polypeptides

- B) Steroids
- C) Terpenes
- D) Phenols

9. Which organic compound, commonly found in the waxes of honeybees (*Apis mellifera*), is a long-chain ester formed from palmitic acid and melissyl alcohol?

A) Myricyl palmitate

- B) Triaccontanyl palmitate
- C) Cetyl palmitate
- D) Stearyl stearate

10. What volatile organic compound is emitted by plants in response to herbivore damage to attract parasitic wasps that prey on the attacking larvae?

A) (Z)-3-hexenyl acetate

- B) Ethylene
- C) Methane
- D) Ethanol

11. Which polycyclic aromatic hydrocarbon is a known environmental pollutant that bioaccumulates in the fatty tissues of marine mammals like orcas?

A) Benzo[a]pyrene

- B) Naphthalene
- C) Anthracene
- D) Phenanthrene

12. What organic molecule serves as the primary energy storage lipid in the seeds of oilseed crops like canola (*Brassica napus*)?

A) Triacylglycerol

- B) Phospholipid
- C) Sphingolipid
- D) Wax ester

13. The defense mechanism of the bombardier beetle involves a violent reaction between hydroquinone and which other organic chemical?

A) Hydrogen peroxide

- B) Hydrochloric acid
- C) Sulfuric acid
- D) Nitric acid

14. Which alkaloid, found in the skin secretions of the poison dart frog (*Phyllobates terribilis*), is a potent voltage-gated sodium channel blocker?

A) Batrachotoxin

- B) Strychnine
- C) Atropine
- D) Nicotine

15. What is the primary organic molecule in the cell walls of fungi, serving as a structural polysaccharide?

A) Chitin

- B) Cellulose
- C) Amylose
- D) Pectin

16. Which organic molecule, produced by many conifers, acts as a natural resin to seal wounds and deter boring insects?

A) Terpenoid

- B) Steroid
- C) Amino acid
- D) Nucleotide

17. The blue color in certain deep-sea crustaceans is produced by a complex formed between a protein and which carotenoid molecule?

- A) Astaxanthin**
- B) Lutein
- C) Zeaxanthin
- D) Beta-carotene

18. Which volatile organic compound is the primary pheromone component in the alarm signal released by many aphid species?

- A) (E)-beta-farnesene**
- B) Geraniol
- C) Linalool
- D) Menthol

19. What is the main organic acid involved in the defensive secretion of the Formica genus of ants?

- A) Formic acid**
- B) Acetic acid
- C) Butyric acid
- D) Lactic acid

20. Which organic sulfur compound is responsible for the characteristic pungent odor released by skunks (Mephitis mephitis)?

- A) (E)-2-butene-1-thiol**
- B) Dimethyl sulfide
- C) Methanethiol
- D) Hydrogen sulfide

21. Which complex organic polymer, making up the woody tissue of plants, is formed by the dehydrogenative polymerization of coniferyl, coumaryl, and sinapyl alcohols?

- A) Lignin**
- B) Cellulose
- C) Hemicellulose
- D) Suberin

22. Which organic compound is the primary nitrogenous waste product excreted by reptiles and birds to conserve water?

- A) Uric acid**
- B) Urea
- C) Ammonia
- D) Creatinine

23. The 'fishy' odor of decaying marine organisms is largely attributed to the presence of which organic amine?

A) Trimethylamine

B) Methylamine

C) Ethylamine

D) Propylamine

24. Which terpene is the primary component of citrus oil and serves as an effective natural insecticide?

A) Limonene

B) Pinene

C) Camphene

D) Myrcene

25. Which organic molecule is the primary component of the structural protein 'silk fibroin' in silkworms?

A) Glycine-serine-alanine polymer

B) Glutamic acid polymer

C) Proline-hydroxyproline polymer

D) Lysine-arginine polymer