

UPSC 2021 Prelims
ENVIRONMENT Answer Key with Explanation

1. Which of the following have species that can establish a symbiotic relationship with other organisms?

1. Cnidarians
2. Fungi
3. Protozoa

Select the correct answer using the code given below.

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Answer: D

Explanation

- The relationship between cnidarians and dinoflagellate algae is termed as "symbiotic", because both the animal host and the algae are benefiting from the association. It is a mutualistic interaction.
- Mycorrhizae are symbiotic relationships that form between fungi and plants. The fungi colonize the root system of a host plant, providing increased water and nutrient absorption capabilities while the plant provides the fungus with carbohydrates formed from photosynthesis.
- Symbiosis in protozoa mostly represents a close mutualistic association between a protozoan and unicellular symbionts (bacteria, cyanobacteria or/and unicellular algae) or protozoans and a multicellular organism (ruminants, lower termites, wood-eating cockroaches, plants). Benefits for a protozoan host can be: extra food supply from intracellular algae or cyanobacteria, protection from predation and oxygen supply.

<https://cals.arizona.edu/azaqua/algaeclass/symbios.htm#:~:text=The%20relationship%20between%20cnidarians%20and,survive%20without%20the%20dinoflagellate%20algae> .

<https://sciweb.nybg.org/science2/hcol/mycorrhizae.asp.html#:~:text=Mycorrhizae%20are%20symbiotic%20relationships%20that,with%20carbohydrates%20formed%20from%20photosynthesis>.

<https://www.researchgate.net/publication/306018729> Symbiosis in protozoa

2. Why is there a concern about copper smelting plants?

1. They may release lethal quantities of carbon monoxide into the environment.
2. The copper slag can cause the leaching of some heavy metals into the environment.
3. They may release sulphur dioxide as a pollutant.

Select the correct answer using the code given below

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1,2 and 3

Answer: B

Explanation

- The copper smelting plants emit substantial amounts of sulphur dioxide into the atmosphere and also the copper slag causes leaching of heavy metals like selenium into the environment. Hence **statements 2 and 3 are correct.**
- NO proof exists for the release of **Lethal quantities** of CO into the environment. Hence **statement 1 is incorrect.**

<https://timesofindia.indiatimes.com/city/chennai/84-gas-leaks-at-sterlite-in-2013-alone-tn-tells-madras-hc/articleshow/69881981.cms#:~:text=CHENNAI%3A%20Sterlite's%20copper%20smeltering,has%20informed%20Madras%20high%20court.>

3. With reference to furnace oil, consider the following statements:

1. It is a product of oil refineries
2. Some industries use it to generate power.
3. Its use causes sulphur emissions into environment

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only

(d)1,2 and 3

Answer: D

Explanation

- Furnace oil is the residue fraction obtained from petroleum distillation, which contains sulphur. Furnace oil contributes to SO₂ emission and secondary sulphate formation as particulate matter (PM). It can also be used to generate power. Hence **all the statements are correct.**

<https://www.britannica.com/technology/fuel-oil>

<https://www.hindustantimes.com/mumbai-news/industries-in-critically-polluted-areas-need-to-reduce-so2-emission-by-90/story-zrRkO8WRy5ItXcA2yZ2Efl.html#:~:text=Furnace%20oil%20is%20the%20residue,oil%20use%20in%20Delhi%20NCR.>

4. What is blue carbon?

- (a) Carbon captured by oceans and coastal ecosystems
- (b) Carbon sequestered in forest biomass and agriculture soils
- (c) Carbon contained in petroleum and natural gas
- (d) Carbon present in atmosphere

Answer: A

Explanation

- Blue carbon is simply the term for carbon captured by the world's ocean and coastal ecosystems.

<https://oceanservice.noaa.gov/facts/bluecarbon.html>

5. In nature, which of the following is/are most likely to be found surviving on a surface without soil?

1. Fern
2. Lichen
3. Moss
4. Mushroom

Select the correct answer using the code given below

- (a)1 and 4 only
- (b)2 only

(c)2 and 3

(d)1,3 and 4

Answer: C

Explanation

Lichen does not need soil

<https://extension.psu.edu/lichen-in-the-garden>

Similarly moss needs only moisture and shade...

<https://www.wikihow.life/Grow-Moss>

6. Which one of the following is used in preparing a natural mosquito repellent?

(a) Congress grass

(b) Elephant grass

(c) Lemongrass

(d) Nut grass

Answer: C

Lemongrass is a tall herb that is abundantly found in tropical and sub-tropical areas of Asia, Africa, and Australia. China and India account for the maximum production of Lemongrass, with an annual production of at least two million pounds. The Lemongrass plant is known to be an **excellent mosquito repellent**. According to a study conducted in 2011, around 95% mosquitos from a specific range of species were either killed or completely repelled due to the intense odor of lemongrass oil.

<https://www.conserve-energy-future.com/is-lemongrass-mosquito-repellent.php>

7.Consider the following kinds of organisms:

1. Copepods
2. Cyanobacteria
3. Diatoms
4. Foraminifera

Which of the above are primary producers in the food chains of oceans?

(a) 1 and 2

(b) 2 and 3

(c) 3 and 4

(d) 1 and 4

Answer: B

Explanation

- An autotroph is an organism that can produce its own food using light, water, carbon dioxide, or other chemicals. Because autotrophs produce their own food, they are sometimes called producers. Cyanobacteria and diatoms are primary producers.
- Copepods are a class of small crustaceans that are widespread and naturally abundant in all aquatic ecosystems as a key link between primary producers and higher predators.
- Foraminifera are heterotrophic, single-celled organisms, members of a phylum or class of amoeboid protists characterized by streaming granular ectoplasm for catching food organisms. Many are opportunistic feeders that prey on other autotrophic and heterotrophic protists.

8.Consider the following animals:

1. Hedgehog
2. Marmot
3. Pangolin

To reduce the chance of being captured by predators, which of the above organisms rolls up/roll up and protects/protects its/ their vulnerable parts?

(a)1 and 2

(b)2 only

(c)3 only

(d)1 and 3

Answer: D

Explanation

- Hedgehogs have spines which are known as quills, and When they feel threatened, their quills immediately go up in full force. The hedgehog has muscles located along his sides that assist in making his spines go up.
- When it is threatened, a pangolin will curl itself into a tight ball, which is impenetrable to predators. Hence **statements 1 and 3 are correct.**
- Marmots are relatively large ground squirrels in the genus Marmota, with 15 species living in Asia, Europe, and North America. These herbivores are active during the summer

when often found in groups, but are not seen during the winter when they hibernate underground. They are the heaviest members of the squirrel family.

<https://animals.mom.com/hedgehogs-protect-themselves-predators-4232.html>

<https://www.savepangolins.org/what-is-a-pangolin>

9. With reference to the 'New York Declaration on Forests', Which of the following statements are correct?

1. It was first endorsed at the United Nations Climate Summit in 2014.
2. It endorses a global timeline to end the loss of forests.
3. It is a legally binding international declaration.
4. It is endorsed by governments, big companies and indigenous communities
5. India was one of the signatories at its inception

Select the correct answer using the code given below

- (a) 1,2 and 4
- (b) 1,3 and 5
- (c) 3 and 4
- (d) 2 and 5

Answer: A

Explanation

- The New York Declaration on Forests is a **voluntary and non-legally binding political declaration** spurred by the United Nations Secretary-General's Climate Summit held in New York in 2014. Hence **statement 3 is incorrect**.
- **In 2014 at the United Nations Climate Summit**, more than 200 governments, companies, civil society and indigenous organisations signed up to the New York Declaration on Forests, **promising to halve tropical deforestation by 2020** and end it by 2030. Hence **statements 1,2 and 4 are correct**.
- **India has not signed the New York Declaration on Forests. Hence statement 5 is incorrect**.

<https://www.climatechangenews.com/2021/10/12/countries-failing-protect-forests-7-years-new-york-declaration/>

10. Magnetite particles, suspected to cause neurodegenerative problems, are generated as environmental pollutants from which of the following ?

1. Brakes of motors vehicles
2. Engines of motor vehicles
3. Microwave stoves within homes
4. Power plants
5. Telephone lines

Select the correct answer using the code given below

- (a) 1,2,3 and 5 only
(b) 1,2 and 4 only
(c) 3,4 and 5 only
(d) 1,2,3,4 and 5

Answer: D

[https://www.researchgate.net/publication/327274701 Magnetite fine particle and na
noparticle environmental contamination from industrial uses of coal#pf6](https://www.researchgate.net/publication/327274701_Magnetite_fine_particle_and_noparticle_environmental_contamination_from_industrial_uses_of_coal#pf6)

[https://www.sciencedirect.com/science/article/pii/S0048969720353572#:~:text=Veh
icle%20brake%20systems%20are%20the,airborne%20magnetite%20at%20the%20ro
adside.&text=Magnetite%20concentration%20is%20similar%20in,and%20petrol%2D
engine%20exhaust%20PM.&text=High%20magnetite%20content%20of%20vehicle,a
%20risk%20to%20human%20health.](https://www.sciencedirect.com/science/article/pii/S0048969720353572#:~:text=Veh
icle%20brake%20systems%20are%20the,airborne%20magnetite%20at%20the%20ro
adside.&text=Magnetite%20concentration%20is%20similar%20in,and%20petrol%2D
engine%20exhaust%20PM.&text=High%20magnetite%20content%20of%20vehicle,a
%20risk%20to%20human%20health.)

11. Which one of the following is a filter feeder?

- (a) Catfish
(b) Octopus
(c) Oyster
(d) Pelican

Answer: C

Explanation

- Filter feeders are a subgroup of suspension feeding animals that feed by straining suspended matter and food particles from water, typically by passing the water over a specialized filtering structure.
- **Oysters**, clams, and other shellfish are efficient filter feeders that help remove excess nitrogen from waters by incorporating it into their shells and tissue as they grow.

12. In which one of the following biogeochemical cycles, the weathering of rocks is the main source of release of nutrients to enter the cycle?

- (a) Carbon cycle
- (b) Nitrogen cycle
- (c) Phosphorus cycle
- (d) Sulphur cycle

Answer: C

Explanation

Phosphorus moves in a cycle through rocks, water, soil and sediments and organisms. Over time, rain and **weathering cause rocks to release phosphate ions** and other minerals. This inorganic phosphate is then distributed in soils and water. Plants take up inorganic phosphate from the soil.

https://en.wikipedia.org/wiki/Phosphorus_cycle

13. Which of the following are detritivores?

1. Earthworms
2. Jellyfish
3. Millipedes
4. Seahorses
5. Woodlice

Select the correct answer using the code given below.

- (a) 1, 2 and 4 only
- (b) 2, 3, 4 and 5 only
- (c) 1, 3 and 5 only
- (d) 1, 2, 3, 4 and 5

Answer: C

Explanation:

- A detritivore is an organism that **eats dead or decaying plants or animals as food**. Detritivores include microorganisms such as bacteria and larger organisms such as fungi, insects, worms, and some crustaceans.
- **Earthworms, Millipedes and woodlice are detritivores whereas jellyfish and seahorses are carnivores.**

14. The 'Common Carbon Metric', supported by UNEP, has been developed for

- (a) Assessing the carbon footprint of building operations around the world
- (b) Enabling commercial farming entities around the world to enter carbon emission trading
- (c) Enabling governments to assess the overall carbon footprint caused by their countries
- (d) Assessing the overall carbon footprint caused by the use of fossil fuels by the world in a unit time.

Answer: A

Explanation

- The Common Carbon Metric is the calculation used to define measurement, reporting, and verification for GHG emissions associated with the operation of buildings types of particular climate regions.

<https://c2e2.unepdtu.org/wp-content/uploads/sites/3/2016/09/unep-sbci-common-carbon-metric.pdf>

15. How is permaculture farming different from conventional chemical farming?

1. Permaculture farming discourages monocultural practices but in conventional chemical farming, monoculture practices are pre- dominant
2. Conventional chemical farming can cause increase in soil salinity but the occurrence of such phenomenon is not observed in permaculture farming.
3. Conventional chemical farming is easily possible in semi- arid regions but permaculture farming is not so easily possible in such regions.
4. Practice of mulching is very important in permaculture farming but not necessarily so in conventional chemical farming

Select the correct answer using the code given below.

- (a) 1 and 3
- (b) 1, 2 and 4
- (c) 4 only
- (d) 2 and 3

Answer: B

Statement 1: Correct

<https://eos.com/blog/monoculture-farming/>

<http://op.niscair.res.in/index.php/IJTK/article/download/28128/465479185>

Statement 2: Correct

<https://www.intechopen.com/chapters/71834>

<https://www.permaculturenews.org/2005/02/01/use-of-permaculture-under-salinity-and-drought-conditions/>

Statement 4: Correct

<https://www.permaculturenews.org/2016/01/22/mulching-with-purpose-and-precision/>

16. With reference to 'palm oil', consider the following statements:

1. The palm oil tree is native to Southeast Asia.
2. Palm oil is a raw material for some industries producing lipstick and perfumes.
3. The palm oil can be used to produce biodiesel.

Which of the statements given above are correct.

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1,2 and 3 only

Answer: B

Statement 1 is incorrect: Oil palm trees are native to Africa but were brought to South-East Asia just over 100 years ago as an ornamental tree crop.

<https://www.iucn.org/resources/issues-briefs/palm-oil-and-biodiversity>

Statement 2 is Correct: Palm oil in many countries is used as a simple frying oil, but many other markets make use of both palm and palm kernel oil:

- Consumer retail food and snack manufacturers
- Personal care and cosmetics (lipsticks and perfumes)
- Biofuel and energy
- Animal feed (palm kernel expeller)
- Pharmaceutical
- Industrial
- Foodservice/service industry

<https://www.biome.com.au/blog/palm-oil-hidden-in-the-worlds-most-glamorous-lipsticks/>

Statement 3 is Correct: The palm oil can be used to produce biodiesel.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7160580/>

17. In the context of india's preparations for Climate – Smart Agriculture, consider the following Statements:

1. The Climate-smart Village approach in India is a part of a project led by the Climate Change, Agriculture and Food Security (CGIAR) , an international Research programme.
2. The project of CCAFS is carried out under Consultative Group on International Agriculture Research (CGIAR) headquartered in France.
3. The International Crops Research Institute for the Semi- Arid Tropics (ICRISAT) in India is one of the CGIAR's research centres.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Answer: D

Explanation

- **Statement 1 is Correct:** CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is working with a vast range of partners to test a range of interventions in climate-smart villages (CSV).
- The CSV project launched in 2011 with 15 climate-smart villages in West Africa, East Africa and South Asia. Additional villages are now being chosen in Latin America and Southeast Asia.
- All the villages are in high-risk areas, which will likely suffer most from a changing climate. Villages are also locations where partners have already established vital links with local communities.

<https://ccafs.cgiar.org/news/climate-smart-villages-india-show-early-signs-great-reform-achievements>

- **Statement 2 is Correct:** Climate Change, Agriculture and Food Security (CCFAS) is carried out under CGIAR (formerly the Consultative Group for International Agricultural Research). Headquarter of CGIAR is in Montpellier, France.

<http://www.fao.org/policy-support/mechanisms/mechanisms-details/en/c/458115/>

- **Statement 3 is Correct:** International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a CGIAR Research Center.

<https://www.cgiar.org/research/center/icrisat/>

18. “ Leaf litter decomposes faster than in any other biome and as result the soil surface is often almost bare. Apart from the trees, the vegetables are largely composed of plant forms that reach up into the canopy vicariously, by climbing the trees or growing as epiphytes, rooted on the upper branches of trees”. This is the most likely description of

- (a) Coniferous forest
- (b) Dry deciduous forest
- (c) Mangrove forest
- (d) Tropical rainforest

Answer: D

Explanation

Tropical rain forest contains the majority of the largest trees, typically 30–45 m in height. Tall, broad-leaved evergreen trees are the dominant plants. The densest areas of biodiversity are found in the forest canopy, as it often supports a rich flora of epiphytes, including orchids, bromeliads, mosses and lichens.

19. The vegetation of savannah consists of grassland with scattered small trees, but extensive areas have no trees. The forest development in such areas is generally kept in check by one or more or a combination of some conditions.

Which of the following are such conditions?

- 1. Burrowing animals and termites
- 2. Fire
- 3. Grazing herbivores
- 4. Seasonal rainfall
- 5. Soil properties

Select the correct answer using the code given below

- (a) 1 and 2
- (b) 4 and 5
- (c) 2,3 and 4

(d) 1,3 and 5

Answer: A

Explanation

[Savanna - Wikipedia](#)

20. Consider the following statements

1. Moringa (drumstick tree) is a leguminous evergreen tree.
2. Tamarind tree is endemic to South Asia
3. In India, most of the tamarind is collected as minor forest produce
4. India exports tamarind and seeds of moringa
5. Seeds of moringa and tamarind can be used in the production of biofuels.

Which of the statements given above are correct?

(a) 1,2,4 and 5

(b) 3,4 and 5

(c) 1,3 and 4

(d) 1,2,3 and 5

Answer: B

Explanation

- **Statement 1 is incorrect:** Moringa is a green leafy fast-growing deciduous plant, native to the Indian subcontinent. It is a non-leguminous tree, a sun- and heat-loving plant, and does not tolerate freezing or frost. Moringa is particularly suitable for dry regions, as it can be grown using rainwater without expensive irrigation techniques.
- **Statement 2 is incorrect:** Tamarind is a leguminous tree bearing edible fruit that is indigenous to tropical Africa (and not endemic to South Asia).
- **Statement 3 is correct:** In India, most of the tamarind is collected as minor forest produce
- **Statement 4 is correct:** India exports tamarind and seeds of moringa to the US, Germany, China, Canada, South Korea, and other European countries.
- **Statement 5 is correct:** Seeds of moringa and tamarind can be used in the production of biofuels.