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Higher Secondary Category (Grades 11–12)

Compilation of Previous Years' Questions

Section -1

The most important role ocean currents play in influencing the biosphere may be in moving heat from the tropics to colder areas near the poles. Probably the best-known example of

this phenomenon is the Gulf Stream, a current that issues from the Gulf of Mexico, flows in the North Atlantic northeastward off the North American coast, and gradually emerges as the North Atlantic Current in mid-ocean. The combination of the warm current and prevailing westerly winds moderates the climate of northwestern Europe. Without the influence of that ocean current, the climate there would be much cooler and possibly drier. Such changes in temperature and moisture would likely favor a different suite of plants and animals in that part of the world, and thus the ecosystems of northwestern Europe would probably look a bit different from the way they do now.

Questions:

1. What is the primary function of ocean currents in relation to the biosphere, as mentioned in the text?

A) They redistribute heat from the tropics to Polar Regions.

B) They disrupt marine life in the tropics.

C) They cause seasonal changes in weather patterns.

D) They bring saltwater to freshwater ecosystems.

2. Which ocean current is cited as a primary example of heat redistribution in the text?

A) The Canary Current

B) The Gulf Stream

C) The Kuroshio Current

D) The Benguela Current

3. How do the Gulf Stream and prevailing winds affect the climate of northwestern Europe?

A) They moderate the climate, making it warmer.

B) They induce frequent storms and heavy rainfalls.

C) They cause significant cooling and make it arider.

D) They create harsher winters with more snow.

4. What would likely happen to the ecosystems in northwestern Europe if the Gulf Stream influence were removed?

A) Marine life would completely vanish.

B) Ecosystems would become identical across Europe.

C) There would be an explosion in biodiversity.

D) Different plants and animals would become more prevalent.

5. What geographical path does the Gulf Stream take according to the text?

A) From the Antarctic Sea straight to South America.

B) From the North Pacific across the Asian coast.

C) From the Caribbean Sea directly to Europe.

D) From the Gulf of Mexico northeastward off the North American coast.

6. What is the primary greenhouse gas responsible for climate change?

A) Oxygen B) Carbon Dioxide C) Nitrogen D) Helium

7. Which of the following is a consequence of climate change?

A) Decreased sea levels C) More frequent extreme weather events

B) Increased biodiversity D) Stable agricultural yields

8. What international agreement aims to combat climate change by limiting global warming?

A) Kyoto Protocol C) Montreal Protocol

B) Paris Agreement D) Geneva Convention

9. Which sector is the largest contributor to global greenhouse gas emissions?

A) Transportation B) Agriculture C) Industry D) Energy production

10. What is the term for the gradual increase in Earth's average temperature due to human activities?

A) Global Warming C) Greenhouse Effect

B) Climate Change D) Ozone Depletion

11. Which of the following is NOT a renewable) energy source?

A) Solar energy B) Wind energy C) Natural gas D) Hydro energy

12. What phenomenon is often referred to as "the melting of ice caps"?

A) Glacier Retreat B) Sea Level Rise C) Desert D) Acidification

13. Which of the following practices can help reduce carbon emissions?

A) Deforestation B) Afforestation C) Industrialization D) Overfishing

14. What is the role of the Intergovernmental Panel on Climate Change (IPCC)?

A) To enforce climate laws

B) To assess scientific information related to climate change

C) To fund renewable energy projects

D) To develop climate change technologies

15. Which of the following is a potential impact of climate change on agriculture?

A) Increased crop diversity

B) Enhanced soil fertility

C) Changes in rainfall patterns

D) Stabilized temperatures

16. What is the term for the phenomenon where warmer ocean temperatures lead to increased evaporation and subsequently more intense storms?

A) Cyclogenesis

B) Thermohaline Circulation

C) Feedback Loop

D) ENSO (El Niño-Southern Oscillation)

17. Which of the following regions is projected to experience the most severe impacts of climate change, including extreme heat and drought?

A) Arctic C) Northern Europe

B) Sub-Saharan Africa D) Southeast Asia

18. Which carbon offset mechanism allows developed countries to invest in greenhouse gas reduction projects in developing countries?

A) Carbon Tax

B) Cap-and-Trade

C) Clean Development Mechanism (CDM)

D) Emissions Trading Scheme

19. What is the estimated percentage of carbon dioxide emissions that come from deforestation and land use changes?

A) 5% B) 10% C) 20% D) 25%

20. Which of the following is considered a positive feedback mechanism in climate change?

A) Increased cloud covers reflecting sunlight

B) Permafrost melting and releasing methane

C)Increased vegetation absorbing CO2

Oceanic phytoplankton absorbing CO2

21. Which of the following regions is most vulnerable to sea-level rise due to climate change?

A) The Himalayas C) The Maldives

B) The Amazon Rainforest D) The Great Plains

22. What term describes the planned reduction of greenhouse gas emissions through government policy?

A) Climate Mitigation C) Climate Resilience

B) Climate Adaptation D) Climate Neutrality

23. Which renewable energy source is most affected by geographical location and seasonal changes?

A) Geothermal B) Solar C) Wind D) Biomass

24. What is the concept of "carbon footprint"?

A) The amount of carbon in the atmosphere

B) The total greenhouse gas emissions caused by an individual or organization

C) The carbon content of fossil fuels

D) The carbon sequestration potential of a forest

25. Which gas has a global warming potential (GWP) significantly higher than carbon dioxide over a 100-year period?

A) Methane B) Nitrous Oxide C) Water Vapor D) Ozone

Section – 2

Carbon sequestration is the process of capturing and storing atmospheric carbon dioxide (CO2) to mitigate global warming. This process plays a crucial role in reducing greenhouse gas concentrations, which are responsible for climate change. There are two main types of carbon sequestration: biological and geological. Biological sequestration occurs when plants absorb CO2 during photosynthesis and store it in biomass, such as forests or soil. On the other hand, geological sequestration involves capturing CO2 from industrial emissions and storing it deep underground in rock formations or depleted oil fields. Oceans also act as a significant carbon sink, absorbing large amounts of CO2. Effective carbon sequestration can help offset emissions from industries, transportation, and agriculture. However, the long-term success of sequestration depends on careful management and monitoring to prevent leaks and ensure stored carbon remains trapped. Additionally, enhancing natural carbon sinks, like reforestation and soil conservation, can complement technological approaches. Overall, carbon sequestration is a vital strategy in the fight against climate change, but it must be paired with efforts to reduce emissions at the source.

26. What is carbon sequestration?

A) The release of carbon dioxide into the atmosphere

B) The process of capturing and storing atmospheric carbon dioxide

C) The natural production of carbon dioxide by plants

D) The process of generating carbon for industrial use

27. Which of the following is a biological method of carbon sequestration?

A) Storing carbon in rock formations

B) Absorbing CO2 in the ocean

C) Photosynthesis by plants

D) Capturing CO_2 from industrial emissions

28. Where is carbon stored in geological sequestration?

A) In plant biomass

B) In soil and trees

C) Deep underground in rock formations

D) In the atmosphere

29. Which of the following acts as a carbon sink?

A) The atmosphere B) Oceans C) Fossil fuels D) Sunlight

30. Why is carbon sequestration important?

A) It releases more carbon into the atmosphere

B) It increases the amount of CO_2 in the atmosphere

C) It helps mitigate global warming by reducing CO_2 levels

D) It stops the process of photosynthesis

31. What is a challenge associated with geological sequestration?

A) Leaks from underground storage

B) Difficulty in finding CO_2 sources

C) Lack of carbon emissions from industry

D) Overgrowth of forests

32. Which of the following enhances natural carbon sequestration?

A) Reforestation C) Deforestation

B) Industrial growth D) Use of fossil fuels

33. Which of the following statements about carbon sequestration is true?

A) It only occurs in oceans.

B) It can be both a natural and a technological process.

C) It increases atmospheric CO2 levels.

D) It is not important in mitigating climate change.

34. Which industry is likely to benefit most from carbon sequestration technologies?

A) Renewable energy

B) Agriculture

C) Manufacturing and industrial sectors

D) Fashion industry

35. What is one long-term goal of carbon sequestration?

A) To increase CO2 levels in the atmosphere

B) To store carbon for future industrial use

C) To reduce greenhouse gas concentrations and mitigate climate change

D) To eliminate the need for renewable energy sources

Section 3

Youth leadership is playing an increasingly important role in global climate action. As the impacts of climate change intensify, young people are stepping up to demand urgent action from governments, corporations, and international organizations. They are advocating for policies that reduce greenhouse gas emissions, protect biodiversity, and ensure environmental justice. Many youth leaders are raising awareness through activism, such as school strikes, protests, and social media campaigns, drawing attention to the critical need for immediate solutions. These young activists often emphasize that climate change disproportionately affects marginalized communities and future generations. Additionally, they are at the forefront of innovative solutions, such as promoting renewable energy, sustainable agriculture, and waste reduction. Youth climate movements, like Fridays for Future, have gained global recognition, influencing public opinion and policy decisions. Despite their age, these leaders demonstrate that the voices of younger generations are essential in shaping a sustainable future. Their passion and commitment show that everyone, regardless of age, can contribute to the fight against climate change. As a result, youth leadership has become a driving force for meaningful and lasting climate action.

36. What role are young people playing in global climate action?

A) They are ignoring the issue of climate change.

B) They are stepping up as leaders demanding urgent action.

C) They are benefiting from climate change.

D) They are solely relying on governments to solve the problem.

37. How are youth leaders advocating for climate action?

A) By ignoring protests and relying only on social media

B) Through school strikes, protests, and social media campaigns

C) By working solely within political parties

D) By delaying action for future generations

38. What type of communities do youth leaders often emphasize are disproportionately affected by climate change?

A) Wealthy communities

B) Marginalized communities

C) Industrial communities

D) Technological communities

39. Which of the following is an example of an innovative solution promoted by youth leaders?

A) Increasing fossil fuel usage

B) Promoting renewable energy

C) Expanding deforestation efforts

D) Banning public protests

40. What are Fridays for Future?

A) A global movement advocating for more industrial production

B) A global youth movement focused on climate activism

C) A government initiative to support fossil fuels

D) A group that opposes environmental activism

41. Why are the voices of younger generations considered essential in climate action?

A) They lack the experience to create change.

B) They will face the long-term impacts of climate change.

C) They are not involved in global decision-making.

D) They are unaffected by climate change.

42. What does youth climate action often demand from governments and corporations?

A) To increase carbon emissions

B) To reduce greenhouse gas emissions and adopt sustainable practices

C) To focus on economic growth without considering the environment

D) To avoid addressing environmental issues

43. How have youth-led climate movements like Fridays for Future influenced global action?

A) They have had little to no impact on public opinion.

B) They have successfully influenced public opinion and policy decisions.

C) They focus solely on entertainment events.

D) They have remained local movements with no global recognition.

44. Which of the following demonstrates youth leadership in climate action?

A) Advocating for increased use of fossil fuels

B) Leading movements that encourage environmental sustainability

C) Supporting companies that contribute to deforestation

D) Ignoring the climate crisis and focusing on other issues

45. Why is youth leadership considered a driving force for climate action?

A) It focuses on delaying climate solutions for future generations.

B) It demonstrates that young people are committed to creating a sustainable future.

C) It relies solely on technological advancements to fix the problem.

D) It rejects renewable energy as a solution.

Sample Question 02

Part A: Full Marks: 10

(Read the following paragraph and answer the questions 1-10)

Climate change has already raised global mean surface temperature by about 1.2°C since 1850–1900, with 2023 reaching roughly 1.45°C above preindustrial and the last 9 years the warmest on record. Global mean sea level has risen ~20 cm since 1901 and is accelerating at ~3.7 mm/yr, with end-century projections of ~0.28–1.01 m, threatening more than 600 million people living within 10 m of sea level. The ocean has absorbed over 90% of excess heat and about 25–30% of anthropogenic CO2, lowering average surface pH by ~0.1 (an acidity increase of ~26%) and intensifying marine heatwaves. At 1.5°C of warming, 70–90% of tropical coral reefs are projected to decline severely, and at 2°C more than 99% could be lost, jeopardizing ecosystems that support ~25% of marine species and the livelihoods of ~500 million people. Biodiversity is under acute pressure, with up to 1 million species at risk of extinction, while marine species have shifted poleward at median rates near ~72 km/decade and terrestrial species upslope by ~11 m/decade. Ecological timing is changing too, with spring leaf-out, flowering, and insect emergence advancing by ~2–8 days per decade across many mid-latitude regions. Health risks are rising: climate change is expected to cause an additional ~250,000 deaths per year between 2030 and 2050 (from heat stress, malnutrition, malaria, and diarrhea), and heat-related mortality among people older than 65 has increased by ~68% comparing 2000–2004 to 2017–2021. Food security is threatened as each 1°C of warming is associated with average yield declines of about ~6% for wheat, ~7% for maize, ~3% for rice, and ~3% for soybean, while droughts and floods raise interannual variability. Disasters already trigger tens of millions of displacements—about 32.6 million new internal displacements in 2022 alone—with up to ~143 million internal climate migrants projected by 2050 across Sub-Saharan Africa, South Asia, and Latin America. Coastal communities face compounding risks as storm surges, erosion, and saltwater intrusion escalate, with adaptation finance needs for developing countries estimated at roughly $160–340 billion per year by 2030 (rising to ~$315–565 billion by 2050) while current flows remain far below needs.

1. Which factor most strongly explains why ocean warming continues even if atmospheric warming temporarily slows?

a) Reduced albedo from melting sea ice
b) The ocean's high heat capacity and thermal inertia
c) Increased solar radiation absorption
d) Declining Ocean circulation rates

2. The acceleration of sea-level rise to ~3.7 mm/yr most directly indicates which underlying process?

a) Increased River discharge alone
b) Thermal expansion combined with ice-sheet mass loss

c) Changes in tidal dynamics
d) Increased coastal erosion

3. Why does a decrease of only ~0.1 in ocean surface pH represent a major chemical change?
a) pH is measured on a linear scale
b) Small pH changes strongly affect ocean temperature
c) pH is logarithmic, so small decreases mean large acidity increases
d) pH directly controls salinity

4. If global warming stabilizes at 1.5 °C instead of 2 °C, which outcome would be most strongly affected?
a) Total elimination of marine heatwaves
b) Preservation of most tropical coral reef ecosystems
c) Complete prevention of sea-level rise
d) Full recovery of ocean pH to preindustrial levels

5. The projected loss of coral reefs poses a disproportionate risk to global biodiversity primarily because:
a) Coral reefs store large amounts of carbon
b) Coral reefs cover most of the ocean floor
c) About one-quarter of marine species depend on coral reef ecosystems
d) Coral reefs regulate global ocean circulation

6. Poleward marine species shifts of ~72 km per decade imply which ecological challenge?
a) Faster evolution of cold-tolerant species
b) Breakdown of existing food webs and fisheries mismatches
c) Reduced competition among marine species
d) Stabilization of marine ecosystems

7. Advancing phenological events (e.g., flowering and insect emergence) increase ecosystem risk mainly because they:
a) Reduce annual rainfall
b) Increase soil erosion
c) Create timing mismatches between species interactions
d) Increase atmospheric CO_2 uptake

8. The estimated ~68% rise in heat-related mortality among people over 65 suggests which policy priority is most urgent?
a) Expansion of cold-weather shelters

b) Improved coastal defense infrastructure
c) Targeted heat adaptation and early-warning systems for vulnerable populations
d) Increased marine conservation areas

9. The consistent decline in crop yields per 1 °C warming implies that food insecurity will increasingly depend on:
a) Technological adaptation alone
b) Stable annual climate patterns
c) The interaction between climate extremes and socioeconomic vulnerability
d) Global population decline

10. The large gap between climate adaptation finance needs and current funding flows most directly increases the risk of:
a) Slower global economic growth only
b) Reduced renewable energy deployment
c) Escalating climate-related displacement and humanitarian crises
d) Lower atmospheric CO_2 concentrations

Part B: Environmental Science Fact Check

11. Endosymbiosis occurs when one organism lives inside another, like nitrogen-fixing bacteria in legume root nodules or mitochondria in eukaryotic cells. Ectosymbiosis involves organisms living on surfaces, like barnacles on whales. If environmental stress causes a mutualistic endosymbiont to receive fewer resources from its host, which transition is most plausible?

A) The relationship would shift from endosymbiosis to ectosymbiosis as the symbiont moves to the host's surface to find more resources.

B) The mutualistic endosymbiosis could shift toward parasitism if the symbiont continues extracting resources while providing diminished benefits.

C) Endosymbionts can never become parasitic because their internal location prevents them from harming the host.

D) The stress would immediately convert the relationship to amensalism where the host is harmed but the symbiont is unaffected.

12.UNCLOS Article 121(3) states that- "Rocks which cannot sustain human habitation or economic life of their own shall have no exclusive economic zone." In the 2016 PCA ruling, what was the *High-Hard* standard established regarding the *Habitation* requirement?

A) The feature must possess a permanent freshwater lens (Ghyben-Herzberg) capable of supporting 50 people for a decade.

B) The feature must have the capacity to support a stable community of people in its natural state, without reliance on external supplies.

C) The feature must be geologically composed of continental crust (granitic) rather than oceanic crust.

D) The feature must exhibit a positive net primary productivity (NPP) in its terrestrial vegetation.

13.Data from the DISCOL experiment provides a cautionary tale for environmental threshold modeling. What was the most significant long-term finding regarding microbial activity 26 years after a simulated disturbance?

A) Microbial populations fully recovered and exceeded pre-disturbance levels due to increased nutrient availability

B) The Oxygen Penetration Depth shifted upward, preventing any further remineralization of carbon.

C) Microbial activity was reduced by up to fourfold, indicating a generational impairment of the benthos' ability to process carbon.

D) Bacteria woke up and reached a state of hyper-productivity that neutralized the effects of sediment plumes.

14.In a non-linear ESS subsystem approaching a saddle-node bifurcation under slow forcing, you measure time series of a state variable and compute variance and lag-1 autocorrelation. Which statement is the least defensible?

A) Rising lag-1 autocorrelation can be consistent with critical slowing down near a loss of stability.

B) Rising variance can occur near a bifurcation if noise is present and the restoring rate weakens.

C) Observing both rising variance and rising autocorrelation proves a tipping point is imminent and identifies the bifurcation type uniquely.

D) These indicators can fail or give false alarms under nonstationary noise, changing external forcing, or multi-attractor dynamics.

15. The stratosphere is described as extremely dry for a specific reason involving the "tropical pipe." Which option matches the mechanism and key condition?

A) Air is dried by UV photolysis of H_2O at 273 K in the mid-latitudes

B) Air is dried by subsidence warming at the equator, evaporating all water vapor upward

C) Air is dried because gravity waves chemically destroy water molecules

D) Air is dried as it passes the Cold Point Tropopause (~193 K), effectively removing almost all water vapor before global circulation

16.In a high-latitude region, sensors recorded a 1.5°C increase in mean annual air temperature over a decade. However, a borehole sensor at the top of the permafrost table recorded a temperature change of nearly 0°C despite the ground being saturated with ice. Which statement best describes the physical mechanism governing this situation?

A) The permafrost is acting as a perfect thermal insulator, preventing the downward flux of sensible heat via conduction due to the low thermal conductivity of frozen mineral soil

B) The system is experiencing the "zero curtain" effect, where atmospheric heat is being consumed by the latent heat of fusion required for the phase transition of ground ice, rather than increasing the kinetic energy of the molecules

C) Increased winter precipitation has led to a thinner snowpack, which facilitates enhanced radiative cooling of the ground, exactly offsetting the rise in summer air temperatures

D) The presence of a thick organic peat layer has increased the ground's albedo, reflecting the additional atmospheric longwave radiation and maintaining a state of thermal equilibrium

17. Observations and models suggest the Atlantic Meridional Overturning Circulation (AMOC) has weakened by ~10-15% since the mid-20th century. Which of the following statements most accurately describes the resulting physical and regional impacts of the slowdown?

A) The North Atlantic region would experience significant atmospheric warming as the heat normally sequestered in the deep ocean is released into the troposphere.

B) A localized sea level rise of 10 - 30 cm would occur along the western coast of North America

C) It will minimize the temperature difference between the Northern and Southern Hemispheres.

D) A localized sea level rise would occur along the eastern coast of North America

18. A construction site operated at 70 dB, which was considered acceptable for the neighborhood. However, the site added a second, identical machine. A resident claims the noise has now "doubled in intensity," but the city inspector says the decibel level only rose to approximately 73 dB. Who is correct regarding the physical impact?

A) The resident is wrong; a 3dB increase means the sound intensity is actually lower than before due to wave interference.

B) Both are correct; the sound intensity I(W/m^2) has doubled, but because the dB scale is logarithmic, this doubling manifests as a small +3 dB change.

C) The inspector is wrong; if the number of sources doubles, the dB must also double to 140 dB according to the SIL formula.

D) The resident is correct; human hearing is linear, so a 3 dB change is perceived as a 100% increase in acoustic energy.

19.A medical researcher is looking at two populations. Population A shows high rates of neurotoxicity and central nervous system failure. Population B shows extreme bone pain and kidney damage. Based on the case studies in the text, which environmental sampling result would confirm the source of these diseases?

A) Population A: Cadmium in rice; Population B: Methylmercury in fish.

B) Population A: Methylmercury in fish; Population B: Cadmium in the Jinzu River basin soils.

C) Population A: Lead in soil; Population B: Arsenic in the groundwater.

D) Population A: High BOD in the water; Population B: High concentrations of $PM_{2.5}$ in the air.

20. In a lab experiment, corals are kept in 31°C (thermal stress) but are placed in total darkness. Surprisingly, these corals do not bleach as quickly as corals kept in 31°C water with bright light. Using the "cellular level" mechanisms described in the text, why does light intensity affect bleaching severity?

A) Light intensity increases the metabolic rate of the coral host, causing it to consume the algae as a food source before they can produce ROS.

B) Light provides the energy needed for the "carbonate buffer system" to work, which actually prevents the coral from expelling its symbionts.

C) In darkness, the corals enter a state of "latent heat" where they no longer react to temperature changes in the surrounding seawater.

D) Thermal stress damages the algal photosystem II; in the presence of light, this damaged system produces excess Reactive Oxygen Species (ROS) that force the coral to expel the algae to avoid tissue damage.

21.Ocean acidification lowers the aragonite saturation state ($\Omega_{ara}g$) by reducing the concentration of carbonate ions. If a bleached reef is in a recovery phase but the local $\Omega_{ara}g$ drops below 3, what is the most likely impact on the reef's structural integrity?

A) The reef will grow faster because the lower saturation state allows for easier absorption of calcium from the surrounding seawater.

B) The skeletal growth and calcification rates will decline sharply, making it difficult for the coral to rebuild the structure lost during the bleaching event.

C) The coral will switch its skeletal composition from aragonite to a more acid-resistant mineral, maintaining its original growth rate.

D) The lower saturation state triggers a secondary bleaching event by directly poisoning the remaining symbiotic algae

22.The species-area relationship shows that larger areas support more species. Island Biogeography theory explains this through the balance between immigration rates and extinction rates. If two islands are equidistant from the mainland but Island X is 100 km^2 and Island Y is 400 km^2, which prediction aligns best with Island Biogeography principles?

A) Island Y would likely support more species because its larger area provides more habitat diversity and lower extinction rates.

B) Both islands would have identical species richness because distance from mainland determines species number, not island size.

C) Island X would have higher species richness because smaller areas concentrate resources, supporting denser populations.

D) The species-area relationship only applies to continents, not islands, so size wouldn't affect species numbers.

23. Alpha diversity measures species richness within a single habitat, while beta diversity compares diversity between different habitats. A researcher surveys three forest patches and finds: Patch A has 45 species, Patch B has 50 species, and Patch C has 40 species. If 20 species are shared among all three patches, which statement best describes the relationship between alpha and beta diversity in this system?

A) Beta diversity is zero because all patches contain forest species, making them functionally identical habitats.

B) Beta diversity would be high if the non-shared species (25 in A, 30 in B, 20 in C) differ substantially between patches, indicating species turnover.

C) Beta diversity equals the average alpha diversity (45 species), calculated by adding all patch diversities and dividing by three.

D) Alpha diversity and beta diversity are inversely proportional, so high alpha automatically means low beta in these patches.

24. Primary succession begins on bare rock with pioneer species like lichens and mosses that initiate soil formation, while secondary succession occurs where soil already exists after disturbances. A volcanic island emerges from the ocean, and a nearby forest experiences a severe wildfire. How would succession rates most likely differ between these two sites?

A) Both sites would show identical succession rates because all succession follows the same universal timeline regardless of starting conditions.

B) The volcanic island would show faster succession because pioneer species always colonize more rapidly than secondary species.

C) The forest would likely show faster succession because existing soil, seed banks, and nearby colonizers accelerate recovery compared to bare rock.

D) Secondary succession is always slower because fire damage makes soil toxic, while volcanic rock provides clean substrate.

25. We know that there is a BDC acceleration of ~1.7-2% per decade, driven by tropospheric warming + stratospheric cooling. Which chain of consequences matches what is stated?

A) Faster BDC → Mean Age of Air increases → tropical lower stratosphere warms by expansion → polar stratosphere cools by compression

B) Faster BDC → Mean Age of Air decreases → ozone transported poleward more quickly → tropical lower stratosphere cools (upwelling/expansion) while polar stratosphere warms (sinking/compression)

C) Faster BDC → Mean Age of Air unchanged → ozone production shifts to poles → tropics become ozone-rich

D) Faster BDC → waves weaken → tropical upwelling slows → stratosphere becomes wetter

26. It is stated that land absorbs ~30%, oceans ~25%, and ~45% remains in the atmosphere. Which inference is most consistent with that partitioning as presented?

A) Sinks remove ~55% and the atmosphere retains ~45%, implying a flux imbalance.

B) Sinks remove ~45% and the atmosphere retains ~55%, implying equilibrium.

C) Oceans remove ~30% and land ~25%, but the split is not specified.

D) All excess is removed rapidly because residence time is short.

27. It is noted that only 1% of surface carbon reaches the abyssal depths of the CCZ, yet it remains there for millions of years. Which set of conditions is specifically credited with maintaining the stability of this Carbon Vault?

A) High turbidity, low photosynthetic rates, and the presence of Xenophyophores

B) High microbial activity, low salinity, and the constant influx of terrigenous sediment.

C) Rapid remineralization, volcanic heat flux, and the mechanical "suctioning" of the top reactive layer.

D) Low temperature, high pressure, and a stable Oxygen Penetration Depth

28. The process of "Flocculation" describes a physical-chemical interaction between mining debris and the natural carbon cycle. What is the consequence of this process?

A) It causes tiny filter-feeders like Xenophyophores to grow at an accelerated rate to compensate for carbon loss.

B) It allows fine clay particles to bind with falling marine snow, altering the natural burial rate of carbon into the soil.

C) It prevents the mining collector from suctioning up the top layer of labile organic carbon.

D) It converts the dissolved Carbon dioxide in the sediment back into solid polymetallic nodules.

29. Using only the reservoir sizes given, which statement is most correct?

A) The ocean reservoir is ~10^2 times the atmospheric reservoir.

B) The terrestrial biosphere reservoir is ~10^2 the atmospheric reservoir.

C) The lithosphere reservoir is ~10^2 times the ocean reservoir.

D) The atmosphere reservoir is ~10^2times the terrestrial biosphere reservoir.

30. WMO states a coupling between ozone decrease and UV-B increase. Which is more consistent?

A) UV-B decreases by 1–2% for every 1% decrease in ozone.

B) UV-B increases by 1–2% for every 1% decrease in ozone.

C) UV-B increases by 10–20% for every 1% decrease in ozone.

D) UV-B is independent of ozone because UV-B is 315–400 nm.

Part C: Full Marks 10

Knowledge about Environment & Nature Full Marks 10

31. Which of the following greenhouse gases has the highest global warming potential (GWP) over a 100-year period?

a) Carbon dioxide (CO_2)

b) Methane (CH_4)

c) Nitrous oxide (N_2O)

d) Sulfur hexafluoride (SF_6)

32.What percentage of anthropogenic CO_2 emissions is absorbed by the oceans annually?

a) 10% b) 25% c) 50% d) 70%

33.Which biome is home to the highest percentage of Earth's biodiversity?

a) Tropical rainforests

b) Coral reefs

c) Temperate deciduous forests
d) Savannas

34.Which global initiative focuses on protecting biodiversity through sustainable development?
a) Montreal Protocol

b) Convention on Biological Diversity (CBD)
c) Kyoto Protocol

d) Paris Agreement

35.Which gas is the primary contributor to acid rain formation?
a) Nitrogen dioxide (NO_2)

b) Sulfur dioxide (SO_2)
c) Ammonia (NH_3)

d) Carbon monoxide (CO)

36.Acid rain primarily damages forests by:
a) Increasing soil fertility

b) Increasing microbial activity in soil
c) Removing essential nutrients from the soil

d) Encouraging invasive species growth

37.What is the primary cause of eutrophication in water bodies?
a) Heavy metal contamination

b) Oil spills
c) Excess nutrients like nitrogen and phosphorus

d) Increased water temperature

38.Which of the following is considered the most effective method for reducing water pollution from agricultural runoff?
a) Implementing buffer strips

b) Increasing pesticide use
c) Diverting runoff into nearby streams

d) Using synthetic fertilizers

39.Which of the following species interactions benefits one species while leaving the other unaffected?

a) Commensalism b) Mutualism c) Parasitism d) Predation

40.Which of the following pollutants is responsible for forming photochemical smog?

a) Particulate matter ($PM_{2.5}$)

b) Chlorofluorocarbons (CFCs)

c) Volatile organic compounds (VOCs)

d) Ozone-depleting substances

Part 5: Bangladesh & Ecology

COP30, held in Brazil, focused on strengthening global action to keep warming close to the 1.5 °C limit set by the Paris Agreement. Countries emphasized faster emission reductions during this decade, especially before 2030, when global emissions must fall by about 43% to stay on track. A major outcome was increased attention to implementing national climate plans rather than only making new promises. COP30 also highlighted the urgent need to scale up climate finance for developing countries, building on the goal of mobilizing at least $100 billion per year. Adaptation received stronger focus, as climate impacts such as floods, heatwaves, and sea-level rise are already affecting millions of people. The conference reinforced support for the Loss and Damage Fund to help vulnerable nations recover from climate-related disasters. Protecting forests and ecosystems was prioritized, recognizing their role in absorbing carbon and supporting biodiversity. Youth, Indigenous communities, and local governments were given greater visibility in climate decision-making. COP30 stressed that current efforts are still insufficient to prevent dangerous climate impacts. Overall, the outcomes highlighted that immediate and cooperative global action is essential to secure a safer future.

41. Why did COP30 emphasize emission reductions before 2030 rather than focusing only on long-term goals?

a) Because climate impacts will stop after 2030
b) Because early reductions are cheaper than later ones
c) Because near-term cuts are crucial to limit warming to 1.5 °C
d) Because long-term targets are no longer important

42.The target of reducing global emissions by about 43% by 2030 mainly reflects:

a) A political compromise without scientific basis

b) The minimum reduction required to stabilize sea level
c) Scientific assessments of pathways consistent with the 1.5 °C goal
d) The average reduction achieved by developed countries

43.Why did COP30 shift attention from making new pledges to implementing national climate plans?
a) Most countries have already achieved their targets
b) Implementation determines whether commitments lead to real emission cuts
c) New pledges are legally prohibited
d) Climate plans are optional under the Paris Agreement

44. Increasing climate finance for developing countries is critical mainly because:
a) Developing countries emit the most greenhouse gases
b) These countries are less affected by climate change
c) They often lack resources to adapt and reduce emissions
d) Climate finance replaces private investment

45. The emphasis on adaptation at COP30 suggests which conclusion about climate change?
a) Mitigation is no longer necessary
b) Climate impacts are already occurring and unavoidable to some extent
c) Adaptation is cheaper than mitigation in all cases
d) Adaptation can fully eliminate climate risks

46. Support for the Loss and Damage Fund mainly recognizes that:
a) All climate impacts can be prevented
b) Insurance markets can cover all climate losses
c) Some climate damages exceed the capacity of adaptation
d) Losses are evenly distributed across countries

47. Why was forest and ecosystem protection prioritized at COP30?
a) Ecosystems eliminate the need for emission reductions
b) Forests absorb carbon and support biodiversity
c) Ecosystem protection mainly increases tourism
d) Forests are unaffected by climate change

48. Greater visibility of youth and Indigenous communities at COP30 implies that climate solutions:
a) Should be decided only by governments
b) Are purely technological

c) Benefit from inclusive and locally informed decision-making
d) Delay international negotiations

49. The statement that current efforts are “still insufficient” most directly indicates:
a) Climate action has failed completely
b) Global cooperation is no longer possible
c) Existing commitments do not yet match the scale of the problem
d) Climate models are unreliable

50. The overall message of COP30 outcomes can best be summarized as:
a) Climate change can be solved gradually without urgency
b) Individual countries can act independently
c) Immediate, cooperative global action is essential
d) Economic growth must stop to address climate change