INTERNATIONAL UNIVERSITY OF EAST AFRICA
'Learning to Succeed'

FACULTY OF SCIENCE AND TECHNOLOGY

END OF SEMESTER EXAMINATIONS - AUGUST 2025

PROGRAMME: BSEM
YEAR/SEM: YEAR 1/SEMESTER 1
COURSE CODE: BSE1104
NAME: ENVIRONMENTAL CHEMISTRY

DATE:
TIME:

INSTRUCTIONS TO CANDIDATES:

SECTION A

Section A: Attempt all questions in this section (40 marks)

Question 1:

1. What role does UV-B radiation play in environmental damage due to ozone depletion?

A. It causes water pollution
B. It warms the oceans
C. It damages DNA in living organisms
D. It blocks photosynthesis

2. Which of the following is the most abundant greenhouse gas in Earth's atmosphere

A. Carbon dioxide
B. Methane
C. Nitrous oxide
D. Water vapor

3. Which of these gases is a byproduct of livestock digestion and contributes significantly to global warming

A. Nitrous oxide
B. Carbon dioxide
C. Methane
D. Water vapor

4. All pollutants are contaminants, but not all contaminants are pollutants.

A. True B. False

5. Which pollutant is produced mainly by vehicle exhaust and industrial activities and is harmful because it replaces oxygen in the bloodstream?

A. Carbonmonoxide

B. Ozone

C. Nitrogen dioxide

D. PM

6. What is the primary focus of environmental chemistry?

A. Studying the chemistry of living organisms

B. Investigating chemical reactions in industrial processes

C. Understanding the chemicals & chemical processes in the environment

D. Analyzing chemical compounds in outer space

7. Which of the following best describes the greenhouse effect?

A. The release of harmful chemicals into the atmosphere

B. The trapping of heat by certain atmospheric gases

C. The destruction of the ozone layer

D. The process of photosynthesis in plants

8. Acid rain is primarily caused by the release of which atmospheric pollutant?

A. Carbon dioxide

B. Methane

C. Sulfur dioxide

D. Oxygen

9. Which chemical compound is responsible for the depletion of the ozone layer in the stratosphere?

A. CO_2

B. CFCs

C. NOx

D. HCl

10. What is the term for the process by which contaminants are removed from groundwater as it passes through layers of soil and rock?

A. Filtration
B. Desalination
C. Eutrophication
D. Leaching

11. What is the term for the process by which plants absorb water from the soil and release it into the atmosphere?

A. Photosynthesis
B. Respiration
C. Transpiration
D. Eutrophication

12. What is the primary greenhouse gas responsible for trapping heat in the Earth's atmosphere?

A. O_2
B. CO_2
C. N_2
D. CH_4

13. Which layer of the Earth's atmosphere contains the ozone layer?

A. Troposphere
B. Stratosphere

C. Mesosphere

D. Exosphere

14. What environmental problem is associated with the excessive use of synthetic fertilizers and runoff into water bodies?

A. Acid rain

B. Desertification

C. Eutrophication

D. Ozone depletion

15. What health issue is associated with the thinning of the ozone layer?

A. Acid rain

B. Deforestation

C. Skin cancer

D. Ocean acidification

16. Environmental chemistry is the discipline which deals with;

A. The movement of chemicals through the various environmental segments and their impacts

B. The reduction of contamination

C. Management of the environment

D. None of the above

17. That part of the Earth upon which plants, animals, and microrganisms live and from which they extract most of their food, minerals, and fuels is known as;

A. Lithosphere

B. Geo-sphere

C. Atmosphere

D. Biosphere

18. In the context of environmental science, ……. is the introduction of harmful substances into the environment.

A. Contamination

B. Pollution

C. Eutrophication

D. Evaporation

19. Identify the chemical reaction below

$CO_{2\ g} + H_2O_{\ l} + \text{energy} \rightarrow C_6H_{12}O_6 + O_2\ g$

A. Respiration

B. Combustion

C. Photosynthesis

D. Oxidation

20. What is the primary source of CO_2 emissions?

A. Volcanic activity

B. Deforestation

C. Mining

D. Fossil fuel combustion

Question 2:

1. Which international agreement was signed to reduce the

production of ozone-depleting substances?

A. Kyoto Protocol
B. Montreal Protocol
C. Paris Agreement
D. Geneva Convention

2. Albedo refers to the fraction of solar energy reflected by a surface.

A. True
B. False

3. What role does UV-B radiation play in environmental damage due to ozone depletion?

A. It causes water pollution
B. It warms the oceans
C. It damages DNA in living organisms
D. It blocks photosynthesis

4. Which of the following represents the largest reservoir of freshwater on Earth?

A. Rivers and streams
B. Ice caps and glaciers
C. Groundwater
D. Lakes

5. Which gas is primarily responsible for absorbing ultraviolet radiation in the stratosphere?

A. Carbon dioxide
B. Methane
C. Ozone
D. Nitrogen dioxide

6. In terms of volume, the greatest proportion of liquid freshwater is found in:

A. Lakes
B. Rivers
C. Groundwater
D. Soil moisture

7. Which of the following layers contains the coldest temperatures in the atmosphere?

A.Troposphere
B. Stratosphere
C. Mesosphere
D. Thermosphere

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B. The reduction of contamination

C. Management of the environment

D. None of the above

9. That part of the Earth upon which animals, plants, and mircoorganisms live and from which they extract most of their food, minerals, and fuels is known as;

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12. What is the primary source of CO_2 emissions?

A. Volcanic activity
B. Deforestation
C. Industrial processes
D. Fossil fuel combustion

13. Ice and snow help cool the Earth by reflecting sunlight back into space.

A. True B. False

14. Atmospheric gases are evenly mixed in all layers of the atmosphere.

A. True B. False

15. How do CFCs destroy ozone molecules?

A. By absorbing UV light
B. By combining with oxygen
C. By releasing chlorine atoms in the stratosphere
D. By increasing global temperatures

16. Which segment of the environment is essential for regulating Earth’s temperature and weather patterns?
A. Lithosphere
B. Atmosphere
C. Hydrosphere
D. Biosphere

17. Which pollutant is produced mainly by vehicle exhaust and industrial activities and is harmful because it replaces oxygen in the bloodstream?

A. CO

B. O_3

C. NO_2

D. $PM_{2.5}$

18. Which of the following best describes the greenhouse effect?

A.The release of harmful chemicals into the atmosphere

B. The trapping of heat by certain atmospheric gases

C. The destruction of the ozone layer

D.The process of photosynthesis in plants

19. What is the term used to describe the thinning of the ozone layer over Antarctica?

A. Ozone gap
B. Ozone deficit
C. Ozone hole
D. Ozone leak

20. What is the term for the process by which contaminants are removed from groundwater as it passes through layers of soil and rock?

A. Filtration

B. Desalination

C. Eutrophication

D. Leaching

SECTION B

Section B; Answer any 3 questions. (20 marks each)

Question 1:

a. Describe the role of carbon dioxide in global warming. What human activities are responsible for increasing carbon dioxide levels in the atmosphere? (10 marks)
b. Why is global warming a concern? (10 marks)

Question 2:

a. What are environmental compartments? (2 marks)
b. Describe the various environmental segments that do exist on planet Earth. How do they relate with each other? (18 marks)

Question 3:

Using relevant diagrams, briefly describe the following biogeochemical cycles. (10 marks each)
i. Carbon cycle
ii. Hydrological cycle

Question 4:

How do forest ecosystems serve as a link between the atmosphere, lithosphere, and hydrosphere? What are the consequences of deforestation on these linkages? (20 MARKS)

Question 5:

a. Draw and name the different layers that make up the atmosphere (10 marks)
b. The atmosphere serves several critical roles that are essential for life on Earth and the planet's overall stability. Discuss (10 marks)

Question 6:

With examples, differentiate between the following terms used in Environmental chemistry. (5 marks each)
i. Contaminant and pollutant
ii. Long term and short term carbon cycles
iii. PM_{10} and $PM_{2.5}$
iv. Indoor and outdoor air pollution

Question 7:

Discuss the following concepts, highlighting their causes and effects. (10 marks each)

i. i). Global warming
ii. ii). Ozone layer depletion

Question 8:

Describe the key processes involved in the nitrogen cycle. Explain the role of microorganisms in each process. (20 marks)

Question 9:

a. Distinguish between biological and industrial nitrogen fixation. What are the environmental implications of increased use of industrial nitrogen fertilizers? (10 marks)
b. Discuss the role of leguminous plants in the nitrogen cycle. How do they contribute to soil fertility and sustainable agriculture? (10 marks)

Question 10:

Describe the vertical structure of the atmosphere and identify the key characteristics (e.g., temperature changes, composition, density) of each atmospheric layer. (20 marks)

Question 11:

Discuss the interrelationship among the four major segments of the environment (atmosphere, lithosphere, hydrosphere, and biosphere). How does human activity affect these segments? (20 marks)

Question 12:

a. Define the following terminologies in the context of environmental chemistry (2 marks each)
i. Eutrophication
ii. Dissolution
iii. Suspension
b. Compare the troposphere and stratosphere in terms of their composition, temperature patterns, and relevance to weather and aviation. (14 marks)