



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF SPATIAL PLANNING AND NATURAL RESOURCES MANAGEMENT
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE WATER
RESOURCES AND ENVIRONMENTAL MANAGEMENT
1ST YEAR 2ND SEMESTER 2024/2025 ACADEMIC YEAR
MAIN CAMPUS**

COURSE CODE: PNB 1104

COURSE TITLE: INTRODUCTION TO ATMOSPHERIC PROCESSES

DATE: 22/4/2025

TIME: 2 HOURS

DURATION: 9.00-11.00

VENUE: LAB 10

Instructions:

- 1. Answer ALL questions in Section A and B and ANY other TWO questions in Section C**
- 2. Tick the most correct alternative in Section A**
- 3. Answers to Questions in Section B and C must be written in the spaces provided on the question paper.**
- 4. Candidates must ensure they submit their work by clicking “finish and submit attempt” button at the end.**

1. What gas is considered as Greenhouse but without adverse effects to the atmosphere?
 - A. Methane (CH_4)
 - B. Carbon dioxide (CO_2)
 - C. Sulphur dioxide (S_2O)
 - D. Water vapor (H_2O)ANSWER: D
2. What is the definition of Global warming?
 - A. Continuous rise in atmospheric temperatures
 - B. Increase in coverage by glacier
 - C. Rise in sea level
 - D. Migration of the sunANSWER: A
3. The following layers of the atmosphere except?
 - A. Stratosphere
 - B. Troposphere
 - C. Lithosphere
 - D. MesosphereANSWER: C
4. What is the right name of water in solid form as component of the earth's sphere?
 - A. Cryosphere
 - B. Hydrosphere
 - C. Lithosphere
 - D. MarineANSWER: A
5. What is Climate change
 - A. Observed/projected gradual increase in global surface temperature
 - B. Long term shifts in atmospheric conditions
 - C. Deforestation of the Amazon Forest
 - D. Application of greenhouse gasesANSWER: B
6. Shrinking of the ice sheets is one of the strong signals of?
 - A. Sea level rise
 - B. Global warming
 - C. Decrease in biodiversity
 - D. Death of desertsANSWER: B
7. What among the following is not a contributor to global warming?
 - A. Pollution caused by chlorofluorocarbons (CFCs)
 - B. Automobile fumes
 - C. Operation of wind mills
 - D. Combustion of fossil fuelsANSWER: C
8. Which of these energy resources is renewable source?
 - A. Petroleum
 - B. Coal
 - C. BiofuelsANSWER: C

9. Energy source that is continuous and has the potential to be stored for future use is referred to?

- A. Wind energy
- B. Solar energy
- C. Conventional sources
- D. Renewable sources

ANSWER: C

10. Energy sources from plants can also be called?

- A. Plant energy
- B. vegetation sources
- C. Living energy
- D. Biofuels

ANSWER: D

11. What name is given to energy that is obtain by fractionation of atoms?

- A. Conventional
- B. Nonrenewable
- C. Fossil
- D. Nuclear

ANSWER: D

12. What is the main aim of UNFCCC?

- A. Stabilization of greenhouse gas
- B. Increase of greenhouse gas
- C. Assessment reports on climate change
- D. Stabilization of oxygen

ANSWER: A

13. All the following are disadvantages of renewable energy except?

- A. Highly variable
- B. High initial cost of investment
- C. High running cost
- D. Unreliable supply

ANSWER: C

14. Biofuel is a renewable resource due to?

- A. It's ability to be replenished
- B. Its vast availability
- C. Low cost of production
- D. Long period of production

ANSWER: A

15. Select some direct indicators of climate change that would be expected to increase in a warming of the tropical region:

- a. Increase in frequency and magnitude of climate extremes
- b. Sea level rise
- c. Temperature over land
- d. Melting of glacier
- e. Increase in night temperatures
- f. Racial conflict
- g. Increase sea surface temperature

- A. a, b, e, g
- B. b, c, f, g
- C. c, d, e, g

D. b, c, d, e
ANSWER: A

16. All the following are Greenhouse gases except?

- A. Methane (CH₄)
- B. Stratospheric Ozone (O₃)
- C. Sulphur dioxide (S₂O)
- D. Water vapor (H₂O)

ANSWER: B

17. In the recent past, climate extremes have?

- A. Increased in frequency and magnitude
- B. Decreased in magnitude
- C. Remained about the same
- D. Unresponsive

ANSWER: A

18. How much do we want to limit global warming to in terms of a global temperate increase?

- A. 2° Celsius
- B. 5° Celsius
- C. 10° Celsius
- D. undefined

ANSWER: A

19. Which of the following contributes most to carbon footprint?

- A. Driving a car to work
- B. Use of public transport
- C. Taking a plane
- D. Riding on a train

ANSWER: A

20. Rainfall season has changed in the tropics due to climate change to have the following effects except?

- A. Increased frequency of occurrence
- B. Shorter duration
- C. Erratic in occurrence
- D. Intense heat

ANSWER: C

21. The following gases are deplete ozone layer except?

- A. Chlorofluorocarbons (CFCs)
- B. Hydrochlorofluorocarbons (HCFCs)
- C. Carbon tetrachloride
- D. Water vapor

ANSWER: D

22. The solar energy that warms the Earth includes the following except?

- A. Gamma rays
- B. Visible radiation
- C. Ultra violet radiation
- D. Sunspots

ANSWER: D

23. Greenhouse gasses in the atmosphere may block heat from escaping into space and trap too much heat next to the Earth's surface causing all the following except: _____.

- A. Another ice age
- B. Global warming
- C. Glacial recession
- D. Extreme weather events

ANSWER: A

24. Which of the following human activities does not lead to global warming?

- A. Burning fossil fuels in our cars
- B. Burning forests
- C. Large-scale agriculture
- D. Use of energy efficient equipment

ANSWER: D

25. The following conditions lead to rain formation Except?

- A. Orographic rise
- B. Convective cooling
- C. Collision of airmasses
- D. Condensation to the surface

ANSWER: D

26. What are Jet streams?

- A. A narrow band of air that travels across the globe.
- B. Fluids that go through solids only.
- C. Gases that pass through liquids only.
- D. Synoptic in nature

ANSWER: A

27. Which of the following is **FALSE** about Cyclones?

- A. Destruction of infrastructure
- B. Endangering of species
- C. Atmospheric disturbances
- D. Caused by human beings

ANSWER: D

28. Climate change is caused by -----and ----- activities?

- A. Anthropogenic and Human activities
- B. Agricultural activities
- C. Use of aerosol cans
- D. Natural and Anthropogenic

ANSWER: D

29. What is the name of the top most layer in the atmosphere?

- A. Exosphere
- B. Thermosphere
- C. Mesosphere
- D. Stratosphere

ANSWER: A

30. In what layer of the atmosphere do we have Aurora activities?

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

ANSWER: B

31. What is environmental lapse rate?

- A. This decrease of temperature with increasing altitude in the lower earth's atmosphere.
- B. The decrease in atmospheric pressure with increase in altitude
- C. The phenomenon of oceanic Rossby waves
- D. The increase of temperature with increase in longitudes

ANSWER: A

32. Which of the following is not type of a precipitation?

- A. Snow
- B. Rain
- C. Hail
- D. Ice

ANSWER: D

33. What is the behavior of Atmospheric temperature in the stratosphere?

- A. Decrease with height
- B. Constant
- C. Haphazard
- D. Increase with height

ANSWER: D

34. Which of the following is not a type of front?

- A. Warm front
- B. Cold front
- C. Occluded front
- D. Mild front

ANSWER: D

35. One of the following is not one weather parameter?

- A. Pressure
- B. Clouds
- C. Precipitation
- D. Humidity

ANSWER: A

36. What are Rossby waves?

- A. These are waves that occur in rotating fluids
- B. These are waves that occur in solid media
- C. These are waves that can travel through solids and liquids
- D. These are a type of electromagnetic waves

ANSWER: D

37. Describe the behavior of temperature within the troposphere?

- A. Varies with height
- B. Increase with height
- C. Decrease with height
- D. Does not vary

ANSWER: C

38. Volcanic eruptions has all of the following effects on the atmosphere except?

- A. Obscuring radiation from reaching the surface
- B. Emission of greenhouse gases into the atmosphere
- C. Introduction of toxic elements into the atmosphere
- D. Clearing of the visibility

ANSWER: D

39. Which of the following is not true about the jet stream?
A. Shortens flight time
B. Saves fuel
C. They flow from the north to south pole
D. Its location can be used to forecast weather
ANSWER: C
40. Which one of the following human activities is affected by weather?
A. Transport
B. Education
C. Farming
D. All of the above
ANSWER: D
41. Which of the following is part of the idealized flow pattern?
A. Ferrel cell
B. Polar cell
C. Hardley cell
D. All of the above
ANSWER: B
42. Which of the following is false about air masses?
A. An air mass is a large body of air covering a relatively wide area and exhibiting "horizontally uniform properties of moisture and temperature.
B. For an air mass to develop, the surface of the source region must be relatively flat and uniform in composition (i.e., oceans, deserts, glaciers.), but not a combination.
C. Air masses are stable and do not change as they move in the atmosphere
D. An air mass is classified by its temperature and moisture.
ANSWER: C
43. How would an air mass be labeled if it forms over ocean and within the tropics?
A. mT
B. cE
C. cA
D. cP
ANSWER: A
44. Which of the following is **FALSE** about weather fronts?
A. A weather front is a transition zone between two air masses of relatively different densities, temperatures, and moisture.
B. When two air masses come into contact with each other, they do not like to mix well because of their different densities.
C. Along a weather front, the warmer, less dense air rises over the colder, denser air to form clouds.
D. Warm fronts move faster than cold fronts because they have a lot of heat energy
ANSWER: D
45. Which of the following is not a type of a weather front?
A. Cold front
B. Warm fronts
C. Occluded fronts

D. Rotating fronts

ANSWER: D

46. Which of the following is NOT an indication of the existence of a weather front?

A. Sharp temperature changes over a relatively short distance

B. Change in moisture content of the air

C. Rapid shifts in wind direction

D. Stable air pressure

ANSWER: D

47. Atmospheric layers are characterized by all the listed features except.

A. Absorption of radiation

B. Reflection of radiation

C. Transmission of radiation

D. Generation of radiation

ANSWER: D

48. Atmospheric circulations are affected by all the features listed except?

A. Temperature

B. Clouds

C. Pressure

D. Wind

ANSWER: C

49. The following affects precipitation type except?

A. Relief features

B. Presence of water body

C. Prevalent winds

D. Soil type

ANSWER: D

50. Which of the following forms of precipitation predominate equatorial region

A. Sleet

B. Rain

C. Mist

D. Virgo

ANSWER: B

SECTION B: 20 Marks

Attempt ALL questions

a. Name the FOUR layers of the atmosphere.

- Troposphere
- Stratosphere
- Mesosphere
- Thermosphere

(4 marks)

b. List any FOUR Air masses that occur in the atmosphere as defined by temperature characteristics.

- Polar airmasses
- Tropical airmasses
- Equatorial airmasses

- Arctic airmasses

(4 marks)

c. Air is usually cooled by THREE processes namely?

- Lateral advection
- Vertical adiabatic cooling
- Radiative cooling

(3 marks)

d. List the FOUR fronts that occur in the atmosphere?

- Warm front
- Cold front
- Occluded front
- Stationary front

(4 marks)

e. Name any FIVE effects of GHGs in the atmosphere?

- Rise in global temperature
- Melting of mountain and ocean glacier
- Degradation of vegetative cover
- Increase in frequency and magnitude of extreme events
- Increase in sea level

(5 marks)

SECTION C: 20 Marks

Attempt ANY TWO questions

a. Discuss the FOUR reservations to the two major classifications of climate

- Anomalies and internal variability are not shown e.g. dry spells/seasons in the wet tropics.
- Do not take into consideration other elements of climate
- Some problems concerning transitional zones and marginal areas
- Data used is not of uniform quality

(10 marks)

a. Discuss how the distribution of pressure and wind systems affect climate of a particular region.

- The belt of equatorial low, the convergence of warm, moist and unstable air (ITCZ) makes this a zone of heavy rainfall
- In the subtropical highs, aridity prevails.
- In polar regions where temperatures are low, precipitation is also low.

(10 marks)

b. Discuss the various roles of the UNFCCC.

- Knowledge-building plays a huge role in the UNFCCC process. Parties are required to gather and share data to build evidence, set goals and track progress on greenhouse gas reduction.
- Establishing major institutions, structures and processes. The Convention lays out a basic structure through which the Parties can work together to achieve its goals.
- Creation of common but differentiated responsibility. The Convention recognises the principle of common but differentiated responsibility (CBDR) and respective capability. This principle acknowledges that different states have different capabilities and responsibilities to address climate change and this can be used as a framework to navigate

the balance between the need for all states to act on climate change, with their varying levels of responsibility for greenhouse gas emissions
(10 marks)

c. Discuss the heat transfer process in the atmosphere?

Conduction: Warm air holds more moisture than cold air. During conduction, heat & moisture from the ocean or land moves into the atmosphere

Convection: It takes heat from the lower atmosphere to the higher atmosphere where pressure is less, causing air to expand, which in turn cools the air.

Radiation: Radiation drives weather. Heat from the sun warms the earth, which radiates the heat back into the atmosphere.

(10 marks)

JOOUST OBSERVES ZERO TOLERANCE TO EXAM CHEATING