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PRESTORMING™

TEST BOOKLET

Test Booklet Series

T.B.C : P-SIA-A-GS

Serial : P-GSI-252601

GENERAL STUDIES - PAPER - I

GEOGRAPHY

TEST - 01



Time Allowed : Two Hours

Maximum Marks : 200

I N S T R U C T I O N S

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES **NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. ENCODE CLEARLY THE TEST BOOK SERIES **A, B, C** OR **D** AS THE CASE MAY BE IN THE APPROPRIATE PLACE IN THE ANSWER SHEET.
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. **DO NOT** write **anything else** on the Test Booklet.
4. This Test Booklet contains **100 items** (questions). Each item is printed in **English**. Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each item.
5. You have to mark all your responses **ONLY** on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. All items carry equal marks.
7. Sooner than you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator *only the Answer Sheet*. You are permitted to take away with you the Test Booklet.
9. Sheets for rough work are appended in the Test Booklet at the end.

10. Penalty for Wrong answers :

THERE WILL BE A PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBJECTIVE TYPE QUESTION PAPERS.

- (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third (0.66)** of the marks assigned to that question will be deducted as a penalty.
- (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be the same penalty as above to that question.
- (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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(1-A)

SIA-A-GS I

1. The term "Wallacean hominids" which was recently in the news, is most appropriately related to which of the following?

- (a) Early human ancestors found in the Amazon rainforest.
- (b) Prehistoric human populations inhabiting the islands of Eastern Indonesia.
- (c) The first evidence of hominid settlement in the Andaman Islands.
- (d) A newly discovered hominid species in the African Rift Valley.

2. **Assertion(A)** : Hot deserts are located at low latitudes

Reason (R) : Continental drift has moved them to lower latitudes from higher latitudes.

Select the correct using the codes given below:

- (a) Both A and R are individually true and R is the correct explanation of A.
- (b) Both A and R are individually true but R is not the correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

3. Consider the following statements:

- 1. Tropical cyclones occur only in oceanic areas where the sea temperature exceeds 33°C.
- 2. In order to achieve the rotational component, the tropical cyclone must be spawned at least 5°N or 5°S of the Equator.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

4. **Assertion (A)** : The circumpolar current encircles Antarctica from west to east.

Reason (R) : The westerly winds in southern hemisphere blow constantly from west to east and do not encounter any major landmasses.

Select the correct using the codes given below:

- (a) Both A and R are individually true and R is the correct explanation of A.
- (b) Both A and R are individually true but R is not the correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

5. **Assertion (A)** : The eruption of volcanoes also brings climate change.

Reason (R) : The Volcanic ash and gases affected the incoming Solar radiation.

Select the correct using the codes given below:

- (a) Both A and R are individually true, and R is the correct explanation of A.
- (b) Both A and R are individually true, but R is not the correct explanation of A
- (c) A is true, but R is false
- (d) A is false, but R is true

6. The Divergent movement of plates results in:
1. Creation of New Oceanic Crusts
 2. Formation of a submarine mountain range
 3. Drifting of the plate
 4. Creation of transform faults
- Which of the statements given above are correct?
- (a) 2, 3 and 4 only
 - (b) 1, 2 and 3 only
 - (c) 1, 3 and 4 only
 - (d) 1, 2, 3 and 4

7. **Assertion(A)** : Most of the Himalayan belt is free from volcanic activity

Reason (R) : Himalaya formed due to the convergence of two continents and has intense folding.

Select the correct option using the codes given below:

- (a) Both A and R are individually true, and R is the correct explanation of A.
- (b) Both A and R are individually true, but R is Not the correct explanation of A
- (c) A is true, but R is false
- (d) A is false, but R is true

8. **Assertion (A)** : The basalt rocks are formed over the surface, while granite rocks reach the surface only by being exposed to erosion.

Reason (R) : Extrusive is a volcanic rock, while Intrusive is a plutonic rock.

Select the correct using the codes given below:

- (a) Both A and R are individually true, and R is the correct explanation of A.
- (b) Both A and R are individually true, but R is Not the correct explanation of A
- (c) A is true, but R is false
- (d) A is false, but R is true

9. Consider the following statement:

1. Most of the sedimentary rocks are deposited in water bodies.
2. The riverine plains are composed of sedimentary rocks.

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

10. **Assertion (A)** : The plains are formed by both internal forces and external forces of the Earth.

Reason (R) : All the plains lie above the mean sea level.

Select the correct using the codes given below:

- (a) Both A and R are individually true, and R is the correct explanation of A.
- (b) Both A and R are individually true, but R is Not the correct explanation of A
- (c) A is true, but R is false
- (d) A is false, but R is true

11. Niagara Falls is located between which of the following pairs of lakes?

- (a) Lake Superior and Lake Huron
- (b) Lake Huron and Lake Erie
- (c) Lake Erie and Lake Ontario
- (d) Lake Ontario and Lake Huron

12. **Assertion(A)** : Species diversity is quite low in the tropical Savannah in comparison to the adjacent tropical rainforests.

Reason (R) : The fire factor plays a role in controlling the species diversity in Savannah.

Select the correct using the codes given below:

- (a) Both A and R are individually true and R is the correct explanation of A.
- (b) Both A and R are individually true but R is not the correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

13. **Assertion (A)** : Most of the radioactive materials are concentrated in the uppermost layers of the Earth.

Reason (R) : The Rate of increase of temperature decreases as we move below.

Select the correct using the codes given below:

- (a) Both A and R are individually true, and R is the correct explanation of A.
- (b) Both A and R are individually true, but R is not the correct explanation of A
- (c) A is true, but R is false
- (d) A is false, but R is true

14. The British Overseas Territory is spread across which of the following ocean basins?

- I. North Atlantic Ocean
- II. South Pacific Ocean
- III. South Atlantic Ocean
- IV. Indian Ocean

Select the correct answer from the codes given below:

- (a) I, II only
- (b) I, IV only
- (c) I, II, III only
- (d) I, II, III and IV only

15. Consider the following pairs:

	River	Flows Through
1	Tijuana	Mexico
2	Limpopo	Mozambique
3	Elbe	Czech Republic

Which of the above are correctly matched?

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

16. Consider the following statements:

1. Rice is the top-most commodity in agricultural exports from India.
2. Vegetable Oil is the top-most commodity in agricultural imports into India.
3. India exports more pulses than it imports.

Which of the above statements are correct?

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

17. Which of the following states borders Bangladesh?

1. Mizoram
2. Manipur
3. Nagaland
4. Assam
5. Sikkim
6. West Bengal

Select the answer using the codes given below:

- (a) Only two
- (b) Only three
- (c) Only four
- (d) Only five

18. Consider the following statements :

Statement I :

Iron does not rust easily in deserts due to the absence of water.

Statement II :

Oxidation is the process in which oxygen in air and water reacts with minerals in the rock.

Which one of the following is correct with respect to the other statements?

- (a) Both Statement I and Statement II are correct and Statement II explains Statement I
- (b) Both Statement I and Statement II are correct but Statement II does not explain Statement I
- (c) Statement I is correct but Statement II is not correct
- (d) Statement I is not correct but Statement II is correct

19. How many of the following cities are present in the tropical region?

1. Darwin
2. New Delhi
3. Manila
4. Buenos Aires
5. Port of Spain
6. Astana
7. Khartoum

Select the correct answer using the codes given below:

- (a) Only three
- (b) Only four
- (c) Only five
- (d) Only six

20. Consider the following statements on Relative Humidity :

Statement I :

Relative Humidity is low in the sub-tropical region

Statement II :

The capacity of air to hold moisture decreases with rising temperature

Statement III :

Cloud formation is abundant in the sub-tropical region

Which one of the following is correct with respect to the above statements?

- (a) Both Statement II and Statement III are correct and both of them explain Statement I
- (b) Both Statement I and Statement II are correct and Statement I explains Statement II
- (c) Only one of the Statements II and III is correct and that explains Statement I
- (d) Neither Statement II nor Statement III is correct.

21. Which of the following appeared on the Earth last?

- (a) Birds
- (b) Amphibians
- (c) Reptiles
- (d) Fishes

22. Which of the following is/are intrusive volcanic landforms?

- 1. Cinder Cone
- 2. Sill
- 3. Dyke
- 4. Batholith

Select the correct answer using the codes given below :

- (a) Only one
- (b) Only two
- (c) Only three
- (d) All four

23. Which of the islands are volcanic in origin?

- 1. South Sandwich Islands
- 2. Mauritius
- 3. Azores

Select the correct answer using the codes given below:

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

24. Consider the following statements on Igneous rocks:

- 1. Basalt is denser than Granite.
- 2. Granite is used in the construction industry, but not basalt

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

25. Consider the following statements on the accelerometer:

1. It is a device used for detecting acceleration and is present in mobile phones
2. Accelerometer data from phones may be used for detecting earthquakes.

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

26. Consider the following statements:

Statement I :

In India, more than fifty per cent of the labourers have exposure to excessive heat.

Statement II :

Agriculture and construction are heat-intensive sectors.

Which one of the following is correct with respect to the other statements?

- (a) Both Statement I and Statement II are correct, and Statement II explains Statement I
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct
- (d) Statement I is not correct, but Statement II is correct

27. You are a fish swimming off the coast of Gabon. You should get to Namibia. How would you get there when travelling through the ocean currents?

- (a) Benguela - South Equatorial - West Wind Drift - Brazil
- (b) South Equatorial - Brazil - West Wind Drift - Benguela
- (c) South Equatorial - Benguela - Brazil - West Wind Drift
- (d) South Equatorial - Brazil - Benguela - West Wind Drift

28. A rock lies buried beneath the ground for thousands of years. Slowly, plant roots reach it, water percolates, chemical reactions accelerate, and over time, the rock completely dissolves into soil, leaving no trace of its parent material.

In which type of climate is such intense chemical weathering and leaching most likely to occur?

- (a) Equatorial climate
- (b) Warm Temperate western margin climate
- (c) Tropical monsoon climate
- (d) Continental steppe climate

29. Where would you most likely find laurel, myrtle, lavender, arbutus and rosemary?

- (a) Italy
- (b) Nigeria
- (c) Japan
- (d) Uruguay

30. Where is temperature inversion **not** observed?

- (a) Troposphere
- (b) Stratosphere
- (c) Mesosphere
- (d) Ionosphere

31. Satellite launching stations are closer to the Equator because:

- (a) Gravitational force is less near the Equator
- (b) Rotational velocity is low
- (c) The equator has high insolation
- (d) Coriolis force is zero

32. Consider the following statements:

1. All Igneous rocks are called parent rocks.
2. All igneous rocks are found on the Earth's surface.

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

33. Which river empties into the Pacific Ocean?

- (a) Yukon
- (b) Seine
- (c) Danube
- (d) Ob

34. Consider the following statements:

Statement I :

Warm waters are less dense than cold waters

Statement II :

Fresh water is denser than salt water

Which one of the following is correct with respect to the other statements?

- (a) Both Statement I and Statement II are correct, and Statement II explains Statement I
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct
- (d) Statement I is not correct, but Statement II is correct

35. A meteorologist using a barometer makes corrections for which of the following?

1. Altitude
2. Latitude
3. Temperature

Select the correct answer using the codes given below:

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

36. Which of the following is **not** a Foehn wind?

- (a) Zonda
- (b) Berg
- (c) Chinook
- (d) Southerly Buster

37. Consider the following:

1. Carbon dioxide
2. Water vapour
3. Nitrogen
4. Hydrogen
5. Methane
6. Ammonia

How many of the above gases were found in the early atmosphere of the Earth?

- (a) 3
- (b) 4
- (c) 5
- (d) 6

38. Which of the following is/are correct inferences from isothermal maps in the month of January?

1. The isotherms are more or less parallel to the latitudes in the Southern Hemisphere.
2. The presence of warm ocean currents and the Gulf Stream makes the isotherms parallel to the latitudes.

Select the answer using the code given below:

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

39. With reference to "Coriolis force", which of the following statements is/are correct?

1. It is directly proportional to the wind velocity and latitude.
2. It is perpendicular to the pressure gradient force.

Select the answer using the code given below:

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

40. Consider the following climate types according to the Koppen scheme of classification:

1. Tropical wet
2. Humid subtropical
3. Marine West Coast
4. Humid continental

How many of the above climate types have a distinct dry season?

- (a) Only one
- (b) Only two
- (c) Only three
- (d) None

41. Consider the following statements with respect to types of Coral Reefs:

1. Fringing reefs are separated from the coast by a much wider and deeper channel or lagoon.
2. Barrier reefs are a coral line platform lying close to the shore.
3. Atolls are similar to barrier reefs except that they are circular in shape.

Which of the statements given above is/ are correct?

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

42. Which among the following are **not** true regarding the equatorial regions?

- (a) It is a sparsely populated region due to the excessive heat and high humidity.
- (b) The Climate is favorable for rubber and cocoa production.
- (c) The main occupations of the region are lumbering and livestock farming.
- (d) The Climate encourages the spread of diseases and pests.

43. Consider the following statements:

1. The differential heating and cooling of the continents and seas have more say in this climate.
2. Most of the year is dry, with little or no precipitation.
3. In addition to the Indian Sub-continent, this Climate is observed in Myanmar, Laos, Cambodia and South China.

Which of the above statements are correct regarding Tropical Monsoon Climate?

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

44. Consider the following pairs:

Tribes		Region
---------------	--	---------------

- | | | |
|---------------|---|-----------|
| 1. Bindibu | - | Indonesia |
| 2. Pygmies | - | Amazon |
| 3. Orang Asli | - | Congo |

How many of the pairs given above are correctly matched?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

45. Consider the following statements:

- 1. Hot, dry summers and cool, wet winters characterize this climate.
- 2. Experience extreme diurnal temperature.
- 3. It is the transitional climate between the rainforest and the desert.

How many of the statements given above are correct regarding the Savanna or the Sudan climate?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

46. The plant species such as Malle, Mulga, and Spinifex grass are found in?

- (a) Hot Desert Climate
- (b) Tropical Savanna climate
- (c) Temperate Steppe Climate
- (d) Siberian Climate

47. Consider the following statements:

Statement I :

Continental shelves can be as shallow as 30 meters or as deep as 600 meters.

Statement II :

The depth of continental shelves is uniform throughout the world.

Which one of the following is correct in respect of the following statements?

- (a) Both Statement-I and Statement-II are correct and Statement-II explains Statement-I
- (b) Both Statement-I and Statement-II are correct and but Statement-II does not explain Statement-I
- (c) Statement-I is correct but Statement-II is not correct
- (d) Statement-I is not correct but Statement-II is correct

48. Which one of the following tributaries of the Indus River system flows entirely within India?

- (a) Chenab
- (b) Sutlej
- (c) Jhelum
- (d) Beas

49. Which of the statements best describes the term 'Supershear Earthquake' as seen in the news?

- (a) Earthquakes that precede larger earthquakes in the same location.
- (b) Lower-magnitude (or lower-intensity) tremors that follow the principal earthquake.
- (c) Seismic events of comparable intensity strike a small area in relatively quick succession.
- (d) An earthquake occurs when a fault ruptures faster than seismic shear waves can travel through rock.

50. Consider the following statements:

Statement I :

Meanders form primarily due to lateral erosion on the outer bank and deposition on the inner bank of a river.

Statement II :

Coriolis force is the main factor responsible for the formation of meanders in rivers.

Which one of the following is correct in respect of the above statements?

- (a) Both Statement-I and Statement-II are correct and Statement-II explains Statement-I
- (b) Both Statement-I and Statement-II are correct but Statement-II does not explain Statement-I
- (c) Statement-I is correct but Statement-II is not correct
- (d) Statement-I is not correct but Statement-II is correct

51. Consider the following with respect to the Neon gas:

- 1. It is a colourless, odourless and toxic gas.
- 2. Neon gas is used in advertising boards and as a cryogenic refrigerant.
- 3. Ukraine is the leading global supplier of neon gas.

Which of the statements given above is/ are correct?

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

52. Consider the following:

Statement I :

Ozone concentration drop is more pronounced in the Southern Hemisphere than in the Northern Hemisphere.

Statement II :

The long presence of low temperatures in the region exacerbates the ozone drop.

Which one of the following is correct with respect to the above statements?

- (a) Both Statement I and Statement II are correct, and Statement II explains Statement I
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct
- (d) Statement I is not correct, but Statement II is correct

53. As the Ganga flows eastward, its left bank tributaries join it in a particular sequence.

Which of the following shows the correct order from west to east?

- (a) Ramganga – Ghaghara – Gandak – Mahananda
- (b) Ghaghara – Ramganga – Mahananda – Gandak
- (c) Gandak – Ramganga – Ghaghara – Mahananda
- (d) Mahananda – Gandak – Ghaghara – Ramganga

54. Consider the following:

Statement I :

India is the largest producer of Monazite in the world.

Statement II :

India is the principal world source of high-quality monazite sands, followed by Brazil.

Which one of the following is correct with respect to the above statements?

- (a) Both Statement I and Statement II are correct, and Statement II explains Statement I
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct
- (d) Statement I is not correct, but Statement II is correct

55. Which one of the following countries is **not** a member of the Panel on Tropical Cyclones (PTC), which is responsible for naming the tropical cyclones that have formed over the Bay of Bengal and the Arabian Sea?

- (a) India
- (b) Indonesia
- (c) Iran
- (d) Maldives

56. With reference to the 'Indian Niño', consider the following statements:

1. In the Positive phase, the mean sea temperatures were close to average across the Indian Ocean.
2. Indian Niño was an independent system and cannot be triggered by El Niño Southern Oscillation (ENSO).
3. The life span of the Indian Niño event is shorter than the Pacific El Niño-La Niña episodes.

How many of the statements given above are correct?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

57. With reference to the forest fire, consider the following statements:

1. In India, the Forest Fire Alert System cannot distinguish between forest fires and other types of fires.
2. Both Tamil Nadu and Odisha use advanced predictive modelling to help identify high-risk areas based on climatic and geographic data.
3. Ground Fires are sustained by glowing combustion (without flames) and can go undetected for a long time.
4. Crown Fires are the most unpredictable fires; due to their nature, it is challenging to control this type of fire.

How many of the statements given above are correct?

- (a) Only one
- (b) Only two
- (c) Only three
- (d) All four

58. Consider the following statements:

1. Slow-moving thunderstorms
2. Thunderstorms repeatedly moving over the same area
3. Cloud Bursts
4. Tropical storms

In which of the above phenomena caused flash flooding to occur?

- (a) Only one
- (b) Only two
- (c) Only three
- (d) All four

59. With reference to the Sendai framework, which of the following is correct?

- (a) It provides the framework for the conservation and wise use of wetlands and their resources.
- (b) It focuses on the adoption of measures which address the three dimensions of disaster risk, including exposure to hazards, vulnerability and capacity.
- (c) It aims to halt and reverse biodiversity loss by 2030.
- (d) It is a collaborative framework to ensure a more inclusive and sustainable approach to ocean conservation in the wider Caribbean region.

60. Consider the following statements regarding Marine heatwaves (MHWs):

1. It occurs when the surface temperature of a particular region of the sea rises to 3 or 4 degrees Celsius above the average temperature for at least five days.
2. MHWs have the potential to persist over multi-year periods.
3. MHWs have been recorded in surface and deep waters, across all latitudes, and in all types of marine ecosystems.
4. MHWs can reduce the reproductivity of corals and make them more vulnerable to life-threatening diseases.

Which of the above statements is/are correct?

- (a) Only one
- (b) Only two
- (c) Only three
- (d) All four

61. Recently, Researchers have discovered the world's deepest blue hole, named Tam Ja Blue Hole (TJBH), It was initially thought to be the second deepest, but recent measurements have now recorded it at a depth of more than 1,380 feet (420 m) below mean sea level (mbSL), surpassing all other blue holes known to date, which is located in?

- (a) Gulf of Ob (Arctic Ocean)
- (b) Gulf of Alaska (Pacific Ocean)
- (c) Mexico's Chetumal Bay (Atlantic Ocean)
- (d) Gulf of Oman (Indian Ocean)

62. Consider the following pairs:

S. no.	Era	Life/Major Events
1.	Pre-Cambrian	Age of Dinosaurs
2.	Palaeozoic	First trace of Plants
3.	Mesozoic	Extinction of Dinosaurs
4.	Cenozoic	Flowering plants and Trees

In how many of the above pairs is the given information correctly matched?

- (a) Only one
- (b) Only two
- (c) Only three
- (d) All four

63. Which of the following is evidence of the concept of Seafloor Spreading?

- I. The Ocean Crust rocks are much older than the continental rocks.
- II. The Sediments on the ocean floor are very thin.
- III. The age of rocks decreases as one moves away from the crust of the mid-oceanic ridge.

Select the correct answer using the code given below.

- (a) I only
- (b) II only
- (c) I, II and III
- (d) II and III only

64. Which one of the following is the characteristic Climate of the Steppe Region?

- (a) Rainfall throughout the year
- (b) The annual range of temperature is low
- (c) They lie along the Trade wind belt
- (d) Practically treeless, and the grasses are much shorter

65. Consider the following Statements:

Statement I : Basaltic lavas are highly fluid in nature due to low silica content.

Statement II : The Basic lavas result in the formation of Shield volcanoes.

Which one of the following is correct with respect to the above statements?

- (a) Both Statement I and Statement II are correct, and Statement II explains Statement I
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct
- (d) Statement I is not correct, but Statement II is correct

66. Consider the following with respect to the Tropical and Extra-Tropical Cyclone:

- 1. Both can originate over the seas.
- 2. Both develop a clear frontal system.
- 3. They move under the influence of Trade winds and Westerlies, respectively.

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

67. Consider the following pairs:

Grasslands	Region
1. Pustaz	- Hungary
2. Pampas	- Uruguay
3. Canterbury	- New Zealand
4. Veld	- Australia

How many of the pairs given above are correctly matched?

- (a) Only one pair
- (b) Only two pairs
- (c) Only three pairs
- (d) All four pairs

68. With reference to the River Kafue, which was recently seen in the news, consider the following statements:

- 1. It is a major tributary of the River Zambezi.
- 2. It flows entirely within Zambia.

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

69. Which of the following best describes 'Thermocline'?

- (a) Region of increasing temperature in Earth's Atmosphere that is located above the mesosphere.
- (b) A boundary region below the sea surface from where there is a rapid decrease in temperature.
- (c) A boundary separating Earth's Atmosphere and outer space.
- (d) A zone around a star where it is not too hot and not too cold for liquid water to exist.

70. Consider the following statements:

- 1. Uniformity of temperatures throughout the year.
- 2. Well-distributed precipitation around the year with low amounts along the summer and winter solstices.
- 3. Heavy downpours of convectional rain every afternoon.

Which of the following climates is described above ?

- (a) Equatorial Climate
- (b) China-type Climate
- (c) Humid subtropical Climate
- (d) Cool Temperate Western Margin climate

71. This type of Mass Movement occurs in the absence of vegetation cover and with heavy rainfall, thick layers of weathered materials get saturated with water, flowing either slowly or rapidly down along definite channels.

Which of the following types of Mass Movement is described above?

- (a) Creep
- (b) Slump
- (c) Mudflow
- (d) Avalanche

72. Consider the following information:

<i>Place in News</i>	<i>Significance/ Reason</i>
1. Chernobyl	A nuclear power plant in Russia that was allegedly attacked during the ongoing conflict with Ukraine
2. Kasso	A commercial scale e-methanol power plant in Denmark
3. Hodeidah	A Red Sea port in Yemen that was attacked during the conflict between Israel and the Houthis

Which of the above pairs are correctly matched?

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

73. Which one of the following ocean currents is responsible for moderating winter temperatures in North-western Europe?

- (a) Gulf Stream
- (b) Norwegian Current
- (c) Labrador Current
- (d) North Atlantic Drift

74. Which one of the following climates is known for the practice of truck farming or market gardening?

- (a) The Laurentian Climate
- (b) The British Climate
- (c) The Steppe Climate
- (d) The Siberian Climate

75. Consider the following statements:

Statement I :

The drainage pattern is called Dendritic drainage due to its Tree-like appearance.

Statement II :

In a dendritic drainage pattern, the tributaries will join the main valley at a right angle as subsequent streams.

Which one of the following is correct with respect to the above statements?

- (a) Both Statement I and Statement II are correct, and Statement II explains Statement I
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct
- (d) Statement I is not correct, but Statement II is correct

76. Which one of the following activities is a major source of revenue in regions of the Siberian Climate?

- (a) Lumbering
- (b) Horticulture
- (c) Viticulture
- (d) All the above

77. Consider the following with respect to the solar insolation:

Statement I :

The annual insolation received by the Earth on 4th July is less than that on 3rd January.

Statement II :

This is due to the perihelion and aphelion position of Earth with respect to the sun.

Which one of the following is correct with respect to the above statements?

- (a) Both Statement I and Statement II are correct, and Statement II explains Statement I
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct
- (d) Statement I is not correct, but Statement II is correct

78. Consider the following:

1. It is frozen raindrops or refrozen melted snow-water.
2. It occurs when a warm layer of air lies above a layer of air below freezing at the Earth's surface.

Which of the following precipitation types is described above?

- (a) Hailstones
- (b) Sleet
- (c) Snow
- (d) Dew

79. The term 'Exfoliation' denotes:

- (a) Angular fragments of rocks that are prised from mountain-sides and fall down the slope, where they are accumulated.
- (b) Slow, gradual but more or less continuous movement of soil down hillslopes.
- (c) Gradual splitting of surface layers of rounded boulders, one after another.
- (d) Splitting of individual grains within rocks, which eventually fall off.

80. Consider the following statements:

1. Receives steady rainfall from the trade winds throughout the year.
2. The climatic region is prone to severe tropical cyclones.

Which among the following climates is described above?

- (a) Tropical Monsoon Climate
- (b) Tropical Marine Climate
- (c) Natal Type Climate
- (d) China-type Climate

81. In West Africa, the North-East Trades blow offshore from the Saharan Desert and reach the Guinea Coast as a dry, dust-laden wind. It is so dry that its relative humidity seldom exceeds 30 per cent. The wind provides a welcome relief from the damp air of the Guinea lands by increasing the rate of evaporation with resultant cooling effects. The wind is locally called:

- (a) Sirocco
- (b) Harmattan
- (c) Khamsin
- (d) Simoom

82. Consider the following with respect to the Masai tribes of Africa:

1. They are settled cultivators who inhabit the central highlands of Kenya, Uganda and Tanzania.
2. They domesticate cattle and goats for both milk and meat.

Which of the statements given above is/ are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

83. Consider the following statements:

Statement I :

Southern Europe get most of their rainfall during winter.

Statement II :

Pressure belts shift southward when the sun is overhead over the Tropic of Capricorn.

Which one of the following is correct with respect to the above statements?

- (a) Both Statement I and Statement II are correct, and Statement II explains Statement I
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct
- (d) Statement I is not correct, but Statement II is correct

84. **Assertion (A) :** The Tarai belt is marshy and swampy with luxurious vegetation.

Reason (R) : Rivers re-emerge in the Tarai without properly defined channels, causing swampy conditions.

- (a) Both Assertion and Reason are true, and Reason is the correct explanation of Assertion
- (b) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion
- (c) Assertion is true, but Reason is false
- (d) Assertion is false, but Reason is true

85. Consider the following:

- 1. Absence of shade is the distinct feature of this Climate.
 - 2. These Climatic conditions don't suit grass growth.
 - 3. Viticulture is the predominant occupation.
- Which of the following climatic regions has the above characteristics?
- (a) British Climate
 - (b) Mediterranean Climate
 - (c) Steppe climate
 - (d) Siberian Climate

86. Consider the following countries:

- I. Turkey
- II. Jordan
- III. Syria
- IV. Saudi Arabia
- V. Iraq
- VI. Iran

The Zagros mountains pass through how many of the above countries?

- (a) Only two
- (b) Only three
- (c) Only four
- (d) Only five

87. Consider the following statement:

- 1. All the sedimentary rocks have different strata of different types of sediments.
- 2. Most of the sedimentary rocks are ex-situ rocks.

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

88. The Philadelphia corridor, recently in the news, connects which of the following regions?

- (a) United States and Canada
- (b) United States and Mexico
- (c) West Bank and Israel
- (d) Gaza and Egypt

89. Recently, Suweyda province in Syria caught the international attention for which one of the following reasons?

- (a) Discovery of rich deposits of rare earth elements
- (b) Israel captures through military action
- (c) Inter-ethnic violence
- (d) Volcanic eruption

90. With reference to passion fruit, consider the following statements:

- 1. It is generally cultivated in tropical regions of the world.
- 2. It is native to the USA.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

91. With reference to recent data on migration and remittances from the Reserve Bank of India, consider the following statements:

- 1. Better job opportunities act as a Push factor in migration.
- 2. There is an increase in migration to the Gulf from India's Northern States compared to that of Southern States.
- 3. Southern States of India receive more remittances from the Gulf compared to Northern States.

How many of the above statements is/are correct?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

92. With reference to aluminium, consider the following statements:

- 1. China is the world's leading producer with a ninety per cent share in global production.
- 2. It is used in the production of pharmaceuticals.
- 3. India's per capita consumption of aluminium is the highest in the world.

How many of the above statements is/are correct?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

93. The eye of the Tropical cyclone has

- (a) High temperature and low pressure
- (b) High temperature and high pressure
- (c) Low temperature and low pressure
- (d) Low temperature and high pressure

94. Cloud seeding is a method of intentional weather modification used in attempts to

- (a) Disperse fog
- (b) Suppress hail
- (c) Produce precipitation
- (d) Disperse clouds

95. Consider the following:

- 1. North Macedonia
- 2. Moldova
- 3. Bulgaria
- 4. Hungary

Which one of the above countries is/are landlocked?

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

96. Consider the following statement:

- 1. All the lakes are situated above the mean sea level.
- 2. The Aral Sea and the Caspian Sea are examples of lakes of Tectonic origin.

Which of the statements given above is/are **not** correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

97. The popular cotton and corn belts of the USA experience which one of the following climates?

- (a) The Warm Temperate Eastern Margin Climate
- (b) The Savanna or Sudan Climate
- (c) Cool Temperate Western Margin Climate
- (d) The Warm Temperate Western Margin Climate

98. Select the correct pair of cities in the automobile industry of the world.

- (a) Detroit, Turin, Oslo, Windsor
- (b) Windsor, Turin, Coventry, Oslo
- (c) Coventry, Detroit, Milan, Oslo
- (d) Windsor, Turin, Coventry, Chennai

99. Consider the following rows:

S. NO.	Type of Earthquake Wave	Medium of Propagation	Shadow Zone
1.	P-wave	Solid and liquid only	145° to 180°
2.	S-wave	Solid only	105° to 180°

Which of the Rows given above are correctly matched?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

100. Consider the following statements:

- 1. Monazite is used in the production of Rare-Earth Elements (REEs) in India.
- 2. Monazite is only found on the coasts of India.
- 3. Neodymium is an REE that can be extracted from monazite reserves.
- 4. India extracts Neodymium and Praseodymium with more than ninety per cent purity.

How many of the above statements is/are correct?

- (a) Only one
- (b) Only two
- (c) Only three
- (d) All four

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TEST 01 – GEOGRAPHY - EXPLANATION
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1. The term "Wallacean hominids" which was recently in the news, is most appropriately related to which of the following?
 - (a) Early human ancestors found in the Amazon rainforest.
 - (b) **Prehistoric human populations inhabiting the islands of Eastern Indonesia.**
 - (c) The first evidence of hominid settlement in the Andaman Islands.
 - (d) A newly discovered hominid species in the African Rift Valley.

EXPLANATION:

Wallacean hominids were early humans who lived in Wallacea, a group of islands in Eastern Indonesia, including Sulawesi, Lombok, Flores, Timor, and Sumbawa, located between Asia and Australia–New Guinea. The region is named after Alfred Russel Wallace, a naturalist who studied its unique wildlife.

- Recently, Scientists have found a series of stone tools on Indonesia's Sulawesi island they say may be evidence of humans living 1.5 million years ago on islands between Asia and Australia, the earliest known humans in the Wallacea region.
- The earliest Wallacean hominids, prehistoric persons known as Homo Erectus, were thought to have only settled in Indonesia's Flores island and the Philippines' Luzon island around 1.02 million years ago, as they were thought to be incapable of distant sea travel, proving the significance of the Sulawesi findings in theories of migration.
- Archaeologists from Australia and Indonesia found the small, chipped tools, used to cut little animals and carve rocks, under the soil in the region of Soppeng in South Sulawesi. Radioactive tracing of these tools and the teeth of animals found around the site was dated at up to 1.48 million years ago. **So, Option (b) is correct.**

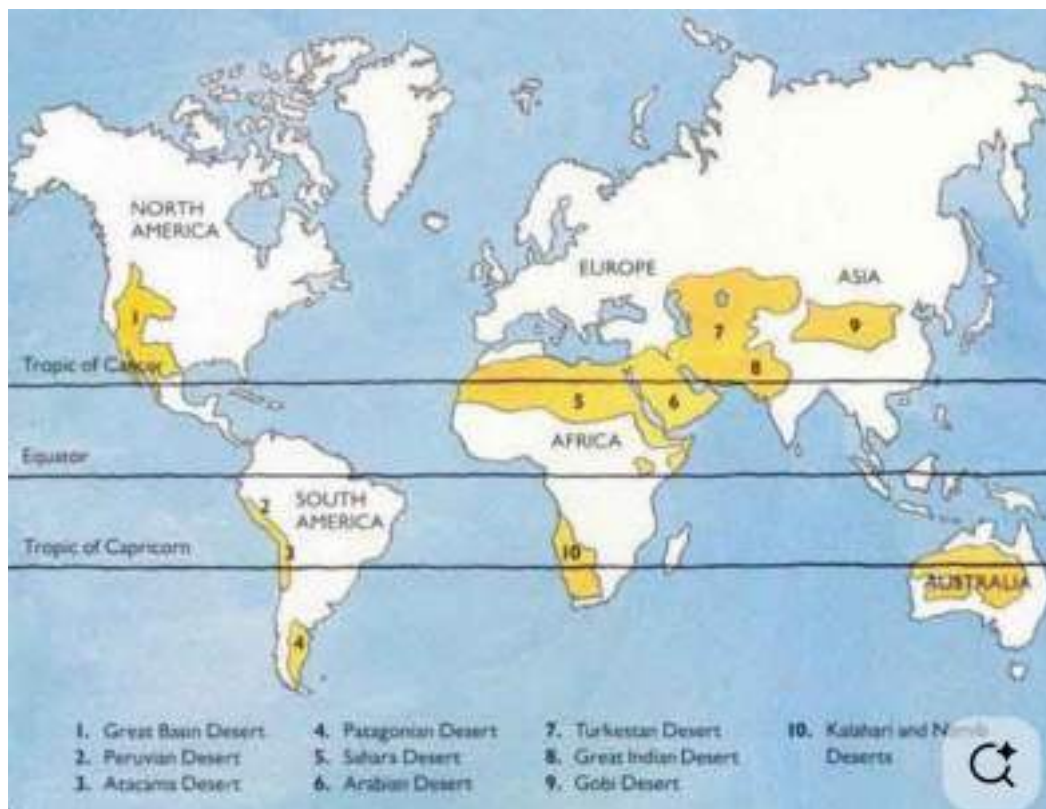


2. **Assertion(A)** : Hot deserts are located at low latitudes.
Reason (R) : Continental drift has moved them to lower latitudes from higher latitudes.
 Select the correct using the codes given below:
 - (a) Both A and R are individually true and R is the correct explanation of A.
 - (b) Both A and R are individually true but R is not the correct explanation of A
 - (c) **A is true but R is false**
 - (d) A is false but R is true

EXPLANATION:

Almost all deserts are confined within the lower latitudes, from 15° to 30° parallels of latitude, north and south of the Equator. They lie in the trade wind belt on the western parts of the continents where Trade Winds are offshore. They are bathed by cold currents which produce a 'desiccating effect' so that moisture is not easily condensed into precipitation. Dryness or aridity is the keynote.

Such deserts are tropical hot deserts, also known as 'Trade Wind deserts'. They include the Great Sahara Desert, as well as the Arabian, Iranian, and Thar Deserts, and the Kalahari. Namib and Atacama Deserts, the Great Australian Desert, and the deserts of south-western USA and northern Mexico. In the continental interiors of the mid-latitudes, the deserts such as the Gobi and Turkestan are characterised by extremes of temperature. **So, Assertion (A) is true.**



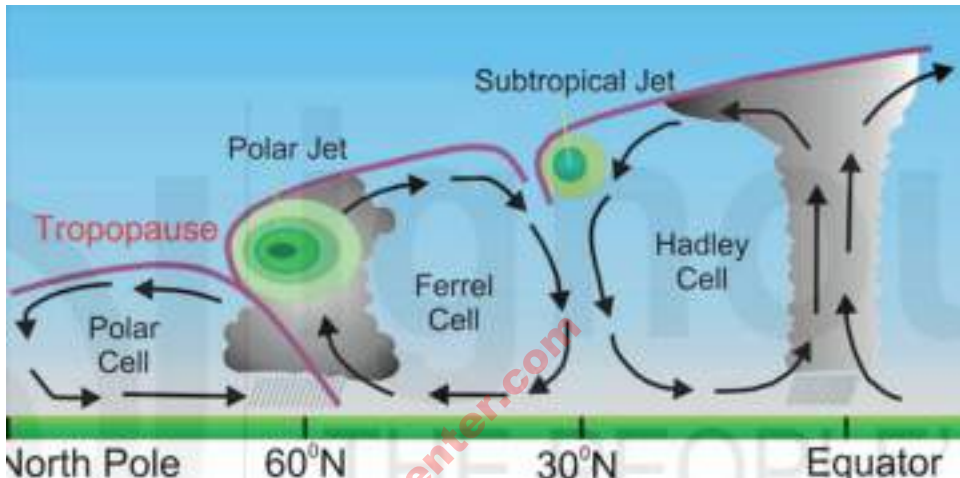
Most deserts lie between 15° and 45° latitude, especially near 30° north and south of the Equator. This is mainly due to the Hadley Cell circulation:

- At the Equator, hot air rises, carrying lots of moisture. The moisture condenses and falls as heavy rain (tropical rainforests form here).
- The now dry air moves poleward at high altitude.
- Around 30° latitude, this air descends. Descending air is dry with low humidity, resulting in a region of high pressure and dry atmosphere.
- These conditions create arid climates, giving rise to major deserts like the Sahara and Arabian Desert.

On the eastern coasts of continents, deserts are less common because of onshore trade winds and warm ocean currents.

Therefore, deserts tend to be located in lower latitudes due to the Hadley cell circulation, not due to continental drift. **So, Reason (R) is not correct.**

ADDITIONAL INFORMATION:

GLOBAL ATMOSPHERIC CIRCULATION	
Definition	<p>Global Atmospheric Circulation is the movement of air around the planet. It explains how thermal energy and storm systems move over the Earth's surface.</p> <p>The global atmospheric circulation model is based on cells. These cells are regions where air moves from areas of low pressure to areas of high pressure. There are three cells in each hemisphere: the Hadley cell, the Ferrel cell, and the Polar cell.</p> <div style="text-align: center;">  </div>
Hadley cell	<p>Hadley Cells are the low-latitude overturning circulations that have air rising at the Equator and air sinking at roughly 30° latitude. They are responsible for the trade winds in the Tropics and control low-latitude weather patterns.</p> <p>At low latitudes, air moves toward the Equator, where it is heated and rises vertically. In the upper atmosphere, air moves poleward. This forms a convection cell that covers tropical and subtropical climates. This cell is named for English physicist and meteorologist George Hadley, who proposed the single circulation for each hemisphere in 1735.</p>
Ferrel cell	<p>The Ferrel Cell operates between 30° and 65° latitude in both hemispheres. In this zone, westerly winds blow from the subtropical high-pressure belt (around 30°) towards the subpolar low-pressure belt (around 60°–65°).</p> <p>At about 60°–65° latitude, the warmer westerlies meet colder polar easterlies. The warm air rises here.</p> <p>After rising into the upper troposphere, this air splits and moves in two directions:</p> <ul style="list-style-type: none"> ➤ Poleward, towards the poles. ➤ Equatorward, back towards the subtropics. <p>This continuous circulation of air—from the surface to the upper atmosphere between 30° and 65°—is what defines the Ferrel Cell.</p>
Polar cell	<p>Polar cell involves the atmospheric circulation prevailing between 60° to poles from surface to upper troposphere in both the hemispheres is called polar cell. Polar cold winds blow from the polar high-pressure belt to the subpolar low-pressure belt. These polar cold winds converge with warm westerlies near 60°–65° latitude and form fronts. The warm wind ascends upward due to the rotation of the Earth, and these winds descend at the poles.</p>

3. Consider the following statements:

1. Tropical cyclones occur only in oceanic areas where the sea temperature exceeds 33°C.
2. In order to achieve the rotational component, the tropical cyclone must be spawned at least 5°N or 5°S of the Equator.

Which of the statements given above is/are correct?

- (a) 1 only
(b) **2 only**
(c) Both 1 and 2
(d) Neither 1 nor 2

EXPLANATION:

Tropical cyclones are violent storms that originate over oceans in tropical areas and move into coastal areas, bringing about large-scale destruction caused by violent winds, very heavy rainfall, and storm surges. This is one of the most devastating natural calamities. They are known as Cyclones in the Indian Ocean, Hurricanes in the Atlantic, Typhoons in the Western Pacific and South China Sea, and Willy-willies in Western Australia. Tropical cyclones originate and intensify over warm tropical oceans. The conditions favourable for the formation and intensification of tropical storms are:

- Large sea surface with a temperature higher than 27° C;
- Presence of the Coriolis force;
- Small variations in the vertical wind speed;
- A pre-existing weak low-pressure area or low-level cyclonic circulation;
- Upper divergence above the sea level system.

Therefore, Large Sea surface temperatures higher than 27° C is enough to form tropical storms. **So, Statement 1 is not correct.**

Due to the lack of the Coriolis force (the force that causes the cyclone to spin), cyclones do not form within 5° latitude of the Equator.

In the presence of the Coriolis force, the air does not simply move from the surroundings towards the centre of the low-pressure system, but is also deflected, leading to the formation of a vortex (rotational component), which is favourable for tropical cyclone formation.

Therefore, in order to achieve the rotational component, the tropical cyclone must be spawned at least 5° N or 5° S of the Equator. **So, Statement 2 is correct.**

ADDITIONAL INFORMATION:

TROPICAL CYCLONES	
Definition	A tropical cyclone is an intense circular storm that originates over warm tropical oceans. It is also called a hurricane or a typhoon. It is characterised by low atmospheric pressure and heavy rain, and its winds exceed 119 km (74 miles) per hour. Tropical cyclones occur every year during the late summer months: July–September in the Northern Hemisphere and January–March in the Southern Hemisphere.
Favorable conditions	<ul style="list-style-type: none"> ➤ The temperature of the surface layer of ocean water must be 26.5 °C (80 °F) or warmer, and this warm layer must be at least 50 metres (150 feet) deep. ➤ A pre-existing atmospheric circulation must be located near the surface warm layer. ➤ The atmosphere must cool quickly enough with height to support the formation of deep convective clouds. ➤ The middle atmosphere must be relatively humid at a height of about 5,000 metres (16,000 feet) above the surface. ➤ The developing system must be at least 500 km (300 miles) away from the Equator.

	<p>➤ The wind speed must change slowly with height through the troposphere—no more than 10 metres (33 feet) per second between the surface and an altitude of about 10,000 metres (33,000 feet).</p>
Tropical cyclone	<p>➤ The energy that intensifies the storm originates from the condensation process in the towering cumulonimbus clouds surrounding the storm's centre. With a continuous supply of moisture from the sea, the storm is further strengthened.</p> <p>➤ On reaching the land, the moisture supply is cut off, and the storm dissipates. The point where a tropical cyclone makes landfall is called the landfall of the cyclone.</p> <p>➤ The cyclones, which generally recurve across the 20°N latitude, are more destructive.</p> <p>➤ A mature tropical cyclone is characterised by strong, spirally circulating winds around the centre, called the eye. The diameter of the circulating system can range from 150 to 250 km. The eye is a region of calm with subsiding air. Around the eye is the eye wall, where there is a strong spiralling ascent of air to greater height reaching the tropopause.</p> <p>➤ The wind reaches maximum velocity in this region, reaching as high as 250 km per hour. Torrential rain occurs here. From the eyewall, rainbands may radiate, and trains of cumulus and cumulonimbus clouds may drift into the outer region. The diameter of the storm over the Bay of Bengal, the Arabian Sea and the Indian Ocean is between 600 and 1200 km. The system moves slowly, at a rate of about 300-500 km per day. The cyclone creates storm surges, and they inundate the coastal lowlands. The storm peters out on the land.</p> <div data-bbox="418 978 1318 1444" data-label="Image"> <p>The diagram illustrates the structure of a tropical cyclone. At the center is the 'Eye of the storm', a calm region. Surrounding it is the 'Eyewall', where winds are strongest. Outside the eyewall are 'Rainbands' and 'Cumulonimbus clouds'. Arrows indicate the inward spiraling of air and the upward movement of air in the eyewall. Labels include 'Surface', 'Wind at peak', 'Cumulonimbus clouds', 'Eye wall', 'Rainbands', 'Subsiding warm air descending cool air', 'Warm moist air rising', and 'Large warm ocean water'.</p> </div>

4. **Assertion(A)** : The circumpolar current encircles Antarctica from west to east.
Reason (R) : The westerly winds in the southern hemisphere blow constantly from west to east and do not encounter any major landmasses.
 Select the correct using the codes given below:
- (a) Both A and R are individually true and R is the correct explanation of A.
 (b) Both A and R are individually true but R is Not the correct explanation of A
 (c) A is true but R is false
 (d) A is false but R is true

EXPLANATION:

Antarctic Circumpolar Current is a wind-driven surface oceanic current encircling Antarctica and flowing from west to east. Affected by adjacent landmasses, submarine topography, and prevailing winds, the Antarctic Circumpolar Current is irregular in width and course. Its motion is further complicated by continuous exchange with other water masses at all depths.

The Antarctic Circumpolar Current separates the Southern Ocean from the Atlantic, Pacific, and Indian oceans at 60° S latitude, which roughly coincides with the current's southern boundary. **So, Assertion (A) is correct.**

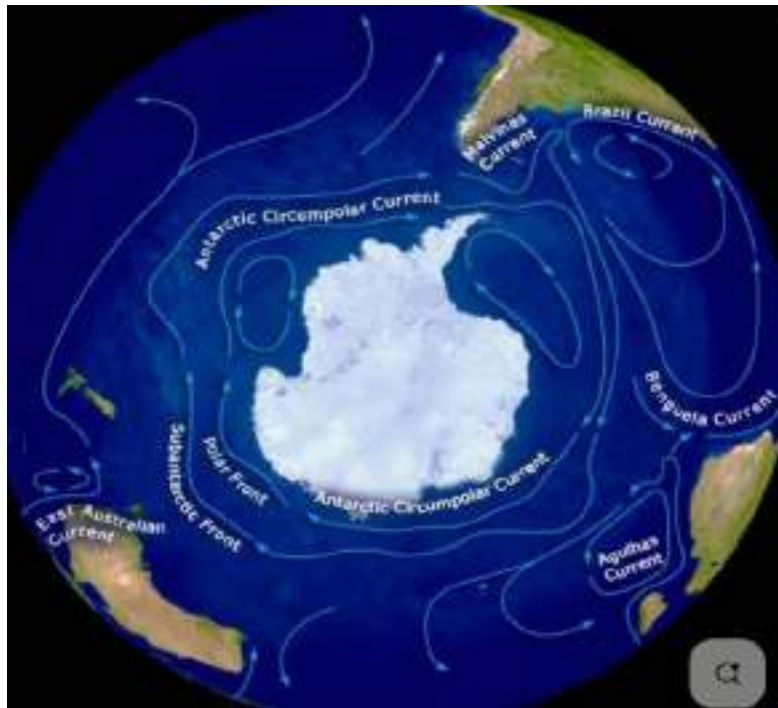
Westerlies are prevailing winds that blow from the west at midlatitudes. They are fed by polar easterlies and winds from the high-pressure horse latitudes, which sandwich them on either side. Westerlies are strongest in the winter, when pressure over the pole is low, and weakest in summer, when the polar high creates stronger polar easterlies.

The strongest westerlies blow through the "Roaring Forties," a wind zone between 40- and 50-degree latitude in the Southern Hemisphere. Throughout the Roaring Forties, there are few landmasses to slow the winds. The tip of South America and Australia, as well as the islands of New Zealand, are the only large landmasses to penetrate the Roaring Forties.

Westerlies have an enormous impact on ocean currents, especially in the Southern Hemisphere. Driven by westerlies, the powerful Antarctic Circumpolar Current (ACC) rushes around the continent (from west to east) at about 4 kilometres per hour (2.5 miles per hour).

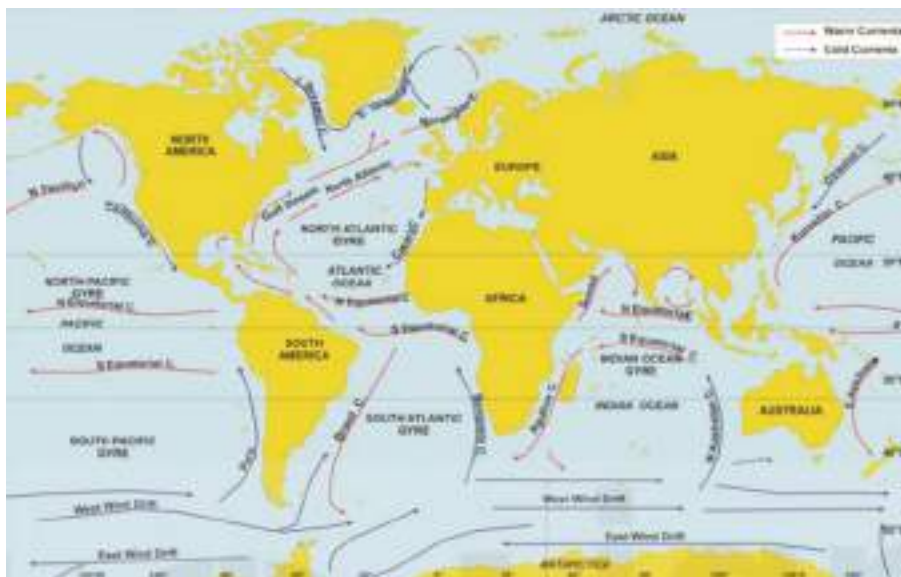
Therefore, the circumpolar current encircles Antarctica from west to east as they do not encounter any major landmasses.

Both A and R are individually true, and R is the correct explanation of A.



ADDITIONAL INFORMATION:

OCEAN CURRENTS	
About	Ocean currents are continuous, predictable movements of ocean water driven by gravity, wind (including the Coriolis force), and variations in water density. Horizontal movements are referred to as currents, while vertical movements are known as upwelling or downwelling. Warm currents carry water from tropical regions to colder areas, while cold currents transport water from colder regions to warmer ones.



<p>Gyres</p>	<p>The circular pattern of ocean currents is caused by Earth's rotation. These patterns are known as gyres, which are large systems of rotating ocean currents. There are five major gyres in the world's oceans. They are</p> <ul style="list-style-type: none"> ➤ North Atlantic – North equatorial current, Gulf Stream ➤ South Atlantic – South equatorial current, Brazil current ➤ North Pacific – North Pacific current, Oyashio current, Kuroshio current. ➤ South Pacific – Peru current. ➤ Indian Ocean - Equatorial Counter current, Somali current, The Agulhas Current
<p>Why does water move in a circular pattern?</p>	<p>The Sun heats water at the Equator. The wind and the Sun make ocean currents move. At the Equator, the Sun heats water the strongest. When water heats, water molecules vibrate faster and eventually move farther apart.</p> <ul style="list-style-type: none"> ➤ Hot water moves to the poles. From the Equator, hot water pushes outward to the north and south poles. At the same time, cold water from the North and South Poles collides with this warm water. ➤ Water spins in a circular pattern because of Earth's rotation. Because Earth spins on its axis, water flows in a circular pattern. Oceans in the northern hemisphere move mostly clockwise. However, in the Southern Hemisphere, ocean currents generally move mostly counterclockwise.

5. **Assertion(A)** : The eruption of volcanoes also brings climate change.

Reason (R) : The Volcanic ash and gases affect the incoming solar radiation.

Select the correct using the codes given below:

- (a) **Both A and R are individually true, and R is the correct explanation of A.**
- (b) Both A and R are individually true, but R is not the correct explanation of A
- (c) A is true, but R is false
- (d) A is false, but R is true

EXPLANATION:

Volcanic eruptions are responsible for releasing molten rock, or lava, from deep within the Earth, forming new rock on the Earth's surface. But the largest and most explosive eruptions also impact the atmosphere.

The gases and dust particles thrown into the atmosphere during large volcanic eruptions can influence the climate.

Particles spewed from volcanoes, like dust and ash, can cause temporary cooling by shading incoming solar radiation if the particles are launched high enough into the atmosphere. The cooling effect can last for months to years, depending on the eruption. But volcanoes can also cause the climate to warm when eruptions spew greenhouse gases into the atmosphere. Over millions of years, this caused global warming during times in Earth's history when extreme amounts of volcanism emitted large amounts of greenhouse gases.

Volcanic ash or dust released into the atmosphere during an eruption shades sunlight and causes temporary cooling. Small ash particles form a dark cloud in the troposphere that shades and cools the area directly below. Most of these particles fall out of the atmosphere as rain within a few hours or days after an eruption. However, the smallest particles of dust can enter the stratosphere and travel vast distances, often spanning the globe. These tiny particles are so light that they can stay in the stratosphere for months, blocking sunlight and causing cooling over large areas of the Earth.

Therefore, volcanic eruptions also bring climate change due to the volcanic ash and gases released during the eruption, which affect the incoming Solar radiation.

So, both A and R are individually true, and R is the correct explanation of A.

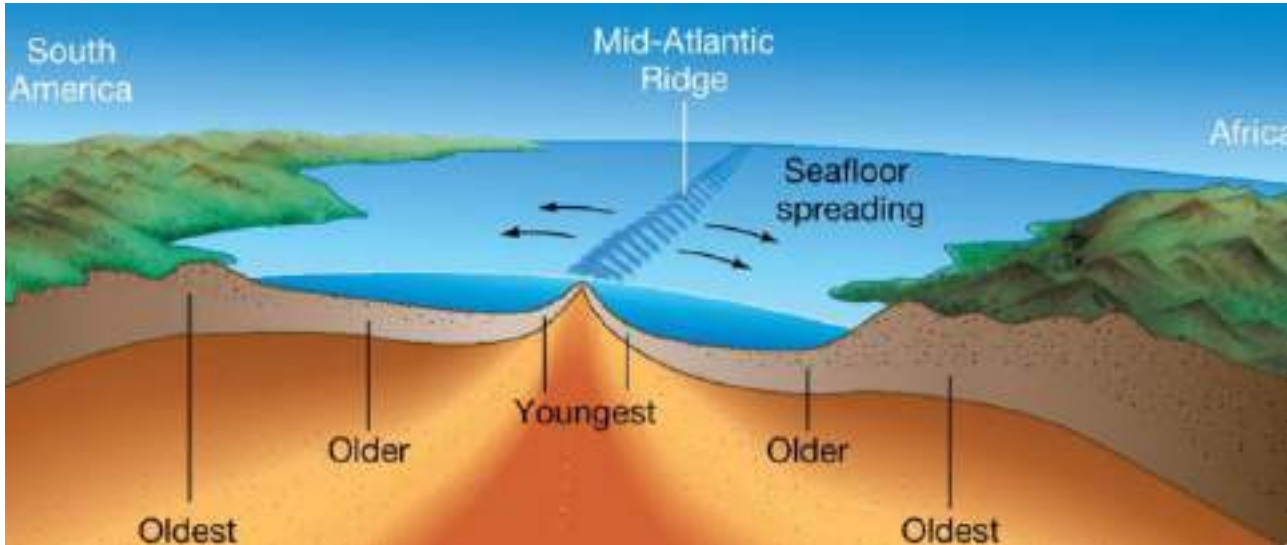
6. The Divergent movement of plates results in:
1. Creation of new oceanic crusts
 2. Formation of a submarine mountain range
 3. Drifting of the plate
 4. Creation of transform faults
- Which of the statements given above are correct?
- (a) 2, 3 and 4 only
(b) 1, 2 and 3 only
(c) 1, 3 and 4 only
(d) **1, 2, 3 and 4**

EXPLANATION:

There are three kinds of plate tectonic boundaries: Convergent, Transform and Divergent, plate boundaries.

- Convergent Boundaries: Crust is destroyed as one plate sinks beneath another (subduction zone). Convergence can occur:
 - Oceanic + Continental plate
 - Oceanic + Oceanic plate
 - Continental + Continental plate
- Transform Boundaries: Crust is neither created nor destroyed. Plates slide past each other horizontally. Transform faults, usually perpendicular to mid-ocean ridges, form due to uneven eruptions and Earth's rotation.
- Divergent boundaries occur along spreading centres where plates are moving apart and new crust is created by magma pushing up from the mantle. The sites where the plates move away from each other are called spreading sites. This process of new crust formation and spreading is continuous,

leading to the plates drifting apart over millions of years. The best-known example of divergent boundaries is the Mid-Atlantic Ridge. At this, the American Plate is/are separated from the Eurasian and African Plates. **So, Statements 1 and 3 are correct.**



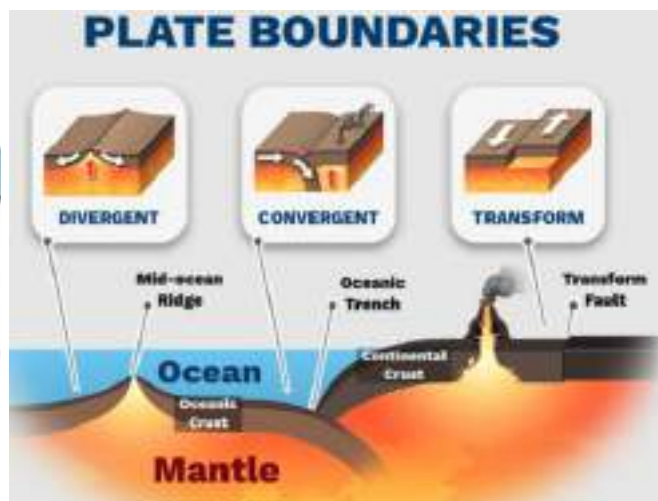
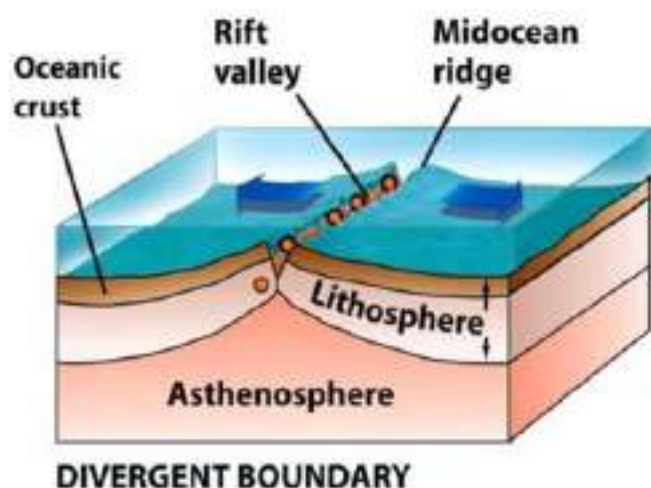
Along the Divergent boundaries, magma rises from deep within the Earth and erupts to form new crust on the lithosphere. Most divergent plate boundaries are underwater and form submarine mountain ranges called oceanic spreading ridges.

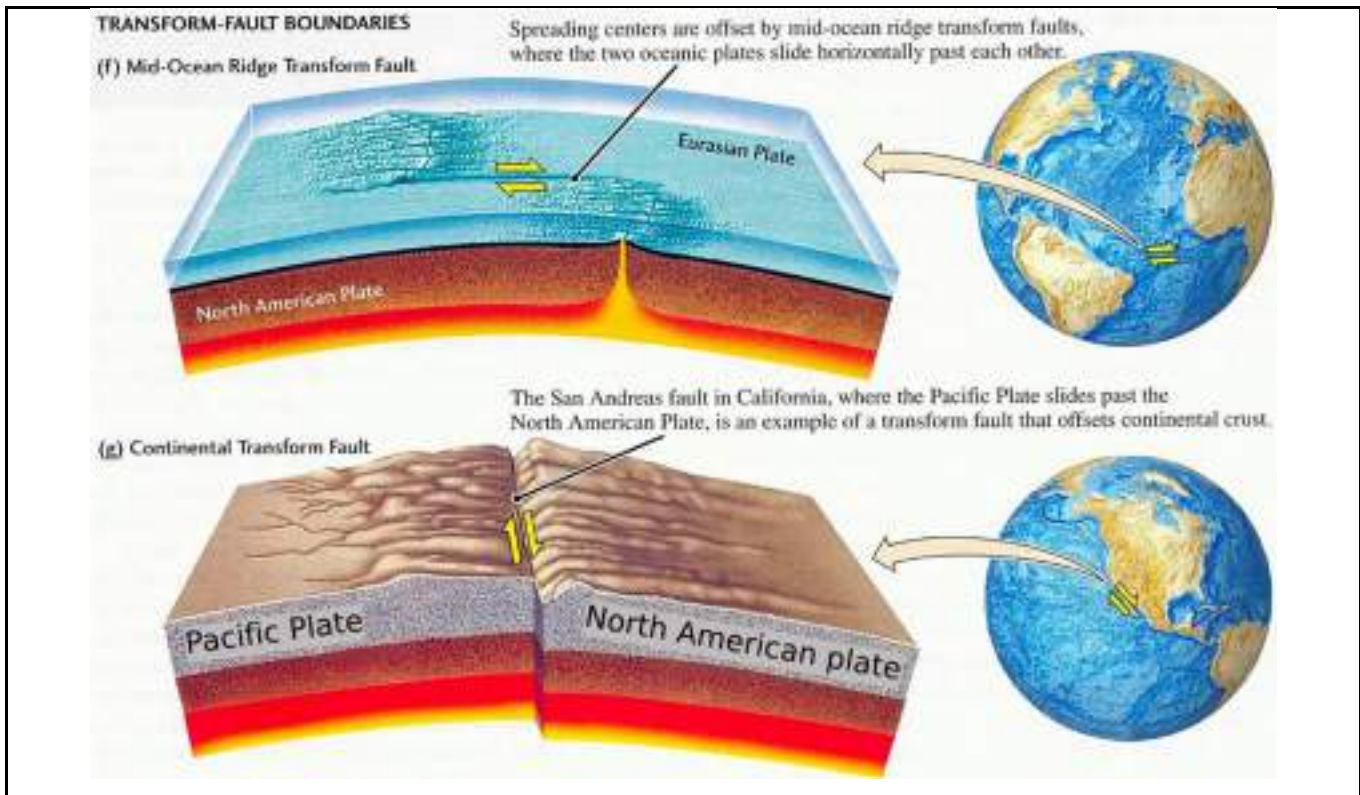
While the process of forming these mountain ranges is volcanic, volcanoes and earthquakes along oceanic spreading ridges are not as violent as they are at convergent plate boundaries. **So, Statement 2 is correct.**

Transform boundaries typically develop along fractures or faults in the Earth's crust, where plates meet but do not converge or diverge.

Many transform faults form as offsets in mid-ocean ridges, accommodating differences in spreading rates or directions between segments of the ridge.

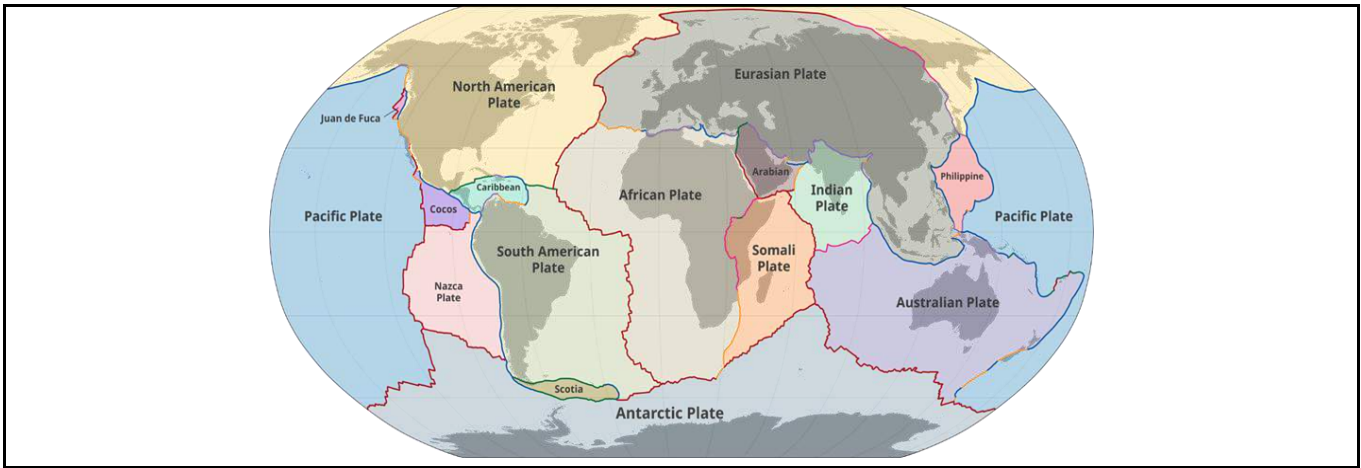
By connecting segments of divergent boundaries, transform boundaries facilitate the irregular movements of tectonic plates across the Earth's curved surface. Therefore, Divergent movement of plates results in the creation of transform faults. **So, Statement 4 is correct.**





ADDITIONAL INFORMATION:

PLATE TECTONICS	
About	<ul style="list-style-type: none"> ➤ In 1967, McKenzie, Parker, and Morgan independently collected the available ideas and developed the concept known as Plate Tectonics. ➤ A tectonic plate (also called a lithospheric plate) is a massive, irregularly-shaped slab of solid rock, generally composed of both continental and oceanic lithosphere. ➤ Plates move horizontally over the asthenosphere as rigid units. ➤ The lithosphere includes the crust and top mantle, with its thickness range varying between 5 and 100 km in oceanic parts and about 200 km in the continental areas. ➤ A plate may be referred to as the continental plate or oceanic plate, depending on which of the two occupies a larger portion of the plate. ➤ The Pacific plate is largely an oceanic plate, whereas the Eurasian plate may be called a continental plate. ➤ The theory of plate tectonics proposes that the Earth's lithosphere is divided into seven major and some minor plates. ➤ Young Fold Mountain ridges, trenches, and/or faults surround these major plates. ➤ Continents are part of a plate, and what moves is the plate. ➤ All the plates, without exception, have moved in the geological past, and shall continue to move in the future as well.



7. **Assertion(A)** : Most of the Himalayan belt is free from volcanic activity

Reason (R) : The Himalayas formed due to the convergence of two continents and exhibit intense folding.

Select the correct option using the codes given below:

- (a) **Both A and R are individually true, and R is the correct explanation of A.**
- (b) Both A and R are individually true, but R is Not the correct explanation of A
- (c) A is true, but R is false
- (d) A is false, but R is true

EXPLANATION:

About 225 million years ago, India was an island south of Asia, separated by the Tethys Ocean. With the breakup of Pangea (200 Ma), India drifted northward.

Around 80 Ma, it was still 6,400 km away but moved rapidly (9–16 cm/year). By 50–40 Ma, the drift slowed to 4–6 cm/year, marking the collision of the Indian and Eurasian plates, the closing of the Tethys Ocean, and the start of Himalayan uplift.

Since both plates were too buoyant to subduct, the collision caused folding, faulting, and thickening of the continental crust (up to 75 km), raising the Himalayas and Tibetan Plateau. This also ended volcanic activity, as magma solidified before reaching the surface.

Even today, the Himalayas are rising by ~1 cm/year as India pushes north, but erosion lowers them at a similar rate.

This active tectonics explains the frequent shallow earthquakes. The Himalayas and Tibetan Plateau stretch 2,900 km east–west, with Mount Everest (8,848 m) as the highest peak on Earth. **Both A and R are individually true, and R is the correct explanation of A.**



8. **Assertion(A)** : The basalt rocks are formed over the surface, while granite rocks reach the surface only by being exposed to erosion.

Reason (R) : Basalt is an Extrusive rock, while granite is an Intrusive rock.

Select the correct using the codes given below:

- (a) **Both A and R are individually true, and R is the correct explanation of A.**
- (b) Both A and R are individually true, but R is not the correct explanation of A
- (c) A is true, but R is false
- (d) A is false, but R is true

EXPLANATION:

The Earth's crust is made of rocks, which are natural masses of mineral matter. Rocks vary in colour, size, and texture and are broadly classified into three types: igneous, sedimentary, and metamorphic. Among these, igneous rocks (also called primary rocks) form when molten magma cools and solidifies. They are of two kinds: extrusive and intrusive. When molten magma cools, it forms igneous rocks. If magma cools on the surface, it forms extrusive rocks like basalt (fine-grained, e.g., Deccan Plateau). If magma cools deep inside the crust, it forms intrusive rocks like granite (large-grained, seen today only when exposed by erosion).

Thus, basalt forms on the surface, while granite reaches the surface only after erosion. This matches the reason: basalt is an extrusive volcanic rock, and granite is an intrusive plutonic rock.

Both A and R are individually true, and R is the correct explanation of A.

ADDITIONAL INFORMATION:

DIFFERENT TYPES OF ROCKS	
About	<p>There are three main types of rocks: igneous, sedimentary, and metamorphic.</p> <p>Igneous Rocks:</p> <ul style="list-style-type: none"> ➤ Form when hot molten rock (magma) cools and hardens. ➤ If magma cools below the surface, it cools slowly, forming large crystals that are intrusive igneous rocks (e.g., granite). ➤ If magma erupts as lava and cools quickly on the surface which are extrusive igneous rocks (e.g., basalt). ➤ Granite often becomes visible on the surface due to erosion or fault movement. <p>Sedimentary Rocks:</p> <ul style="list-style-type: none"> ➤ Form from layers of sediment (small rock particles, sand, shells, remains of organisms). ➤ Sediments are carried by rivers, glaciers, or wind, deposited in layers, and compressed over time. <p>Examples: sandstone, conglomerates, limestone (formed mainly from marine animal remains and sea water).</p> <p>Metamorphic Rocks:</p> <ul style="list-style-type: none"> ➤ Formed when existing igneous, sedimentary, or other metamorphic rocks are changed by heat and pressure. ➤ The rock doesn't melt but forms new crystals, often arranged in layers due to pressure. ➤ This process is called metamorphism. ➤ Example: limestone → marble under heat and pressure. ➤ Usually occurs during tectonic activity like plate collisions. <p>Example: Connemara marble in west Galway.</p>

9. Consider the following statement:
1. Most of the sedimentary rocks are deposited in water bodies.
 2. The riverine plains are composed of sedimentary rocks.

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) **Both 1 and 2**
- (d) Neither 1 nor 2

EXPLANATION:

Sedimentary rocks are formed due to the aggregation and compaction of sediments. These sediments and debris, derived from the disintegration and decomposition of rocks by agents of weathering and erosion, are gradually deposited in water bodies.

Layers of sediments accumulate over time, and the increasing weight and pressure consolidate and compact them into sedimentary rocks. Most sedimentary rocks are deposited in water bodies (lakes, ponds, basins, rivers, and seas). However, they can also form on land surfaces, e.g., loess, sand dune deposits, alluvial fans, and cones. **So, Statement 1 is correct.**

Riverine plains, also called alluvial plains, consist of sand, silt, and clay carried by relatively slow-moving waters in gentle river channels.

Continuous deposition of these sediments in riverbeds leads to the formation of sedimentary rocks such as siltstones and claystones. Therefore, the riverine plains are composed of sedimentary rocks.

So, Statement 2 is correct.

10. **Assertion(A)** : The plains are formed by both internal forces and external forces of the Earth.

Reason (R) : All the plains lie above the mean Sea level.

Select the correct using the codes given below:

- (a) Both A and R are individually true, and R is the correct explanation of A.
- (b) Both A and R are individually true, but R is Not the correct explanation of A
- (c) **A is true, but R is false**
- (d) A is false, but R is true

EXPLANATION:

Plains are the simplest relief features, consisting of extensive flat or gently undulating surfaces without large hills or deep valleys. They cover about 55% of the Earth's surface and are generally less than 300 meters above sea level.

Plains are formed by both internal (endogenic) and external (exogenic) forces. Many plains originated from the uplift or emergence of submerged landmasses under epicontinental seas due to diastrophic movements, such as the Great Plains of the USA or the northern Atlantic coastal plains, representing formation by internal forces.

Plains can also form through sediment deposition, where wind, water, and ice fill depressions over time via weathering and erosion, representing formation by external forces. **So, A is true.**

Not all plains lie above the mean Sea level, some plains such as the Caspian Depression lie below the mean Sea level.

Caspian Depression, a flat lowland, is in Kazakhstan and Russia, much of it below sea level at the north end of the Caspian Sea.

It is one of the largest such areas in Central Asia, occupying about 200,000 square km. Both the Ural and Volga rivers flow through the depression into the Caspian. **So, R is false.**

ADDITIONAL INFORMATION:

CLASSIFICATION OF PLAINS	
Types of plains	<p>Plains can be classified into three main types:</p> <p>Structural Plains: Formed mainly by the uplift or subsidence of parts of the sea-floor or continental shelf. They are found along the borders of most continents.</p> <ul style="list-style-type: none"> • Example of uplifted plains: Southeastern plain of the USA (uplifted Gulf of Mexico). • Example of subsided plains: Central lowlands of Australia. <p>Erosional Plains: Created by the long-term erosion of uplands. Their surface is not perfectly smooth, so they are also called peneplains (almost plain).</p> <ul style="list-style-type: none"> • Examples: Canadian Shield, West Siberian Plain. <p>Depositional Plains: Formed by the deposition of sediments transported by rivers, glaciers, lakes, or wind. The following are different types of Depositional plains:</p> <ul style="list-style-type: none"> • Alluvial (riverine) plains: Formed by river deposits. Examples: Indo-Gangetic Plain (India), Hwang-Ho Plain (China), Lombardy Plain (Italy), Ganga-Brahmaputra Delta (Bangladesh). • Lacustrine (lake) plains: Formed by lake sediments. Examples: Kashmir Valley, Manipur Valley. • Glacial plains: Formed by glacial deposits. Examples: Plains of Canada, Northwestern Europe. • Loess plains: Formed by wind-borne fine dust (loess). Example: Loess plains of Northwestern China.

11. Niagara Falls is located between which of the following pairs of lakes?

- (a) Lake Superior and Lake Huron
- (b) Lake Huron and Lake Erie
- (c) **Lake Erie and Lake Ontario**
- (d) Lake Ontario and Lake Huron

EXPLANATION:

Niagara Falls is one of North America's most famous natural spectacles, located on the Niagara River, which forms the border between Ontario (Canada) and New York State (U.S.).

The falls are divided into two main parts by Goat Island:

- Horseshoe Falls (on the Canadian side) – 188 ft (57 m) high.
- American Falls (on the U.S. side) – 190 ft (58 m) high.

The Niagara River connects Lake Erie and Lake Ontario, forming part of the Great Lakes Basin. This system was shaped during the last Ice Age about 12,500 years ago, when retreating glaciers allowed meltwater to flow from Lake Erie through the Niagara River to Lake Ontario, and further to the St. Lawrence River and the Atlantic Ocean.

So, Option (c) is correct.



ADDITIONAL INFORMATION:

GREAT LAKES OF AMERICA

About

- The Great Lakes are a chain of deep freshwater lakes in east-central North America comprising Lakes Superior, Michigan, Huron, Erie, and Ontario.
- They are one of the great natural features of the continent and of the Earth.
- Although Lake Baikal in Russia has a larger volume of water, the combined area of the Great Lakes—some 94,250 square miles (244,106 square kilometres)—represents the largest surface of fresh water in the world, covering an area exceeding that of the United Kingdom.



Lake Superior	<p>Lake Superior, the most northwesterly and largest of the five Great Lakes of North America, is one of the world's largest bodies of fresh water.</p> <ul style="list-style-type: none"> ➤ Bounded on the east and north by Ontario (Canada), on the west by Minnesota (U.S.), and on the south by Wisconsin and Michigan (U.S.), it discharges into Lake Huron at its eastern end via the St. Marys River. ➤ Lake Superior is 563 km long (east to west), and its greatest width is 258 km from north to south. It has a mean surface elevation of 180 metres above sea level and a maximum depth of 406 metres.
Lake Huron	<p>Lake Huron, the second largest of the Great Lakes of North America, is bounded on the west by Michigan (U.S.) and on the north and east by Ontario (Canada).</p> <ul style="list-style-type: none"> ➤ The lake is 331 km long from northwest to southeast, and its maximum width is 295 km. ➤ Inflow into the lake is received from Lake Superior (via the St. Marys River), from Lake Michigan (via the Straits of Mackinac), and from numerous streams draining the adjacent lands. ➤ The lake discharges at its southern end into Lake Erie (via the St. Clair River, Lake St. Clair, and the Detroit River). ➤ With a mean surface height of 176 metres above sea level, the lake reaches a maximum depth of 230 metres. ➤ Many islands lie in the northeastern part of the lake, notably the Manitoulin Islands and many others in Georgian Bay and the North Channel. ➤ Scenic Mackinac Island and several others are located near the Straits of Mackinac in the northwest part of the lake, and Saginaw Bay indents the Michigan coast.
Lake Michigan	<ul style="list-style-type: none"> ➤ Lake Michigan is the third largest of the five Great Lakes of North America and the only one lying wholly within the United States. Bordered by the states of Michigan (east and north), Wisconsin (west), Illinois (south-west), and Indiana (southeast), it connects with Lake Huron through the Straits of Mackinac in the north. ➤ The lake is 517 km long (north to south); it has a maximum width of 190 km. ➤ With a mean surface elevation of 176 m above sea level, the lake has a maximum depth of 281 m.
Lake Ontario	<ul style="list-style-type: none"> ➤ Lake Ontario is the smallest and most easterly of the Great Lakes of North America. It is bounded on the north by Ontario (Canada) and on the south by New York (U.S.). ➤ The lake is roughly elliptical; its major axis, 311 km long, lies nearly east to west, and its greatest width is 85 km. ➤ The Niagara River is the main feeder of the lake; others include the Genesee, Oswego, and Black rivers from the south and the Trent River from the north. ➤ With a mean surface elevation of 74 m above sea level, Lake Ontario has a mean depth of 86 m, and its deepest point is 244 m.
Lake Erie	<ul style="list-style-type: none"> ➤ Lake Erie is the fourth largest of the five Great Lakes of North America. It forms the boundary between Canada (Ontario) to the north and the United States (Michigan, Ohio, Pennsylvania, and New York) to the west, south, and east. ➤ The major axis of the lake extends from west-southwest to east-northeast for 388 km, and the lake has a maximum width of 57 miles. ➤ With a mean surface height of 170 metres above sea level, Erie has the smallest mean depth of 62 feet of the Great Lakes, and its deepest point is 210 feet.

12. **Assertion(A)** : Species diversity is quite low in the tropical Savannah in comparison to the adjacent tropical rainforests.

Reason (R) : The fire factor plays a role in controlling the species diversity in the Savannah.

Select the correct using the codes given below:

- (a) **Both A and R are individually true and R is the correct explanation of A.**
- (b) Both A and R are individually true but R is not the correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

EXPLANATION:

A tropical rainforest is a luxuriant forest found in wet tropical uplands and lowlands around the Equator. Tropical rainforests, which worldwide make up one of Earth's largest biomes (major life zones), are dominated by broad-leaved trees that form a dense upper canopy (layer of foliage) and contain a diverse array of vegetation and other life.

Species diversity is high in Tropical rainforests due to various factors such as:

- No distinct dry Season
- Year-round Precipitation
- Abundance of Sunlight throughout the Year.

Whereas, Tropical savannas grow in tropical regions between 8° and 20° from the Equator.. Here, Species diversity is low in comparison to the Tropical Rain Forest due to:

- Distinct dry season
- Rainfall is confined to a few months, not throughout the year.
- Dry-season fires

Fire shapes savanna ecosystems, whereby it promotes landscape heterogeneity in woody cover, and recurrent Fire maintains open canopies and a grass-dominated ground layer. Therefore, Fire plays a vital role in controlling the species diversity in the Savannah. **Both A and R are individually true, and R is the correct explanation of A.**

13. **Assertion(A)** : Most of the radioactive materials are concentrated in the uppermost layers of the Earth.

Reason (R) : The Rate of increase of temperature decreases as we move below.

Select the correct using the codes given below:

- (a) Both A and R are individually true, and R is the correct explanation of A.
- (b) Both A and R are individually true, but R is not the correct explanation of A
- (c) **A is true, but R is false**
- (d) A is false, but R is true

EXPLANATION:

The geothermal gradient is the rate at which Earth's temperature rises with depth, averaging about 25°C per kilometre. This heat flows from the Earth's interior to the surface and drives geothermal energy, which humans use for heating and power generation.

The Earth's interior is extremely hot, reaching over 5000°C near the core, almost as hot as the Sun's surface. Studies in the early 20th century revealed that this heat comes mainly from the radioactive decay of elements like uranium, thorium, and potassium, which are concentrated in the crust and upper mantle, not the core. About 50% of Earth's heat comes from this radioactive decay, while the rest comes from primordial heat trapped since Earth's formation. **A is true, but R is false**



14. The British Overseas Territory is spread across which of the following ocean basins?

- I. North Atlantic Ocean
- II. South Pacific Ocean
- III. South Atlantic Ocean
- IV. Indian Ocean

Select the correct answer from the codes given below:

- (a) I, II only
- (b) I, IV only
- (c) **I, II, III only**
- (d) I, II, III and IV only

EXPLANATION:

The United Kingdom Overseas Territories (UKOTs), also known as British Overseas Territories (BOTs), include a total of 14 UK overseas territories (UKOTs) that have retained a constitutional link with the UK.

- Bermuda is a British Overseas Territory, situated in the North Atlantic Ocean. Bermuda consists of a cluster of seven main islands, the largest of which is known as the main island, and around 170 smaller islets and rocks. **So, statement I is correct.**



The Pitcairn, Henderson, Ducie, and Oeno Islands are commonly known as the Pitcairn Islands, a British Overseas Territory in the South Pacific.

The Islands lie halfway between New Zealand and the Americas in the South Pacific. Of the four islands – Pitcairn, Henderson, Ducie and Oeno – only Pitcairn is inhabited. **So, Statement II is correct.**



- The island of Saint Helena, Ascension Island and the archipelago of Tristan da Cunha (including Gough Island) collectively form a single United Kingdom Overseas Territory (UKOT) stretching across 3,642 km of the South Atlantic Ocean.
- The Falkland Islands are an archipelago in the South Atlantic Ocean consisting of the two main islands of East Falkland and West Falkland, plus nearly 800 other smaller islands. **So, Statement III is correct.**



The Chagos Archipelago, a British Indian Ocean Territory (BIOT), is situated in the Indian Ocean. It is an archipelago of over 50 islands.

- There is no permanent population in this BIOT, but the atoll of Diego Garcia (the largest and most southerly of the islands) hosts a joint UK-US military facility.
- As of May 2025, the United Kingdom has agreed to a treaty, which has not yet been ratified, with Mauritius. Whereby sovereignty will be handed to Mauritius for the archipelago as a whole, but the UK will continue to lease Diego Garcia to continue its operation as a UK-US military base. **So, Statement IV is not correct.**



ADDITIONAL INFORMATION:

BRITISH OVERSEAS TERRITORY	
Recently in News	<p>UK Prime Minister Keir Starmer, on May 22, 2025, signed a deal transferring sovereignty of the Chagos Islands to Mauritius, including the key Diego Garcia military base.</p> <p>The base, which plays a central role in UK-US defence operations in the Indian Ocean, will now be leased from Mauritius under a new 99-year lease.</p>
About	<p>Under the deal, the UK will pay Mauritius an average of £101 million (\$129m) per year, amounting to a total of £3.4 billion (\$4.35 billion) over the course of the lease. Starmer also claimed the arrangement would cost less than operating an aircraft carrier annually.</p>
Chagos Archipelago	<p>The Chagos archipelago comprises more than 60 low-lying islands in the Indian Ocean, roughly 1,600 km to the northeast of the main island of Mauritius. Chagos has a land area of only 56.1 sq km, with Diego Garcia alone spread over 32.5 sq km, which is about the same as the land area of Lakshadweep.</p> <ul style="list-style-type: none"> ➤ Including the lagoons within its atolls, however, Chagos has a total area of more than 15,000 sq km. ➤ The Great Chagos Bank, spread over 12,642 sq km, is the world's largest atoll structure. ➤ Diego Garcia is the largest island in the Chagos Archipelago, located in the Indian Ocean. ➤ The Chagos Islands remained uninhabited until the late 18th century, when the French brought in enslaved labourers from Africa and India to work on newly established coconut plantations. <p>In 1814, under the Treaty of Paris, France ceded Mauritius—including the Chagos Archipelago—to the British.</p>



In 1965, the UK constituted the British Indian Ocean Territory (BIOT), of which the Chagos Islands were a central part. The BIOT was meant to provide the British (and by extension their Cold War allies, the Americans) with an overseas base in the Indian Ocean.

15. Consider the following pairs:

	River	Flows Through
1	Tijuana	Mexico
2	Limpopo	Mozambique
3	Elbe	Czech Republic

Which of the above are correctly matched?

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

EXPLANATION:

The Tijuana River is an intermittent river that flows 120 miles through the Mexican state of Baja California, then crosses the U.S.-Mexico border into southern California for 5 miles before flowing into the Tijuana River Estuary and ending where it connects to the Pacific Ocean near San Diego. The Tijuana River flows South to North from Mexico into California. **So, Pair 1 is correct.**



The Limpopo River is the second largest river in Mozambique with its source in South Africa's Witwatersrand. The river has a length of 1087 miles and flows through South Africa, Botswana, Zimbabwe, and Mozambique before draining into the Indian Ocean.

The river has a slow rate of flow due to siltation in the river's bed. The main tributary of the Limpopo is the Oliphants River. The upper course of the river flows through the Kalahari Desert. **So, Pair 2 is correct.**



The Elbe River, originating in the Krkonose Mountains in the Czech Republic, stretches approximately 724 miles before reaching the North Sea near Cuxhaven, Germany.

- The Elbe River traverses through two countries, the Czech Republic and Germany, impacting numerous towns and cities along its path. Beginning in the Czech Republic, the river first flows through the towns of Vrchlabí, Jaroměř, and Hradec Králové. It then proceeds toward the capital city of Prague, where it is joined by the Vltava River. **So, Pair 3 is correct.**



16. Consider the following statements:

1. Rice is the top-most commodity in agricultural exports from India
2. Vegetable Oil is the top-most commodity in agricultural imports into India
3. India exports more pulses than it imports

Which of the above statements are correct?

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

EXPLANATION:

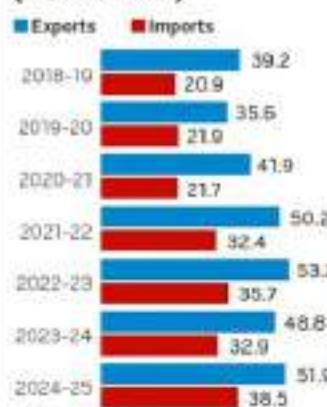
At the level of specific agricultural commodities, India has achieved the highest global ranking in the export of rice (both basmati and non-basmati). The Indian share in the global exports of basmati rice stands at 53% and that of non-basmati rice at 45%. They account for 20% and 21% of India's agriculture exports, respectively.

INDIA'S TOP AGRICULTURAL EXPORT ITEMS (in million dollars)

	2024-25	Apr-Jun 2024	Apr-Jun 2025	% Growth
Marine products	7405.00	1626.87	1945.70	19.45
Basmati rice	5944.48	1544.92	1494.40	-3.27
Non-Basmati rice	6527.58	1263.34	1413.02	11.65
Spices	4451.54	1088.89	1154.04	5.98
Buffalo meat	4060.54	793.28	806.82	13.05
Coffee	1805.57	519.80	588.07	13.14
Fruits & vegetables	2065.39	459.14	522.44	13.79
Tobacco	1979.01	426.86	509.19	19.29
Processed F&V	1805.76	384.37	429.60	11.62
Castor oil	1152.37	348.34	355.31	2.03
Oilseeds	1344.31	332.22	306.01	-7.89
Oilmeals	1344.39	330.69	290.19	-12.25
TOTAL	51940.67	12209.66	12922.32	5.84

Source: Department of Commerce

INDIA'S AGRICULTURE TRADE (in billion dollars)



From the above data, both basmati and non-basmati rice together make rice (as a whole category) the top-most agricultural export commodity of India. **So, Statement 1 is correct.**

India's agricultural imports are dominated by two commodities: Edible oils and pulses.

TOP IMPORTS (\$MN)

	2022-23	2023-24	Apr-Dec 2023	Apr-Dec 2024
Vegetable oils	20,837.7	14,871.66	11,638.03	13,518.96
Pulses	1,943.89	3,746.78	2,467.93	3,789.75
Fresh fruits	2,483.95	2,734.97	2,032.64	2,230.2
Cashew	1,805.67	1,431.39	1,193.04	1,414.36
Spices	1,336.65	1,455.57	1,123.81	1,220.61
Raw cotton	1,438.69	598.66	498.81	918.69
Natural rubber	937.6	739.18	554.15	875.7
TOTAL	35,686.2	32,870.03	24,641.45	29,251.41

Source: Department of Commerce

From the above data, we can conclude that vegetable oil is the top-most commodity in agricultural imports into India. **So, Statement 2 is correct.**

India's farm imports are limited to a few commodities. More than two-thirds of the value of imports in 2024-25 were from vegetable oils, pulses and fresh fruits.

Based on pulses export data, in 2023-24, India imported 47.38 lakh tonnes of pulses despite exporting 5.94 lakh tonnes.

Thus, India is importing more pulses than exporting. **So, Statement 3 is not correct.**

Table 2. India's Pulses Export and Import trend from 2021-22 to 2023-24

Year	Import (Lakh Tonnes)	Export (Lakh Tonnes)
2021-22	26.99	3.87
2022-23	24.96	7.62
2023-24	47.38	5.94

Author's calculation compiled from Department of Food & Public Distribution (Ministry of Agriculture and Farmer's Welfare)

17. Which of the following states borders Bangladesh?

1. Mizoram
2. Manipur
3. Nagaland
4. Assam
5. Sikkim
6. West Bengal

Select the answer using the codes given below:

- (a) Only two
- (b) **Only three**
- (c) Only four
- (d) Only five

EXPLANATION:

India shares 4096.7 Km of its land border with Bangladesh. West Bengal, Assam, Meghalaya, Tripura and Mizoram are the States which share the border with Bangladesh. The State-wise length of the borders is as under:

State	Total length (Length in Km)
West Bengal	2216.70
Assam	263.00
Meghalaya	443.00
Tripura	856.00
Mizoram	318.00
TOTAL	4096.70

The entire stretch consists of plain, riverine, hilly/jungle and with hardly any natural obstacles. The area is heavily populated, and at many stretches the cultivation is carried out till the last inch of the border. Hence, Manipur, Nagaland, and Sikkim do not share a border with Bangladesh. **So, Option (b) is correct.**



ADDITIONAL INFORMATION:

INTERNATIONAL LAND BORDER	
About	<p>India shares borders with the countries as below: -</p> <ul style="list-style-type: none"> ➤ Bangladesh - 4096.70 kms running along West Bengal, Assam, Meghalaya, Tripura and Mizoram. ➤ Pakistan - 3323 kms running along Gujarat, Rajasthan, Punjab, Union Territory of Jammu & Kashmir and Union Territory of Ladakh. ➤ China - 3488 kms running along Arunachal Pradesh, Sikkim, Uttarakhand, Himachal Pradesh and Union Territory of Ladakh. ➤ Nepal - 1751 kms running along Uttarakhand, Uttar Pradesh, Bihar, West Bengal and Sikkim. ➤ Bhutan - 699 kms running along Sikkim, West Bengal, Assam and Arunachal Pradesh. ➤ Myanmar - 1643 kms running along Arunachal Pradesh, Nagaland, Manipur and Mizoram. ➤ Afghanistan - 106 kms running along Union Territory of Ladakh

18. Consider the following statements:

Statement I : Iron does not rust easily in deserts due to the absence of water.

Statement II : Oxidation is the process in which oxygen in air and water reacts with minerals in the rock.

Which one of the following is correct with respect to the other statements?

- (a) **Both Statement I and Statement II are correct and Statement II explains Statement 1**
- (b) Both Statement I and Statement II are correct but Statement II does not explain Statement I
- (c) Statement I is correct but Statement II is not correct
- (d) Statement I is not correct but Statement II is correct

EXPLANATION:

Rust is the result of a chemical reaction between metal, typically iron, and oxygen in the presence of moisture. This process, known as oxidation, transforms the metal into a new compound, iron oxide, which we commonly recognise as rust.

The process of rusting can be represented by the following equation:

- Iron (Fe) + Oxygen (O₂, from the air) + water (H₂O) → rust (iron oxide Fe₂O₃). For rusting, the presence of both oxygen and water (or water vapour) is essential.
- In the desert region, the amount of moisture in the air is too low. The region is characterised by low humidity and dryness. Because of these reasons, rusting of iron is too slow in the desert.
- Since desert regions are dry and have very low humidity, the availability of water vapour is minimal.

As a result, the rusting process is extremely slow in deserts, and iron does not rust easily there. **So, Statement I is correct.**

- Oxidation is a type of chemical weathering. Oxidation is also known as rusting. It is the process whereby the rock minerals lose one or more ions or atoms in the presence of oxygen and water reacts. **So, Statement II is correct.**
- Rusting is created by the interaction of oxygen and iron in the presence of water. As rust expands, it weakens rock and helps break it apart.

Therefore, Iron does not rust easily in deserts due to the absence of water, as rusting process requires oxygen and water.

So, both Statement I and Statement II are correct, and Statement II explain Statement I.

ADDITIONAL INFORMATION:

RUSTING PROCESS	
About	<ul style="list-style-type: none"> ➤ The rusting process begins when iron reacts with water and oxygen. Initially, the iron dissolves in the acidic solution created by moisture and carbon dioxide in the air, forming ferrous iron and releasing hydrogen. ➤ This is the first step in the rusting process. The presence of water acts as a medium that facilitates the transfer of electrons, which is essential for the oxidation reaction to occur. ➤ Without moisture, the rusting process would be significantly slower or might not occur at all. ➤ Once the iron has dissolved, the next step involves the oxidation of ferrous iron by oxygen in the air, leading to the formation of hydrated ferric oxide, which is the reddish-brown substance we identify as rust. ➤ This transformation involves the iron losing electrons to oxygen, a process that is accelerated by the presence of salts and acids. ➤ These substances act as catalysts, speeding up the reaction and making the metal more susceptible to rusting.

19. How many of the following cities are present in the tropical region?

1. Darwin
2. New Delhi
3. Manila
4. Buenos Aires
5. Port of Spain
6. Astana
7. Khartoum

Select the correct answer using the codes given below:

- (a) Only three
- (b) **Only four**
- (c) Only five
- (d) Only six

EXPLANATION:

The tropics are regions of Earth that lie roughly in the middle of the globe. The tropics between the latitude lines of the Tropic of Cancer and the Tropic of Capricorn. The tropics include the Equator and parts of North America, South America, Africa, Asia, and Australia. The tropics account for 36 percent of Earth's landmass and are home to about a third of the world's people.

The tropics are warm all year, averaging 25 to 28 degrees Celsius (77 to 82 degrees Fahrenheit). This is because the tropics get more exposure to the Sun and they don't experience the kind of seasons the rest of Earth does. The tropical seasons are broken up into just two: the wet season and the dry season.

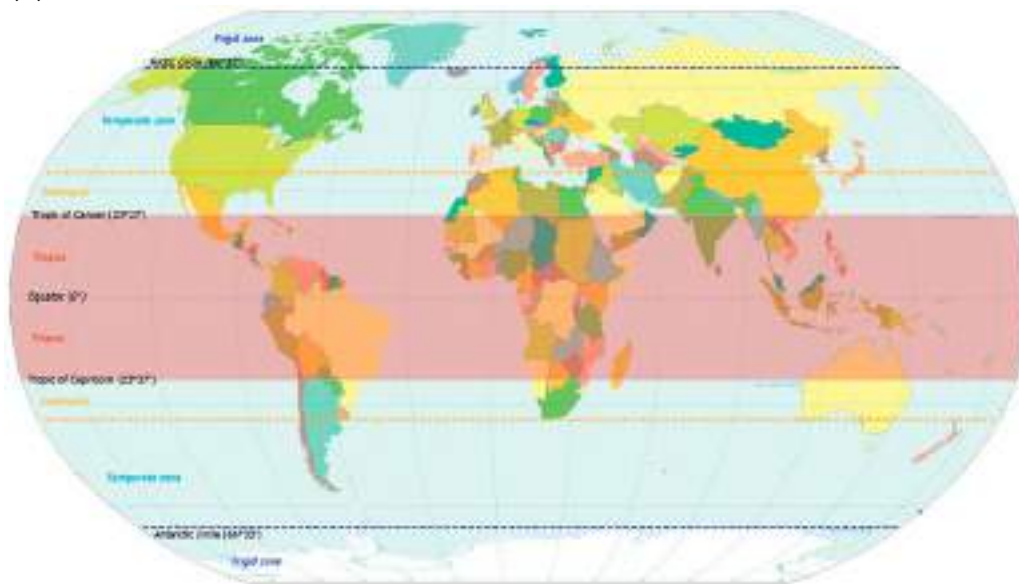
Cities that are present in the tropical region are:

- **Darwin** – Australia's northern most tropical city. Darwin has a tropical savanna climate. Humidity and temperatures are high year-round, with average lows between 19 and 25 degrees Celsius and average highs between 30 and 33 degrees Celsius.
- **Manila** – Manila, capital and chief city of the Philippines. It lies in the tropical zone.
- **Port of Spain** - Port of Spain is capital city and chief port of Trinidad and Tobago, southeastern West Indies. It lies in the tropical zone.
- **Khartoum** - Khartoum is a city and the executive capital of Sudan. It lies in the tropical zone.

Cities that are not present in the tropical region are:

- **New Delhi** – In India, the city lies in subtropical zone. These areas experience a high percentage of sunny days and have climates that are warmer than temperate zones.
- **Buenos Aires** - Buenos Aires, city and capital of Argentina. It lies in the temperate zone.
- **Astana** - It is the capital city of Kazakhstan. It lies in the temperate zone.

So, Option (b) is correct.



20. Consider the following statements on Relative Humidity:

Statement I : Relative Humidity is low in the sub-tropical region

Statement II : The capacity of air to hold moisture decreases with rising temperature

Statement III : Cloud formation is abundant in the sub-tropical region

Which one of the following is correct with respect to the above statements?

- (a) Both Statement II and Statement III are correct and both of them explain Statement I
- (b) Both Statement I and Statement II are correct and Statement I explains Statement II
- (c) Only one of the Statements II and III is correct and that explains Statement I
- (d) **Neither Statement II nor Statement III is correct.**

EXPLANATION:

Relative humidity (expressed as a percentage) is a measure of the actual amount of water vapour in the air compared to the total amount of vapour that can exist in the air at its current temperature. It is also expressed as a ratio or percentage of vapour pressure (V.P.) to saturation vapour pressure (S.V.P.).

$$R.H = (V.P / S.V.P) * 100$$

- The global distribution of relative humidity at various levels is not zonally uniform, with centers of various intensities at all latitudes. It is maximum in the equatorial zone and minimum in the dry subtropical belts around 30°N and 30°S.
- The highest values of relative humidity occur in the equatorial zone, where the mean water vapour content of the air and the temperature are high.
- Away from the equatorial belt, the relative humidity decreases toward the subtropical regions because deep convection is suppressed by the mean downward motion of the air in the subtropical high-pressure belts. **So, Statement I is correct.**

With the change of air temperature, the capacity to retain moisture increases or decreases and the relative humidity is also affected.

When the temperature of the air rises, its water vapour retentive capacity also rises correspondingly, and the relative humidity decreases. If the temperature of air decreases, its water vapour retentive capacity also decreases and relative humidity Increases. **So, Statement II is not correct.**

Clouds are formed when air contains as much water vapor (gas) as it can hold. Clouds also tend to form in abundance in the middle latitudes 60 degrees north and south of the Equator.

- This is where the edges of polar and mid-latitude (or Ferrel) circulation cells collide and push air upward, fueling the formation of the large-scale frontal systems that dominate weather patterns in the mid-latitudes.
- While clouds tend to form where air rises as part of atmospheric circulation patterns, descending air inhibits cloud formation. Since air descends between about 15 and 30 degrees north and south of the Equator, clouds are rare and deserts are common at this latitude.

Area between the tropical zone and the temperate zone (25° to 40° North and South latitude) is the sub-tropical zone. Therefore, Cloud formation is abundant in 60 degree latitude not in subtropics. **So, Statement III is not correct.**

21. Which of the following appeared on the Earth last?

- (a) **Birds**
- (b) Amphibians
- (c) Reptiles
- (d) Fishes

EXPLANATION:

- The earliest vertebrates were jawless fish, similar to living hagfish. They lived between 500 and 600 million years ago. The first fish with a complete vertebral column evolved about 450 million years ago. These fish also had jaws and may have been similar to living sharks. Up to this point, all early vertebrates had an endoskeleton made of cartilage rather than bone. About 400 million years ago, the first bony fish appeared. A bony skeleton could support a larger body. Early bony fish evolved into modern ray-finned and lobe-finned fish.
- The first amphibians evolved from a lobe-finned fish ancestor about 365 million years ago. They were the first vertebrates to live on land, but they had to return to water to reproduce. This meant they had to live near bodies of water.

- The first reptiles evolved from an amphibian ancestor at least 300 million years ago. They laid amniotic eggs and had internal fertilisation. They were the first vertebrates that no longer had to return to water to reproduce. They could live just about anywhere.
- Mammals and birds both evolved from reptile-like ancestors. The first mammals appeared about 200 million years ago and the earliest birds about 150 million years ago.

Therefore, Birds appeared last on the Earth after fish, amphibians and reptiles. **So, Option (a) is correct.**

22. Which of the following is/are intrusive volcanic landforms?

1. Cinder Cone
2. Sill
3. Dyke
4. Batholith

Select the correct answer using the codes given below:

- (a) Only one
- (b) Only two
- (c) **Only three**
- (d) All Four

EXPLANATION:

Extrusive igneous landforms are formed when magma from deep within the Earth rises to the surface, where it cools to form lava. This can happen explosively or slowly, depending on the chemical composition of the lava and whether there is an easy path for it to take to the surface. If there is no pathway, pressure builds up over time (like a shaken soda) until the magma forcibly explodes outward. Example: Shield volcanoes, Stratovolcanoes, Cinder cones, Lava Domes and Maar-Diatreme Volcanoes. Cinder cones- Short, steep volcanoes associated with limited eruptive events. Sunset Crater Volcano and Capulin Volcano are cinder cones. Therefore, Cinder cones are extrusive volcanic landforms. **So, Statement 1 is not correct.**

The lava that is released during volcanic eruptions, on cooling, develops into igneous rocks. The cooling may take place either on reaching the surface or while the lava is still in the crustal portion. Depending on the location of lava cooling, igneous rocks are classified as volcanic rocks (cooling at the surface) and plutonic rocks (cooling in the crust). The lava that cools within the crustal portions assumes different forms. These forms are called intrusive forms.

Some of the intrusive volcanic landforms are

- **Batholiths** - A large body of magmatic material that cools in the deeper depths of the crust develops in the form of large domes. They appear on the surface only after the denudational processes remove the overlying materials. They cover large areas, and at times, assume depth that may be several kilometres. These are granitic bodies. Batholiths are the cooled portion of magma chambers. **So, Statement 4 is correct.**
- **Laccoliths** - These are large dome-shaped intrusive bodies with a level base and connected by a pipe-like conduit from below. It resembles the surface volcanic domes of a composite volcano, only these are located at deeper depths. It can be regarded as the localised source of lava that finds its way to the surface.
- **Lopoliths** - As the lava moves upwards, a portion of it may tend to move in a horizontal direction wherever it encounters a weak plane. It may get rest in different forms. If it develops into a saucer shape, concave towards the sky body, it is called a lopolith.
- **Phacolite** - A wavy mass of intrusive rocks, at times, is found at the base of synclines or at the top of anticlines in folded igneous country. Such wavy materials have a definite conduit to source

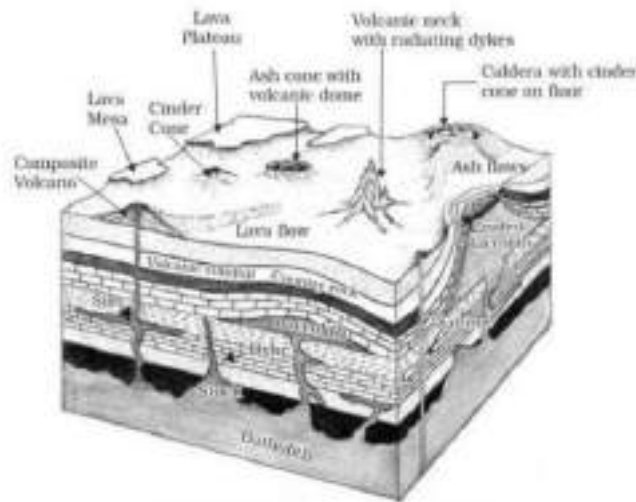
beneath in the form of magma chambers (subsequently developed as batholiths). These are called the phacoliths.

- **Sills** - The near-horizontal bodies of intrusive igneous rocks are called a sill or a sheet, depending on the thickness of the material. The thinner ones are called sheets, while the thick horizontal deposits are called sills.

So, Statement 2 is correct.

- **Dykes** - When the lava makes its way through cracks and the fissures developed in the land, it solidifies almost perpendicular to the ground. It gets cooled in the same position to develop a wall-like structure. Such structures are called dykes. Ex. Western Maharashtra area.

So, Statement 3 is correct.



Extrusive and intrusive volcanic landforms

ADDITIONAL INFORMATION:

VOLCANOES	
About	Volcanoes are classified based on the nature of the eruption and the form they develop at the surface.
Types	<ul style="list-style-type: none"> ➤ Shield Volcanoes - Barring the basalt flows, the shield volcanoes are the largest of all the volcanoes on Earth. <ul style="list-style-type: none"> • The Hawaiian volcanoes are the most famous examples. • These volcanoes are primarily composed of basalt, a type of lava that is highly fluid when erupted. For this reason, these volcanoes are not steep. • They become explosive if somehow water gets into the vent; otherwise, they are characterised by low-explosivity. The upcoming lava moves in the form of a fountain and throws out the cone at the top of the vent, and develops into a cinder cone. ➤ Composite Volcanoes - These volcanoes are characterised by eruptions of cooler and more viscous lavas than basalt. <ul style="list-style-type: none"> • These volcanoes often result in explosive eruptions. • Along with lava, large quantities of pyroclastic material and ashes find their way to the ground. This material accumulates in the vicinity of the vent openings, leading to the formation of layers, and this makes the mounts appear as composite volcanoes. ➤ Caldera - These are the most explosive of the Earth's volcanoes. They are usually so explosive that when they erupt, they tend to collapse on themselves rather than

build any tall structure. The collapsed depressions are called calderas. Their explosiveness suggests that the magma chamber supplying the lava is not only vast but also in close proximity.

- **Flood Basalt Provinces** - These volcanoes outpour highly fluid lava that flows for long distances. Some parts of the world are covered by thousands of sq. kilometres of thick basalt lava flows.
 - There can be a series of flows with some flows attaining a thickness of more than 50 m. Individual flows may extend for hundreds of km.
 - The Deccan Traps from India, presently covering most of the Maharashtra plateau, are a much larger flood basalt province. It is believed that initially the trap formations covered a much larger area than the present.
- **Mid-Ocean Ridge Volcanoes** - These volcanoes occur in the oceanic areas. There is a system of mid-ocean ridges more than 70,000 km long that stretches through all the ocean basins. The central portion of this ridge experiences frequent eruptions.

23. Which of the islands are volcanic in origin?

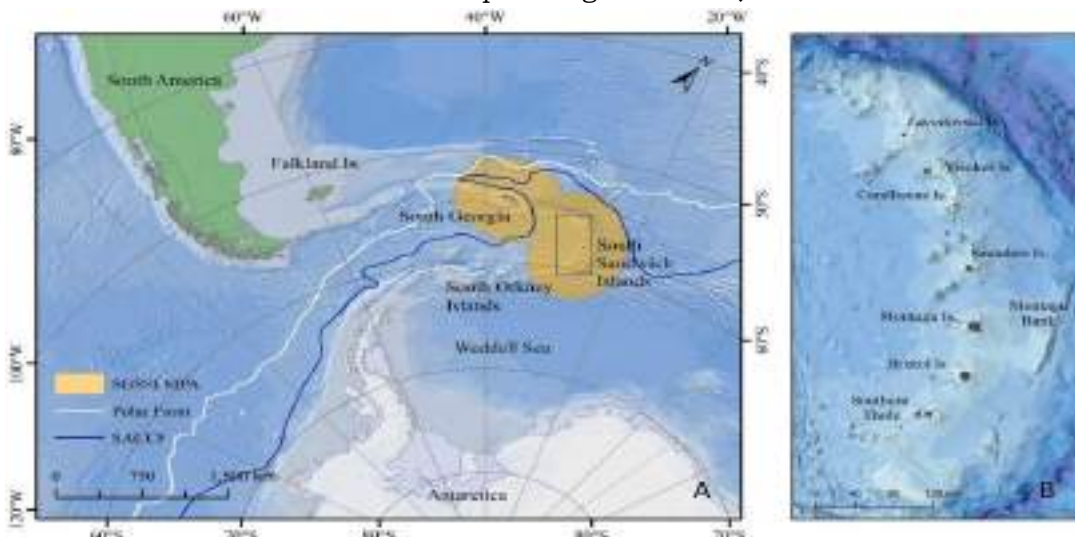
1. South Sandwich Islands
2. Mauritius
3. Azores

Select the correct answer using the codes given below:

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

EXPLANATION:

The South Sandwich Islands, located in the South Atlantic Ocean, consist of a chain of eleven main islands that form an arc 240 miles (400 km) long. These islands are entirely volcanic in origin. The South Sandwich Islands are a volcanic island arc caused by the subduction of the South American Plate beneath the South Sandwich Plate. The South Sandwich plate is one of the smallest geologic plates and is created at the South Sandwich spreading centre. **So, Statement 1 is correct.**



Mauritius, a Mascarene island in the Indian Ocean, was formed around 10 million years ago by an undersea volcano. A huge eruption took place on the floor of the Indian Ocean; as a result, layers of

lava formed on an island. The eruption collapsed to form a caldera, and later on, from those activities, it formed a plateau. The plateau is bordered by small mountains that may have formed the rim of an ancient volcano. **So, Statement 2 is correct.**



The Azores archipelago is located at the triple junction of the North American, Eurasian and African lithospheric plates. These oceanic volcanic islands emerge from the Azores Plateau, which is defined by the 2,000-meter bathymetric line and is roughly N-S crossed by the Mid-Atlantic Ridge. All the Azores islands are of volcanic origin, having emerged from the surrounding seafloor due to the progressive piling up of submarine volcanic products, a process that is estimated to have started approximately 36 million years ago. **So, Statement 3 is correct.**



24. Consider the following statements on Igneous rocks:

1. Basalt is denser than Granite
2. Granite is used in the construction industry, but not Basalt

Which of the above statements is/are correct?

- (a) **1 only**
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

EXPLANATION:

Basalt and Granite are both igneous rocks, but they have distinct characteristics due to their formation processes and compositions.

- **Formation:** Basalt forms when lava erupts from a volcano and cools rapidly on the Earth's surface. This rapid cooling prevents large crystals from forming, resulting in its fine-grained texture. Granite, on the other hand, forms from magma that cools slowly deep underground. This slow cooling allows for larger crystals to grow, giving it its coarse-grained texture.
- **Composition:** Basalt is a mafic rock, meaning it has a low silica content and is rich in iron and magnesium minerals, such as pyroxene and olivine. Granite is a felsic rock, meaning it has a high silica content and is rich in quartz and feldspar.
- **Appearance:** Basalt is typically dark grey to black due to its mineral composition. Granite is characterised by a light pink to grey colouration, with visible crystals of quartz and feldspar.
- Basalt is much more common than Granite on Earth's surface.
- **Hardness:** Both are strong rocks, but Granite is generally harder and more resistant to weathering than

Densities of Igneous Rocks

Rock Type	Density Range (g/cm ³)
Igneous Rocks	
Rhyolite	2.35 - 2.70
Granite	2.50 - 2.81
Andesite	2.40 - 2.80
Basalt	2.70 - 3.30
Gabbro	2.70 - 3.50

Therefore, from the table, we can infer that the density of Basaltic rocks is greater than that of Granite.

So, Statement 1 is correct.

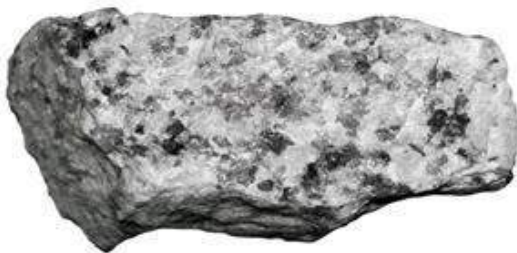
Granite is widely used in paving blocks, as a building stone, and in tombstones. While Basalt finds its way into numerous applications due to its impressive properties. Its strength, durability, and resistance to weathering make it a valuable material across various industries.

- **Aggregate:** Crushed Basalt is widely used as aggregate in concrete, asphalt pavements, and railroad ballast. Its angular shape and high crushing strength contribute to superior structural integrity.

- **Dimension Stone:** Cut and polished basalt slabs serve as aesthetically pleasing and durable flooring, wall cladding, countertops, and paving stones. Its dark colour and unique texture add elegance to both indoor and outdoor spaces.
- **Riprap:** Large basalt blocks protect shorelines, embankments, and bridge piers from erosion by waves and currents. Their resistance to abrasion and weathering makes them ideal for such demanding environments.

Therefore, Both Basalt and Granite have a wide range of uses across the construction industry and many more. **So, Statement 2 is not correct.**

Granite



Basalt



ADDITIONAL INFORMATION:

BASALT	
Key Features	<ul style="list-style-type: none"> ➤ Category: Igneous, Volcanic, Extrusive. ➤ Chemical Composition: Mafic (low in silica, high in iron and magnesium). ➤ Colour: Grey to black, with potential green, red, or brown hues depending on the presence of specific minerals. ➤ Texture: Fine-grained (aphanitic), sometimes porphyritic (containing larger crystals) or vesicular (containing cavities). ➤ Hardness: Moderate (5-6 on Mohs scale), suitable for construction purposes. ➤ Mineral Composition: Dominantly plagioclase feldspar, pyroxene, and olivine, with accessory minerals like magnetite, ilmenite, and trace elements.
Found In	<ul style="list-style-type: none"> ➤ Oceanic Basalt <ul style="list-style-type: none"> • Mid-ocean Ridges: The majority of Basalt resides on the ocean floor, forming the crust of oceanic tectonic plates. As plates diverge at Mid-Ocean Ridges, molten mantle rises, cools, and solidifies into basaltic seafloor. This process forms vast underwater mountain ranges, like the Mid-Atlantic Ridge, composed primarily of Basalt. ➤ Continental Basalt <ul style="list-style-type: none"> • Flood Basalts: These massive outpourings of basalt magma cover large areas, often exceeding thousands of square kilometres. Examples include the Deccan Traps in India, the Siberian Traps in Russia, and the Columbia River Plateau in the US. These eruptions are thought to be triggered by mantle plumes or rifting events within continents. • Volcanic Arcs: Where oceanic and continental plates converge, subduction zones form. As the oceanic plate descends, its water content melts the overlying

	<p>mantle, generating magma that erupts as basalt volcanoes, forming island arcs and continental mountain chains like the Andes.</p> <ul style="list-style-type: none"> • Precambrian Basalts: Formed billions of years ago, they are often found in fold and thrust belts, remnants of ancient mountain ranges. These rocks have undergone significant metamorphism, transforming the original Basalt into green-colored rocks known as greenstones.
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25. Consider the following statements on the accelerometer:

1. It is a device used for detecting acceleration and is present in mobile phones
2. Accelerometer data from phones may be used for detecting earthquakes.

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) **Both 1 and 2**
- (d) Neither 1 nor 2

EXPLANATION:

An accelerometer is a device that measures the vibration, or acceleration, of motion of a structure. The force caused by vibration or a change in motion (acceleration) causes the mass to "squeeze" the piezoelectric material, which produces an electrical charge that is proportional to the force exerted upon it. Since the charge is proportional to the force, and the mass is constant, then the charge is also proportional to the acceleration. These sensors are used in a variety of ways – from space stations to handheld devices.

➤ For example, almost all smartphones house an accelerometer. They help the phone know whether it undergoes acceleration in any direction, and this is why your phone's display switches on when you flip it. In an industrial setting, accelerometers help engineers understand a machine's stability and enable them to monitor for any unwanted forces/vibrations. **So, Statement 1 is correct.**

Most smartphones running Google's Android operating system have on-board accelerometers – the circuitry which detects when a phone is being moved. These are most commonly used to tell the phone to reorient its display from portrait to landscape mode when it is tilted, and also help provide information about step-count for Google's on-board fitness tracker. But the sensors are surprisingly sensitive, and can also act like a mini seismometer.

➤ Recently, Google has introduced a function that allows users to allow their phone to automatically send data to the Android Earthquake Alerts System if their device picks up vibrations that are characteristic of the Primary (P) waves of an earthquake using an accelerometer. By combining data from thousands or even millions of other phones, the system can work out whether an earthquake is happening or not. It can then send out alerts to phones in the area where the seismic waves are likely to hit, giving an early warning. **So, Statement 2 is correct.**

ADDITIONAL INFORMATION:

ACCELEROMETER	
Types	<p>➤ Piezoelectric Accelerometers</p> <ul style="list-style-type: none"> • A piezoelectric accelerometer is a type of accelerometer that works by sending an electrical signal from the sensor when it experiences a sudden acceleration. • Piezoelectric accelerometers are highly effective at measuring shocks and vibrations. <p>➤ Piezo Resistance Accelerometers</p>

	<ul style="list-style-type: none"> • A piezoresistance - or piezoresistive - accelerometer is a type of accelerometer that works by varying its resistance based on the acceleration it experiences. The change in acceleration can be measured to understand the rate of acceleration experienced by the sensor. • Piezoresistive accelerometers are less sensitive than piezoelectric accelerometers, as they are not best at measuring low-frequency impacts. • However, they work best at high amplitudes and find their application in vehicle crash testing and weapons testing. <p>➤ Capacitive Accelerometers</p> <ul style="list-style-type: none"> • Capacitive sensors work by changing their capacitance based on the acceleration they experience. Their construction involves two capacitive plates and a diaphragm. As the sensor experiences acceleration, the diaphragm moves and changes the distance between the capacitive plates. This results in the capacitance of the sensor changing, and this change in capacitance can be measured and translated to the rate of acceleration on the sensor. • Capacitive MEMS (microelectromechanical system) accelerometers are used in most smartphones today.
Application	<p>Accelerometers find their purpose in many industrial, manufacturing, commercial, and laboratory applications.</p> <p>➤ Digital Devices: Accelerometers in smartphones, digital cameras, and other mobile devices are responsible for rotating the display based on the orientation you hold it.</p> <p>➤ Vehicles: The invention of airbags has saved millions of lives. Accelerometers are used to trigger airbags – sensors send a signal when they experience a sudden shock.</p> <p>➤ Drones: Accelerometers help drones stabilise their orientation midflight.</p> <p>➤ Rotating Machinery: Accelerometers used in rotating machines detect undulating vibrations.</p> <p>➤ Industrial Platforms: Industrial accelerometers are used to measure platform stability or tilt.</p> <p>➤ Vibration Monitoring: Machines that move generate vibrations, and these vibrations can be harmful to the machines if left to amplify without supervision. Accelerometers are useful in monitoring vibrations and are increasingly used in locations like industrial plants and turbines.</p>

26. Consider the following statements:

Statement I : In India, more than fifty per cent of the labourers have exposure to excessive heat.

Statement II : Agriculture and construction are heat-intensive sectors.

Which one of the following is correct with respect to the other statements?

- (a) **Both Statement I and Statement II are correct, and Statement II explains Statement I**
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct
- (d) Statement I is not correct, but Statement II is correct

EXPLANATION:

Heatwaves, a period of unusually high temperatures compared to normal, typically occur from March to June, with a peak in May. Most States are prone to heat waves in varying degrees, with Central, Northwest, East, & north Peninsular India bearing the brunt.

- In a report in 2024, the International Labour Organisation (ILO) warned that more than 70% of all workers worldwide are at risk of exposure to excessive heat. It added that India lost an estimated \$100 billion from heat-induced productivity losses.
- Small businesses and informal workers, such as construction workers, farmers, street vendors, and food delivery partners, bore the brunt of Heatwaves.
- Agriculture, Construction and industry, where they work either under direct sunlight or under sheds with metallic or asbestos sheets, are the heat-intensive sectors.
- Excessive heat can have a devastating impact on agriculture. Studies show that just 1 degree of warming reduces wheat yields by about 5.2% in India. Heatwaves, late in the rice growing season, can reduce yield.

Therefore, in India, more than fifty per cent of the labourers have exposure to excessive heat. Among them, farmers and construction labourers bear the brunt more as Agriculture and Construction are heat-intensive sectors.

Both Statement I and Statement II are correct, and Statement II explains Statement 1.

ADDITIONAL INFORMATION:

HEATWAVES	
About	<p>A heatwave can be defined as a period where local excess heat accumulates over a sequence of unusually hot days and nights.</p> <ul style="list-style-type: none"> ➤ Heatwaves consist of a period of abnormally hot weather that can last from a few days to months, characterised by unusually high maximum and minimum temperatures for a location. ➤ The minimum temperature is just as important as the maximum temperature, as cooler nights allow the body to recover. If the nights are unusually hot, higher temperatures will be reached earlier in the day and last for longer. ➤ Heatwaves have spread rapidly into new regions of the globe and are occurring at unseasonable times of the year. ➤ The IPCC states that with further global warming, we can expect an increase in the intensity, frequency and duration of heatwaves. ➤ Multiple risks interact with heatwaves, such as droughts, fire weather, flash flooding and air pollution, which have compounding impacts for people and nature.
Impact	<p>Heatwaves are among the most hazardous natural weather hazards. Intense heatwaves can pose serious health, social, environmental, and economic risks.</p> <ul style="list-style-type: none"> ➤ According to a study in 2022, in Europe alone, it was estimated that over 60,000 people died from heat-related stress. ➤ Heatwaves impact human health and well-being, public safety and infrastructure, as well as the natural environment. Broader adverse impacts include: <ul style="list-style-type: none"> • Agriculture productivity • Labour productivity • Water sanitation • Critical infrastructure damage • Wildlife and animal deaths • Biodiversity • Outdoor exercise and exposure

27. You are a fish swimming off the coast of Gabon. You should get to Namibia. How would you get there when travelling through the ocean currents?

- (a) Benguela - South Equatorial - West Wind Drift - Brazil
- (b) **South Equatorial - Brazil - West Wind Drift - Benguela**
- (c) South Equatorial - Benguela - Brazil - West Wind Drift
- (d) South Equatorial - Brazil - Benguela - West Wind Drift

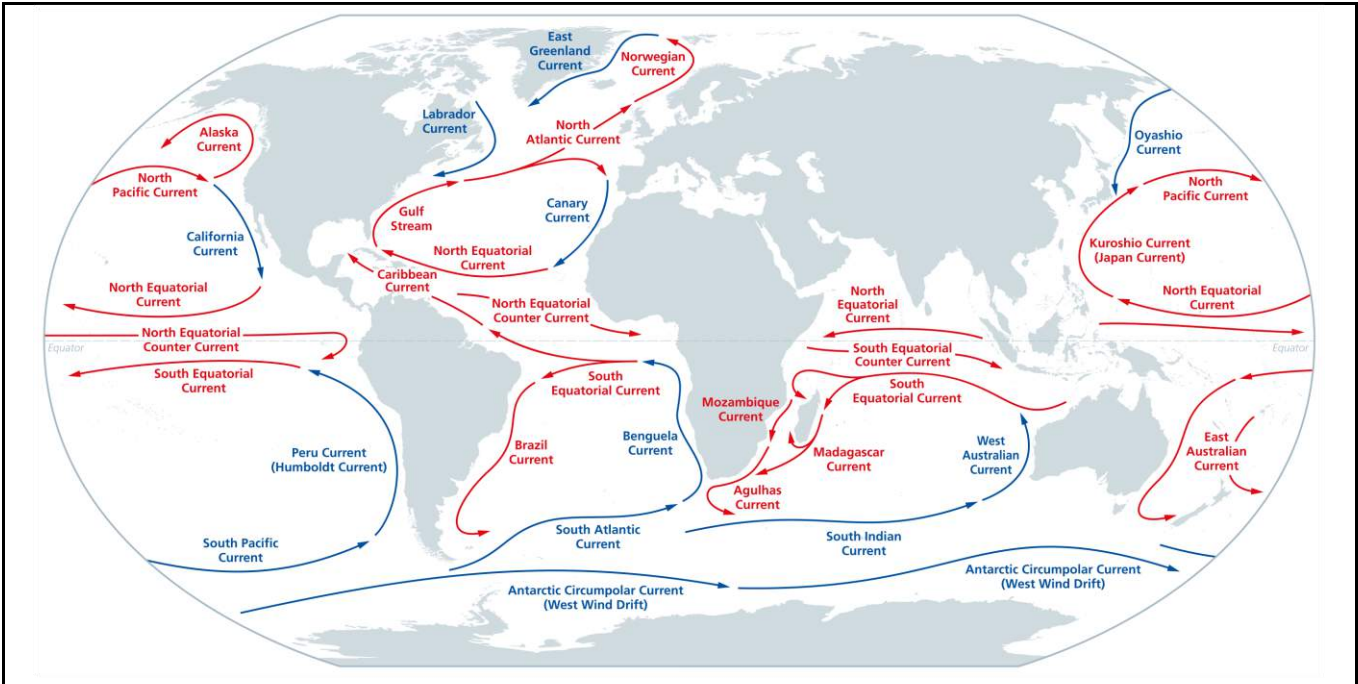
EXPLANATION:

If a fish is swimming off the coast of Gabon and wants to reach Namibia, it should travel through the following ocean currents in order:

- **South Equatorial Current:** The southeast trade winds maintain the South Equatorial Current, which flows toward the west where it divides into two branches: one that continues to the Northern Hemisphere and enters the Caribbean—together with a small amount of water from the North Equatorial Current—as the Guiana (Guyana) Current and one that turns south as the Brazil Current, a weak counterpart of the Gulf Stream.
- **Brazil Current:** It is a branch of the Atlantic South Equatorial Current, flowing southward in the South Atlantic Ocean along the eastern coast of South America from Cape St. Roque, Brazil, to about latitude 30°–40° S, where the northward-flowing Falkland Current deflects it to the east. It is a warm ocean current that is relatively weak and shallow.
- **Antarctic Circumpolar Current:** Also known as the West Wind Drift, is a wind-driven surface oceanic current encircling Antarctica and flowing from west to east. Affected by adjacent landmasses, submarine topography, and prevailing winds, the Antarctic Circumpolar Current is irregular in width and course. Its motion is further complicated by continuous exchange with other water masses at all depths. It is a Cold current.
- **Benguela Current:** It is a branch of the West Wind Drift of the Southern Hemisphere. It flows northward in the South Atlantic Ocean along the west coast of southern Africa, nearly to the Equator before merging with the westward-flowing Atlantic South Equatorial Current. The prevailing southerly and southwesterly winds produce upwelling of water with a cool temperature, a relatively low salinity, and a high concentration of plankton, creating excellent fishing grounds. It is a cold current.

Therefore, the correct order of ocean currents to travel from Gabon to Namibia through swimming is the South Equatorial Current, the Brazil Current, the West Wind Drift, and the Benguela Current. **So, Option (b) is correct.**





28. A rock lies buried beneath the ground for thousands of years. Slowly, plant roots reach it, water percolates, chemical reactions accelerate, and over time, the rock completely dissolves into soil, leaving no trace of its parent material.

In which type of climate is such intense chemical weathering and leaching most likely to occur?

- (a) **Equatorial climate**
- (b) Warm Temperate western margin climate
- (c) Tropical monsoon climate
- (d) Continental steppe climate

EXPLANATION:

Soils in tropical rainforests are typically deep but not very fertile, partly because large proportions of some mineral nutrients are bound up at any one time within the vegetation itself rather than free in the soil.

The moist, hot climatic conditions lead to deep weathering of rock and the development of deep, typically reddish soil profiles rich in insoluble sesquioxides of iron and aluminium, commonly referred to as tropical red earths. Over time, the rock completely dissolves into soil, leaving no trace of its parent material.

Precipitation in tropical rainforest regions exceeds evapotranspiration at almost all times, and a nearly permanent surplus of water exists in the soil and moves downward through the soil into streams and rivers on valley floors. Through this process, nutrients are leached out of the soil, leaving it relatively infertile. Sandy soils, particularly, become thoroughly leached of nutrients and support stunted rainforests of peculiar composition.

Therefore, the above intense chemical weathering and leaching occur primarily in an Equatorial climate. **So, Option (a) is correct.**

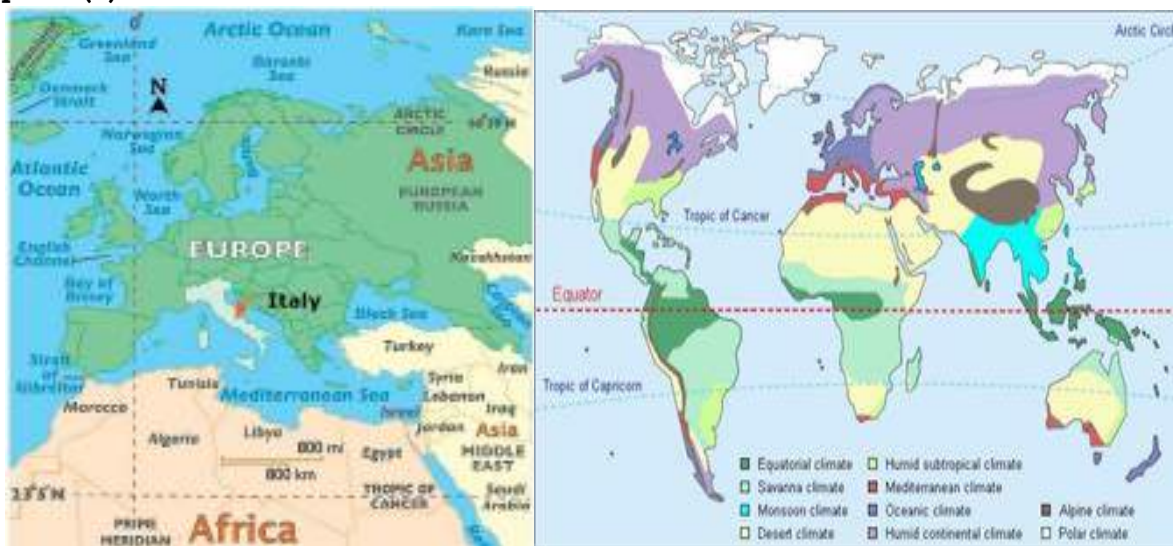
29. Where would you most likely find laurel, myrtle, lavender, arbutus and rosemary?

- (a) **Italy**
- (b) Nigeria
- (c) Japan
- (d) Uruguay

EXPLANATION:

Italy is associated with the warm temperate western margin (Mediterranean region) climate, also called the dry summer subtropical climate.

- There are five regions of the world with a Mediterranean climate. These include the borderlands of the Mediterranean Sea, the central and southern California coast in the USA, Central Chile, the Cape Town area of South Africa, and the South and southwestern coast of Australia.
- The Mediterranean is the only climatic region of the world that receives rainfall only in winter.
- Mediterranean vegetation: Scrubs and Bushes are the most predominant. The common species are Laurel, Myrtle, Lavender, Arbutus, and Rosemary, which are strongly scented or perfumed. **So, Option (a) is correct.**



ADDITIONAL INFORMATION:

CLIMATE AND VEGETATION	
Nigeria	<p>Nigeria is characterised by a wet Equatorial climate and a savanna climate.</p> <ul style="list-style-type: none"> ➤ Equatorial regions are also known as tropical rainforests, characterised by a tropical wet climate. The equatorial region supports the luxuriant growth of natural vegetation, characterised by broad-leafed, evergreen, and dense forests. ➤ Savanna type of climatic region is characterised by an alternate hot rainy season and cool dry season. It is characterised by an alternate hot rainy season and cool dry season.
Japan	<p>The Cool Temperate Eastern Margins Laurentian Climatic Region:</p> <ul style="list-style-type: none"> ➤ It is found in Northeastern North America, including eastern Canada, the northeastern United States (Maritime Provinces and New England states), and Newfoundland. In Asia, it is found in eastern coastal lands, including Eastern Siberia, Eastern China, Manchuria, Korea, and northern Japan. ➤ Fishing, along with lumbering and agriculture, is the most important economic undertaking here. This region is renowned for its world-renowned fishing grounds, including the Grand Banks of Newfoundland, which is attributed to the intermixing of warm and cold currents.
Uruguay	<p>The Natal type of Climatic Region is named after the Natal Province of South Africa. It is located in New South Wales (Australia), Natal (South Africa), and the Parana-Paraguay-Uruguay basin (South America).</p> <ul style="list-style-type: none"> ➤ This type of climate is found only in the Southern Hemisphere. ➤ The narrowness of the continents and the dominance of maritime influence result in a very small annual temperature range.

- This region is home to several varieties of tree species, including Eucalyptus in Australia, Parana Pine, and Quebracho (also known as Axe Breaker, an extremely hard wood used for tanning), as well as Verba mate trees found in the forests of southwestern Brazil, eastern Paraguay, and northeastern Argentina.
- Palm trees, Chestnuts, Ironwood, Blackwoods, and wattle trees are the tree species found in the Natal climatic region.

30. Where is temperature inversion **not** observed?

- (a) Troposphere
- (b) Stratosphere
- (c) Mesosphere**
- (d) Ionosphere

EXPLANATION:

Normally, temperature decreases with an increase in elevation. It is called the normal lapse rate. At times, the situations are reversed, and the normal lapse rate is inverted. It is called the Inversion of temperature.

Temperature inversion, a reversal of the normal behaviour of temperature, occurs in the troposphere (the region of the atmosphere nearest Earth's surface), in which a layer of warmer air overlies a layer of cool air at the surface. (Under normal conditions, air temperature usually decreases with height in the troposphere) **So, Option (a) is not correct.**

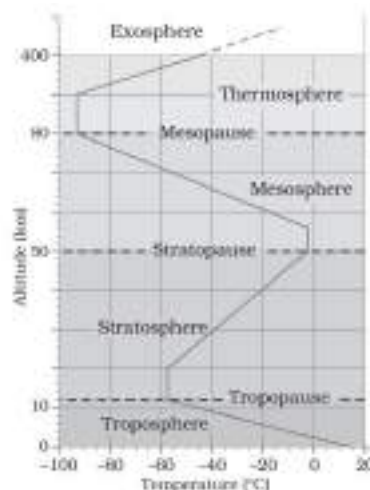
The stratosphere is defined as a region of the atmosphere that extends from about 15 to 50 km in altitude, characterised by an increase in temperature with altitude due to the absorption of UV light by oxygen and ozone, which inhibits vertical motion.

In this layer, the temperature rises as it increases in height, which is observed as the temperature inversion. **So, Option (b) is not correct.**

The mesosphere lies above the stratosphere, which extends up to a height of 80 km. In this layer, once again, temperature starts decreasing with the increase in altitude and reaches up to 100 °C at the height of 80 km.

Thus, it shows that the temperature decreases with an increase in elevation, which is called the normal lapse rate. Therefore, in the mesosphere, temperature inversion is not observed. **So, Option (c) is correct.**

The ionosphere is located between 80 and 400 km above the mesopause. It contains electrically charged particles known as ions, and hence, it is known as the ionosphere. Radio waves transmitted from the Earth are reflected back to the Earth by this layer. The temperature here starts increasing with height. Thus, the temperature inversion is observed. **So, Option (d) is not correct.**



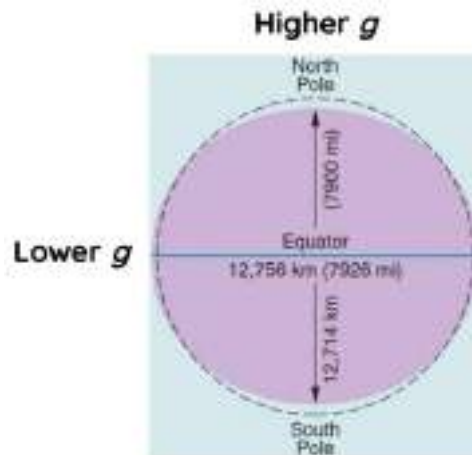
31. Satellite launching stations are closer to the Equator because:

- (a) **Gravitational force is less near the Equator**
- (b) Rotational velocity is low
- (c) The equator has high isolation
- (d) Coriolis force is zero

EXPLANATION:

Earth's diameter is wider at the Equator, creating a phenomenon called an equatorial bulge. The equatorial bulge means that people standing at sea level near the poles are closer to the centre of Earth than people standing at sea level near the Equator.

- Earth's gravitational pull is slightly weaker at the Equator due to its equatorial bulge.
- The slightly weaker gravitational pull and momentum of the spinning Earth make equatorial regions ideal places for space launches.
- It takes an enormous amount of energy to launch a satellite or other spacecraft out of Earth's atmosphere. It takes less energy (rocket fuel) to launch in lower gravity. Hence, Satellite launching stations are closer to the Equator as the gravity is less near the Equator in comparison to other latitudes. **So, Option (a) is correct.**



The rotational speed, or spin, at the Arctic Circle is slower than the spin at the Tropic of Cancer, because the circumference of the Arctic Circle is much smaller and a point doesn't have to travel as far to complete a revolution.

The spin at the Tropic of Cancer is much slower than the spin at the Equator. Near the poles, Earth's rotational speed, or spin, is near zero. At the Equator, the spin is about 1,670 kilometres per hour (1,038 miles per hour). Thus, the rotational velocity is high at the Equator. **So, Option (b) is not correct.**

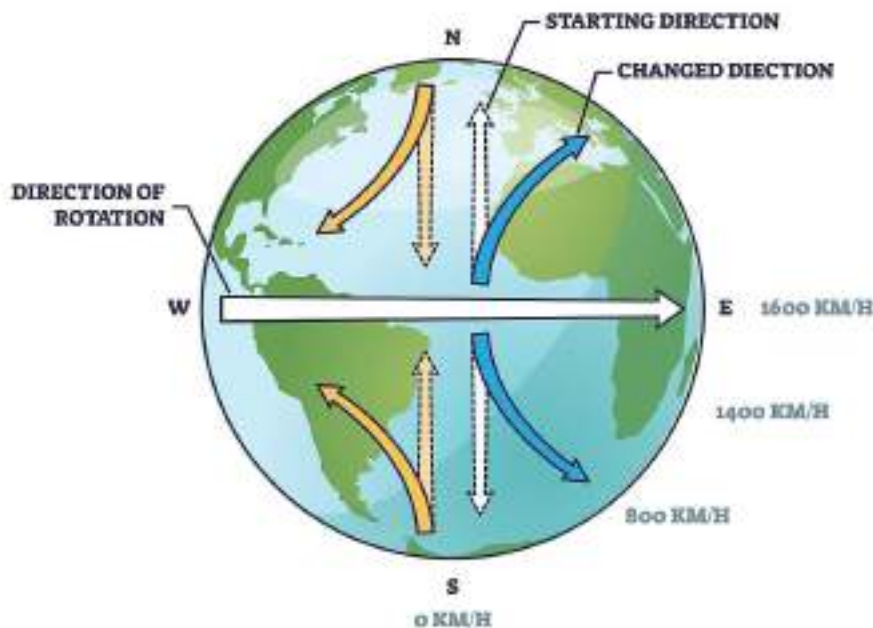


The energy received by the Earth is known as incoming solar radiation, which is termed as insolation. Maximum insolation is received over the subtropical deserts, where the cloudiness is the least. The Equator receives comparatively less insolation than the tropics. Generally, at the same latitude, the insolation is more over the continent than over the oceans. In winter, the middle and higher latitudes receive less radiation than in summer. Insolation has nothing to do with the Satellite launch station.

So, Option (c) is not correct.

The effect of the Coriolis force is an apparent deflection of the path of an object that moves within a rotating coordinate system. The object does not actually deviate from its path, but it appears to do so because of the motion of the coordinate system.

The Coriolis effect is most apparent in the path of an object moving longitudinally. On Earth, an object that moves along a north-south path, or longitudinal line, will undergo apparent deflection to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. The Coriolis force is strongest near the poles and absent at the Equator. Though the Coriolis force is zero at the Equator, it is not the primary reason for launching satellites closer to the Equator. **So, Option (d) is not correct.**



32. Consider the following statements:

1. All Igneous rocks are called parent rocks.
2. All igneous rocks are found on the Earth's surface.

Which of the above statements is/are correct?

- (a) **1 only**
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

EXPLANATION:

Igneous rocks are formed when hot molten material, called magma (inside the Earth) or lava (on the surface), cools, solidifies, and crystallizes. They are also known as Primary or Parent Rocks because they were the first to form in the Earth's crust after its origin.

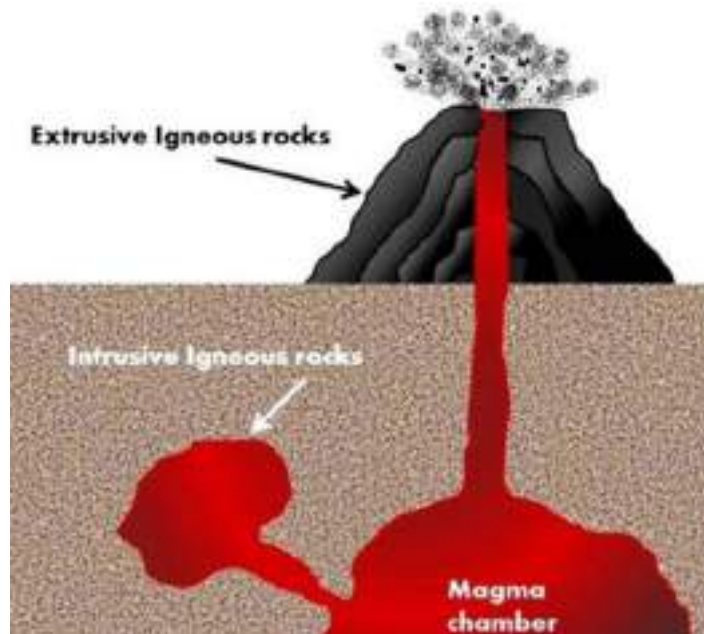
All other types of rocks—sedimentary and metamorphic—are formed either directly or indirectly from igneous rocks. For this reason, igneous rocks are considered the foundation of the rock cycle. They

have been forming throughout Earth's geological history and continue to form even today. **So, Statement 1 is correct.**

Igneous rocks are of two types:

- Extrusive (volcanic) rocks, such as basalt, which form when lava cools on the Earth's surface.
- Intrusive (plutonic) rocks, such as granite, which form when magma cools slowly deep inside the crust.

Since magma can solidify both within the crust and on the surface, not all igneous rocks are found at the surface. When magma cools inside the crust, it forms intrusive landforms like dikes, sills, laccoliths, lopoliths, phacoliths, and batholiths. When it reaches the surface and solidifies, it creates extrusive landforms such as lava plains, basalt plateaus, and lava tunnels. Thus, igneous rocks occur both below the crust and on the Earth's surface. **So, Statement 2 is not correct.**



ADDITIONAL INFORMATION:

LAVA & ITS TYPES	
About	Lava is molten rock expelled by a volcano during an eruption. It originates deep within the earth, where temperatures are high enough to melt rock.
Basic lavas	<ul style="list-style-type: none"> ➤ These are the hottest lavas, about 1,000°C and are highly fluid. ➤ They are dark colored like basalt, rich in iron and magnesium, but poor in silica. ➤ As they are poured out of the volcano, they flow quietly and are not very explosive. ➤ Due to their high fluidity, they flow readily with a speed of 10 to 30 miles per hour. ➤ They affect extensive areas, spreading out as thin sheets over great distances before they solidify. ➤ The resultant volcano is gently sloping with a wide diameter and forms a flattened shield or dome.
Acid Lavas	<ul style="list-style-type: none"> ➤ These lavas are highly viscous with a high melting point. ➤ They are light-coloured, of low density, and have a high percentage of silica. ➤ They flow slowly and seldom travel far before solidifying. The resultant cone is therefore steep-sided. ➤ The rapid congealing of lava in the vent obstructs the flow of the outpouring lava, resulting in loud explosions, throwing out many volcanic bombs or pyroclasts.

- Sometimes the lavas are so viscous that they form a spine or plug at the crater, like that of Mt. Pelee in Martinique.
- Some spines are very resistant, and while most of the material of very old volcanoes is removed by erosion, the spine may remain.

33. Which River empties into the Pacific Ocean?

- (a) **Yukon**
 (b) Seine
 (c) Danube
 (d) Ob

EXPLANATION:

The Yukon River is the third-longest River in the United States and a major river in the northwestern part of North America. The 3,190km long Yukon River originates from its source in the Canadian province of British Columbia and then flows through the Canadian territory of Yukon. From there, the river flows westwards through the central portion of Alaska, United States, and finally empties into the Bering Sea, which is part of the Pacific Ocean. **So, Option (a) is correct.**



The Seine River is France's second-longest River after the Loire, covering a distance of 775 kilometres. This River has a drainage basin, known as the Paris Basin, of approximately 79,000 square kilometres and drains mainly northern France. The Seine rises northwest of Dijon and flows through Paris into the English Channel, an arm of the Atlantic Ocean separating northern France and southern England. It is one of Europe's major historic rivers, with 37 bridges constructed across it in Paris, of which some date back to the early 17th century.

Therefore, the Seine River drains into the English Channel in the Atlantic Ocean (Not the Pacific Ocean). **So, Option (b) is not correct.**



The Danube River is the second longest in Europe after the Volga. It rises in the Black Forest mountains of western Germany and flows for some 2,850 km to its mouth on the Black Sea (not in the Pacific Ocean).

Along its course, it passes through 10 countries: Germany, Austria, Slovakia, Hungary, Croatia, Serbia, Bulgaria, Romania, Moldova, and Ukraine. **So, Option (c) is not correct.**



Ob River, River of central Russia. It is the seventh longest River in the world, flows north and west across western Siberia in a twisting diagonal from its sources at the confluence of its headwaters, the Biya and Katun Rivers in the Altai Mountains to its outlet through the Gulf of Ob into the Kara Sea of the Arctic Ocean (not in the Pacific Ocean).

The River passes primarily through Russian territories, though many of its tributaries drain land areas in neighbouring China, Mongolia, and Kazakhstan. The River is joined by its largest tributary, the Irtysh River, at about 69° East longitude. **So, Option (d) is not correct.**



34. Consider the following statements:

Statement I : Warm waters are less dense than cold waters

Statement II : Fresh water is denser than salt water

Which one of the following is correct with respect to the other statements?

- (a) Both Statement I and Statement II are correct, and Statement II explains Statement I
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct**
- (d) Statement I is not correct, but Statement II is correct

EXPLANATION:

Cold water is always more dense than warm water; the density changes amount to about 4 tenths of one per cent between near-freezing and 30 degrees Celsius (86 degrees Fahrenheit). Although small, the difference allows warm water to "float" on top of cold water, a phenomenon that occurs every day in the world's oceans. **So, Statement I is correct.**

➤ Warm Water Density

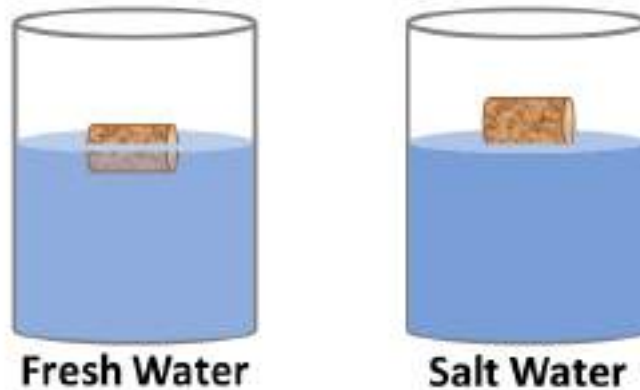
- The reason warm water is less dense than cold water is the heat itself. When heat is introduced to water (from a source like the Sun), its molecules are excited by the energy.
- They begin moving faster, so when they bump into one another, they bounce further away. The increased space between the fast-moving molecules decreases the density.

➤ Cold Water Density

- Cold water has greater density than hot water because its water molecules are more sluggish; vibrations and movements are slower and less energetic.
- The molecules bounce and jostle each other less, so more can fit together in a smaller space. Because they are packed together more tightly, the water's density is greater.

Water with high salinity is denser than water with low salinity. Denser water tends to sink, while relatively lighter water tends to rise. Saltwater freezes at a temperature (-2°) lower than that of fresh

water (0°). Therefore, Fresh water with the least salinity is less dense than salt water. **So, Statement II is not correct.**



35. A meteorologist using a barometer makes corrections for which of the following?

1. Altitude
2. Latitude
3. Temperature

Select the correct answer using the codes given below:

- (a) Only one
- (b) Only two
- (c) All three**
- (d) None


EXPLANATION:

A barometer is a scientific instrument used to measure atmospheric pressure, also called barometric pressure. Atmospheric pressure is an indicator of weather. Changes in the atmosphere, including changes in air pressure, affect the weather. Meteorologists use barometers to predict short-term changes in the weather.

A gold slide is a mechanical device attached to the barometer for quick computation of the total correction (required due to index error, height, latitude, and temperature), which is to be applied to the barometric reading.

- Height Correction (Altitude): Height correction is applied to obtain a reading at sea level. **So, Statement 1 is correct.**
- Latitude Correction: Since the polar radius of the Earth is less than the equatorial radius by about 13 miles, the gravitational force at the poles is greater than at the Equator. Hence, for the same atmospheric pressure, the height of the unadjusted mercury column is greater at the Poles than at the Equator. Latitude correction is applied to obtain barometric pressure at a specific reference latitude (Often 45 degrees). After applying latitude correction, the height of the mercury column is greater in Poles than in Equator. **So, Statement 2 is correct.**
- Temperature Correction: Barometers are constructed to show correct readings at a standard temperature (0°C or 273K). Hence, the temperature correction is subtracted for temperatures greater than the standard temperature and added for temperatures less than the standard temperature. **So, Statement 3 is correct.**

ADDITIONAL INFORMATION:

TYPES OF BAROMETERS	
About	<p>Mercury Barometer:</p> <ul style="list-style-type: none"> ➤ The mercury barometer is the oldest type of barometer, invented by the Italian physicist Evangelista Torricelli in 1643. ➤ The tube is marked with a series of measurements that track the number of atmospheres or bars. Observers can tell what the air pressure is by looking at where the mercury stops in the barometer. <p>Aneroid Barometer:</p> <ul style="list-style-type: none"> ➤ In 1844, the French scientist Lucien Vidi invented the aneroid barometer. ➤ An aneroid barometer has a sealed metal chamber that expands and contracts, depending on the atmospheric pressure around it. Mechanical tools measure how much the chamber expands or contracts. These measurements are aligned with atmospheres or bars. <p>Digital Barometers:</p> <ul style="list-style-type: none"> ➤ Today's digital barometers measure and display complex atmospheric data more accurately and quickly than ever before. ➤ The digital barometer is now an important tool in many of today's smartphones. This type of digital barometer uses atmospheric pressure data to make accurate elevation readings. These readings help the smartphone's GPS receiver pinpoint a location more accurately, greatly improving navigation. <div style="text-align: center;">  <p>Mercury Aneroid</p> </div>

36. Which of the following is **not** a Foehn wind?

- (a) Zonda
- (b) Berg
- (c) Chinook
- (d) **Southerly Buster**

EXPLANATION:

The main types of local winds are sea breezes and land breezes, Anabatic and katabatic winds, and Foehn winds.

Foehn winds are dry and hot local winds. Foehn winds are caused by the subsidence of moist air after passing a high mountain. The air is forced to move upslope when encounters a mountain barrier.

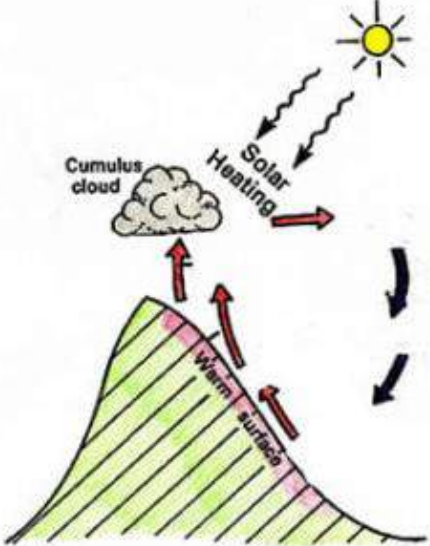
- As the temperature decreases with height, the moist air will become saturated and condense to form clouds and rain when it rises to a certain height. The amount of water vapour that remains in the air therefore decreases.
- After passing the ridge and descending along the leeside of the mountain, the air becomes warmer. Temperature of drier air will rise even faster. This results in dry and hot winds.
 - Zonda, winter foehn (that is, a warm dry wind blowing down the side of a mountain) in Argentina, where it blows from the west across the Andes Mountains. **So, Option (a) is not correct.**

- Berg winds-hot, dry winds (Foehn winds) occur mainly from April to September and are most frequent on the west coast of South Africa, where they occur approximately fifty times a year. **So, Option (b) is not correct.**
- Chinook (North America), warm, dry wind descending the eastern slopes of the Rocky Mountains, primarily in winter. Winds of the same kind occur in other parts of the world and are known generally as foehns. **So, Option (c) is not correct.**

The "southerly burster", or "southerly buster", is an intense cold front (it's not a Foehn wind) which occurs mostly in spring and summer months along the coast of New South Wales in eastern Australia, roughly between Gabo Is-land in the south and Port Macquarie in the north. **So, Option (d) is correct.**

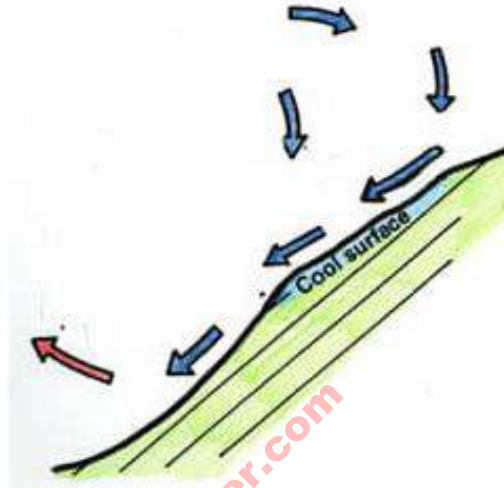


ADDITIONAL INFORMATION:

LOCAL WINDS OF THE WORLD	
About	Local winds occur on a small spatial scale, their horizontal dimensions typically several tens to a few hundreds of kilometres. They also tend to be short-lived lasting typically several hours to a day. There are many such winds around the world, some of them cold, some warm, some wet, some dry. There are many hazards associated with the winds.
Anabatic Winds	<p>This wind is caused by thermal (heat) processes. Anabatic (upslope) winds occur over slopes which are heated by the Sun. Air which is in contact with slopes that are warmed expands upward and cool and sinks over neighbouring valleys. Anabatic winds are usually slow, at only 1-2m/s and are rarely important except near coasts where they can increase the strength of sea breezes.</p> 

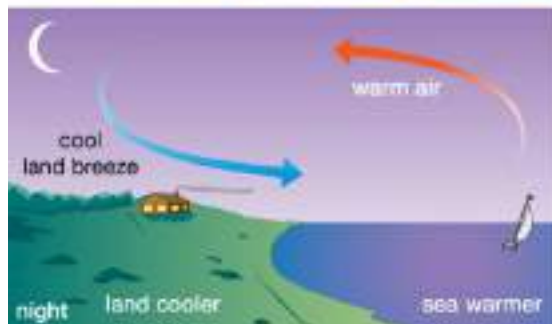
Katabatic Winds

- Katabatic (downslope) winds occur over slopes which are cooled. Katabatic winds occur where air in contact with sloping ground is colder than air at the same level away from the hillside over the valley.
- Katabatic winds are nocturnal phenomena in most parts of the world (i.e. they tend to happen at night) as there is surface cooling, especially when there is little cloud and due to lack of heating by the Sun.



Sea breezes & Land Breezes

- Sea breezes are the result of differential heating of the land and the sea. Sea breezes occur by day, when the land becomes warmer than the sea.
- Land breezes occur at night and in the early morning, when the land is cooler than the sea. This is because as the air cools in the night time (as there is less heating from the Sun) it contracts. Pressure is higher over the land than the sea.



37. Consider the following:

1. Carbon dioxide
2. Water Vapour
3. Nitrogen
4. Hydrogen
5. Methane
6. Ammonia

How many of the above gases were found in the early Atmosphere of the Earth?

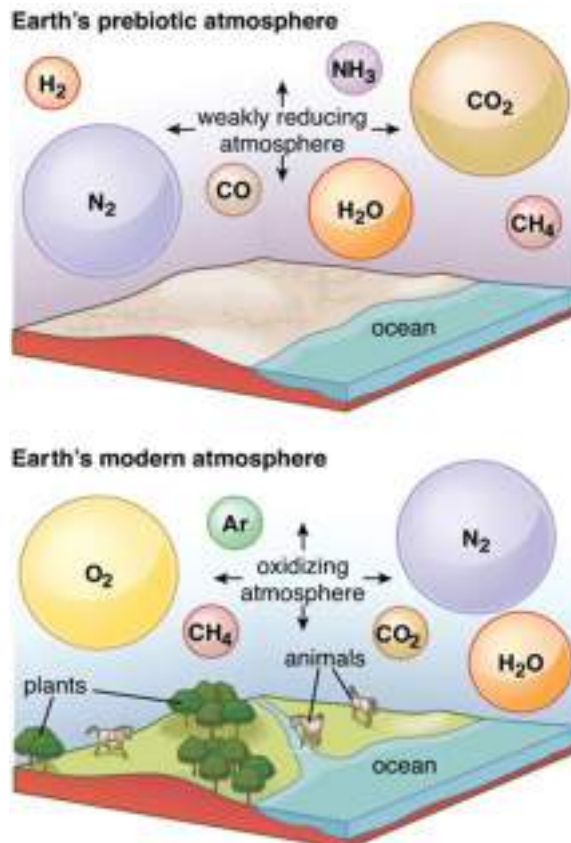
- (a) 3
- (b) 4
- (c) 5
- (d) 6**

EXPLANATION:

The Earth formed about 4.6 billion years ago, and its early atmosphere developed mainly through volcanic outgassing. This primitive atmosphere contained gases such as methane, ammonia, carbon dioxide, water vapour, hydrogen, nitrogen, and noble gases like neon, but it lacked free oxygen. It is believed to have resembled the present atmospheres of Mars and Venus, which are dominated by carbon dioxide, have little or no oxygen, and contain small amounts of other gases like methane and ammonia.

As the Earth cooled, the water vapour released from volcanoes condensed to form oceans. Meanwhile, nitrogen, being chemically unreactive, gradually accumulated in the atmosphere and became one of its major components. Therefore, all the above gases were found in the early Atmosphere of the Earth.

So, Option (d) is correct.



ADDITIONAL INFORMATION:

THE ATMOSPHERE	
About	<p>The atmosphere is made up of gases, water vapour, and dust particles. It extends from the Earth's surface to thousands of kilometres, eventually merging with the solar wind.</p> <p>Earth's atmosphere is a mixture of gases, primarily nitrogen (78%) and oxygen (21%), with smaller amounts of argon, water vapour, carbon dioxide, and other trace gases. As we go higher, the proportion of gases changes. At about 120 km above the Earth, oxygen becomes almost negligible, while carbon dioxide and water vapour are present only up to about 90 km from the surface.</p>
Evolution of Atmosphere	<p>The Earth's atmosphere developed in three main stages.</p> <ul style="list-style-type: none"> ➤ Initially, Earth had a primordial atmosphere composed of hydrogen and helium, but it was blown away by strong solar winds, similar to other terrestrial planets. ➤ Later, gases from Earth's hot interior were released through volcanic activity, a process called degassing. This created an early atmosphere made up of water vapour, nitrogen, carbon dioxide, methane, and ammonia, but almost no oxygen. ➤ As the Earth cooled, water vapour condensed and fell as rain, which collected in low areas to form oceans about 4 billion years ago. ➤ Life appeared around 3.8 billion years ago, and by 2.5–3 billion years ago, photosynthesis had evolved. ➤ Oxygen first built up in the oceans, and about 2 billion years ago, it began to accumulate in the atmosphere, shaping the air we have today.
Various elements of the Atmosphere	<p>The main components of Earth's atmosphere include:</p> <ul style="list-style-type: none"> ➤ Nitrogen (N₂) - 78.084% ➤ Oxygen (O₂) - 20.946% ➤ Argon (Ar) - 0.934% ➤ Variable gases such as water vapour (H₂O), carbon dioxide (CO₂), and ozone (O₃) <p>Volatile compounds, as well as elements important in present and past atmospheres or in interactions between the atmosphere, biosphere, and other portions of the crust, include the following:</p> <ul style="list-style-type: none"> ➤ Present major components: molecular nitrogen (N₂) and molecular oxygen (O₂) ➤ Noble gases: helium (He), neon (Ne), argon (Ar), krypton (Kr), and xenon (Xe) ➤ Abundant variable components: water vapour (H₂O) and carbon dioxide (CO₂) ➤ Other components: molecular hydrogen (H₂), methane (CH₄), carbon monoxide (CO), ammonia (NH₃), nitrous oxide (N₂O), nitrogen dioxide (NO₂), hydrogen sulfide (H₂S), dimethyl sulfide [(CH₃)₂S], sulfur dioxide (SO₂), and hydrogen chloride (HCl).

38. Which of the following is/are correct inference/inferences from isothermal maps in the month of January?

1. The isotherms are more or less parallel to the latitudes in the Southern Hemisphere.
2. The presence of warm ocean currents and the Gulf Stream makes the isotherms parallel to the latitudes.

Select the answer using the code given below:

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

EXPLANATION:

The Isotherms are lines joining places having equal temperature. The isotherms are generally parallel to the latitude. The deviation from this general trend is more pronounced in January than in July, especially in the northern hemisphere.

- In the northern hemisphere the land surface area is much larger than in the southern hemisphere. Hence, the effects of land mass and the ocean currents are well pronounced.
 - In January the isotherms deviate to the north over the ocean and to the south over the continent. This can be seen on the North Atlantic Ocean.
 - The presence of warm ocean currents, Gulf Stream and North Atlantic drift, make the Northern Atlantic Ocean warmer and the isotherms bend towards the north. Over the land the temperature decreases sharply and the isotherms bend towards south in Europe. **So, Statement 2 is not correct.**
- The effect of the ocean is well pronounced in the southern hemisphere. Here the isotherms are more or less parallel to the latitudes and the variation in temperature is more gradual than in the northern hemisphere. **So, Statement 1 is correct.**

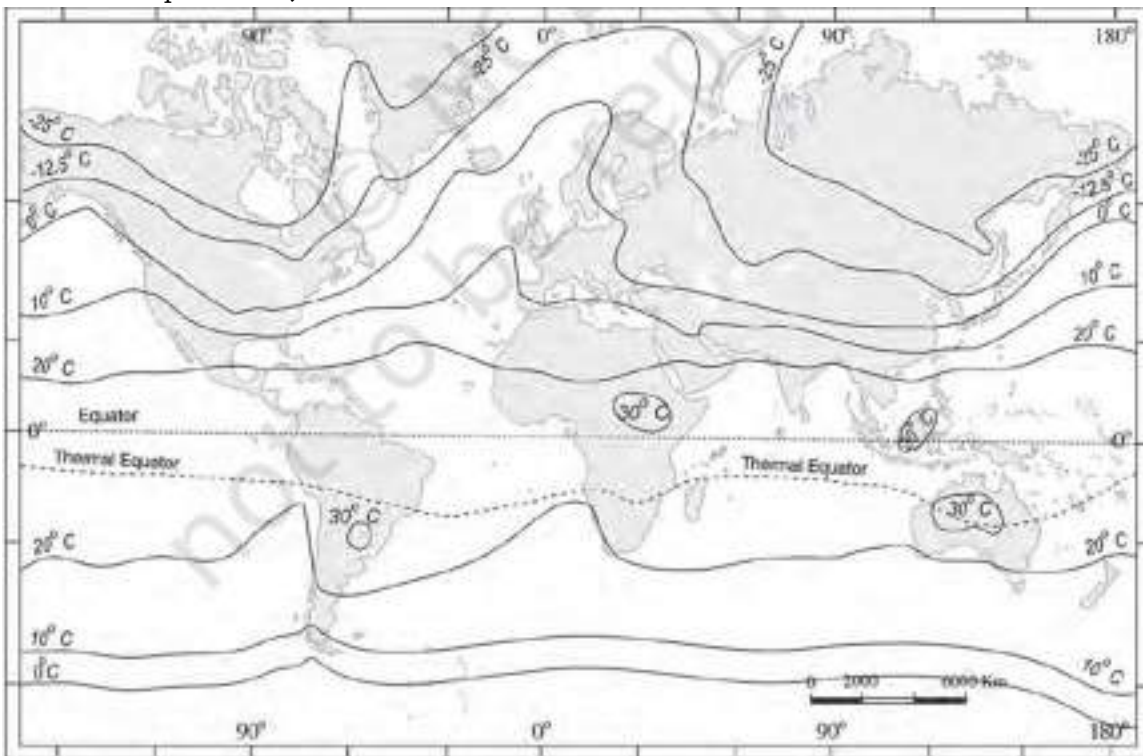


Figure 8.4 (a) : The distribution of surface air temperature in the month of January

ADDITIONAL INFORMATION:

INVERSION OF TEMPERATURE

About	<ul style="list-style-type: none"> ➤ The Temperature decreases with increase in elevation. It is called normal lapse rate. At times, the situations is reversed and the normal lapse rate is inverted. It is called Inversion of temperature. ➤ Inversion is usually of short duration but quite common nonetheless. ➤ A long winter night with clear skies and still air is ideal situation for inversion. The heat of the day is radiated off during the night, and by early morning hours, the earth is cooler than the air above. Over polar areas, temperature inversion is normal throughout the year.
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- Surface inversion promotes stability in the lower layers of the atmosphere. Smoke and dust particles get collected beneath the inversion layer and spread horizontally to fill the lower strata of the atmosphere.
- Dense fogs in mornings are common occurrences especially during winter season. This inversion commonly lasts for few hours until the sun comes up and begins to warm the earth.
- The inversion takes place in hills and mountains due to air drainage. Cold air at the hills and mountains, produced during night, flows under the influence of gravity. Being heavy and dense, the cold air acts almost like water and moves down the slope to pile up deeply in pockets and valley bottoms with warm air above. This is called air drainage. It protects plants from frost damages.



39. With reference to "Coriolis force", which of the following statements is/are correct?

1. It is directly proportional to the wind velocity and latitude.
2. It is perpendicular to the pressure gradient force.

Select the answer using the code given below:

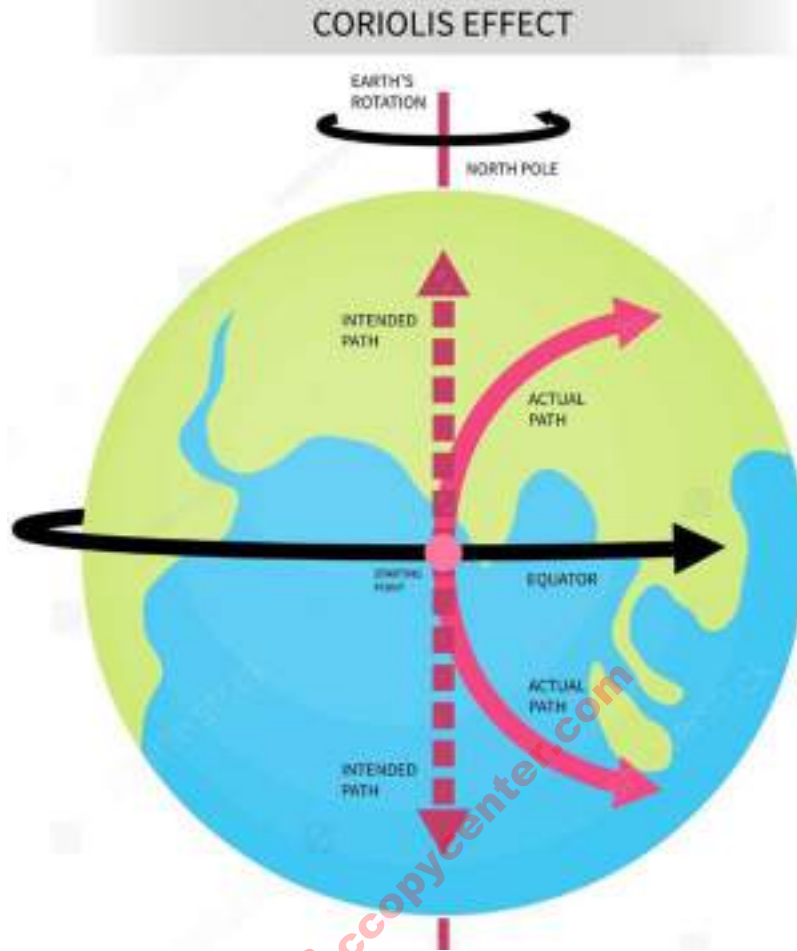
- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2**
- (d) Neither 1 nor 2

EXPLANATION:

The force exerted by the rotation of the earth is known as the Coriolis force. If the Earth did not rotate and remained stationary, the atmosphere would circulate between the poles (high pressure areas) and the equator (a low pressure area) in a simple back-and-forth pattern.

But because the Earth rotates, circulating air is deflected. Instead of circulating in a straight pattern, the air deflects toward the right in the Northern Hemisphere and toward the left in the Southern Hemisphere, resulting in curved paths. This deflection is called the Coriolis effect.

The deflection is more when the wind velocity is high. The Coriolis force is directly proportional to the angle of latitude. It is maximum at the poles and is absent at the equator. **So, Statement 1 is correct.**



The Coriolis force acts perpendicular to the pressure gradient force. The pressure gradient force is perpendicular to an isobar. The higher the pressure gradient force, the more is the velocity of the wind and the larger is the deflection in the direction of wind.

As a result of these two forces operating perpendicular to each other, in the low-pressure areas the wind blows around it.

At the equator, the Coriolis force is zero and the wind blows perpendicular to the isobars. The low pressure gets filled instead of getting intensified. That is the reason why tropical cyclones are not formed near the equator. **So, Statement 2 is correct.**

ADDITIONAL INFORMATION:

FORCES AFFECTING THE VELOCITY AND DIRECTION OF WIND	
About	<p>Forces that affect the velocity and direction of wind are:</p> <ul style="list-style-type: none"> ➤ Pressure gradient force ➤ Frictional force ➤ Coriolis force ➤ Centrifugal action of wind
Pressure Gradient	<ul style="list-style-type: none"> ➤ The force that causes wind movement results from horizontal pressure differences. ➤ It is the direction and magnitude of the pressure gradient which ultimately determines wind direction and its velocity. ➤ This is the force generated due to the differences in horizontal pressure, and it operates from the high-pressure area to a low-pressure area.

	<ul style="list-style-type: none"> ➤ Since a closely spaced gradient implies a steep pressure change, it also indicates strong wind speed. ➤ The wind direction follows the direction of change of pressure, i.e. perpendicular to the isobars. ➤ The pressure gradient is strong where the isobars are close to each other and is weak where the isobars are apart.
Frictional Forces	<ul style="list-style-type: none"> ➤ At or near the earth's surface, friction is an important factor affecting wind. But its effect is confined to only a few thousand meters from the surface. ➤ Frictional forces act not only to slow down the wind movement but also to change the wind direction. ➤ The irregularities of the earth's surface offer resistance to the wind motion in the form of friction. ➤ This force determines the angle at which air will flow across the isobars, as well as the speed at which it will move. ➤ It may also alter wind direction. Over the relatively smooth ocean surface, the friction is minimum, so the air moves at low angles to the isobars and at a greater speed. ➤ Over uneven terrain, however, due to high friction, the wind direction makes high angles with, isobars and the speed gets retarded.
Centrifugal Action of Wind	<ul style="list-style-type: none"> ➤ The centrifugal force is an apparent force that includes the effects of inertia for winds moving along a curved path. ➤ The directionality of the centrifugal force points outward from the center of the curve. ➤ It should be noted that centrifugal force is hardly a force in the true sense of the term. ➤ It results from a state of imbalance existing between other forces when isobars are curved. ➤ In fact, this imbalance is necessary to provide the change in the direction needed for curved flow. ➤ The Coriolis force is a factor which operates forcefully only when there is a high velocity wind with a small radius of curvature as in small-sized violent tropical storms. ➤ It acts in a direction radially outward from the center of curvature of the wind's path.

40. Consider the following climate types according to the Koppen scheme of classification:

1. Tropical wet
2. Humid subtropical
3. Marine West Coast
4. Humid continental

How many of the above climate types have a distinct dry season?

- (a) Only one
- (b) Only two
- (c) Only three
- (d) None**

EXPLANATION:

Dry climates have very low rainfall, not enough for plant growth, and occur from 15°–60° latitude north and south. At low latitudes (15°–30°), they are found in subtropical high-pressure belts where descending air prevents rainfall.

On the west coasts of continents, deserts extend closer to the equator due to cold ocean currents (e.g., Atacama Desert in South America). In mid-latitudes (35°–60°), they occur in the interiors of continents, often in rain-shadow areas.

- Dry climates are divided into steppe or semi-arid climate (BS) and desert climate (BW). They are further subdivided as
 - Subtropical steppe
 - Subtropical desert
 - Mid-latitude steppe and
 - Mid-latitude desert
- Tropical wet climate is found near the equator. The major areas are the Amazon Basin in South America, western equatorial Africa and the islands of East Indies. Significant amount of rainfall occurs in every month of the year as thunder showers in the afternoon. Therefore, no dry season.
- Humid subtropical climate occurs poleward of Tropic of Cancer and Capricorn, mainly in North Indian plains and South China interior plains. The climate is similar to Tropical wet and dry climate (Aw) climate except that the temperature in winter is warm. There is no dry season observed in this climate.
- Marine west coast climate is located poleward from the Mediterranean climate on the west coast of the continents. The main areas are: Northwestern Europe, west coast of North America, north of California, southern Chile, southeastern Australia and New Zealand. Precipitation occurs throughout the year. Precipitation varies greatly from 50-250cm. So, no dry season.
- Humid continental - Cold climate with humid winter occurs poleward of marine west coast climate and mid latitude steppe. The winters are cold and snowy. The frost-free season is short. The annual ranges of temperature are large. The weather changes are abrupt and short. Poleward, the winters are more severe. So, no dry season. **So, Option (d) is correct.**

ADDITIONAL INFORMATION:

CLASSIFICATION OF CLIMATIC TYPES ACCORDING TO KOEPPEN		
Group	Type	Characteristics
A – Tropical Humid Climate	Tropical wet	No dry season
	Tropical monsoon	Monsoonal, short dry season
	Tropical wet and dry	Winter dry season
B – Dry Climate	Subtropical steppe	Low-latitude semi-arid or dry
	Subtropical desert	Low-latitude arid or dry
	Mid-latitude steppe	Mid-latitude semi-arid or dry
	Mid-latitude desert	Mid-latitude arid or dry
C – Warm Temperate (Mid-latitude) Climates	Humid subtropical	No dry season, warm summer
	Mediterranean	Dry hot summer
	Marine west coast	No dry season, warm and cool summer

D – Cold Snow-forest Climates	Humid continental	No dry season, severe winter
	Subarctic	Winter dry and very severe
E – Cold Climates	Tundra	No true summer
	Polar ice cap	Perennial ice
H – Highland	Highland	Highland with snow cover

41. Consider the following statements with respect to Types of Coral Reefs:

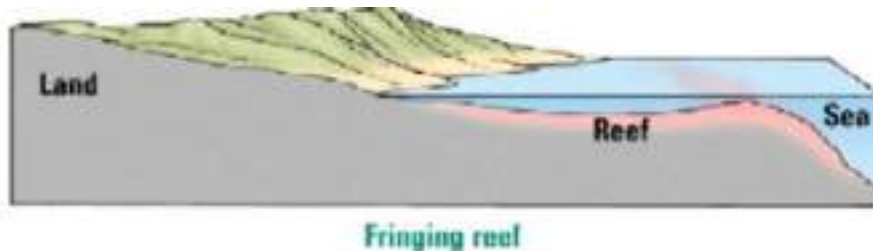
1. Fringing reefs are separated from the coast by a much wider and deeper channel or lagoon.
2. Barrier reefs are a coral line platform lying close to the shore.
3. Atolls are similar to barrier reefs except that they are circular in shape.

Which of the statements given above is/ are correct?

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

EXPLANATION:

In tropical seas, coral polyps and other tiny marine organisms secrete calcium carbonate, which builds up to form coral reefs. Though very small, these creatures live in colonies and over time their skeletons form coralline limestone. The three main types of coral reefs are fringing reefs, barrier reefs, and atolls. Fringing reefs grow close to the shore and may be separated by a shallow lagoon (not deeper lagoon). They are widest off headlands and absent at river mouths. The outer edge grows faster due to wave action, and the reefs usually slope steeply into the sea up to about 100 feet. **So, Statement 1 is not correct.**



A barrier reef is separated from the coast by a much wider and deeper channel or lagoon. The reef is partially submerged. Where it lies above the water level and sand can accumulate on it, a little vegetation is possible.

The barrier reefs have narrow gaps at several places to allow the water from the enclosed lagoon to return to the open ocean. Such gaps are very useful for shipping and provide the only entrances for ships to enter or leave the lagoon.

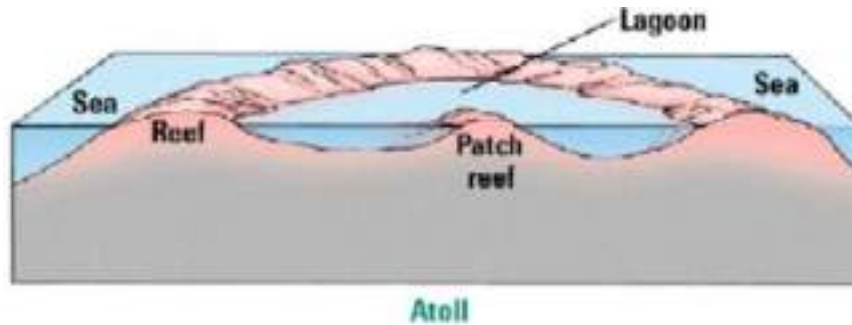
The best-known barrier reef is the Great Barrier Reef off the coast of Queensland, Australia. It is 1,200 miles long, separated from the coast by a channel 100 miles wide in places and over 200 feet deep. **So, Statement 2 is not correct.**



Atolls are similar to barrier reefs except that they are circular in shape, enclosing a shallow lagoon without any land in the centre. The encircling ring is usually broken in a few places to allow the free flow of water.

On the inside of the reefs, sand and limestone debris collect and palm trees like coconuts may grow. Such palm trees thrive well in the brackish water of the lagoon.

The nuts fall into the water and are distributed widely by floating from one coral island to another. The calm waters are useful for fishing and canoeing. Some of the large atolls, e.g. Suvadiva in the Maldives, have a lagoon over 40 miles across. A number of them provide essential air bases for trans-Pacific aircraft. **So, Statement 3 is correct.**



42. Which among the following are **not** true regarding The Equatorial regions?
- It is a sparsely populated region due to the excessive heat and high humidity.
 - The Climate is favorable for Rubber and Cocoa production.
 - The main occupations of the region are lumbering and livestock farming.**
 - The Climate encourages the spread of diseases and pests.

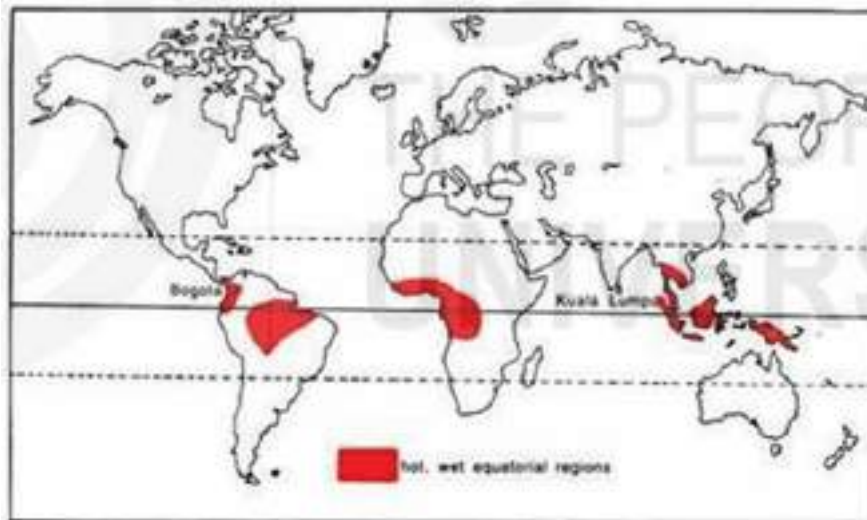
EXPLANATION:

The equatorial region is the area around the equator, generally within 10° North and 10° South latitude. It is characterized by high, consistent temperatures (around 26–28°C) due to direct solar radiation, which leads to daily convectional rainfall and supports dense tropical rainforests.

Regions such as the Amazon and Congo basins typically feature high humidity, an absence of distinct seasons, and a low annual temperature range.

- The equatorial region is sparsely populated due to extreme heat, humidity, dense forests, and diseases.
- Its hot and wet climate is ideal for crops like rubber and cocoa, but it also encourages the spread of pests and illnesses such as malaria and yellow fever.
- Lumbering and livestock farming are not the main occupations in the equatorial region because forests are difficult to exploit commercially and natural pastures for animals are absent. Trees grow in mixed stands, heavy hardwoods cannot be transported easily via rivers, and there are no frozen surfaces to aid transport.

- Livestock farming is limited due to the lack of meadow grass, and the few animals reared, such as bullocks and buffaloes, are mainly used for work, with low milk and meat yields compared to temperate grasslands. **So, Option (c) is not correct.**



ADDITIONAL INFORMATION:

FACTORS AFFECTING THE DEVELOPMENT OF EQUATORIAL REGIONS	
Equatorial Climate and Health Issues	<ul style="list-style-type: none"> ➤ Excessive heat and high humidity cause serious physical and mental strain. ➤ People sweat heavily, lose energy, and are prone to sunstroke, malaria, and yellow fever. ➤ This reduces their ability to work and weakens their resistance to diseases.
Prevalence Of Bacteria and Insect Pests	<ul style="list-style-type: none"> ➤ The hot, wet climate, which stimulates rapid plant growth, also encourages the spread of insects and pests. ➤ Germs and bacteria are more easily transmitted through moist air. ➤ Equatorial conditions are ideal for the survival of such organisms. ➤ Insects and pests not only spread diseases but are also injurious to crops. They plague both men and animals.
Jungle Hinders Development and Maintenance	<ul style="list-style-type: none"> ➤ The dense jungle makes development and maintenance difficult. Clearing land is hard, and tall grass and undergrowth quickly regrow, threatening crops and estates if not regularly managed. ➤ Building roads and railways requires cutting through forests, thickets, and swamps, while workers face wild animals, snakes, and insects. ➤ Even after construction, maintenance is costly, leaving many remote areas in the Amazon, Congo, and Borneo without modern transport, relying instead on rivers as natural highways.
Rapid Deterioration of Tropical Soil.	<ul style="list-style-type: none"> ➤ Tropical soils are often mistakenly thought to be naturally rich. In their untouched state, they are fairly fertile due to a thick layer of humus formed from decaying leaves. Shifting cultivators can achieve good yields on newly cleared land. ➤ However, once the humus is depleted and vegetation removed, heavy rains quickly wash away nutrients, causing rapid soil deterioration and erosion. ➤ Exceptions include volcanic regions like Java, where fertile ash and active land management maintain productivity. ➤ Similarly, places such as Malaysia, Singapore, and eastern Brazil have improved tropical soil fertility through careful planning and human effort.

Consider the following statements:

1. The differential heating and cooling of the continents and seas have more say in this Climate.
2. Most of the year is dry, with little or no precipitation.
3. In addition to the Indian Sub-continent, this Climate is observed in Myanmar, Laos, Cambodia and South China.

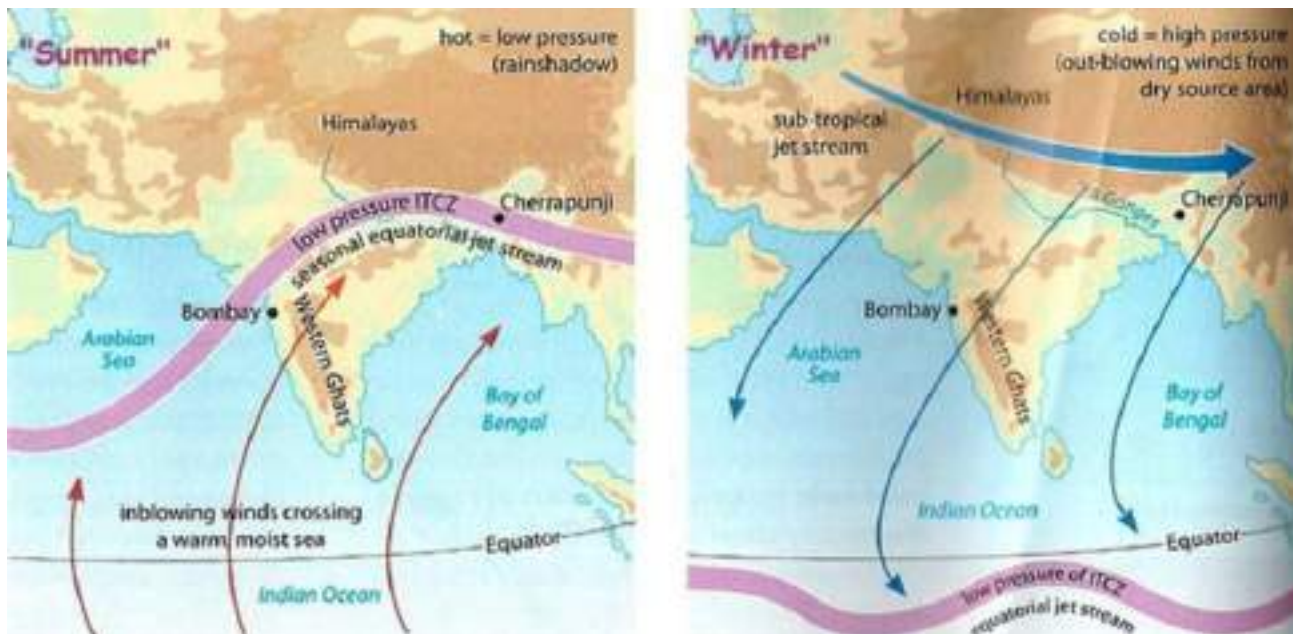
Which of the above statements are correct regarding Tropical Monsoon Climate?

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

EXPLANATION:

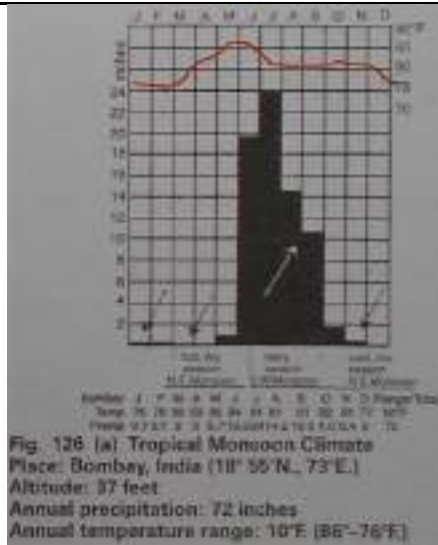
The tropical monsoon climate is caused by the differential heating and cooling of land and sea.

- Summer (Sun overhead at Tropic of Cancer): Central Asia heats rapidly, creating an intense low-pressure zone. The seas remain comparatively cooler. At the same time, high pressure develops over Australia. Winds blow outward as the southeast monsoon, and after crossing the equator, they are deflected and drawn toward Asia, reaching the Indian subcontinent as the southwest monsoon with heavy rainfall.
- Winter (Sun overhead at Tropic of Capricorn): Central Asia cools quickly, forming a high-pressure zone. Winds blow outward as the northeast monsoon. After crossing the equator, they are drawn to the low-pressure zone in Australia, arriving there as the northwest monsoon. **So, Statement 1 is correct.**



There are three seasons in Tropical Monsoon Climate:

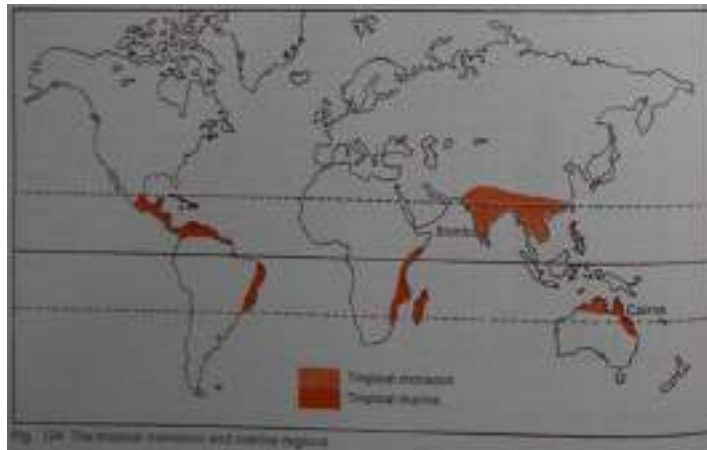
- Cool, dry season (Oct–Feb): "Outblowing dry winds, the northeast monsoon, bring little or no rain to the Indian sub-continent."
- Hot, dry season (March–mid June): There is practically no rain anywhere.
- Rainy season (mid-June–Sept): Almost all the rain for the year falls within this rainy season. As much as 95% of the annual rainfall is concentrated within four months.



From the above, it can be seen that for about eight months (Oct–mid June), the climate remains dry with little or no rainfall, while nearly all the annual rainfall is received during the four-month monsoon season. **So, Statement 2 is correct.**

Tropical monsoon climates are best developed in the Indian sub-continent, Myanmar, Thailand, Laos, Cambodia, parts of Vietnam and south China and northern Australia.

Outside this zone, the climate is modified by the influence of the on-shore Trade Winds all year round, and has a more evenly distributed rainfall. Such a climate, better termed the Tropical Marine Climate, is experienced in Central America, the West Indies, north-eastern Australia, the Philippines, parts of East Africa, Madagascar, the Guinea Coast and eastern Brazil. **So, Statement 3 is correct.**



ADDITIONAL INFORMATION:

CLIMATE ZONES	
About	<p>Climate zones are areas with distinct climates. These zones might correspond to weather patterns, latitude, or communities of plants and animals.</p> <p>There are many climate classification systems, which define zones based on different climatic factors or combinations of factors.</p> <p>The Koppen climate classification, created by Wladimir Köppen in 1884, is one of the most widely used systems for defining climate zones.</p> <p>Though revised several times, it is still used by scientists worldwide.</p> <p>The Koppen system divides climates into five groups based on rainfall and temperature:</p>

- **Tropical** - In this hot and humid zone, the average temperatures are greater than 64°F (18°C) year-round and there is more than 59 inches of precipitation each year.
- **Dry** - These climate zones are so dry because moisture is rapidly evaporated from the air and there is very little precipitation.
- **Temperate** - In this zone, there are typically warm and humid summers with thunderstorms and mild winters.
- **Continental** - These regions have warm to cool summers and very cold winters. In the winter, this zone can experience snowstorms, strong winds, and very cold temperatures—sometimes falling below -22°F (-30°C)
- **Polar** - In the polar climate zones, it's extremely cold. Even in summer, the temperatures here never go higher than 50°F (10°C)!

43. Consider the following pairs:

Tribes	Region
1. Bindibu	Indonesia
2. Pygmies	Amazon
3. Orang Asli	Congo

How many of the pairs given above are correctly matched?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None**

EXPLANATION:

The Bindibu, also known as the Pintupi, were a native group of Aboriginal people from central and western Australia, not Indonesia. The Bindibu tribe lived a traditional hunting and gathering lifestyle in the deserts around Lake Mackay in Australia. **So, Pair 1 is not correct.**



The Democratic Republic of Congo is one of the most ethnically diverse countries in the world. The Pygmies are considered to have been some of the earliest peoples to have inhabited the Congo River Basin. They are characterised by their short stature, are mainly hunters and gatherers, and they inhabit the rainforest. The forests of Ituri and Kibali are home to Congo's remaining Pygmy groups, which include the Twa, Bambuti, Baka, Mbuti and the Babinga. **So, Pair 2 is not correct.**



The Orang Asli refers to the indigenous people of Peninsular Malaysia, comprising three main sub-tribes: Senoi, Proto-Malay, and Negrito, each with its own distinct sub-ethnic groups.

This group is characterised by its rich diversity in languages, cultures, and customary lands, reflecting the unique identity and heritage of the indigenous population in the region. **So, Pair 3 is not correct.**



44. Consider the following statements:

1. Hot, dry summers and Cool, wet winters characterize this Climate.
2. Experience extreme diurnal temperature.
3. It is the transitional Climate between the rainforest and the desert.

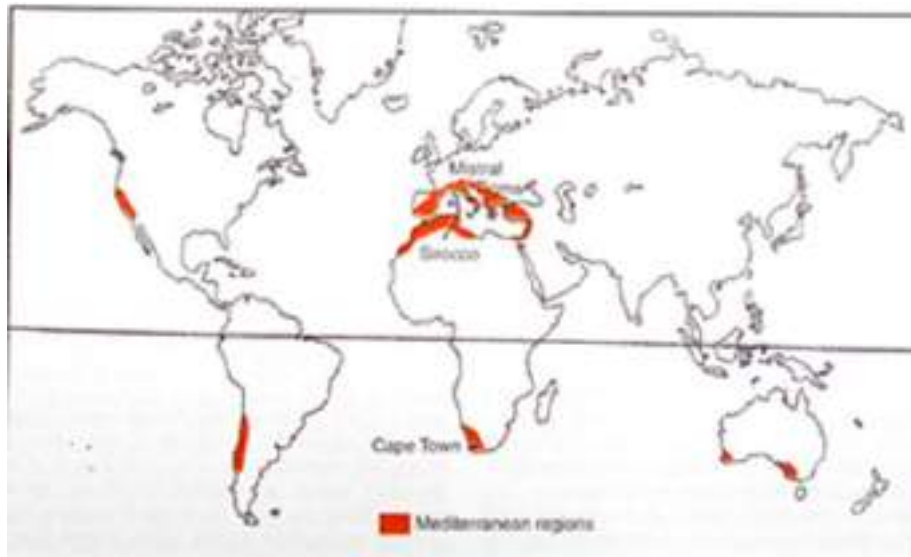
How many of the statements given above are correct regarding the Savanna or the Sudan Climate?

- (a) Only one
- (b) Only two**
- (c) All three
- (d) None

EXPLANATION:

The Sudan type of climate is characterised by an alternate hot, rainy season and cool, dry Season. In the Northern Hemisphere, the hot, rainy season typically begins in May and lasts until September, as in Kano, Nigeria. The rest of the year is cool and dry.

Whereas Mediterranean climate is characterised by hot, dry summers and cool, wet winters and is located between about 30° and 45° latitude north and south of the Equator and on the western sides of the continents. **So, Statement 1 is not correct.**

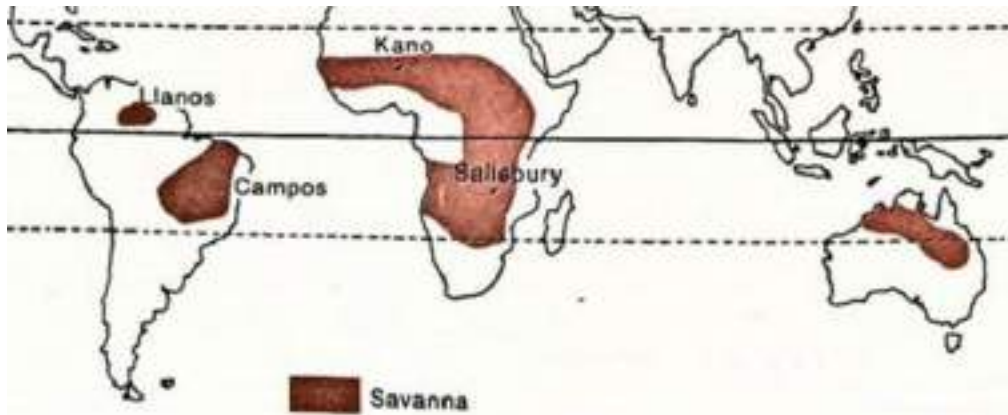


Savanna or Sudan-type climates experience extreme diurnal temperature fluctuations. In the savanna (Sudan) climate, days are hot and nights are comparatively cold. Daytime temperatures can rise to about 38 °C, while nighttime lows may fall to around 15 °C.

This results in a diurnal range of 10–15 °C, particularly during the dry winter season. In summer, however, the high daytime temperatures combine with humidity, leading to smaller temperature ranges and conditions similar to those of the rainy tropics.

So, Statement 2 is correct.

The Savanna or Sudan Climate is a transitional type of climate found between the equatorial forests and the trade wind hot deserts. It is confined within the tropics and is best developed in the Sudan, where the dry and wet seasons are most distinct, hence its name, the Sudan Climate. **So, Statement 3 is correct.**



ADDITIONAL INFORMATION:

TROPICAL WET/DRY (SAVANNA) CLIMATE	
Geographical Location	<p>The Tropical Wet/Dry climate (Köppen classifications Aw and As) occurs mainly between 5°–10° and 15°–20° latitudes.</p> <p>Large savanna regions under this climate include north and south-central Africa, the Llanos of Venezuela, the Campos of Brazil, northern and eastern India, western Central America, the Caribbean Islands, south Florida, Myanmar, and the Indo-Chinese Peninsula.</p>
Temperature	<p>The Tropical Wet/Dry climate has a greater annual temperature range than other tropical wet climates because it lies at higher latitudes with more variation in insolation.</p> <p>Despite this, its average annual temperature remains similar, with mean monthly values ranging from 18 °C to above 25 °C.</p> <p>Maximum temperatures usually occur in late spring to early summer before the rainy season, with a possible secondary peak after the rains. The annual temperature range becomes larger toward the poleward edges of this climate zone.</p>
Precipitation	<p>The Tropical Wet/Dry climate is the driest of the tropical wet climates. Like the monsoon climate, it has a distinct seasonality to its precipitation. However, its wet season is much shorter and receives far less precipitation than the monsoon climate.</p>

45. The plant species such as Malle, Mulga, and Spinifex grass are found in?

- (a) Hot Desert Climate
- (b) Tropical Savanna climate**
- (c) Temperate Steppe Climate
- (d) Siberian Climate

EXPLANATION:

The tropical savanna climate, also known as the tropical wet and dry climate (Aw), is found in grassland regions of the tropics. It remains hot throughout the year, with average monthly temperatures above 18°C. Rainfall is seasonal, with heavy rains in summer and a dry winter. The prevailing Trade Winds (easterlies) strongly influence the rainfall pattern.

The natural vegetation is mainly tall grasses with scattered deciduous trees such as acacias, which shed their leaves during the dry season to reduce water loss. In Australia, this climate is found in the northern regions from Broome to Townsville, where typical plants include Mallee, Mulga, and Spinifex grass. **So, Option (b) is correct.**



Mallee shrub



Mulga tree



Spinifex grass



ADDITIONAL INFORMATION:

OTHER CLIMATES	
Hot Desert Climate	<p>Hot desert climates occur between 15° and 30° latitude north and south, in the subtropical high-pressure belt. These regions are hot, dry, and sunny throughout the year.</p> <ul style="list-style-type: none"> ➤ Summer temperatures may rise above 40°C, and in the hottest deserts, exceed 45°C. ➤ The annual average temperature is very high, often above 30°C. ➤ Nights are much cooler than days, and in winter months, night temperatures may fall close to freezing due to rapid heat loss under clear skies. ➤ Major deserts include the Sahara, Kalahari, Arabian, Thar, Simpson (Australia), and Sonoran (U.S.–Mexico).
Temperate Steppe Climate	<p>A steppe is a large flat grassland, drier than savannas but wetter than deserts. Rainfall is insufficient for forests but adequate for grass and shrubs.</p> <ul style="list-style-type: none"> ➤ Temperate Steppes: Found in mid-latitude continental interiors (e.g., Eurasian Steppe, Great Plains, Rocky Mountain Steppes). ➤ Subtropical Steppes: Found near subtropical deserts, with short wet seasons (e.g., Sahel in Africa, parts of Central Asia).
Cool Temperate	<p>This climate occurs only in the Northern Hemisphere in high latitudes (50°–70°N), stretching across Canada, Scandinavia, Russia, and Alaska.</p>

Continental (Siberian) Climate	<ul style="list-style-type: none"> ➤ To the north, it merges into the Arctic tundra. ➤ Winters are long, extremely cold, and snowy, while summers are short and mild. ➤ The natural vegetation is dominated by coniferous forests (taiga) of pine, spruce, fir, and larch. ➤ The largest belt is in Siberia, forming the world's biggest continuous forest region.
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46. Consider the following statements:

Statement I : Continental shelves can be as shallow as 30 meters or as deep as 600 meters.

Statement II : The depth of continental shelves is uniform throughout the world.

Which one of the following is correct in respect of the following statements?

- (a) Both Statement-I and Statement-II are correct and Statement-II explains Statement-I
- (b) Both Statement-I and Statement-II are correct and but Statement-II does not explain Statement-I
- (c) Statement-I is correct but Statement-II is not correct**
- (d) Statement-I is not correct but Statement-II is correct

EXPLANATION:

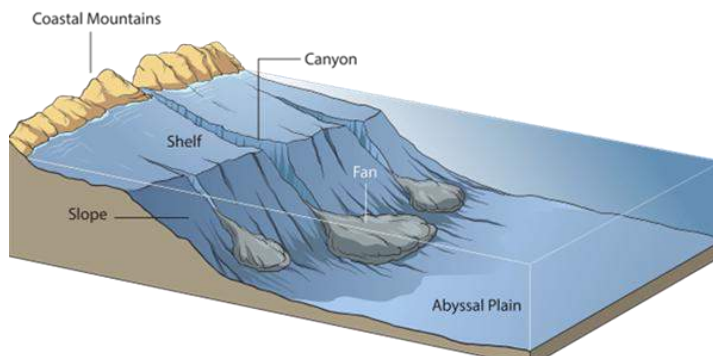
The continental shelf is the extended margin of each continent occupied by relatively shallow seas and gulfs. It is the shallowest part of the ocean showing an average gradient of 1° or even less.

➤ Width:

- The width of the continental shelves varies from one ocean to another. The average width of continental shelves is about 80 km.
- The shelves are almost absent or very narrow along some of the margins like the coasts of Chile, the west coast of Sumatra, etc.
- On the contrary, the Siberian shelf in the Arctic Ocean, the largest in the world, stretches to 1,500 km in width.

➤ Depth:

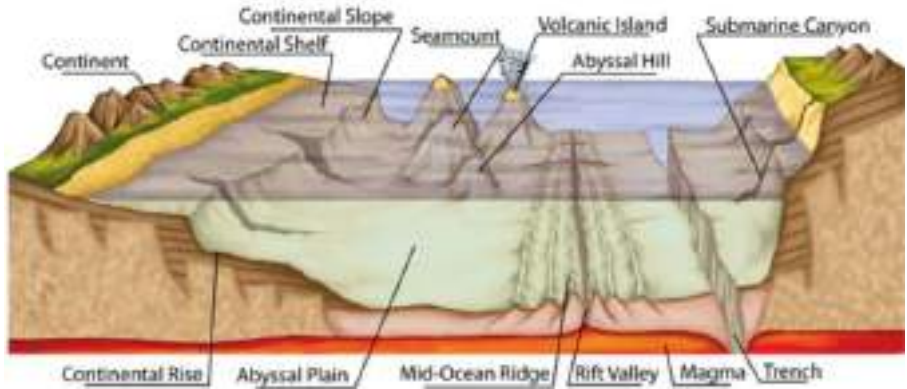
- The depth of the shelves also varies. It may be as shallow as 30 m in some areas while in some areas it is as deep as 600 m. **So, Statement-I is correct but Statement-II is not correct.**



ADDITIONAL INFORMATION:

DIVISIONS OF THE OCEAN FLOORS

About	<ul style="list-style-type: none"> ➤ The ocean floors can be divided into four major divisions: <ul style="list-style-type: none"> • Continental Shelf • Continental Slope • Deep Sea Plain • Oceanic Deep. ➤ Besides, these divisions there are also major and minor relief features in the ocean floors like ridges, hills, sea mounts, guyots, trenches, canyons, etc.
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Continental Slope	<ul style="list-style-type: none"> ➤ The continental slope connects the continental shelf and the ocean basins. It begins where the bottom of the continental shelf sharply drops off into a steep slope. ➤ The gradient of the slope region varies between 2-5°. ➤ The depth of the slope region varies between 200 and 3,000 m. ➤ The slope boundary indicates the end of the continents. Canyons and trenches are observed in this region.
Deep Sea Plain	<ul style="list-style-type: none"> ➤ Deep sea plains are gently sloping areas of the ocean basins. These are the flattest and smoothest regions of the world. ➤ The depths vary between 3,000 and 6,000m. These plains are covered with fine-grained sediments like clay and silt.
Oceanic Deeps or Trenches	<ul style="list-style-type: none"> ➤ These areas are the deepest parts of the oceans. The trenches are relatively steep sided, narrow basins. They are some 3-5 km deeper than the surrounding ocean floor. ➤ They occur at the bases of continental slopes and along island arcs and are associated with active volcanoes and strong earthquakes. ➤ They are very significant in the study of plate movements. ➤ As many as 57 deeps have been explored so far; of which 32 are in the Pacific Ocean; 19 in the Atlantic Ocean and 6 in the Indian Ocean.

47. Which one of the following tributaries of the Indus River system flows entirely within India?

- (a) Chenab
- (b) Sutlej
- (c) Jhelum
- (d) Beas**

EXPLANATION:

The Chenab River, a river in the Indian subcontinent, flows through northwestern India and northeastern and eastern Pakistan. The Chenab is formed by the confluence of two streams, Chandra and Bhaga, in the western (Punjab) Himalayas in India's Himachal Pradesh state.

- It flows west through Jammu and Kashmir between the steep cliffs of the Siwalik Range (south) and the Lesser Himalayas (north). Turning southwest, it continues into Pakistan, descending from the uplands into the broad alluvial lowlands of Punjab province.
- After receiving the Jhelum River near Trimmu, the Chenab empties into the Sutlej River, a tributary of the Indus River. **So, Option (a) is not correct.**



Sutlej River, the longest of the five tributaries of the Indus River. It rises on the north slope of the Himalayas in Lake La'nga in southwestern Tibet, at an elevation above 4,600 metres.

- Flowing northwestward and then west-southwestward through Himalayan gorges, it enters and crosses the Indian state of Himachal Pradesh before beginning its flow through the Punjab plain near Nangal, Punjab state.
- Continuing southwestward in a broad channel, it receives the Beas River and forms 65 miles (105 km) of the India-Pakistan border before entering Pakistan and flowing another 220 miles (350 km) to join the Chenab River west of Bahawalpur. **So, Option (b) is not correct.**



Jhelum River, a river of northwestern India and northern and eastern Pakistan. It constitutes the westernmost of the five rivers of the Punjab region that merge with the Indus River in eastern Pakistan. The Jhelum rises from a deep spring at Vernag, in the western Jammu and Kashmir union territory.

So, Option (c) is not correct.



Beas River, a river in Himachal Pradesh and Punjab states, northwestern India.

The Beas rises at an elevation of 14,308 feet (4,361 metres) at Rohtang Pass in the western (Punjab) Himalayas (a section of the vast Himalayas Mountain range), in central Himachal Pradesh. The Beas flows entirely within India, joining the Sutlej in the Indian state of Punjab. **So, Option (d) is correct.**



ADDITIONAL INFORMATION:

INDUS RIVER

About

- The Indus originates in the northern slopes of the Kailash range in Tibet near Lake Manasarovar. It follows a north-westerly course through Tibet. It enters Indian territory in Jammu and Kashmir.
- Several tributaries - the Zaskar, the Shyok, the Nubra and the Hunza join it in the Kashmir region.
- The main tributaries of the Indus in India are the Jhelum, Chenab, Ravi, Beas and Sutlej.



Ravi River	<ul style="list-style-type: none"> ➤ Ravi River, in northwestern India and northeastern Pakistan. It rises in the Himalayas in Himachal Pradesh state, India, and flows west-northwest past Chamba, turning southwest at the boundary of the Jammu and Kashmir union territory. ➤ The river then flows to the Pakistani border and along it for more than 50 miles (80 km) before entering Pakistan's Punjab province. ➤ It flows past Lahore and turns west near Kamalia, emptying into the Chenab River south of Ahmadpur Sial after a course of about 450 miles (725 km).
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48. Which of the statements best describes the term 'Supershear Earthquake' as seen in the news?
- Earthquakes that precede larger earthquakes in the same location.
 - Lower-magnitude (or lower-intensity) tremors that follow the principal earthquake.
 - Seismic events of comparable intensity strike a small area in relatively quick succession.
 - An earthquake occurs when a fault ruptures faster than seismic shear waves can travel through rock.**

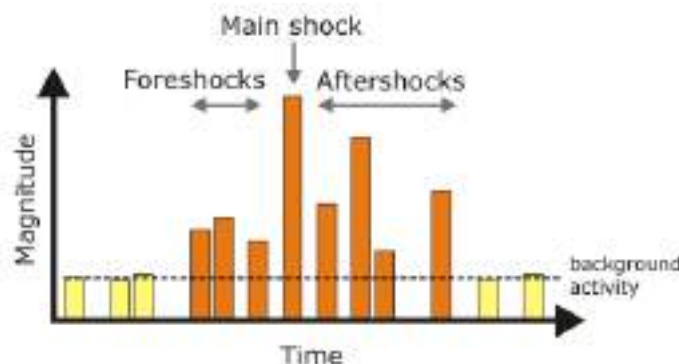
EXPLANATION:

The earthquakes that precede larger earthquakes in the same location are called Foreshock. An earthquake cannot be identified as a foreshock until after a larger earthquake in the same area occurs.

- A relatively small tremor (or an earthquake) that commonly precedes a relatively large magnitude earthquake (called the "main shock"), by seconds to weeks or months and originates in or near the rupture zone of the main shock. **So, Option (a) is not correct.**

Aftershock is the term used to describe a shaking event that follows an earthquake. Aftershocks are more accurately described as the lower-magnitude (or lower-intensity) tremors that follow the principal earthquake or main shock (that is, the largest earthquake in a sequence of earthquakes).

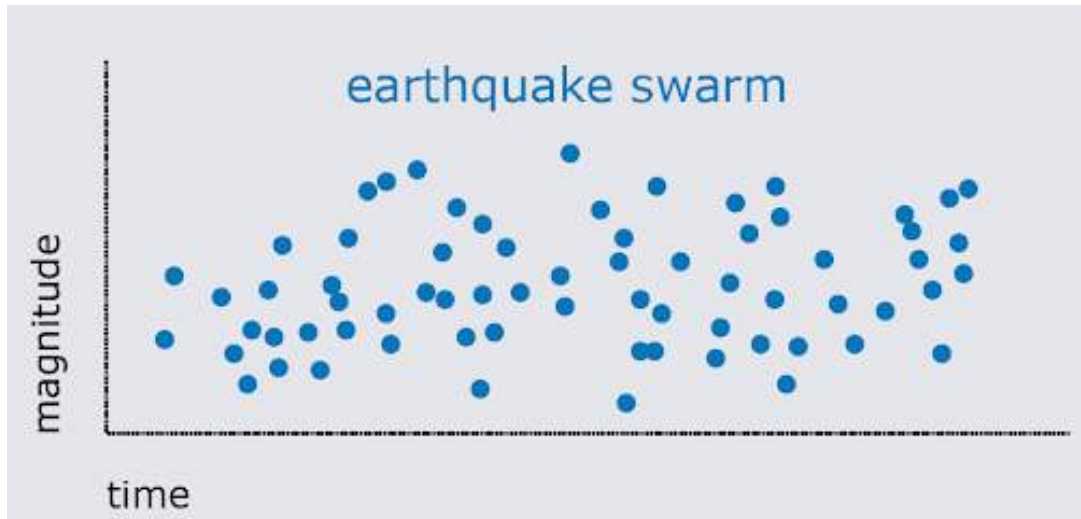
- Aftershocks tend to be the most severe and happen more frequently in the hours and days that follow an earthquake. However, their magnitude and frequency decrease over time. **So, Option (b) is not correct.**



When multiple seismic events of comparable intensity strike a small area in relatively quick succession is called earthquake swarm.

A series of low magnitude tremors occurring within a limited area over time periods from a week or so to several months. An earthquake swarm shows no pronounced main shock, and the frequency of shocks gradually increases until a maximum is reached and then the activity gradually dies out. **So,**

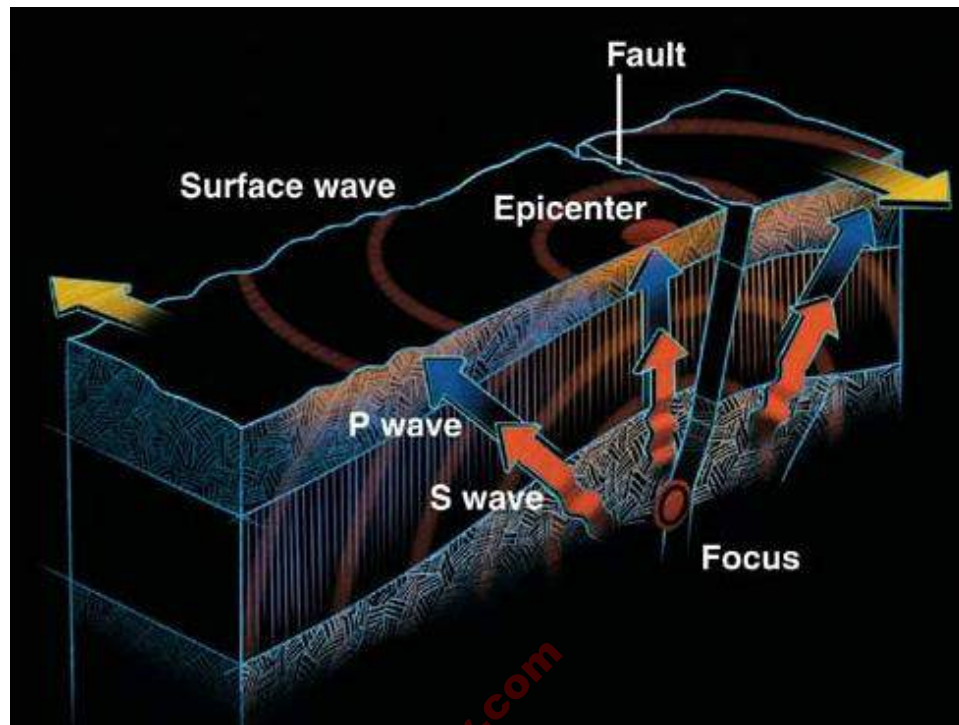
Option (c) is not correct.



Supershear earthquakes occur when a fault ruptures faster than seismic shear waves can travel through rock. These earthquakes are the rarest type of earthquake. They occur when the speed of the earthquake (4 to 5 km/s) exceeds the shear wave speed (3.5 km/s) of the host rock. This is very much like a supersonic aircraft that exceeds the speed of sound. When and how long an earthquake 'transitions' to supershear speed is very hard to observe in nature, laboratory and numerical models because the transition occurs over very small spatial scales (millimetres in the lab), at speeds that are hard to resolve, and because real-world fault conditions, like stress heterogeneities, don't match ideal models. **So, Option (d) is correct.**

ADDITIONAL INFORMATION:

EARTHQUAKE	
About	<ul style="list-style-type: none"> ➤ It is a natural event. It is caused due to release of energy, which generates waves that travel in all directions. The release of energy occurs along a fault. ➤ A fault is a sharp break in the crustal rocks. Rocks along a fault tend to move in opposite directions. As the overlying rock strata press them, the friction locks them together. ➤ However, their tendency to move apart at some point of time overcomes the friction. As a result, the blocks get deformed and eventually, they slide past one another abruptly. This causes a release of energy, and the energy waves travel in all directions. ➤ The point where the energy is released is called the focus of an earthquake, alternatively, it is called the hypocentre. The energy waves travelling in different directions reach the surface. ➤ The point on the surface, nearest to the focus, is called epicentre. It is the first one to experience the waves. It is a point directly above the focus.



**Earthquake
waves**

Earthquake waves are basically of two types — body waves and surface waves.

- Body waves are generated due to the release of energy at the focus and move in all directions travelling through the body of the earth. Hence, the name body waves.
- The body waves interact with the surface rocks and generate new set of waves called surface waves. These waves move along the surface.
- The velocity of waves changes as they travel through materials with different densities. The denser the material, the higher is the velocity. Their direction also changes as they reflect or refract when coming across materials with different densities.
- There are two types of body waves. They are called P and S-waves.
 - P-waves move faster and are the first to arrive at the surface. These are also called Primary waves. The P-waves are similar to sound waves. They travel through gaseous, liquid and solid materials.
 - S-waves arrive at the surface with some time lag. These are called secondary waves. An important fact about S-waves is that they can travel only through solid materials. This characteristic of the S-waves is quite important. It has helped scientists to understand the structure of the interior of the earth. Reflection causes waves to rebound whereas refraction makes waves move in different directions. The variations in the direction of waves are inferred with the help of their record on seismograph.
- The surface waves are the last to report on seismograph. These waves are more destructive. They cause displacement of rocks, and hence, the collapse of structures occurs.

49. Consider the following statements:

Statement I : Meanders form primarily due to lateral erosion on the outer bank and deposition on the inner bank of a river.

Statement II : Coriolis force is the main factor responsible for the formation of meanders in rivers. Which one of the following is correct in respect of the above statements?

- (a) Both Statement-I and Statement-II are correct and Statement-II explains Statement-I
- (b) Both Statement-I and Statement-II are correct but Statement-II does not explain Statement-I
- (c) Statement-I is correct but Statement-II is not correct**
- (d) Statement-I is not correct but Statement-II is correct

EXPLANATION:

Meanders are loop-like bends that develop in rivers flowing across large floodplains and delta regions where the slope of the land is very gentle.

When the gradient becomes low, the river loses speed and instead of cutting downward, it begins to erode sideways. Small irregularities along the banks gradually turn into curves.

On the outer bank of the curve, the water current is stronger, which causes lateral erosion, while on the inner bank the current is slower, leading to deposition of sediments.

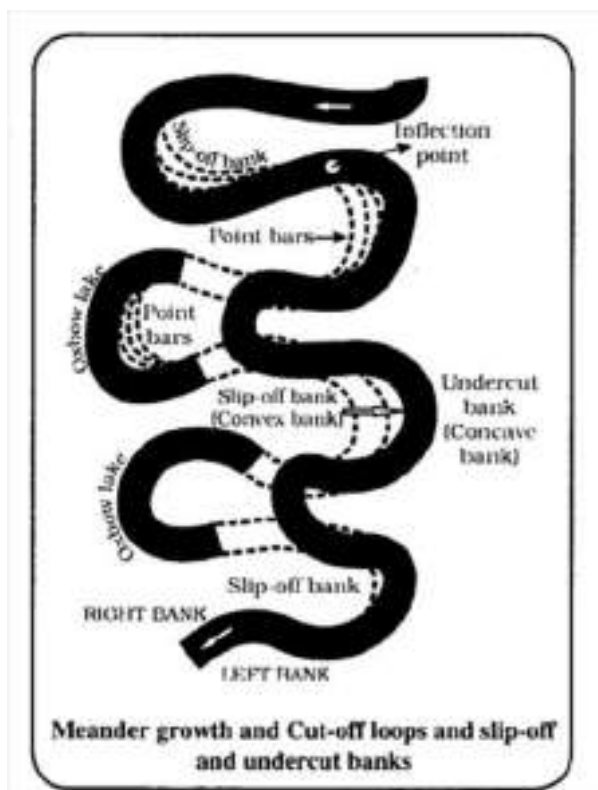
This continuous process of erosion on the outside and deposition on the inside makes the bends more pronounced, resulting in the formation of meanders. If there is no erosion or deposition, the tendency of the river to meander is reduced. **So, Statement I is correct.**

Meanders are a type of channel pattern formed mainly due to lateral erosion and deposition in rivers flowing through plains with gentle slopes. They develop because of the following reasons:

- Propensity of water flowing over very gentle gradients to work laterally on the banks;
- Unconsolidated nature of alluvial deposits making up the banks with many irregularities which can be used by water exerting pressure laterally;
- Coriolis force acting on the fluid water deflecting it like it deflects the wind. But it is not the main factor responsible for the formation of meanders in rivers. **So, Statement II is not correct.**

ADDITIONAL INFORMATION:

MEANDERS	
About	<ul style="list-style-type: none"> ➤ In large flood and delta plains, rivers rarely flow in straight courses. Loop-like channel patterns called meanders develop over flood and delta plains. ➤ Meanders, named from the Menderes (historically known as the Maeander) River in Turkey, are most often formed in alluvial materials (stream-deposited sediments) and thus freely adjust their shapes and shift downstream according to the slope of the alluvial valley. ➤ In meanders of large rivers, there is active deposition along the concave bank and undercutting along the convex bank. ➤ The concave bank is known as cut-off bank which shows up as a steep scarp and the convex bank presents a long, gentle profile. ➤ As meanders grow into deep loops, the same may get cut-off due to erosion at the inflection points and are left as ox-bow lakes.



50. Which of the following with respect to the Neon gas is /are correct?

1. It is a colourless, odourless and toxic gas.
2. Neon gas is used in advertising boards and as a cryogenic refrigerant.
3. Ukraine is the leading global supplier of neon gas.

Select the correct answer using the code given below:

(a) 2 and 3 only

(b) 2 only

(c) 3 only

(d) 1, 2 and 3

EXPLANATION:

Neon is a colorless, odorless, tasteless gas that is lighter than air. This chemical element is one of the inert noble gases, which almost never react with other elements. Neon is found in Earth's atmosphere and within the rocks of Earth's crust. Though neon is about 3½ times as plentiful as helium in the atmosphere, dry air contains only 0.0018 percent neon by volume. It is used in fluorescent lamps, electric signs, and as an ingredient in antifog devices and lasers.

Neon gas is not toxic. It's classified as a simple asphyxiant, which means it poses a risk only when it displaces oxygen in confined spaces. **So, Statement 1 is not correct.**

Neon is used in advertising signs, high-voltage indicators, vacuum tubes, lightning arresters, and cryogenic refrigeration. Its distinct red-orange glow makes it ideal for visual displays.

➤ Liquid neon excels as a cryogenic refrigerant, particularly for applications that require extreme cold. With a boiling point of -246°C (-411°F), it offers exceptional cooling capacity that's several times greater than liquid helium per unit volume. Neon's higher molecular weight compared to helium provides notable advantages in certain cooling applications – it's less prone to leakage and requires simpler compression equipment.

- When electricity passes through neon-filled glass tubes, it produces the distinctive reddish-orange glow that's become synonymous with advertising and decoration.
- Neon signs (which don't only use neon, but also other gases) work by applying high voltage to electrodes sealed in glass tubes containing neon gas. The electrical discharge excites the gas atoms, causing them to release energy as light in a process called electroluminescence. **So, Statement 2 is correct.**



Ukraine supplies approximately half of the world's neon and is a major source of the ultra-high purity neon used in chip manufacturing. The semiconductor industry accounts for up to 90 percent of neon gas laser demand. In manufacturing semiconductor chips, a mixture of gases (termed excimer gas) generates the single wavelength of light used for deep ultraviolet photolithography. **So, Statement 3 is correct.**

51. Consider the following statements:

Statement I : Ozone concentration drop is more pronounced in the Southern Hemisphere than in the Northern Hemisphere.

Statement II : Long presence of low temperatures in the region exacerbates ozone drop.

Which one of the following is correct with respect to the above statements?

- (a) **Both Statement I and Statement II are correct, and Statement II explains Statement I**
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct
- (d) Statement I is not correct, but Statement II is correct

EXPLANATION:

Ozone is a gas made up of three oxygen atoms (O₃). It occurs naturally in small (trace) amounts in the upper atmosphere (the stratosphere). Ozone protects life on Earth from the Sun's ultraviolet (UV) radiation.

- In the lower atmosphere (the troposphere) near the Earth's surface, ozone is not emitted directly from any source; rather, it forms as a secondary pollutant through photochemical reactions between air pollutants such as nitrogen oxides (NO_x) and volatile organic compounds (VOCs) released from vehicle exhaust, gasoline vapours, and industrial emissions, in the presence of sunlight.
- This ground-level ozone is a major component of smog, harmful to human health (causing respiratory problems) and damaging to crops and ecosystems. Ninety per cent of the ozone in the atmosphere sits in the stratosphere, the layer of atmosphere between about 10 and 50 kilometres in altitude.

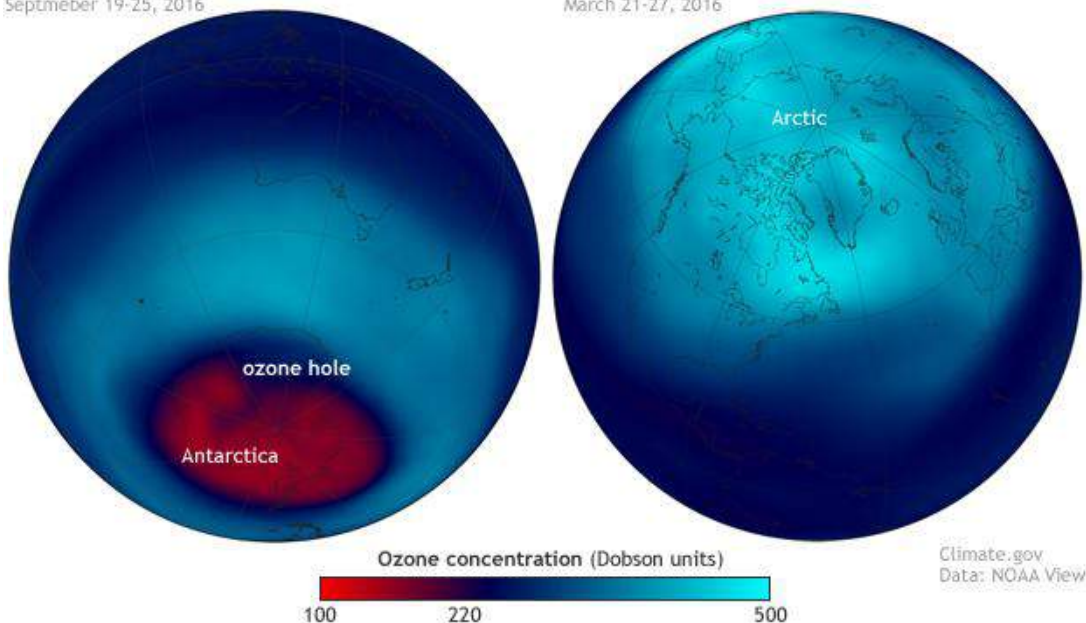
Ozone Depletion:

- Depletion of stratospheric ozone occurs over both hemispheres of the Earth. However, this phenomenon is more pronounced in the Southern Hemisphere (Antarctica) than in the Northern Hemisphere (Arctic). This is the case because the formation of the ozone hole is directly linked to the stratosphere's temperature.
- Once temperatures drop below -78°C , polar stratospheric clouds tend to form, which exacerbate ozone depletion.
- In the Antarctic, the long presence of low temperatures in the stratosphere is stimulating their formation, whereas the Arctic is characterised by larger year-to-year meteorological variability. **So, Both Statement I and Statement II are correct, and Statement II explains Statement I.**

The ozone layer in Southern and Northern Hemisphere spring

September 19-25, 2016

March 21-27, 2016



ADDITIONAL INFORMATION:

OZONE DEPLETION	
About	Ozone depletion, gradual thinning of Earth's ozone layer in the upper atmosphere caused by the release of chemical compounds containing gaseous chlorine or bromine from industry and other human activities. The thinning is most pronounced in the polar regions, especially over Antarctica.
Ozone Depletion	<ul style="list-style-type: none"> ➤ When chlorine and bromine atoms come into contact with ozone in the stratosphere, they destroy ozone molecules. One chlorine atom can destroy over 100,000 ozone molecules before it is removed from the stratosphere. ➤ Ozone can be destroyed more quickly than was naturally created. ➤ Some compounds release chlorine or bromine when they are exposed to intense UV light in the stratosphere. These compounds contribute to ozone depletion and are called ozone-depleting substances (ODS). ➤ ODS that release chlorine include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), carbon tetrachloride, and methyl chloroform. ODS that release bromine include halons and methyl bromide. Although ODS are emitted at the Earth's surface, they are eventually carried into the stratosphere in a process that can take as long as two to five years.

52. As the Ganga flows eastward, its left bank tributaries join it in a particular sequence. Which of the following shows the correct order from west to east?

- (a) **Ramganga – Ghaghara – Gandak – Mahananda**
 (b) Ghaghara – Ramganga – Mahananda – Gandak
 (c) Gandak – Ramganga – Ghaghara – Mahananda
 (d) Mahananda – Gandak – Ghaghara – Ramganga

EXPLANATION:

- The Ganga originates as Bhagirathi from the Gangotri glaciers in the Himalayas at an elevation of about 7010m in Uttarkashi district of Uttarakhand and flows for a total length of about 2525 km up to its outfall into the Bay of Bengal through the former main course of Bhagirathi-Hooghly.
 - The principal tributaries joining the river from right are the Yamuna and the Son.
 - The Ramganga, the Ghaghra, the Gandak, the Kosi and the Mahananda join the river from left.
 - The Chambal and the Betwa are the two other important sub-tributaries.
- The Ramganga is a small river originating in the Garhwal hills near Gairsain. After crossing the Shiwaliks, it flows southwest, enters the plains near Najibabad, and joins the Ganga near Kannauj (U.P.).
- The Ghaghara rises from the Mapchachungo glaciers, collects waters from its tributaries (Tila, Seti, Beri), cuts a gorge at Shishapani, and after being joined by the Sarju (Kali), it flows into the Ganga at Chhapra (Bihar).
- The Gandak, formed by the Kali Gandak and Trishulganga, rises in the Nepal Himalayas between Dhaulagiri and Mount Everest. It drains central Nepal, enters Bihar through Champaran, and meets the Ganga at Sonpur near Patna.
- The Mahananda, rising in the Darjeeling hills, joins the Ganga from the right bank in West Bengal, before the river enters Bangladesh.

The correct order from west to east of left bank tributaries of Ganga are: Ramganga > Ghaghara > Gandak > Mahananda. **So, Option (a) is correct.**



ADDITIONAL INFORMATION:

GANGA RIVER	
About	<ul style="list-style-type: none"> ➤ The Ganga is India's most important river, both for its vast basin and its cultural significance. ➤ It originates from the Gangotri glacier near Gaumukh (3,900 m, Uttarkashi, Uttarakhand), where it is called the Bhagirathi. ➤ At Devprayag, the Bhagirathi meets the Alaknanda and from there it is known as the Ganga. ➤ The Alaknanda rises from the Satopanth glacier near Badrinath and receives tributaries like the Dhaulī and Vishnu Ganga (meeting at Vishnu Prayag), the Pindar (at Karna Prayag), and the Mandakini/Kali Ganga (at Rudra Prayag). ➤ The Ganga enters the plains at Haridwar and then flows south, southeast, and east before splitting into two distributaries—the Bhagirathi and the Padma. Its total length is 2,525 km, flowing through Uttarakhand (110 km), Uttar Pradesh (1,450 km), Bihar (445 km), and West Bengal (520 km). ➤ The Ganga basin is the largest in India, covering about 8.6 lakh sq. km. It has many tributaries—perennial rivers from the Himalayas and seasonal rivers from the Peninsula. ➤ The Son is the major right-bank tributary, while the main left-bank tributaries include the Ramganga, Gomati, Ghaghara, Gandak, Kosi, and Mahananda. Finally, the Ganga empties into the Bay of Bengal near Sagar Island.
Ganga sub- basin	<ul style="list-style-type: none"> ➤ The Ganga sub-basin extends over an area of 1086000 sq. km and lies in India, Tibet, Nepal and Bangladesh. The drainage area lying in India is 861404 sq. km which is nearly 26.2% of the total geographical area of the country. ➤ The sub-basin is bounded on the north by the Himalayas, on the west by the Aravalis and the ridge separating it from Indus basin, on the south by the Vindhas and Chhotanagpur plateaus and on the east by the Brahmaputra ridge. ➤ The sub-basin lies in the States of Uttar Pradesh, Madhya Pradesh, Bihar, Rajasthan, West Bengal, Haryana, Himachal Pradesh and the Union Territory of Delhi.

53. Consider the following statements:

Statement I : India is the largest producer of Monazite in the world.

Statement II : India is the principal world source of high-quality monazite sands, followed by Brazil. Which one of the following is correct with respect to the above statements?

- (a) Both Statement I and Statement II are correct, and Statement II explains Statement I
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct
- (d) Statement I is not correct, but Statement II is correct**

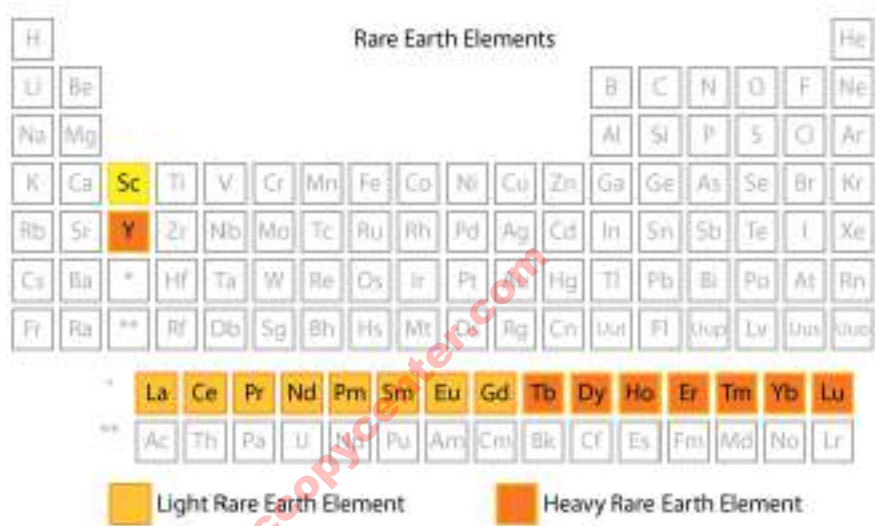
EXPLANATION:

China is the largest producer of monazite. The Chinese mine produces 80% or more of the world's monazite. Most of the monazite in the world is found in India, Malaysia, Vietnam, and Brazil. The largest deposits of monazite can be found in Sri Lanka and southern India.

- According to the Atomic Minerals Directorate for Exploration and Research (AMD), a constituent Unit of the Department of Atomic Energy (DAE), India has 10.70 million tonnes of Monazite which contains 9,63,000 tonnes of Thorium Oxide.
- India is the principal world source of high-quality monazite sands, with Brazil a close second. Monazite contained in 130 deposits in the coastal beach placer sands in Kerala, Tamil Nadu, Odisha, Andhra Pradesh, Maharashtra & Gujarat and in the inland alluvium in parts of Jharkhand, West Bengal and Tamil Nadu.

So, Statement I is not correct, but Statement II is correct.

ADDITIONAL INFORMATION:

RARE EARTH METALS	
About	<ul style="list-style-type: none"> ➤ Rare earth elements (REE) are a group of 17 elements, including the 15 elements of the lanthanide series on the periodic table of elements together with the transition metals scandium and yttrium. ➤ The latter two elements exhibit similar properties to the lanthanides and are found in the same ore bodies. ➤ REEs are key components in many electronic devices that we use in our daily lives, as well as in a variety of industrial applications. ➤ China is the world's largest producer of REEs, accounting for 70% of global annual mine production. 
Uses	<ul style="list-style-type: none"> ➤ REEs are essential components in diverse industrial and high-technology applications, including electronics, clean energy, aerospace, automotive and defence. Their unique physical, chemical, magnetic and luminescent properties provide opportunities to improve efficiency and durability while decreasing the size and weight of certain electronic components and alloys. ➤ Manufacturing permanent magnets is the largest and most important end use of REEs. Permanent magnets are used in cell phones, televisions, computers, automobiles, wind turbines, MRI machines, jet aircraft and many other products. ➤ REEs are used extensively in clean technologies and alternative energy systems, such as wind turbines, fuel cells, rechargeable batteries, and electric vehicles. ➤ Because of their luminescent properties, REEs are also used in an array of other applications, such as LCD screens, LEDs, lasers, and fluorescent lighting. They can be found in catalytic converters, optical glass used in camera lenses, and the polishing powders used to produce semiconductors.

54. Which one of the following country is **not** a member of the Panel on Tropical Cyclones (PTC), which is responsible for naming the tropical cyclones that have formed over the Bay of Bengal and the Arabian Sea?

- (a) India
- (b) Indonesia**
- (c) Iran
- (d) Maldives

EXPLANATION:

The Panel is one of the five regional tropical cyclone bodies established as part of the World Meteorological Organisation's (WMO) Tropical Cyclone Programme (TCP) which aims at promoting and coordinating the planning and implementation of measures to mitigate tropical cyclone disasters on a worldwide basis.

- The main objective of the WMO/ESCAP Panel on Tropical Cyclones is to promote measures to improve tropical cyclone warning systems in the Bay of Bengal and the Arabian Sea.
- The basic purpose of the operational plan is to facilitate the most effective tropical cyclone warning system for the region with existing facilities.
- It is responsible for naming the tropical cyclones that have formed over the Bay of Bengal and the Arabian Sea.
- The first meeting of the Panel was held in 1972.
- Originally, it consists of six member countries were Bangladesh, India, Myanmar, Pakistan, Sri Lanka and Thailand.
- Gradually, the role and responsibility of the PTC increased over the years, and more countries affected by tropical cyclones joined the Panel (Maldives in 1982, Sultanate of Oman in 1997, Yemen in 2016, United Arab Emirates, Saudi Arabia, Qatar and Iran in 2018).
- Total 13 member countries of the Panel on Tropical Cyclones (PTC). Indonesia is not a member. **So, Option (b) is correct.**

ADDITIONAL INFORMATION:

PANEL ON TROPICAL CYCLONES (PTC)	
Functions	<p>The functions of the PTC include:</p> <ul style="list-style-type: none"> ➤ To review regularly the progress in various fields of tropical cyclone damage prevention; ➤ To recommend plans and measures for improvement of community preparedness and disaster prevention; ➤ To promote, prepare and submit to member countries plans for co-ordination of research programmes and activities on tropical cyclones; ➤ To facilitate training of personnel from member countries in tropical cyclone forecasting ➤ To plan for co-ordination of research programmes and activities concerning cyclones ➤ To prepare and submit, at the request and on behalf of the member countries requests for technical, financial and other assistance offered under United Nations Development Programme (UNDP) and by other organisations and contributors and ➤ To consider, upon request, possible sources of financial and technical support for such plans and programmes.

55. With reference to the 'Indian Niño', consider the following statements:

1. In the Positive phase, the mean sea temperatures were close to average across the Indian Ocean.
2. Indian Niño was an independent system and cannot be triggered by El Niño Southern Oscillation (ENSO).
3. The life span of the Indian Niño event is shorter than the Pacific El Niño-La Niña episodes.

How many of the statements given above are correct?

- (a) Only one**
(b) Only two
(c) All three
(d) None

EXPLANATION:

The Indian Ocean Dipole - often called the "Indian Niño" because of its similarity to its Pacific equivalent - refers to the difference in sea-surface temperatures in opposite parts of the Indian Ocean. Temperatures in the eastern part of the ocean oscillate between warm and cold compared with the western part, cycling through phases referred to as "positive", "neutral" and "negative".

- During a positive phase, warm waters are pushed to the Western part of the Indian Ocean, while cold deep waters are brought up to the surface in the Eastern Indian Ocean.
- A negative dipole phase would bring about the opposite conditions - warmer water and greater precipitation in the eastern Indian Ocean, and cooler and drier conditions in the west. A negative IOD refers to a prolonged period of at least eight weeks of warmer waters near Indonesia and cooler waters off the Horn of Africa.
- A neutral phase (NOT positive phase) would mean sea temperatures were close to average across the Indian Ocean. **So, Statement 1 is not correct.**

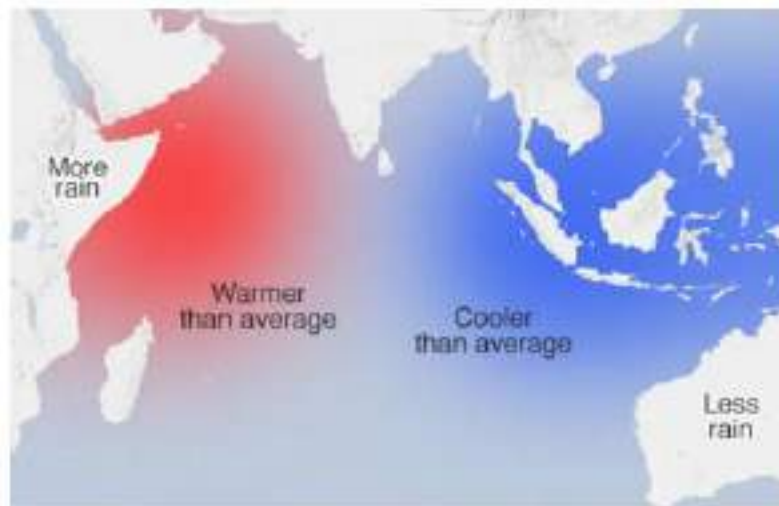
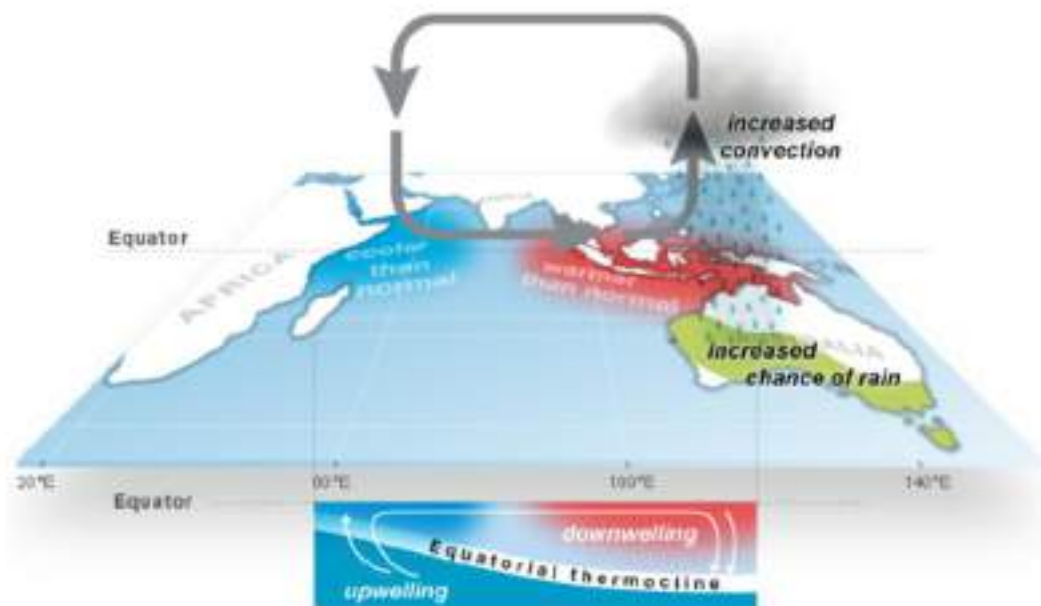


Fig – Positive Indian Ocean Dipole



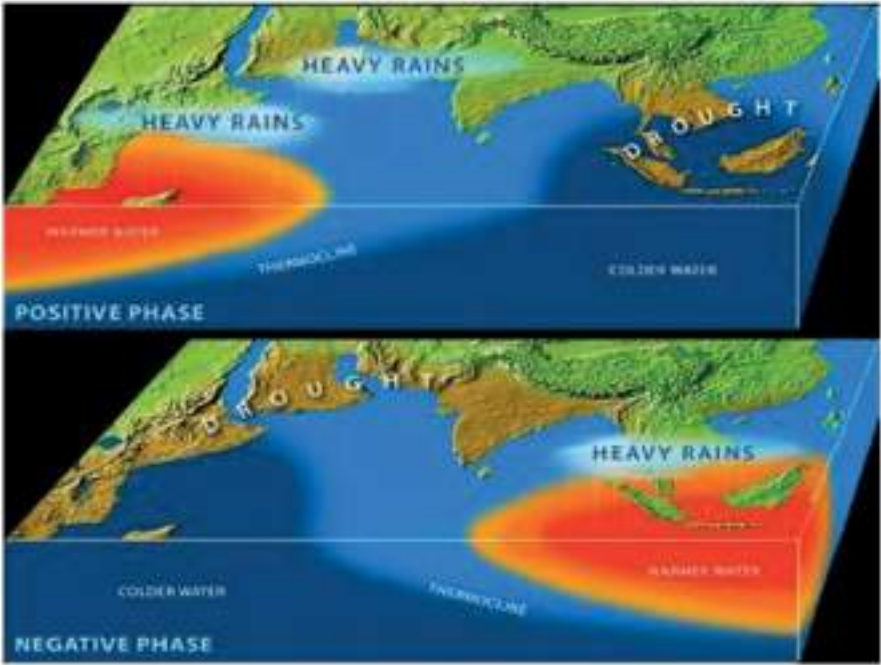
Indian Ocean Dipole (IOD): Negative phase

The IOD was identified as an independent system only in 1999. El Niño Southern Oscillation (ENSO) is one of the main triggers of IOD events. During El Niño, the anomalous (departure from average) surface winds near Indonesia blow from southeast to northwest, helping to bring cold water to the surface near Java and Sumatra and initiating a positive IOD event. Similarly, La Niña tends to trigger negative IOD events. **So, Statement 2 is not correct.**

The life span of an IOD event is shorter than Pacific El Niño-La Niña episodes, which normally last about nine months. A typical IOD will develop in winter, quickly peak, then decay by early summer when the monsoon erodes any influence on tropical Indian Ocean winds.

The episodes of El Niño and La Niña typically last nine to 12 months, but can sometimes last for years. El Niño and La Niña events occur every two to seven years, on average, but they don't occur on a regular schedule. Generally, El Niño occurs more frequently than La Niña. **So, Statement 3 is correct.**

ADDITIONAL INFORMATION:

INDIAN OCEAN DIPOLE	
About	<p>The IOD is an ocean-atmosphere interaction very similar to the El Niño fluctuations in the Pacific Ocean, playing out, as the name shows, in the Indian Ocean. It is also a much weaker system than El Niño, and thus has relatively limited impacts.</p> <ul style="list-style-type: none"> ➤ With a positive IOD, winds over the Indian Ocean blow from east to west (from the Bay of Bengal towards the Arabian Sea). This results in warming of the Arabian Sea (western Indian Ocean near the African Coast), cooling and dryness in the eastern Indian Ocean around Indonesia, becoming colder and drier. Positive IOD (Arabian Sea warmer than Bay of Bengal) results in the frequency of more cyclones in the Arabian Sea. ➤ In the negative dipole year (negative IOD), reverse conditions happen. Indonesia becomes much warmer and rainier. While the African coast becomes colder and less rainy. Negative IOD results in stronger than usual cyclogenesis (formation of tropical cyclones) of Bay of Bengal. Cyclogenesis in Arabian Sea is suppressed. <div style="text-align: center;">  </div>
EL Niño SOUTHERN	<p>The formation of an El Niño is linked with the Pacific Ocean circulation pattern known as the Southern Oscillation. Southern Oscillation is a coherent interannual fluctuation of atmospheric pressure over the tropical Indo-Pacific region.</p>

OSCILLATION (ENSO)	<p>Effects of El Niño:</p> <p>The warmer waters had a devastating effect on marine life existing off the coast of Peru and Ecuador. Fish catches off the coast of South America were lower than in the normal years (due to the absence of upwelling). Severe droughts occur in Australia, Indonesia, India and southern Africa and heavy rains in California, Ecuador, and the Gulf of Mexico. El Niño and the Indian monsoon are inversely related.</p>
EL NIÑO MODOKI	<p>El Niño Modoki is a coupled ocean-atmosphere phenomenon in the tropical Pacific. It is different from another coupled phenomenon in the tropical Pacific namely, El Niño. Conventional El Niño is characterised by strong anomalous warming in the eastern Equatorial Pacific. The El Niño Modoki phenomenon is characterised by the anomalously warm central equatorial Pacific, flanked by anomalously cool regions in both west and east.</p>
LA NIÑA	<p>After an El Niño event, weather conditions usually return to normal. However, in some years, the trade winds can become extremely strong, and an abnormal accumulation of cold water can occur in the central and eastern Pacific.</p> <p>Some of the other weather effects of La Niña include:</p> <ul style="list-style-type: none"> ➤ Abnormal heavy monsoons in India and Southeast Asia, ➤ Cool and wet winter weather in southeastern Africa, wet weather in eastern Australia, ➤ Cold winter in western Canada and northwestern United States, ➤ Winter drought in the southern United States.

56. With reference to the Forest fire, consider the following statements:

1. In India, the Forest Fire Alert System cannot distinguish between forest fires and other types of fires.
2. Both Tamil Nadu and Odisha use advanced predictive modelling to help identify high-risk areas based on climatic and geographic data.
3. Ground Fires are sustained by glowing combustion (without flames) and can go undetected for a long time.
4. Crown Fires are the most unpredictable fires; due to their nature, it is challenging to control this type of fire.

How many of the statements given above are correct?

- (a) Only one
- (b) Only two
- (c) Only three
- (d) All four**

EXPLANATION:

According to the Forest Survey of India, more than 36% of the country's forest cover is prone to fire. India has implemented several policies and schemes to address forest fire management, including the National Action Plan on Forest Fires and the Forest Fire Prevention and Management Scheme (FFPMS). The existing Forest Fire Alert System cannot distinguish between forest fires and other types of fires, delaying ground-level validation and response. **So, Statement 1 is correct.**

India could use advanced predictive modelling to help identify high-risk areas based on climatic and geographic data. To strengthen this, drones equipped with thermal imaging cameras must be used to monitor fire-prone areas, assess damage, and guide firefighting efforts.

Such initiatives have already been piloted by states such as Tamil Nadu and Odisha, and these could be scaled at the national level. Furthermore, there is merit in exploring how existing and relevant data

from the Forest Survey of India, the India Meteorological Department, and the Indian Space Research Organisation can be integrated and analysed for improved forest fire management. **So, Statement 2 is correct.**

Ground fires burn underneath the surface by smoldering combustion and are more often ignited by surface fires. Ground fires burn mostly in decayed roots below ground and in the duff layer. The duff layer is made up of compacted dead plant materials such as leaves, bark, needles, and twigs. Ground fires are sustained by glowing combustion (without flames) and can go undetected for a long time because they produce little to no smoke and spread slowly. **So, Statement 3 is correct.**



Crown fire is the most unpredictable fires that burn the top of trees and spread rapidly by wind. In most of the cases these fires are invariably ignited by surface fires. This is one of the most spectacular kinds of forest fires, which usually advance from top to bottom of trees or shrubs, more or less independent of surface fires.

In dense conifer stands with a brisk wind, the crown fire may race ahead of the supporting surface fire. Since it is over the heads of ground forces, it is uncontrollable until it again drops to the ground, and since it is usually fast-moving, it poses grave danger to the firefighters, becoming trapped and burned. **So, Statement 4 is correct.**



Fig.-3.4: Crown Fire

ADDITIONAL INFORMATION:

FOREST FIRES	
About	<p>Since early April, satellite data from the Forest Survey of India (FSI) has recorded thousands of forest fire incidents, with the central state of Madhya Pradesh reporting the highest number — 2,754 incidents between April 11 and 18. Maharashtra followed with 1,766 fires, Chhattisgarh with 876, and Odisha with 603.</p> <p>These figures mark a continuation of a broader trend. Since November 1, 2024, Madhya Pradesh has recorded more than 21,000 fires. Nationwide, fire alerts peaked in March with over 84,000 incidents.</p>
Forest Fire Trends	<p>According to the India State of Forest Report 2023, the number of forest fire hotspots has shown a declining trend over the past three fire seasons. In the 2021–2022 season,</p>

	<p>2,23,333 fire spots were recorded, which decreased to 2,12,249 in 2022–2023, and further declined to 2,03,544 in the 2023–2024 season.</p> <p>In northeast India, most forest fires are linked to shifting cultivation, also known as slash-and-burn farming.</p>
Types	<p>The types of forest fire are as follows:</p> <ul style="list-style-type: none"> ➤ Surface Fire-A Forest fire may burn primarily as a surface fire, spreading along the ground as the surface litter (senescent leaves and twigs and dry grasses etc) on the forest floor and is engulfed by the spreading flames. ➤ Underground Fire - The fires of low intensity, consuming the organic matter beneath and the surface litter of forest floor are sub-grouped as underground fire. In most of the dense forests a thick mantle of organic matter is found on top of the mineral soil. This fire spreads in by consuming such materials. ➤ Ground Fire - These fires are fires in the sub surface organic fuels, such as duff layers under forest stands, Arctic tundra or taiga, and organic soils of swamps or bogs. There is no clear distinction between underground and ground fires. The smoldering under ground fires sometime changes into Ground fire. ➤ Crown Fire - A crown fire is one in which the crown of trees and shrubs burn, often sustained by a surface fire. A crown fire is particularly very dangerous in a coniferous forest because resinous material given off burning logs burn furiously. ➤ Firestorms - Among the forest fires, the fire spreading most rapidly is the firestorm, which is an intense fire over a large area. As the fire burns, heat rises and air rushes in, causing the fire to grow. More air makes the fire spin violently like a storm.

57. Consider the following statements:

1. Slow-moving thunderstorms
2. Thunderstorms repeatedly moving over the same area
3. Cloud Bursts
4. Tropical storms

In which of the above phenomena caused flash flooding to occur?

- (a) Only one
- (b) Only two
- (c) Only three

(d) All four

EXPLANATION:

A flash flood is a sudden and intense flood that usually happens within minutes to a couple of hours after a storm or dam break. Unlike regular flooding, which builds up slowly, flash flooding hits fast and with little warning. That's what makes it so dangerous. These floods tend to hit low-lying areas, such as riverbanks, city streets, underground garages, or spots with poor drainage. And when water rises several feet in just a few minutes, things can go from calm to chaos fast.

- Most flash floods are caused by slow-moving thunderstorms, thunderstorms that move repeatedly over the same area, or heavy rains from tropical storms and hurricanes.
- Flash floods are often associated with cloudbursts – sudden, intense rainfall in a short period of time. **So, Option (d) is correct.**

ADDITIONAL INFORMATION:

FLASH FLOODING	
Recently in news	More than 100 people dead in Himachal Pradesh recently due to flash floods. At least 373 killed in Kerala's Wayanad in late July 2024. Five soldiers lost their lives in Ladakh in June 2024. Dozens dead in Sikkim in October 2023.
About	A flash flood occurs when an overwhelming quantity of water rushes into an area over a very short time — often within minutes or hours of intense rainfall. In some cases, they are triggered by sudden dam breaches or obstructions in rivers giving way.
Causes	<ul style="list-style-type: none"> ➤ Heavy rainstorms or hurricanes: When the sky opens up and dumps more water than the ground can soak in, water starts running off and pooling fast. ➤ Slow-moving or repeating storms: When storms hover over the same spot for hours, water just keeps building up. ➤ Dam or levee failure: Man-made dams or levees can hold back tons of water—but if they suddenly give out, that water goes on a destructive path. ➤ Ice jams: In colder regions like parts of Canada or the northern US, melting ice can block rivers. When the ice breaks, it releases a wall of water downstream. ➤ Urban flooding: Cities are full of concrete. Water has nowhere to go, so it backs up fast, flooding roads and basements. ➤ Burned areas or steep terrain: Wildfire zones and mountain slopes can't soak up rain like usual, making runoff faster and more dangerous. ➤ Rapid snowmelt: In spring, warm temperature mixed with rain can melt snowpacks too quickly, causing flooding in valleys and towns.
Cloudburst	<p>A cloudburst refers to an extreme amount of rain falling in a very short duration over a limited geographical area, typically less than 20-25 kilometres. The India Meteorological Department (IMD) defines a cloudburst as rainfall exceeding 100 mm per hour over a small region.</p> <ul style="list-style-type: none"> ➤ Cloudbursts often occur in mountainous regions like Himachal Pradesh, Uttarakhand, or Jammu and Kashmir due to orographic lift — when moist air rises rapidly due to terrain and cools quickly, releasing massive rainfall. ➤ While cloudbursts can trigger flash floods, especially in hilly terrain, they are not the same. A cloudburst refers to the rainfall event, while a flash flood refers to the result — the sudden overflow of water. One can occur without the other.

58. With reference to the Sendai framework, which of the following is correct?

- (a) It provides the framework for the conservation and wise use of wetlands and their resources.
- (b) It focuses on the adoption of measures which address the three dimensions of disaster risk including exposure to hazards, vulnerability and capacity.**
- (c) It aims to halt and reverse biodiversity loss by 2030.
- (d) It is a collaborative framework to ensure a more inclusive and sustainable approach to ocean conservation in the wider Caribbean region.

EXPLANATION:

Ramsar framework the Convention on Wetlands is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. Almost 90% of UN member states, from all the world's geographic regions, have acceded to become "Contracting Parties". The Convention was adopted in the Iranian city of Ramsar in 1971 and came into force in 1975. **So, Option (a) is not correct.**

The Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) was the first major agreement of the post-2015 development agenda and provides Member States with concrete actions to protect development gains from the risk of disaster.

- The Sendai Framework works hand in hand with the other 2030 Agenda agreements, including The Paris Agreement on Climate Change, The Addis Ababa Action Agenda on Financing for Development, the New Urban Agenda, and ultimately the Sustainable Development Goals.
- The Sendai Framework focuses on the adoption of measures which address the three dimensions of disaster risk (exposure to hazards, vulnerability and capacity, and hazard's characteristics) to prevent the creation of new risk, reduce existing risk and increase resilience. **So, Option (b) is correct.**
- The Sendai Framework outlines seven global targets to guide and against which to assess progress.



The conclusion of the 15th Conference of Parties to the UN Convention on Biological Diversity saw the adoption of the Kunming-Montreal Global Biodiversity Framework (GBF) in 2022. Amidst a dangerous decline in nature threatening the survival of 1 million species and impacting the lives of billions of people, the Kunming-Montreal Global Biodiversity Framework aims to halt and reverse nature loss. The framework consists of global targets to be achieved by 2030 and beyond to safeguard and sustainably use biodiversity. **So, Option (c) is not correct.**

The Wider Caribbean's marine resources are vital to the region's biodiversity, climate resilience, and economic development.

- The Ocean Coordination Mechanism (OCM) is a groundbreaking regional governance platform for the Wider Caribbean that provides a permanent, inclusive structure for aligning action, sharing knowledge, and optimizing the use of limited resources by enhancing coordination and collaboration across the Caribbean and North Brazil Shelf Large Marine Ecosystems (CLME+ region).
- The OCM, however, has set clear objectives and a collaborative framework to ensure a more inclusive and sustainable approach to ocean conservation.
- OCM also promotes blue carbon projects, which use coastal ecosystems for carbon storage, benefiting both the environment and local communities. **So, Option (d) is not correct.**

59. Consider the following statements regarding Marine heatwaves (MHWs):

1. It occurs when the surface temperature of a particular region of the sea rises to 3 or 4 degrees Celsius above the average temperature for at least five days.
2. MHWs have the potential to persist over multi-year periods.
3. MHWs have been recorded in surface and deep waters, across all latitudes, and in all types of marine ecosystems.
4. MHWs can reduce the reproductivity of corals and make them more vulnerable to life-threatening diseases.

Which of the above statements is/are correct?

- (a) Only one
- (b) Only two
- (c) Only three
- (d) All four**

EXPLANATION:

Marine heatwaves (MHWs) are events characterised by prolonged and extremely warm ocean conditions. Such events have been detected in recent decades in many regions of the global ocean, including the Mediterranean, the Australian seas, the Northwest Atlantic, the Northeast Pacific, as well as the Indian Ocean and the Mozambique Channel.

➤ Warmer oceans cause marine heat waves (MHWs), which occur when the surface temperature of a particular region of the sea rises to 3 or 4 degrees Celsius above the average temperature for at least five days. **So, Statement 1 is correct.**

Marine heatwaves (MHWs) have increased by 50% over the past decade and now last longer and are more severe. MHWs not only impact ocean ecosystems but can also alter atmospheric circulation through teleconnections. By changing evaporation, humidity, and pressure patterns over the ocean, they influence jet streams, storm tracks, and rainfall over distant land regions. These effects can persist for several weeks, and in some cases, when connected to large-scale ocean-atmosphere interactions like ENSO, they may last for years. **So, Statement 2 is correct.**

They can affect small areas of coastline or span multiple oceans. MHWs have been recorded in surface and deep waters, across all latitudes, and in all types of marine ecosystems. **So, Statement 3 is correct.**

MHWs contribute to coral bleaching, which reduces the reproductivity of corals and makes them more vulnerable to life-threatening diseases. Thousands of marine animals depend on coral reefs for survival, and damage to corals could, in turn, threaten their existence. **So, Statement 4 is correct.**

ADDITIONAL INFORMATION:

HEATWAVES	
About	Heatwaves, or heat and hot weather that can last for several days, can have a significant impact on society, including a rise in heat-related deaths. Heatwaves are among the most dangerous of natural hazards, but they rarely receive adequate attention because their death tolls and destruction are not always immediately obvious.
Impact	<ul style="list-style-type: none"> ➤ The health impact of a heatwave depends on the intensity and duration of the temperature, the acclimatisation and adaptation of the population, and the infrastructure and preparedness. ➤ Exposure to heat causes severe symptoms, such as heat exhaustion and heat stroke – a condition which causes faintness, as well as dry, warm skin, due to the inability of the body to control high temperatures.

- Other symptoms include swelling in the lower limbs, heat rash on the neck, cramps, headache, irritability, lethargy and weakness. Heat can cause severe dehydration, acute cerebrovascular accidents and contribute to thrombogenesis (blood clots).
- People with chronic diseases who take daily medications have a greater risk of complications and death during a heatwave, as do older people and children.

60. Recently, Researchers have discovered the world's deepest blue hole, named Tam Ja Blue Hole (TJBH), It was initially thought to be the second deepest, but recent measurements have now recorded it at a depth of more than 1,380 feet (420 m) below mean sea level (mbSL), surpassing all other blue holes known to date, which is located in?

- (a) Gulf of Ob (Arctic Ocean)
- (b) Gulf of Alaska (Pacific Ocean)
- (c) Mexico's Chetumal Bay (Atlantic Ocean)**
- (d) Gulf of Oman (Indian Ocean)

EXPLANATION:

Blue holes are underwater sinkholes, like sink holes on land. Underwater sink holes, springs, and caverns are karst (calcium carbonate rock) features that are scattered across Florida's Gulf continental shelf. They vary in size, shape and depth, but most are ecological hot spots with a high diversity of abundance of plants and animals.

Blue holes are vertical marine caves that were carved over thousands of years by glacial runoff during the Ice Age.

- Recently, Mexico's Tam Ja Blue Hole (TJBH)), now officially known as the deepest blue hole on Earth. The blue hole is located in Mexico's Chetumal Bay off the Yucatan Peninsula (Atlantic Ocean).
- Discovered in 2021, the initial measurements using echo-sounders only reached a depth of 900 feet, unable to capture the full depth of the Tam Ja' Blue Hole.
- New measurements taken during a December scuba-diving expedition indicate that the blue hole goes down a whopping 1,380 feet (420meters) below the sea level — nearly the height of Trump Tower in Chicago.
- The blue hole surpasses the previous record holder, the Sansha Yongle Blue Hole, also known as the Dragon Hole in the South China Sea, by 480 feet.

Well-known examples are the Dragon Hole in the South China Sea and, the Great Blue Hole, Dean's Blue Hole in the Caribbean, The Dahab Blue Hole in Egypt and the Great Blue Hole in Belize. **So, Option (c) is correct.**



61. Consider the following Pairs:

Era		Life/Major Events
1. Pre-Cambrian	-	Age of Dinosaurs
2. Palaeozoic	-	First trace of Plants
3. Mesozoic	-	Extinction of Dinosaurs
4. Cenozoic	-	Flowering plants and Trees

In how many of the above pairs is the given information correctly matched?

- (a) Only one
- (b) Only two
- (c) Only three**
- (d) All four

EXPLANATION:

The geologic time scale is divided into four large periods of time: the Cainozoic Era, Mesozoic Era, Palaeozoic Era, and the Precambrian.

The Precambrian was the "Age of Early Life." It is divided into three eons: Hadean, Archean, and Proterozoic.

- During the Precambrian, continents formed and our modern atmosphere developed, while early life evolved and flourished. Soft-bodied creatures like worms and jellyfish lived in the world's oceans, but the land remained barren. Common Precambrian fossils include stromatolites and similar structures, which are traces of mats of algae-like microorganisms, and microfossils of other microorganisms. The Mesozoic Era, is known as the "Age of Dinosaurs. **So, Pair 1 is not correct.**

During the Paleozoic Era (541 to 251.9 million years ago), fish diversified and marine organisms were very abundant. The Paleozoic Era is further divided into seven periods/sub-periods: the Cambrian, the Ordovician, the Silurian, the Devonian, the Mississippian, the Pennsylvanian, the Permian.

- Life and major events in the Paleozoic Era: Reptiles dominated and replaced amphibians. The first reptiles appeared as vertebrates, along with the formation of coal beds and the rise of amphibians. The first trace of life on land was plants. The first fish evolved, while initially there was no terrestrial life, and marine invertebrates were abundant. **So, Pair 2 is correct.**

The Mesozoic Era was the "Age of Reptiles." This era is divided into three Periods: the Triassic, the Jurassic, and the Cretaceous.

- During the Mesozoic, Pangaea began separating into the modern continents, and the modern Rocky Mountains rose. Dinosaurs, crocodiles, and pterosaurs ruled the land and air. Common Mesozoic fossils include dinosaur bones and teeth, and diverse plant fossils.
- Some of the life/major events in Mesozoic era are
 - Age of Dinosaurs.
 - Frogs and turtles.
 - Extinction of Dinosaurs. **So, Pair (3) is correct.**

The Cenozoic (Cainozoic) Era is the "Age of Mammals." It is divided into three Periods: the Paleogene, the Neogene, and the Quaternary.

- During the Cenozoic Era, Birds and mammals rose in prominence after the extinction of giant reptiles. Some of the life forms and major events in the Cenozoic Era include modern humans (Homo sapiens), early human ancestors, and apes.

- Flowering plants and trees also appeared, along with anthropoid apes, rabbits and hares, and small mammals such as rats and mice. Common Cenozoic fossils include cat-like carnivores and early horses, as well as ice-age woolly mammoths. **So, Pair 4 is correct.**

Geological Time Scale

Eons	Era	Period	Epoch	Age/ Years Before Present	Life/ Major Events
		Quaternary	Holocene	0 - 10,000	Modern Man
			Pleistocene	10,000 - 2 million	Homo Sapiens
		Tertiary	Pliocene	2 - 5 million	Early Human Ancestor
			Miocene	5 - 24 million	Ape; Flowering Plants and Trees
			Oligocene	24 - 37 million	Anthropoid Ape
			Eocene	37 - 58 Million	Rabbits and Hare
			Palaeocene	57 - 65 Million	Small Mammals : Rats - Mice
	Mesozoic 65 - 245 Million Mammals	Cretaceous		65 - 144 Million	Extinction of Dinosaurs
		Jurassic		144 - 208 Million	Age of Dinosaurs
		Triassic		208 - 245 Million	Frogs and turtles
		Permian		245 - 286 Million	Reptile dominate-replace amphibians
		Carboniferous		286 - 360 Million	First Reptiles; Vertebrates; Coal beds
		Devonian		360 - 408 Million	Amphibians
		Silurian		408 - 438 Million	First trace of life on land: Plants
		Ordovician		438 - 505 Million	First Fish
		Cambrian		505 - 570 Million	No terrestrial Life ; Marine Invertebrate
Proterozoic				570 - 2,500 Million	Soft-bodied arthropods
Archean				2,500 - 3,800 Million	Blue green Algae; Unicellular bacteria
Hadean	Pre-Cambrian 570 Million - 4,800 Million			3,800 - 4,800 Million	Oceans and Continents form - Ocean and Atmosphere are rich in Carbon dioxide
Origin of Stars				5,000 Million	Origin of the sun
Supernova	5,000 - 13,700 Million			12,000 Million	Origin of the universe
Big Bang				13,700 Million	

62. Which of the following is evidence of the Concept of Seafloor Spreading?

- The Ocean Crust rocks are much older than the continental rocks.
- The Sediments on the ocean floor are very thin.
- The age of rocks decreases as one move away from the crest of the mid-oceanic ridge.

Select the correct answer using the code given below.

- I only
- II only**
- I, II and III
- II and III only

EXPLANATION:

The expansion in the floor area of the ocean by the creation of new ocean floor is called sea-floor spreading.

There are two main types of crust: continental crust and oceanic crust, which differ in a number of ways.

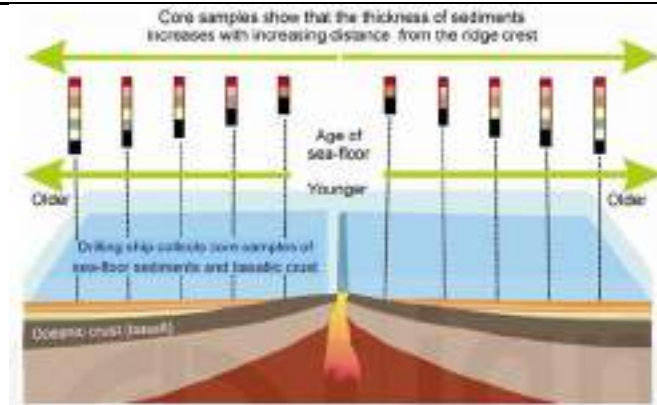
- Continental crust is thicker than oceanic crust, averaging 20-70 km thick, compared to 5-10 km for oceanic crust.
- Continental crust is also older than oceanic crust; the oldest rocks in continental crust are about 4.4 billion years old, while the oldest oceanic crust only goes back about 180 million years.
- Continental crust is made largely of granite, while oceanic crust is mostly composed of basalt. **So, Statement I is not correct.**

The sediments on the ocean floor are unexpectedly very thin. Oceanic crust is relatively young compared to continental crust (no older than ~200 million years because it is continuously recycled at subduction zones). Since the crust is geologically young, it has had less time to accumulate thick layers of sediments. **So, Statement II is correct.**

The rocks equidistant on either side of the crest of mid-oceanic ridges show remarkable similarities in terms of period of formation, chemical compositions and magnetic properties. Rocks closer to the mid-oceanic ridges have normal polarity and are the youngest. The age of the rocks increases as one moves away from the crest. The age of rocks in the oceanic crust is nowhere more than 200 million years old. Some of the continental rock formations are as old as 3,200 million years. **So, Statement III is not correct.**

ADDITIONAL INFORMATION:

THE CONCEPT OF SEAFLOOR SPREADING	
About	<p>Seafloor spreading is a geologic process in which tectonic plates—large slabs of Earth's lithosphere—split apart from each other. Seafloor spreading and other tectonic activity processes are the result of mantle convection.</p> <ul style="list-style-type: none"> ➤ Mantle convection is the slow, churning motion of Earth's mantle. Convection currents carry heat from the lower mantle and core to the lithosphere. Convection currents also “recycle” lithospheric materials back to the mantle. ➤ Seafloor spreading occurs at divergent plate boundaries. As tectonic plates slowly move away from each other, heat from the mantle's convection currents makes the crust more plastic and less dense. The less-dense material rises, often forming a mountain or elevated area of the seafloor. ➤ Eventually, the crust cracks. Hot magma fueled by mantle convection bubbles up to fill these fractures and spills onto the crust. This bubbled-up magma is cooled by frigid seawater to form igneous rock. ➤ This rock (basalt) becomes a new part of Earth's crust.
Evidences	<p>There are abundant evidences that support the sea-floor spreading hypothesis. Below are two important observations that support the sea-floor spreading:</p> <ul style="list-style-type: none"> ➤ First, rock samples of the deep ocean floor show that basaltic oceanic crust and overlying sediment cover become progressively younger as the Mid-Atlantic Ridge is approached and that the sediment cover is also thinner near the ridge. ➤ Second, the rock making up the ocean floor is considerably younger than the continents, with no oceanic crust older than 200 million years ago (Jurassic). In contrast, the oldest continental rocks are dated around 4.04 billion years old. This confirms that older ocean crust has been re-absorbed or consumed in the ocean trench systems.



There are some well-established evidences that provide sound support for the sea-floor spreading hypothesis. These evidences include marine magnetic anomalies, geomagnetic reversals, the Vine-Matthews hypothesis and the age of the ocean floor.

63. Which one of the following is the characteristic Climate of the Steppe Region?

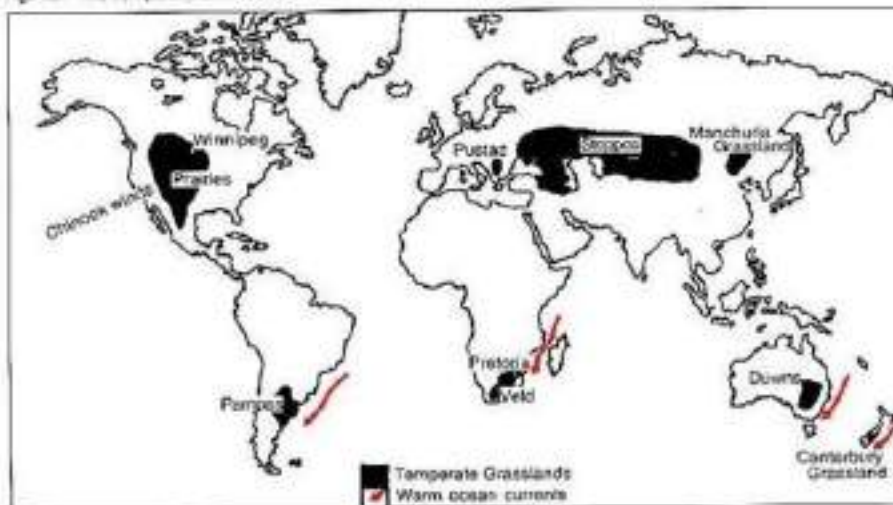
- (a) Rainfall throughout the year
- (b) The annual range of temperature is low
- (c) They lie along the Trade wind belt
- (d) Practically treeless, and the grasses are much shorter**

EXPLANATION:

The annual precipitation of the Steppe Climate can be expected to be light. The average rainfall may be taken as about 20 inches, but this again varies according to location, from 10 inches to 30 inches. The heaviest rain comes in the middle of the year, with 3.1 inches each in June and July. Most of the winter months have about an inch of precipitation, brought by the occasional depressions of the Westerlies and coming in the form of snow.

In many other continental stations, the annual precipitation is even less, though the general pattern remains the same, with most of the rain falling in the summer. Thus, Steppe regions do not receive rainfall evenly throughout the year. **So, Option (a) is not correct.**

Fig. 137 The Temperate Grasslands



The Steppe Region, with its location in the heart of the continent, means that it has little maritime influence. Their climate is thus continental with extremes of temperature. Summers are very warm, over 66°F.

The annual range of temperature is High, a direct result of continentality. Winters are so cold that parts of the Eurasian Steppes are snow-covered for several months. The snow melts with the return of spring, and by mid-summer, temperatures soar to over 65°F. It is really hot for its latitude. **So, Option (b) is not correct.**

The Steppe Region, bordering deserts and located away from the Mediterranean regions and the interiors of continents, is characterized by temperate grasslands.

They lie in the Westerly wind belt, not in the trade wind belt. They are so remote from maritime influence that the grasslands are practically treeless. These grasslands are so distinctive in their natural vegetation that, although those which occur in the southern hemisphere have a much more moderate climate, they are often dealt with together. In the Northern Hemisphere, the grasslands are far more extensive and are largely continental. **So, Option (c) is not correct.**

The term 'steppe vegetation' geographically refers to the scanty vegetation of the sub-arid lands of continental Eurasia.

It is natural to expect the steppes to be grass-covered, differing only in the density and quality of the grass. Their greatest difference from the tropical savanna is that they are practically treeless, and the grasses are much shorter. Where the rainfall is moderate, above 20 inches, the grasses are tall, fresh and nutritious and are better described as long prairie grass. **So, Option (d) is correct.**

64. Consider the following Statements:

Statement I : Basaltic lavas are highly fluid in nature due to low silica content.

Statement II : The Basic lavas result in the formation of Shield volcanoes.

Which one of the following is correct with respect to the above statements?

(a) Both Statement I and Statement II are correct, and Statement II explains Statement I

(b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I

(c) Statement I is correct, but Statement II is not correct

(d) Statement I is not correct, but Statement II is correct

EXPLANATION:

Basalt is the most common rock type in the Earth's crust (the outer 10 to 50 km). In fact, most of the ocean floor is made of basalt. Huge outpourings of lava called "flood basalts" are found on many continents.


➤ Most lava flows, including the ones from Kilauea and Mauna Loa volcanoes in Hawai'i Volcanoes National Park, have basaltic compositions. The low silica concentrations in these lavas mean that they are highly fluid (e.g., have low viscosity) and they flow easily, forming lava flows that may travel great distances from the vent where they erupt to cover broad areas of land. **So, Statement I is correct.**

➤ Low viscosity basaltic magma results in the formation of shield volcanoes that flows easily down slope away from the summit vent. The low viscosity of the magma allows the lava to travel down slope on a gentle slope, but as it cools and its viscosity increases, its thickness builds up on the lower slopes giving a somewhat steeper lower slope. **So, Statement II is correct.**

Thus, shield volcanoes are formed from low-viscosity basaltic magma. **Both Statement I and Statement II are correct, and Statement II explains Statement I.**



ADDITIONAL INFORMATION:

TYPES OF VOLCANOES	
Cinder cone	<ul style="list-style-type: none"> ➤ Cinder cones are the most common type of volcano in the world. They may look like an idealized depiction of a volcano as they are steep, conical hills that usually have a prominent crater at the top. ➤ Cinder cones are more technically known as scoria cones. Scoria are irregularly-shaped, highly vesicular (bubble-shaped cavities) fragments of lava that are erupted into the air and are typically solid when they land. ➤ Cinder cones are often surrounded by dark lava flows erupted from near their base. ➤ Example - Wizard Island in Crater Lake National Park in United states, is a cinder cone that formed after the caldera-forming eruption. 
Dome Volcano	<ul style="list-style-type: none"> ➤ Volcanic Domes form from the slow extrusion of highly viscous silicic lava. These lavas are too thick to spread out into a lava flow. Most domes are small, and many do not have a crater. ➤ Some dome-forming eruptions start with highly explosive eruptions that wane into dome-building ones as the gas content in the magma decreases.
Composite Volcanoes (Stratovolcanoes)	<ul style="list-style-type: none"> ➤ Composite cones are large volcanoes (many thousands of feet or meters tall) generally composed of lava flows, pyroclastic deposits, and mudflow (lahar) deposits, as well as lava domes. ➤ Composite volcanoes are active over long periods (tens to hundreds of thousands of years) and erupt periodically.

	<ul style="list-style-type: none"> ➤ These mountains commonly have snow-covered peaks standing high above the surrounding mountainous terrain. ➤ Example - Aniakchak National Monument (ANIA), Alaska, United States
Shield Volcanoes	<ul style="list-style-type: none"> ➤ Shield volcanoes are truly massive with volumes that dwarf other types of volcanoes, even large composite volcanoes. ➤ Shield volcanoes are usually constructed almost entirely of basaltic and/or andesitic lava flows which were very fluid when erupted. They are built by repeated eruptions that occurred intermittently over vast periods of time (up to a million years or longer). ➤ Although shield volcanoes are the largest volcanoes on Earth, they do not form soaring mountains with conical peaks like composite volcanoes.

65. Consider the following with respect to the Tropical and Extra-Tropical Cyclone:

1. Both can originate over the seas.
2. Both develop a clear frontal system.
3. They move under the influence of Trade winds and Westerlies, respectively.

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

EXPLANATION:

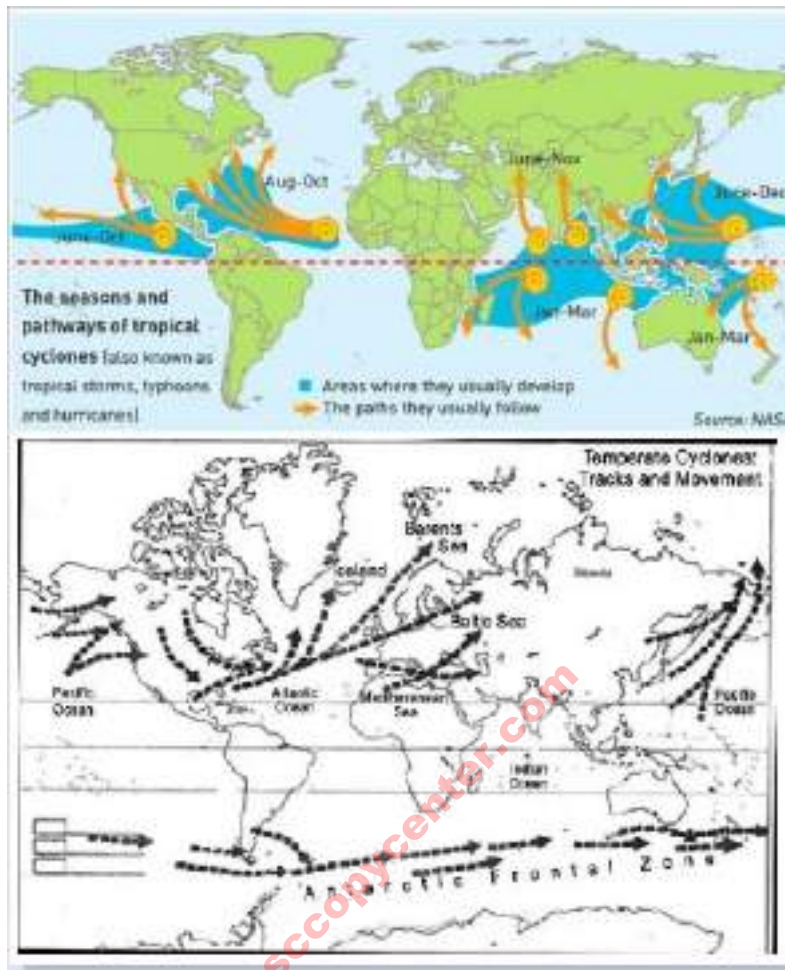
Tropical cyclone, an intense circular storm that originates over warm tropical oceans (seas) and is characterized by low atmospheric pressure, high winds, and heavy rain.

- Drawing energy from the sea surface and maintaining its strength as long as it remains over warm water, a weaker tropical cyclone (such as a tropical depression or a tropical storm) can mature to become a much stronger tropical cyclone known as a hurricane, typhoon, cyclone, or other name depending upon the region in which it occurs.
- Tropical cyclones are formed along the zone of confluence of north-east and south-east trade winds. This zone is known as the Inter Tropical Convergence Zone (ITCZ).

Temperate cyclones (Extra-tropical cyclone) are formed along a front in mid-latitudes between 35° and 65° N and S. They blow from west to east and are more pronounced in winter season. These cyclones are mainly observed in the Atlantic Ocean and northwest Europe.

The extra tropical cyclones differ from the tropical cyclones in a number of ways:

- The extra tropical cyclones has a clear frontal system which is not present in the tropical cyclones.
So, Statement 2 is not correct.
- Extra tropical cyclones cover a large area and can originate over the land and sea whereas tropical cyclones originate only over the seas and reach the land they dissipate. Therefore, both can originate over the seas. **So, Statement 1 is correct.**
- The extra tropical cyclone affects a much larger area as compared to the tropical cyclone. The velocity of wind in a tropical cyclone is much higher and is more destructive.



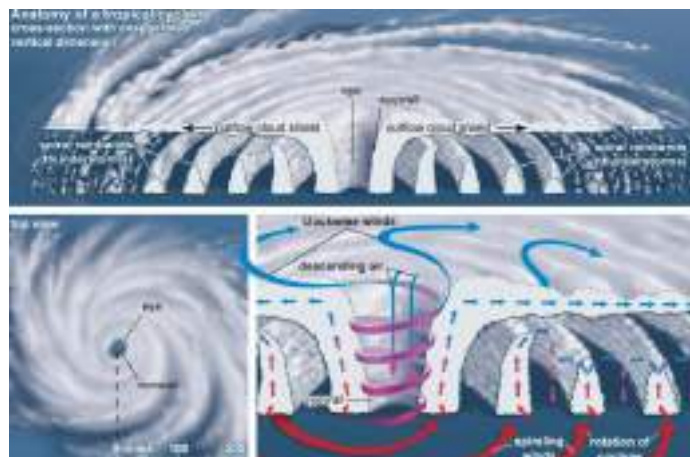
Tropical cyclones:

- In both the Northern and Southern Hemispheres tend to move westward and drift slowly poleward.
- Their motion is due in large part to the general circulation of Earth's atmosphere.
- Surface winds in the tropics, known as the trade winds, blow from east to west, and they are responsible for the general westward motion of tropical cyclones.

Extra-tropical cyclones:

- It always moves towards the east due to the prevailing westerlies.
- The temperate cyclones move in easterly (west to east) direction under the influence of westerly winds combined with coriolis force and control the weather conditions in the middle latitudes.

So, Statement 3 is correct.



ADDITIONAL INFORMATION:

CHARACTERISTICS OF EXTRA TROPICAL (TEMPERATE) AND TROPICAL CYCLONES	
EXTRA TROPICAL CYCLONES	TROPICAL CYCLONES
<ul style="list-style-type: none"> ➤ The temperate cyclone may be 1600kms wide. ➤ The isobars are elliptical in shape. The cold air mass moves faster than the warm air mass. ➤ These cyclones move at a speed of 5 to 25 kmph. ➤ They give light showers which are highly beneficial for the crops and human health and efficiency. In the ending part of the cyclone there is thunder and lightning. ➤ Each cyclone is followed by clear weather. 	<ul style="list-style-type: none"> ➤ Their diameter varies between 150 and 300 meters. ➤ The isobars are circular in shape. ➤ The central area is designed as the eye of the cyclone. ➤ They do not have fronts. ➤ They derive their energy from latent heat. ➤ Their velocity varies between 50 and 300kms. ➤ They give torrential rainfall. ➤ They occur in the Autumn season. ➤ The clouds in the tropical cyclone are cumulonimbus having vertical extension upto 12kms.

66. Consider the following pairs:

Grasslands	Region
-------------------	---------------

- | | | |
|---------------|---|-------------|
| 1. Pustaz | - | Hungary |
| 2. Pampas | - | Uruguay |
| 3. Canterbury | - | New Zealand |
| 4. Veld | - | Australia |

How many of the pairs given above are correctly matched?

- (a) Only one pair
(b) Only two pairs
(c) Only three pairs
(d) All four pairs

EXPLANATION:

The Pustaz of Hungary are a grassland biome. The Puszta consists of vast plains where specific land-use practices such as animal husbandry, including grazing of hardy livestock breeds adapted to the natural conditions of alkaline pastures, steppes, meadows and wetlands.

The Puszta, represented by the Hortobágy National Park, is a complex mosaic of natural grasslands, loess ridges, alkaline pastures, meadows and smaller and larger wetlands (mostly marshes), which has presented ideal conditions for pastoralism since prehistoric times, and which existed before the appearance of large animal-breeding cultures in this area. **So, Pair (1) is correct.**

The Pampas of South America are a grassland biome. They are flat, fertile plains that covers an area of 300,000 sq. miles or 777,000 square kilometers, from the Atlantic Ocean to the Andes Mountains. It is found primarily in Argentina and extends into Uruguay. The word Pampas comes from the Guarani Indian word for level plain. **So, Pair (2) is correct.**

The Canterbury-Otago tussock grasslands are an ecoregion of South Island, New Zealand. This ecoregion is a large area of dry grassy plains between the east coast and the Southern Alps that form the spine of South Island, in the regions of Canterbury and Otago.

The grasslands altogether form the largest flat plain of New Zealand and are largely used for grazing livestock. Less rain falls on this eastern side of the Southern Alps so the climate is dry with a warm

summer and cold winter, with the highland basins being the driest of all (less than 500mm per year).

So, Pair (3) is correct.

Grassveld is the characteristic vegetation of the South African Highveld, dominated by species of red grass. Where the red grass grows on well-drained, fertile soils subject to comparatively light rainfall.

The drier South African Middleveld favors both red grass and drought-resistant species of grasses.

These grasses are less luxuriant and the ground cover less complete than those of the Highveld. **So,**

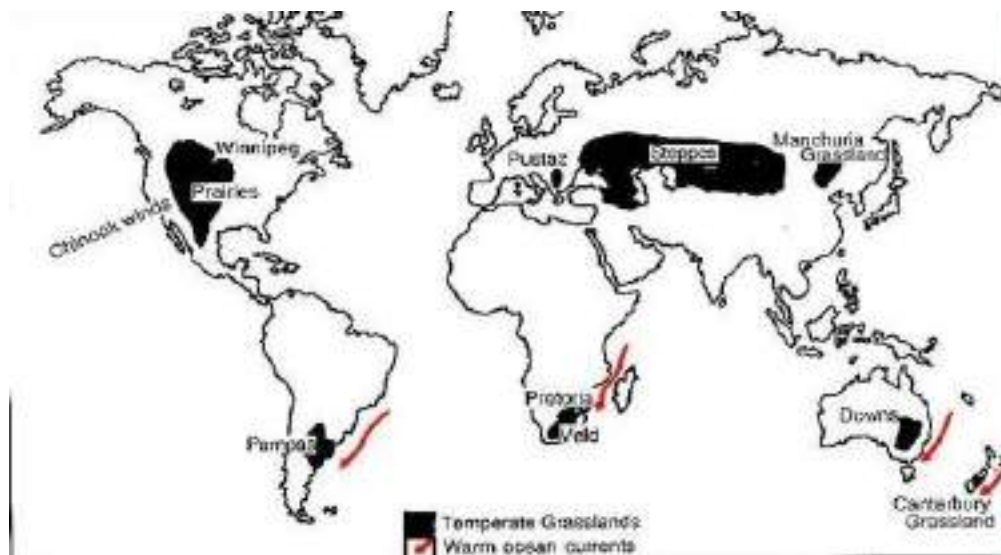
Pair (4) is not correct.

ADDITIONAL INFORMATION:

TEMPERATE CONTINENTAL (STEPPE) CLIMATE

About

- Bordering the deserts, away from the Mediterranean regions and in the interiors of continents are the temperate grasslands.
- Though they lie in the Westerly wind belt, they are so remote from maritime influence that the grasslands are practically treeless.
- These grasslands are so distinctive in their natural vegetation that, although those which occur in the southern hemisphere have a much more moderate climate, they are often dealt with together.
- In the northern hemisphere, the grasslands are far more extensive and are entirely continental.
- In Eurasia, they are called the Steppes, and stretch eastwards from the shores of the Black Sea across the great Russian plain to the foothills of the Altai Mountains, a distance of well over 2,000 miles. They are broken in a few places, being interrupted by the highlands.



Climate

- **Temperature:** Their location in the heart of continents means that they have little maritime influence. Their climate is thus continental with extremes of temperature.
- Winters are very cold in the continental steppes of Eurasia because of the enormous distances from the nearest sea.
- **Precipitation:** In its continental position, the annual precipitation of the Steppe Climate can be expected to be light. The average rainfall may be taken as about 20 inches, but this again varies according to location from 10 inches to 30 inches.

67. With reference to the River Kafue, which was recently seen in the news, consider the following statements:

1. It is a major tributary of the River Zambezi.
2. It flows entirely within Zambia.

Which of the above statements is/are correct?

- (a) 1 Only
 (b) 2 only
(c) Both 1 and 2
 (d) Neither 1 nor 2

EXPLANATION:

The Kafue River plays a large role in Zambia's ecosystem. The river rises on the Democratic Republic of Congo-Zambia border and then makes its way southward before turning west near the Lukanga Swamp. From here, it continues south and then east through the Kafue Gorge and the Kafue Flats. It then joins the famous Zambezi near Chirundu in Zimbabwe.

- The Kafue River basin supports about 60% of Zambia's 20 million people, providing water for fishing, irrigation, and industry. It supplies drinking water to around five million people, including those in the capital, Lusaka. The city gets 40 percent of its water supply from the river Kafue.
- It is a major tributary to the Zambezi and the largest and longest river lying entirely within Zambia.
So, Statement 1 and 2 are correct.
- The river runs through the extensive Kafue National Park where it is a source of water for an abundance of wild animals, roughly dissecting the park creating a north and south separation.
- Recently, Zambia faced environmental crisis after acid spill (acidic waste from a copper mine) in major river that threatens both people and wildlife along the Kafue River, which stretches over 1,500 kilometers through the heart of Zambia.

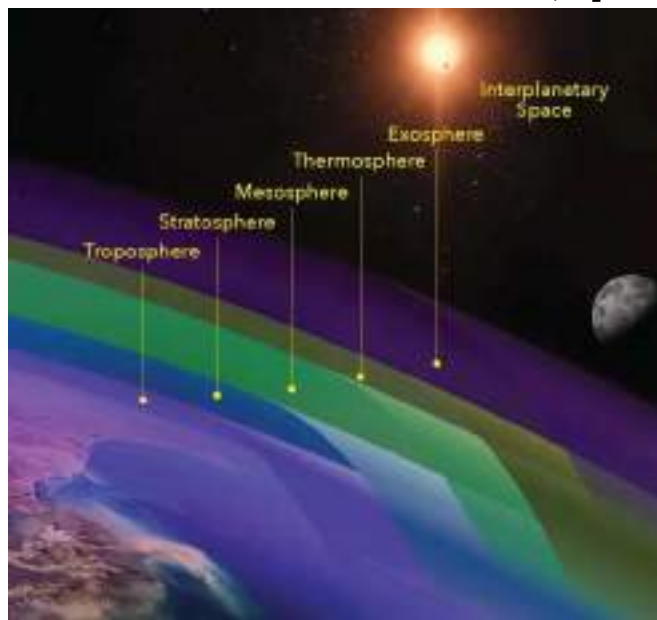


68. Which of the following best describes 'Thermocline'?

- (a) Region of increasing temperature in Earth's Atmosphere that is located above the mesosphere.
- (b) A boundary region below the sea surface from where there is a rapid decrease in temperature.**
- (c) A boundary separating Earth's Atmosphere and outer space.
- (d) A zone around a star where it is not too hot and not too cold for liquid water to exist.

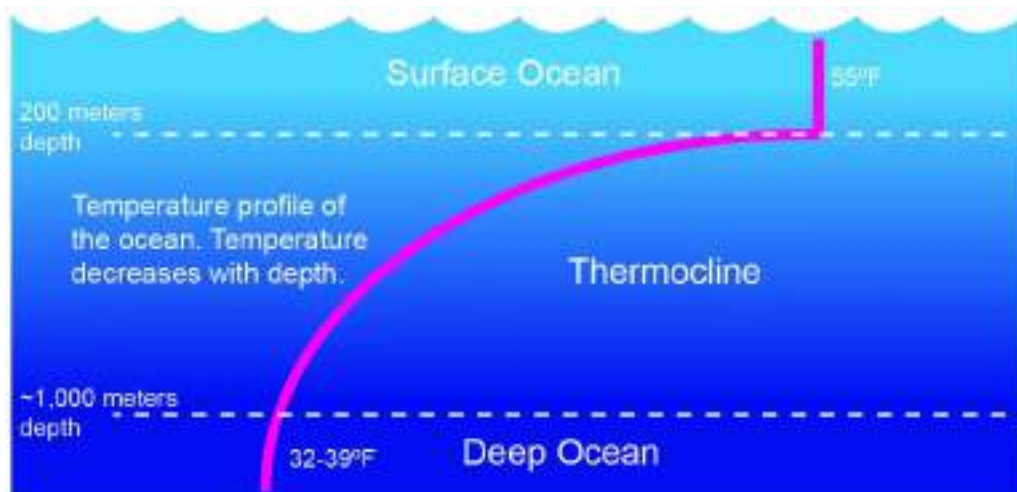
EXPLANATION:

Thermosphere, region of increasing temperature in Earth's atmosphere that is located above the mesosphere. In this layer with so few gas particles, each one absorbs more radiative energy, which causes the thermosphere to reach such high temperatures. This layer is notable for being home to the International Space Station and other low-Earth-orbit satellites. **So, Option (a) is not correct.**



The temperature-depth profile for the ocean water shows how the temperature decreases with the increasing depth. The profile shows a boundary region between the surface waters of the ocean and the deeper layers.

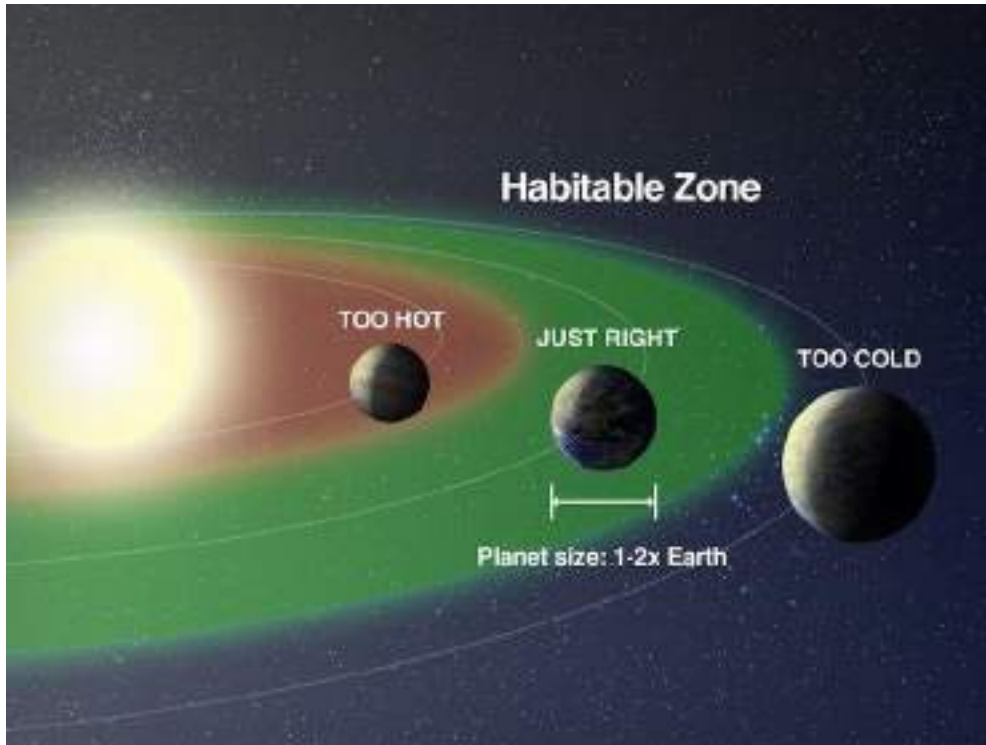
The boundary usually begins around 100 - 400 m below the sea surface and extends several hundred of metres downward. This boundary region, from where there is a rapid decrease of temperature, is called the thermocline. **So, Option (b) is correct.**



Kármán line, boundary separating Earth's atmosphere and outer space. The line is neither sharp nor well defined but is often taken to encircle Earth at an altitude between 80 to 100 km above mean sea level. **So, Option (c) is not correct.**

The habitable zone is the area around a star where it is not too hot and not too cold for liquid water to exist on the surface of surrounding planets.

The distance Earth orbits the Sun is just right for water to remain a liquid. This distance from the Sun is called the habitable zone, or the Goldilocks zone. Rocky exoplanets found in the habitable zones of their stars are more likely targets for detecting liquid water on their surfaces. **So, Option (d) is not correct.**



ADDITIONAL INFORMATION:

TEMPERATURE STRUCTURE OF OCEAN	
About	<p>The temperature structure of oceans over middle and low latitudes can be described as a three-layer system from surface to the bottom.</p> <ul style="list-style-type: none"> ➤ The first layer represents the top layer of warm oceanic water, and it is about 500m thick with temperatures ranging between 20° and 25° C. This layer, within the tropical region, is present throughout the year but in mid latitudes it develops only during summer. ➤ The second layer called the thermocline layer lies below the first layer and is characterised by rapid decrease in temperature with increasing depth. The thermocline is 500 -1,000 m thick. ➤ The third layer is very cold and extends up to the deep ocean floor. In the Arctic and Antarctic circles, the surface water temperatures are close to 0° C and so the temperature change with the depth is very slight. Here, only one layer of cold water exists, which extends from surface to deep ocean floor.

69. Consider the following statements:

1. Uniformity of temperatures throughout the year.
2. Well-distributed precipitation around the year, with low amounts along the summer and winter solstices.
3. Heavy downpours of convectional rain every afternoon.

Which of the following climate is described above ?

(a) Equatorial Climate

(b) China-type Climate

(c) Humid subtropical Climate

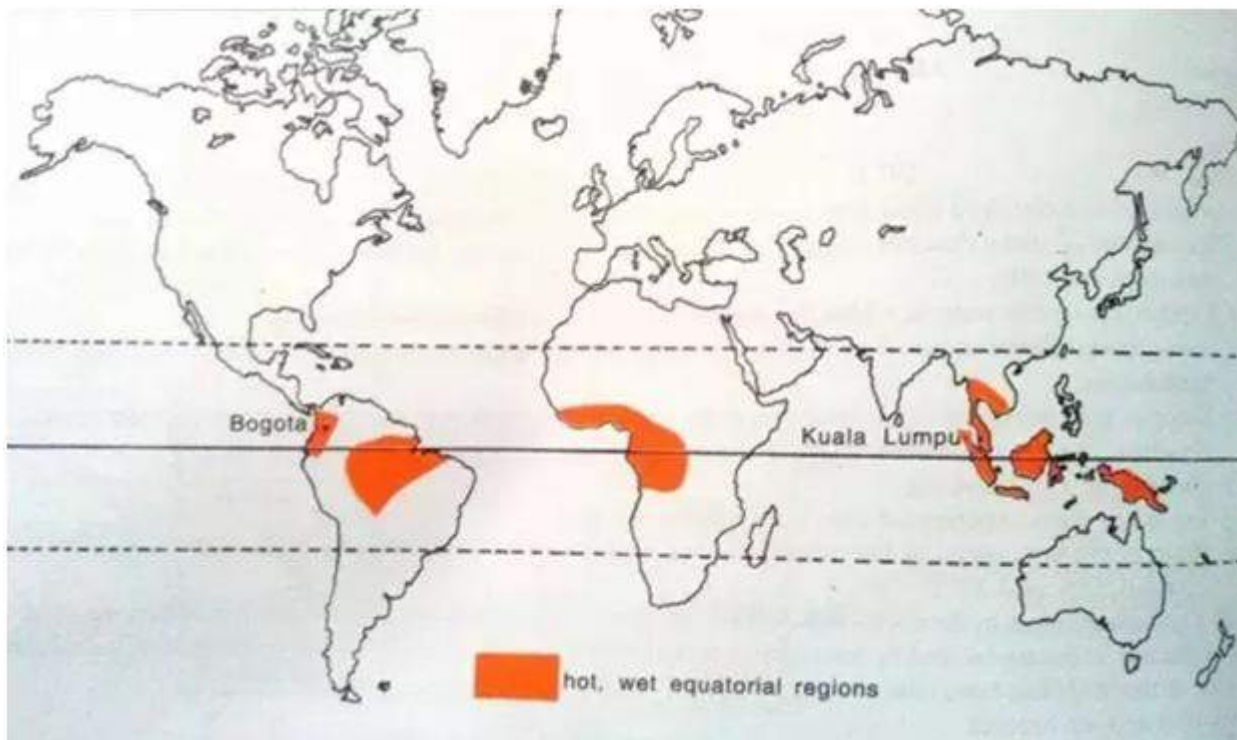
(d) Cool Temperate Western Margin climate

EXPLANATION:

The Equatorial hot, wet climate is found between 5° and 10° north and south of the equator.

- The most outstanding feature of the equatorial climate is its great uniformity of temperature throughout the year. The mean monthly temperatures are always around 80°F with very little variation. There is no winter.
- Precipitation is heavy, between 60 inches, and well distributed throughout the year. There is no month without rain, and a distinct dry season like those of the Savanna or the Tropical Monsoon Climates, is absent. Instead, there are two periods of maximum rainfall, in April and October which occur shortly after the equinoxes, least rain falls at the Summer (June) and Winter (December) solstices.
- Due to the great heat in the equatorial belt, mornings are bright and sunny. There is much evaporation and convectional air currents are set up, followed by heavy downpours of convectional rain in the afternoons from the towering cumulonimbus clouds.

So, Option (a) is correct.



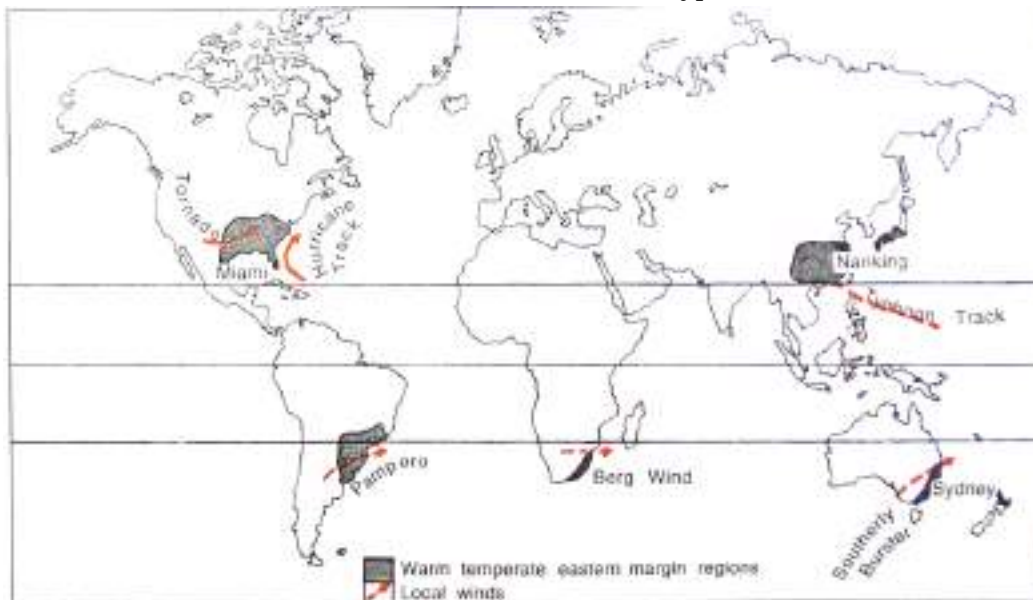
ADDITIONAL INFORMATION:

TYPE OF CLIMATE

China Type Climate

This type of climate is found on the eastern margins of continents in warm temperate latitudes, just outside the tropics. It has comparatively more rainfall than the Mediterranean climate in the same latitudes, coming mainly in the summer.

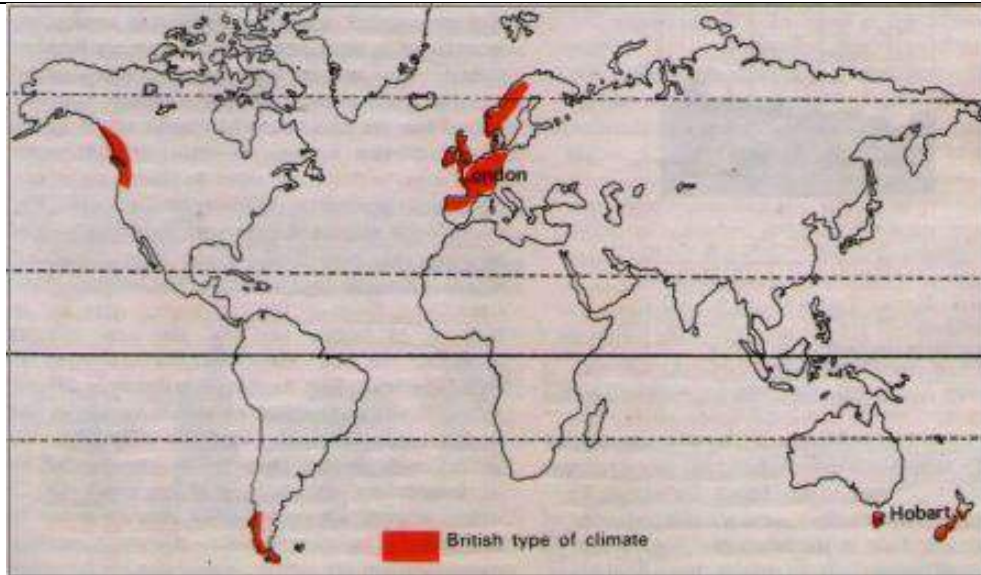
- It is, in fact, the climate of most parts of China- a modified form of monsoonal climate. It is thus also called the Temperate Monsoon or China Type of climate.
- In the southern hemisphere, this kind of climate is experienced along the warm temperate eastern coastlands of all the three continents: in New South Wales with its eucalyptus forests; in Natal where cane sugar thrives; and in the maize belt of the Parana-Paraguay-Uruguay basin.
- As the regions are influenced by the onshore Trade Winds all the year round, without any monsoon variations, the climate cannot be described as temperate Monsoon. It is sometimes referred to as the Natal type of climate.



The Cool Temperate Western Margin Climate

British Type Climate:

- Cool temperate western margins are under the permanent influence of the westerlies all year round.
- From Britain, the climatic belt stretches far inland into the lowlands of North-West Europe, including such regions as northern & western France, Belgium, the Netherlands, Denmark, Western Norway & North-West Iberia.
 - Climate: The mean annual temperatures are usually between 40°F and 60°F.
 - Precipitation: It has adequate rainfall throughout the year with a tendency towards a slight winter or autumn maximum from cyclonic sources.
 - Natural Vegetation: The natural vegetation of this climatic type is deciduous forests. The trees shed their leaves in the cold season. Some of the more common species include oak, elm, Birch, Beech, Poplar, & Hornbeam. Chestnut, Sycamore, maple & lime also found in some areas.



70. This type of Mass Movement occurs in the absence of Vegetation cover and with heavy rainfall, thick layers of weathered materials get saturated with water, flowing either slowly or rapidly down along definite channels.

Which of the following types of Mass Movement is described above?

- (a) Creep
- (b) Slump
- (c) Mudflow**
- (d) Avalanche

EXPLANATION:

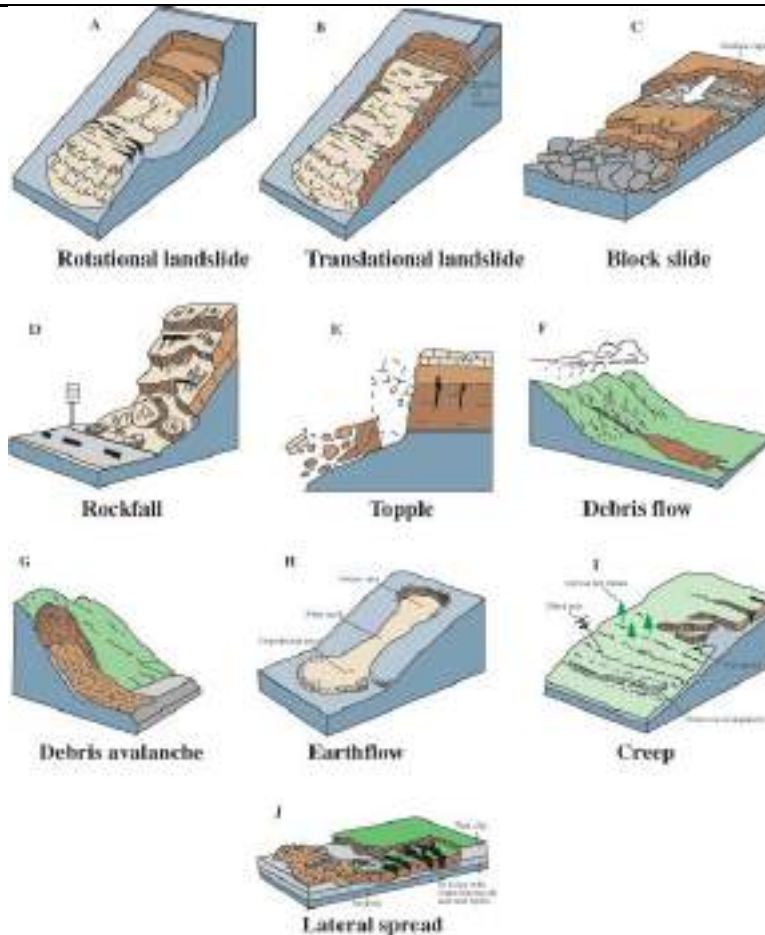
Mass movements transfer the mass of rock debris down the slopes under the direct influence of gravity. The movements of mass may range from slow to rapid, affecting shallow to deep columns of materials and include creep, flow, slide and fall. Mass movements are very active over weathered slopes rather than over un-weathered materials.

Rapid Mass Movements are mostly prevalent in humid climatic regions and occur over gentle to steep slopes. Mudflow is one type in this category.

Mudflow:

- In the absence of vegetation cover and with heavy rainfall, thick layers of weathered materials get saturated with water and either slowly or rapidly flow down along definite channels. It looks like a stream of mud within a valley.
- When the mudflows emerge out of channels onto the piedmont or plains, they can be very destructive engulfing roads, bridges and houses.
- Mudflows occur frequently on the slopes of erupting or recently erupted volcanoes. Volcanic ash, dust and other fragments turn into mud due to heavy rains and flow down as tongues or streams of mud causing great destruction to human habitations.

So, Option (c) is correct.



ADDITIONAL INFORMATION:

MASS MOVEMENTS	
About	Mass movements can be grouped under three major classes: (i) slow movements; (ii) rapid movements; (iii) landslides.
Slow Movements	<p>Creep: It can occur on moderately steep, soil covered slopes.</p> <ul style="list-style-type: none"> ➤ Creep is the imperceptibly slow, steady, downward movement of slope-forming soil or rock. Movement is caused by shear stress sufficient to produce permanent deformation, but too small to produce shear failure. ➤ There are generally three types of creep: <ul style="list-style-type: none"> • Seasonal, where movement is within the depth of soil affected by seasonal changes in soil moisture and soil temperature; • Continuous, where shear stress continuously exceeds the strength of the material; and • Progressive, where slopes are reaching the point of failure as other types of mass movements. ➤ Creep is indicated by curved tree trunks, bent fences or retaining walls, tilted poles or fences, and small soil ripples or ridges. <p>Solifluction: It involves slow downslope flowing soil mass or fine-grained rock debris saturated or lubricated with water.</p> <ul style="list-style-type: none"> ➤ This process is quite common in moist temperate areas where surface melting of deeply frozen ground and long continued rain respectively, occur frequently.

	➤ When the upper portions get saturated and when the lower parts are impervious to water percolation, flowing occurs in the upper parts.
Rapid Movements	➤ Earthflow: Movement of water-saturated clayey or silty earth materials down low-angle terraces or hillsides. ➤ Avalanche: It is more characteristic of humid regions with or without vegetation cover and occurs in narrow tracks on steep slopes. This debris avalanche can be much faster than the mudflow. Debris avalanche is like snow avalanche.
Landslides	These are known as relatively rapid and perceptible movements. The materials involved are relatively dry. The size and shape of the detached mass depend on the nature of discontinuities in the rock, the degree of weathering and the steepness of the slope. ➤ Slump is slipping of one or several units of rock debris with a backward rotation with respect to the slope over which the movement takes place. ➤ Debris Slide: Rapid rolling or sliding of earth debris without backward rotation of mass. Debris fall is nearly a free fall of earth debris from a vertical or overhanging face. ➤ Rockslide: Sliding of individual rock masses down bedding, joint or fault surfaces

71. Consider the following information:

Place in News	Significance/Reason
1. Chernobyl	A nuclear power plant in Russia that was allegedly attacked during the ongoing conflict with Ukraine
2. Kasso	A commercial-scale e-methanol power plant in Denmark
3. Hodeidah	A Red Sea port in Yemen that was attacked during the conflict between Israel and the Houthis

Which of the above pairs are correctly matched?

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

EXPLANATION:

The Chernobyl nuclear power plant in the former Soviet Union involved a 1000-MW (electrical) boiling water, graphite-moderated, direct-cycle reactor. The Chernobyl nuclear power plant refers to the facility in Ukraine where, on 26 April 1986, Unit 4 was destroyed by two explosions, leading to the release of highly radioactive substances that spread across Europe.

Kursk Nuclear Power Plant:

- It is an important part of the United Energy System of Russia. Its key consumer is the Center energy system covering 19 regions of the Central Federal District.
- Kursk NPP produces 52% of the total output of all electric power plants of Chernozemye (Black Earth Belt). It feeds 90% of the industry of Kursk region.
- It also supplies electricity to northern and north-eastern Ukraine. Recently, Russia accused Ukraine that Kursk Nuclear Power Plant was allegedly attacked during the ongoing conflict with Ukraine. **So, Pair (1) is not correct.**



Kassø Power Plant in Aabenraa, Denmark, the world's first large-scale e-methanol production site, turns renewable energy, water, and CO₂ into a green fuel and chemical. This innovation offers a viable path for industries that can't plug in to reduce their carbon footprint, helping companies and Europe realise net-zero targets.

E-methanol brings massive potential for real climate impact. From shipping to materials, it helps decarbonise industries that can't be directly electrified and paves the way to produce more sustainable plastics materials. **So, Pair (2) is correct.**

Hodeidah, city, western Yemen situated on the Tihāmah coastal plain that borders the Red Sea. It is one of the country's chief ports and has modern facilities.

Recently, Israel has attacked Houthi targets in three Yemeni ports and a power plant. The strikes on Hodeidah, Ras Isa and Salif ports, and Ras Qantib power plant were due to repeated Houthi attacks on Israel. **So, Pair (3) is correct.**



72. Which one of the following ocean currents is responsible for moderating winter temperatures in North-western Europe?

- (a) Gulf Stream
- (b) Norwegian Current
- (c) Labrador Current
- (d) North Atlantic Drift**

EXPLANATION:

The Gulf Stream originates in the Gulf of Mexico, flows along the eastern margins of North America, and continues near Newfoundland, Canada. The Labrador Current meets the Gulf Stream near Newfoundland, creating favourable conditions for fishing.

The Gulf Stream plays a crucial role in regulating the climate of the regions it affects. It transports warm water from the tropics toward higher latitudes, influencing the temperature and weather patterns along the way. The warmth it carries helps to moderate the climate in areas such as the eastern United States and Western Europe, making these regions warmer than they would otherwise be. This also drives thermohaline circulation in the ocean which is an important process because it moves nutrients and enforces balance.

The north-western European climate is influenced not by the Gulf Stream alone, but by the combined effect of the Gulf Stream and the North Atlantic Drift. **So, Option (a) is not correct.**

The Norwegian Current is a colder, less salty current flowing along Norway's coast. Norway Current, branch of the North Atlantic Current, sometimes considered a continuation of the Gulf Stream (issuing from the Gulf of Mexico). The Norway Current enters the Norwegian Sea north of Scotland and flows northeastward along the coast of Norway before flowing into the Barents Sea. With subsurface temperatures ranging from 46° F (8° C) in the south to about 39° F (4° C) in the north, the current exerts a moderating influence on the climate of Norway and northern Europe. **So, Option (b) is not correct.**



The Labrador Current is a cold current formed from waters around 1.5°C, originating from the Arctic Ocean. It flows southward along the coast of Labrador, merging with the Gulf Stream near Newfoundland.

This current contributes to the cooling of Canada's Atlantic provinces and the north-eastern United States, while bringing icebergs from Greenland. **So, Option (c) is not correct.**



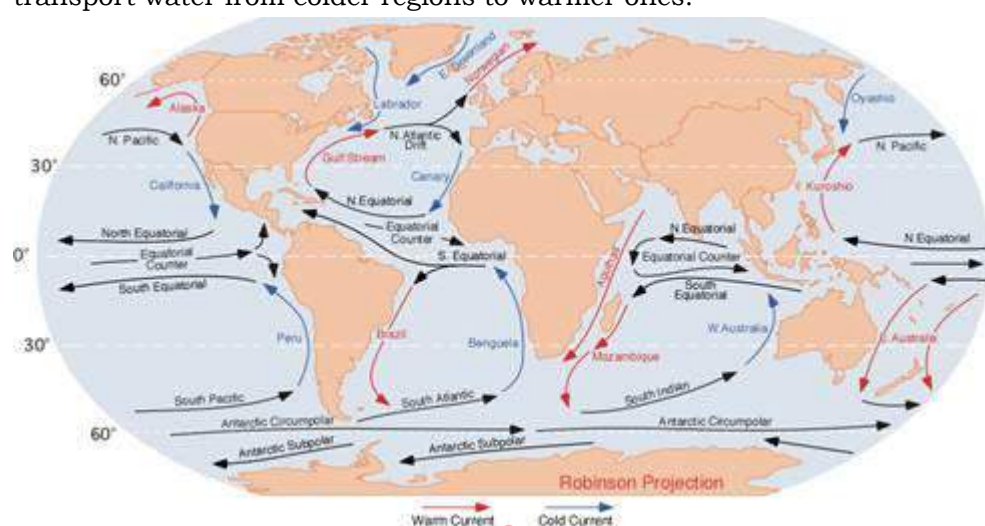
The North Atlantic Drift is a warm ocean current that originates from the Gulf Stream in the western Atlantic. It flows across the North Atlantic, driven by the Earth's rotation and prevailing wind systems, eventually splitting into several smaller currents near the coasts of Europe.

The North Atlantic Drift brings warm water and air to Western Europe, moderating the region's climate. Countries in northwestern Europe, like the United Kingdom, France, and Germany, benefit from milder winters compared to other regions at similar latitudes, such as Canada or Russia. **So, Option (d) is correct.**

- Temperate Winters: The current keeps European coastal regions free of ice, even during harsh winters.
- Increased Precipitation: Warm air associated with the current leads to higher moisture levels, resulting in more rainfall, particularly in coastal areas.



ADDITIONAL INFORMATION:

OCEAN CURRENTS AND THEIR TYPES	
About	<p>Ocean currents are continuous, predictable movements of ocean water driven by gravity, wind (Coriolis force), and water density. Horizontal movements are referred to as currents, while vertical movements are known as upwelling or downwelling. Warm currents carry water from tropical regions to colder areas, while cold currents transport water from colder regions to warmer ones.</p> 
North Equatorial Current	<p>The North Equatorial Current moves between 10°N and 20°N, driven by the trade winds.</p> <ul style="list-style-type: none"> ➤ It originates off the coast of Mexico and flows westward. ➤ When it reaches the Philippines/Taiwan region, it splits: one branch moves northward, becoming part of the Kuroshio Current, while the other moves southward, forming the Mindanao Current.
Kuroshio Current	<p>The Kuroshio Current is a powerful western boundary current formed by the North Equatorial Current. It moves from Taiwan and the Ryukyu Ridge towards the polar regions.</p> <ul style="list-style-type: none"> ➤ The Kuroshio Current warms the climate of regions of Japan and is responsible for forming coral reefs there. ➤ It also plays a key role in fishing activities along Japan's coast due to upwelling when it meets the Oyashio Current.
Oyashio Current	<p>The Oyashio Current is the southern extension of the Kamchatka Current. It flows southward along Japan's eastern coast and meets the Kuroshio Current, creating upwelling and productive fishing grounds.</p>
Peru (Humboldt) Current	<p>The Peru Current, also known as the Humboldt Cold Current, flows northward along the western coast of South America. It is slow and shallow, providing rich nutrients to coastal ecosystems through upwelling.</p>
Antarctic Circumpolar Current	<p>The Antarctic Circumpolar Current (ACC) flows clockwise around Antarctica, from west to east.</p> <ul style="list-style-type: none"> ➤ It plays a key role in keeping warm water away from Antarctica, maintaining the ice sheets. ➤ The ACC also supports upwelling, bringing nutrient-rich waters to the surface and fostering abundant marine life.

The Agulhas Current	<p>The Agulhas Current forms the western boundary of the Southern Indian Ocean, flowing southward along the coast of Mozambique and South Africa. It then turns eastward, joining the flow from Africa to Australia.</p> <ul style="list-style-type: none"> ➤ The sources of the Agulhas Current include the East Madagascar Current and the Mozambique Current. ➤ The Agulhas Current acts as a convergence zone where warm water from the Indian Ocean meets cold water from the Antarctic Circumpolar Current, resulting in an upwelling zone that supports productive marine life. ➤ The interaction between the Agulhas Current and the Benguela Current aids in thermohaline circulation, mixing warm and cold waters.
The Brazilian Current	<p>The Brazilian Current originates from the south equatorial current of the Atlantic Ocean and is part of the South Atlantic Subtropical Gyre, flows along the Brazilian coast to the mouth of the Rio de la Plata.</p> <p>It is slower and weaker compared to the Gulf Stream but contributes to fishing conditions when it meets the Falkland Current.</p>
The Falkland (Malvinas) Current	<p>This cold current originates from the Antarctic Circumpolar Current and flows northward along Patagonia's coast, transporting nutrient-rich cold water to the Brazilian Current.</p> <p>This current results from the movement of water from the Atlantic Drift as it rounds Cape Horn.</p>

73. Which one of the following climates is known for the practice of truck farming or market gardening?

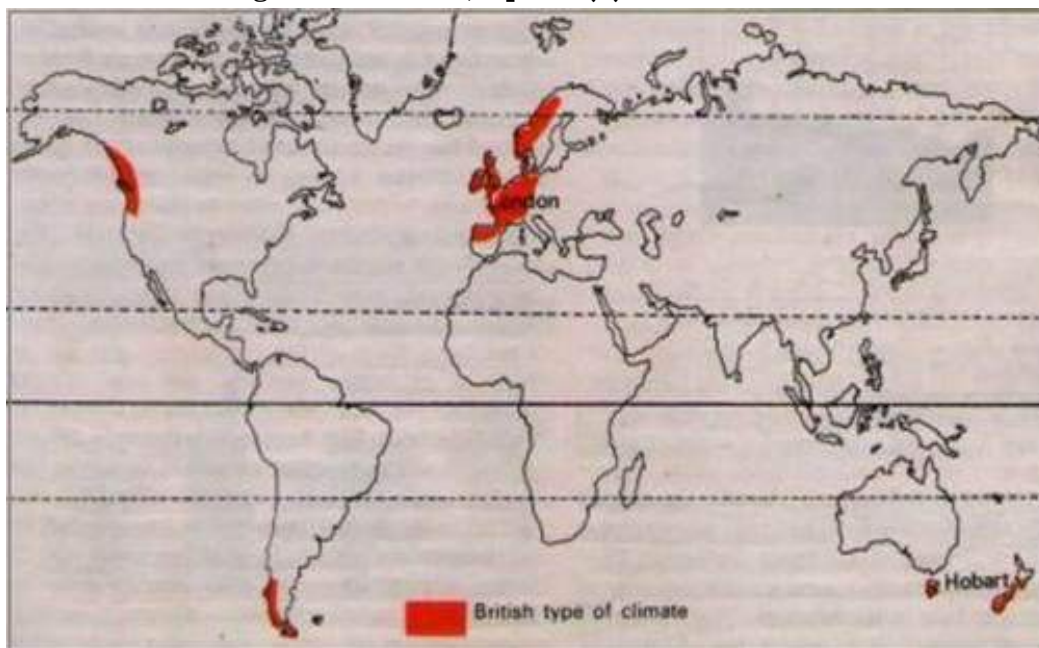
- (a) The Laurentian Climate
- (b) The British Climate**
- (c) The Steppe Climate
- (d) The Siberian Climate

EXPLANATION:

The British Climatic region is known for the practice of truck farming or market gardening. Though market gardening is practised throughout the world wherever there is a large urban population, nowhere else is it so highly specialised as in North-West Europe. Several factors account for this:

- All the north-western European countries (Britain, France, Germany and Denmark) are highly industrialised and have high population densities. There are more towns and cities than on other continents despite its small size. It is understandable that the demand for fresh vegetables, green salads, eggs, meat, milk and fruits will be tremendous.
- In north-western Europe, intensive market gardening is carried out in many specialised areas, e.g. the Vales of York and Evesham in the United Kingdom, where climatic, soil and other factors best suit this form of agriculture.
- Farms are normally small, located near large cities or industrial areas. Farming is carried out intensively, aiming at high yield and maximum cash returns.
- As the crops are perishable, a good network of transport is indispensable. The produce, such as lettuces, cabbages, cauliflowers, tomatoes, onions, peas and fruits, is seldom shipped but conveyed by high-speed conveyances such as trucks or vans. Perhaps a more appropriate term to use is truck farming, which is commonly used in the United States.
- Early vegetables, potatoes, and tomatoes reach London from the Canary Islands, the Channel Islands, and Brittany in north-western France.

- Similarly, bulbs and flowers from the polder lands of the Netherlands and eggs, bacon and other dairy products from Denmark are sent to most of the major industrial centers of Europe in almost perfect condition for household consumption.
- The horticultural industry in the Netherlands is so highly specialised that Dutch tulips and bulbs are flown by the K.L.M. (Dutch Airlines) to Rome, Paris, Zurich, and London.
- In Australia, high-speed boats ply across the Bass Strait daily from Tasmania to rush vegetables, tomatoes, apples and beans to most of the large cities in mainland Australia. Australians nicknamed Tasmania the garden state. **So, Option (b) is correct.**



ADDITIONAL INFORMATION:

ECONOMIC DEVELOPMENT ACROSS CLIMATIC REGIONS

Laurentian Climate

- Lumbering and its associated timber, paper, and pulp industries are among the most important economic undertakings.
- Agriculture is less important in view of the severity of the winter and its long duration. Fortunately, the maritime influence and the heavy rainfall enable some hardy crops to be raised for local needs. Potatoes thrive over large areas of the podzolised soils, while hardy cereals like oats and barley can be sown and successfully harvested before the onset of the cold winter.
- Several other interesting crops are produced in the Asian region of this climate, such as soya beans (northern China, Manchuria and Korea are amongst the world's leading producers), groundnuts, sesame, rape seeds, Tung oil and mulberry.
- In the North American region with this climate, arable farming is not carried out on a large scale, except in the more favourable localities.
- Farmers are engaged in dairy farming, hay cultivation and, in mild maritime areas, fruit growing.
- The fertile Annapolis Valley in Nova Scotia is the world's most renowned region for apples.
- Fishing is, however, the most outstanding economic activity of the Laurentian climatic regions.

<p>The Steppe Climate</p>	<ul style="list-style-type: none"> ➤ The grasslands have been ploughed up for extensive, mechanised wheat cultivation and are now the 'granaries of the world'. Besides wheat, maize is increasingly cultivated in the warmer and wetter areas. ➤ The tufted grasses have been replaced by the more nutritious lucerne or alfalfa grass for cattle and sheep rearing. These temperate grasslands are now the leading ranching regions of the globe. ➤ Extensive Mechanised Wheat Cultivation: The temperate grasslands are ideal for extensive wheat cultivation. The cool, moist spring stimulates early growth, and the light showers in the ripening period help to swell the grains to ensure a good yield. ➤ Pastoral Farming: When pioneer settlers first moved into the temperate grasslands, there were very few animals. The natural conditions suit animal farming. Subsequently, cattle, sheep, pigs and horses were introduced, and they proved very successful. With the development of refrigerated ships in the late nineteenth century, the temperate grasslands became major pastoral regions, exporting large quantities of beef, mutton, wool, and hides. Milk, butter, cheese and other dairy products.
<p>Siberian Climate</p>	<ul style="list-style-type: none"> ➤ Trapping: Many fur-bearing animals inhabit the northern lands of Canada and Eurasia. Wherever the cold is keenest, the quality and thickness of the fur also increase. ➤ Muskrat, ermine, mink, and silver fox are the most important fur-bearing animals sought after in Canada. Animals such as the silver fox and ermine are kept in captivity and skinned when the furs reach a marketable stage. They fetch high prices in sophisticated cities like New York, London, Paris, Rome and Zurich, where the pelts are processed as attractive fur coats and women's handbags.

74. Consider the following statements:

Statement-I : The drainage pattern is called Dendritic drainage due to its Tree-like appearance.

Statement-II : In a Dendritic drainage pattern, the tributaries will join the main valley at a right angle as subsequent streams.

Which one of the following is correct with respect to the above statements?

- (a) Both Statement I and Statement II are correct, and Statement II explains Statement I
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct**
- (d) Statement I is not correct, but Statement II is correct

EXPLANATION:

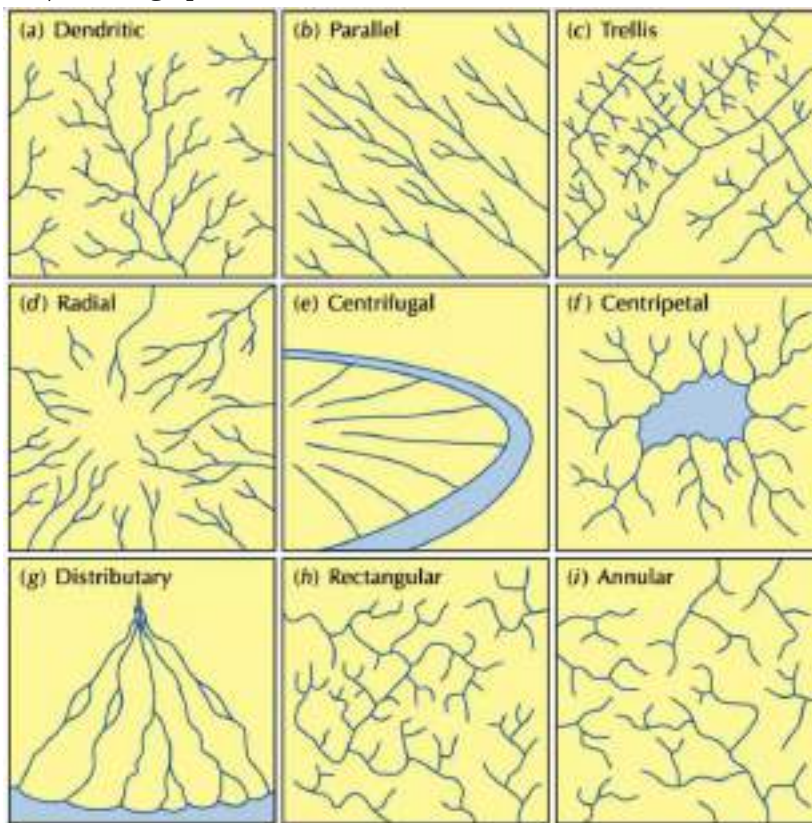
The flow of water through well-defined channels is known as 'drainage', and the network of such channels is called a 'drainage system'. The drainage pattern of an area is the outcome of the geological time period, nature and structure of rocks, topography, slope, amount of water flowing and the periodicity of the flow. There are different drainage patterns. Some of them are:

- The drainage pattern resembling the branches of a tree is known as "dendritic"; examples of this include the rivers of the northern plains. **So, Statement I is correct.**
- When the rivers originate from a hill and flow in all directions, the drainage pattern is known as 'radial'. The rivers originating from the Amarkantak range present a good example of it.

- When the primary tributaries of rivers flow parallel to each other and secondary tributaries join them at right angles, the pattern is known as 'trellis'.
- When the rivers discharge their waters from all directions into a lake or depression, the pattern is known as 'centripetal'.

A trellis drainage pattern is characterized by nearly parallel main tributaries that are joined by short, perpendicular subsequent streams. These tributaries meet the main streams at almost right angles, giving the drainage a distinctive grid-like appearance.

This pattern typically develops in regions with alternating bands of resistant and less resistant rocks. Resistant rocks (e.g., sandstone or quartzite) form parallel ridges, while weaker rocks (e.g., shale or limestone) erode easily to form valleys. The main tributaries flow along these valleys, and the short subsequent streams descend from the ridges to join them, creating the trellis-like arrangement. Therefore, the subsequent streams typically joining the main tributaries at right angles is a key feature of trellis (Not Dendritic) drainage pattern. **So, Statement II is not correct.**



ADDITIONAL INFORMATION:

DRAINAGE PATTERN	
About	Over time, a stream system achieves a particular drainage pattern to its network of stream channels and tributaries as determined by local geologic factors. Drainage patterns or nets are classified based on their form and texture. Their shape or pattern develops in response to the local topography and subsurface geology.
Dendritic Drainage Pattern	<ul style="list-style-type: none"> ➤ The most common drainage pattern resembles the branches of a tree. ➤ It develops in regions with homogeneous rock structure, where rocks offer equal resistance to erosion. ➤ Tributaries join the mainstream at acute angles (less than 90°) without any fixed direction control. <p>Example: Most of the rivers in the Northern Plains of India</p>

Parallel Drainage pattern	<ul style="list-style-type: none"> ➤ Found in areas with a steep slope or elongated landforms such as resistant rock ridges. ➤ Streams and their tributaries run almost parallel to each other, following the surface slope. ➤ This pattern may also form due to major faults cutting across folded bedrock. ➤ Often shows transitions with dendritic or trellis patterns. <p>Example: Small rivers in the Western Ghats.</p>
Rectangular Drainage Pattern	<ul style="list-style-type: none"> ➤ Develops in regions that have undergone faulting or jointing. ➤ Streams follow the lines of weakness in rocks, changing direction sharply. ➤ Tributaries meet the mainstream at right angles or high angles, forming a block-like appearance. <p>Example: Drainage in parts of the Vindhyan plateau</p>
Radial Drainage Pattern	<ul style="list-style-type: none"> ➤ Streams flow outward from a central elevated point, like spokes of a wheel. ➤ Common on conical hills, volcanic cones, and domes. ➤ Tributaries extend upslope toward the summit, flowing downwards in all directions. <p>Example: Rivers from Amarnath Peak, Mt. Vesuvius.</p>
Centripetal Drainage Pattern	<ul style="list-style-type: none"> ➤ Opposite of radial pattern. ➤ Streams flow inward into a central basin or depression. ➤ Often associated with interior drainage basins, where water collects in lakes that may later dry up, leaving salt flats. <p>Example: Loktak Lake basin in Manipur, basins in the southwestern USA.</p>

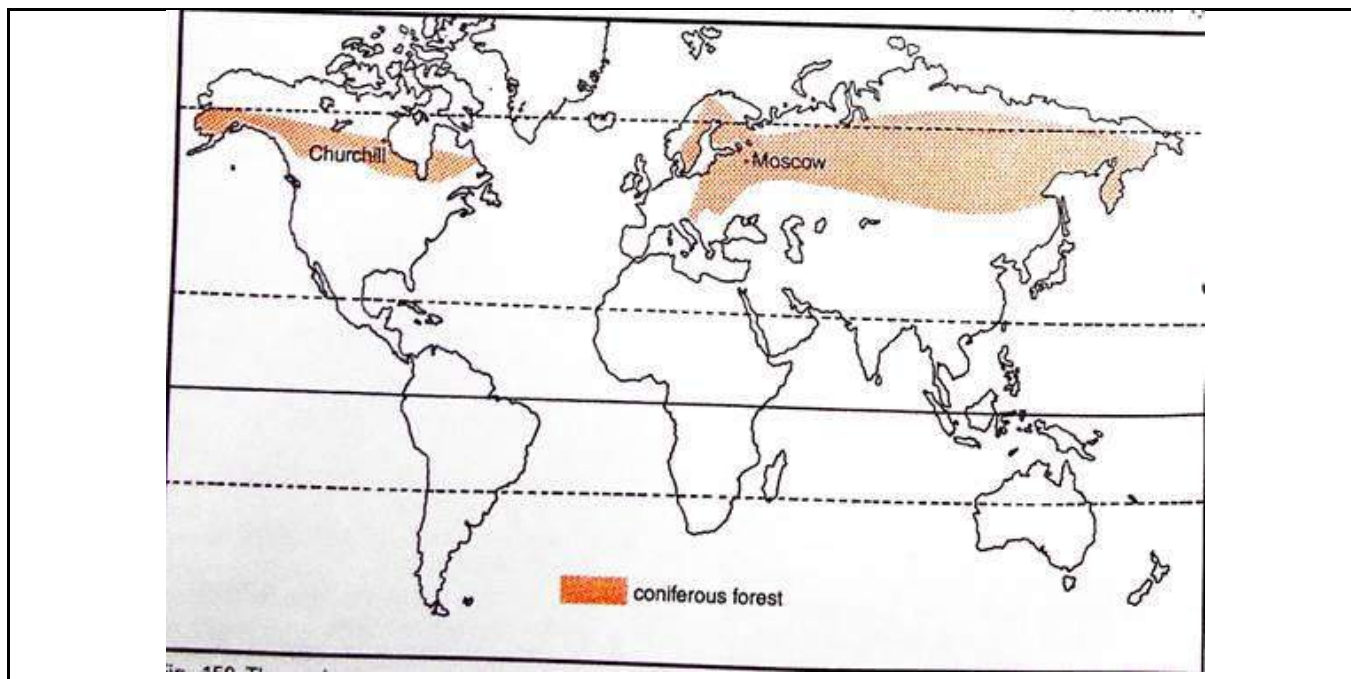
75. Which one of the following activities is a major source of revenue in regions of the Siberian Climate?

- (a) **Lumbering**
- (b) Horticulture
- (c) Viticulture
- (d) All the above

EXPLANATION:

The predominant vegetation of the Cool Temperate Continental (Siberian) Climate, also known as a "sub-Arctic" type of climate, is an evergreen coniferous forest. It stretches in a great, continuous belt across North America, Europe and Asia. The greatest single band of the coniferous forest is the taiga (a Russian word for coniferous forest) in Siberia.

- The coniferous forest regions of the northern hemisphere are comparatively little developed.
- In Canada, Eastern Europe, and Asian Russia, large tracts of coniferous forests are still untouched. Only in the more accessible areas are the forests cleared for Lumbering (a collective term for harvested wood).
- Lumbering is the most important occupation in the Siberian type of climate. It refers to the commercial activity of felling trees and processing them into timber for use in construction, furniture, paper, and other industries.
- In these northerly latitudes, agriculture is almost impossible, and Lumbering replaces farming in the continental interiors. Even where crops are cultivated, farmers are idle in the winter months and can supplement their income by doing lumbering in the forests, as they do in most parts of Europe. **So, Option (a) is correct.**



ADDITIONAL INFORMATION:

THE COOL TEMPERATE CONTINENTAL (SIBERIAN) CLIMATE	
About	<ul style="list-style-type: none"> ➤ The Cool Temperate Continental (Siberian) Climate is experienced only in the northern hemisphere, where the continents within the high latitudes have a broad east-west spread. ➤ The Siberian Climate is conspicuously absent in the southern hemisphere because of the narrowness of the southern continents in the high latitudes. ➤ The strong oceanic influence reduces the severity of the winter, and coniferous forests are found only on the mountainous uplands of southern Chile, New Zealand, Tasmania and south-east Australia.
Natural Vegetation	<ul style="list-style-type: none"> ➤ No other trees are so well adapted as the conifers to withstand such an inhospitable environment as the Siberian type of climate. ➤ The coniferous forest belts of Eurasia and North America are the richest sources of softwood for use in building construction, furniture, matches, paper and pulp, rayon and other branches of the chemical industry. <p>Coniferous forest:</p> <ul style="list-style-type: none"> • Coniferous forests are of moderate density. • Almost all conifers are evergreen. • Conifers are conical in shape. • Leaves are small, thick, leathery and needle-shaped. • There is little undergrowth.
Associated Economic Activities	<p>The Cool Temperate Eastern Margin (Laurentian) Climate is an intermediate type of climate between the British and the Siberian type of climate.</p> <p>Lumbering and its associated timber, paper, and pulp industries are among the most important economic undertakings.</p> <p>Saw-milling: This process converts the logs into sawn timber, plywood, planks, hardboard, and other constructional woods.</p>

	<p>Paper and pulp industry: Timber is pulped by both chemical and mechanical means to make wood pulp, the raw material for paper-making and newsprint. The development of the printing industry has made paper and pulp indispensable. Canada and the USA are leading producers of the world's supplies of newsprint and wood pulp, respectively.</p> <p>As a fuel: Less than a quarter of the world's softwood is burnt as fuel, because its industrial uses are far more significant. In contrast, almost three-quarters of the world's hardwoods are burnt as fuel, particularly tropical hardwoods where the trees occur in mixed stands.</p> <p>As an industrial raw material: From the by-products of the timber, many chemically processed articles are derived, such as rayon, turpentine, varnishes, paints, dyes, liquid resins, wood-alcohols, disinfectants and cosmetics.</p>
Viticulture	<ul style="list-style-type: none"> ➤ Viticulture is defined as the study and practice of cultivating grapevines, primarily aimed at producing fruit suitable for specific purposes, such as winemaking. ➤ It involves managing various factors that influence vine performance and fruit qualities, including environmental conditions and cultivation practices. ➤ Viticulture is one of the agricultural sectors of major economic importance in Mediterranean climate zones.
Horticulture	<ul style="list-style-type: none"> ➤ Horticulture is a branch of agriculture that deals with the cultivation of fruits, vegetables, flowers, and ornamental plants. ➤ Unlike general farming, which often focuses on food grains and large-scale crops, horticulture emphasizes intensive, scientific, and specialized cultivation of high-value plants.

76. Consider the following with respect to the solar insolation:

Statement I : The annual insolation received by the Earth on 4th July is less than that on 3rd January.

Statement II : This is due to the perihelion and aphelion position of Earth with respect to the sun.

Which one of the following is correct with respect to the above statements?

- (a) **Both Statement I and Statement II are correct, and Statement II explains Statement I**
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct
- (d) Statement I is not correct, but Statement II is correct

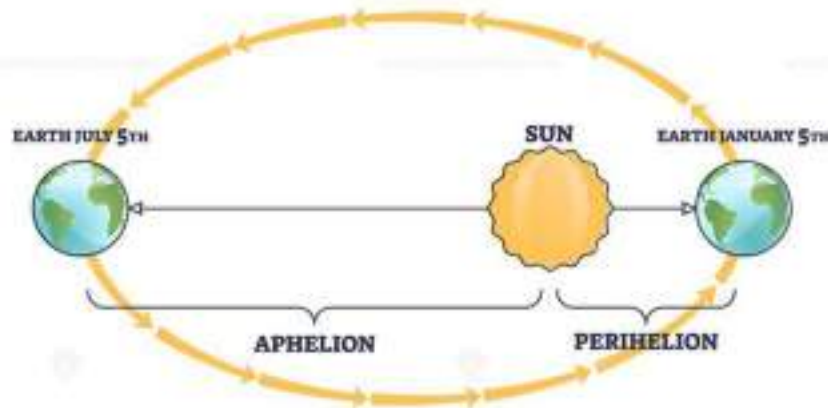
EXPLANATION:

The earth's surface receives most of its energy in short wavelengths. The energy received by the earth is known as incoming solar radiation which in short is termed as insolation.

- As the earth is a geoid resembling a sphere, the sun's rays fall obliquely at the top of the atmosphere, and the earth intercepts a very small portion of the sun's energy.
- On an average the earth receives 1.94 calories per sq. cm per minute at the top of its atmosphere.
- The solar output received at the top of the atmosphere varies slightly in a year due to the variations in the distance between the earth and the sun.
 - During its revolution around the sun, the earth is farthest from the sun (152 million km) on 4th July. This position of the earth is called aphelion.
 - On 3rd January, the earth is the nearest to the sun (147 million km). This position is called perihelion.

Therefore, the annual insolation received by the earth on 3rd January is slightly more than the amount received on 4th July, due to the perihelion and aphelion position of Earth with respect to the sun. **So, Both Statement I and Statement II are correct, and Statement II explains Statement I.**

PERIHELION AND APHELION



ADDITIONAL INFORMATION:

VARIABILITY OF INSOLATION AT THE SURFACE OF THE EARTH

About

The amount and intensity of insolation (incoming solar radiation) vary over the course of a day, a season, and a year. Several factors are responsible for these variations:

- Rotation of the Earth on its axis
- Angle of inclination of the Sun's rays
- Length of the day
- Transparency of the atmosphere
- Configuration of land (slope/aspect)

Among these, the tilt of the Earth's axis ($66\frac{1}{2}^\circ$ with the plane of its orbit, or $23\frac{1}{2}^\circ$ from the perpendicular) and the angle of solar inclination are the most significant.

Effect of Latitude and Solar Angle:

- The latitude of a place determines the angle at which solar rays strike the surface.
- At higher latitudes, the rays are more slanting:
- They spread over a larger surface area, reducing energy received per unit area.
- They pass through a greater thickness of the atmosphere, resulting in more absorption, scattering, and diffusion.
- At lower latitudes (near the equator), rays are more vertical, covering a smaller area and delivering more concentrated energy.

Role of the Atmosphere:

- The atmosphere is largely transparent to shortwave solar radiation, allowing much of the incoming energy to reach the Earth's surface.
- Within the troposphere, gases such as water vapour, ozone, and carbon dioxide absorb a significant portion of near-infrared radiation.
- Dust, smoke, and aerosols scatter incoming visible light in different directions:
- Rayleigh scattering explains why the sky appears blue.
- During sunrise and sunset, when rays travel a longer path, shorter wavelengths are scattered away, leaving red and orange hues.

Minor Factors:

- Length of the day: Longer days allow more time for insolation.
- Local land features: Slopes facing the Sun receive more direct energy

	<p>➤ These, however, have relatively lesser influence compared to axial tilt and solar angle.</p> <p>The variations in insolation are primarily controlled by the Earth's axial tilt and the angle of incidence of solar rays, while the atmosphere further modifies the amount of energy received through absorption, scattering, and diffusion. These processes together explain phenomena such as seasonal changes, latitudinal differences in climate, and optical effects like the blue sky and red sunsets.</p>
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77. Consider the following:

1. It is frozen raindrops or refrozen melted snow-water.
2. It occurs when a warm layer of air lies above a layer of air below freezing near the Earth's surface.

Which of the following Precipitation types is given above?




(a) Hailstones


(b) Sleet

(c) Snow


(d) Dew

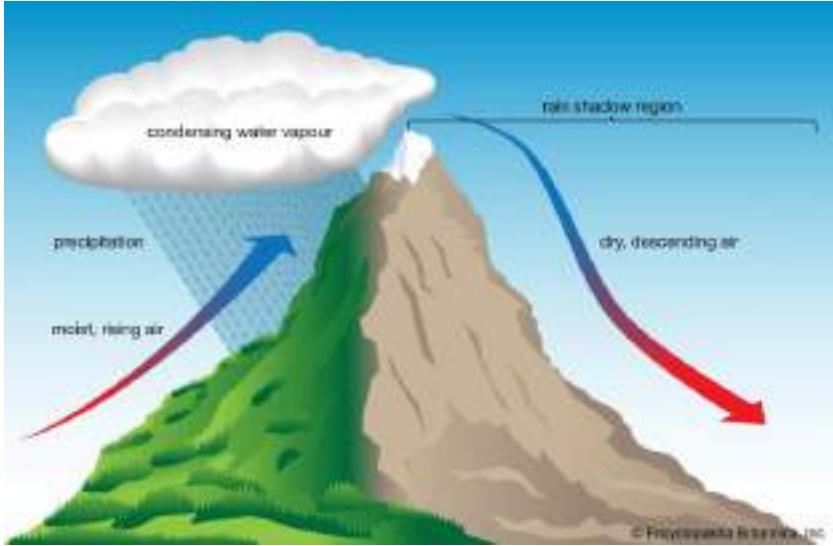
EXPLANATION:

<p>Hailstones</p> 	<p>➤ Precipitation means water falling from the atmosphere to the Earth in liquid or solid form. It happens when water droplets or ice crystals in clouds become too heavy to remain suspended and fall down due to gravity.</p> <p>➤ It can fall as rain, snow, sleet, hail, drizzle, or freezing rain. The exact form depends on the way it forms and the temperature at the time.</p> <p>➤ Hail is precipitation in the form of small balls or lumps of ice (hailstones), usually 5–50 mm in size. They are made of layers of clear and cloudy ice.</p> <p>➤ Hail forms during thunderstorms, when strong upward winds (updrafts) lift water droplets high into the cold part of the atmosphere where they freeze. As they move up and down inside the storm cloud, more layers of ice build up before they finally fall to the ground. Hail is more common in spring and summer. So, Option (a) is not correct.</p>
<p>Sleet</p> 	<p>➤ Sleet is frozen raindrops and refrozen melted snow-water.</p> <p>➤ When a layer of air with the temperature above freezing point overlies a subfreezing layer near the ground, precipitation takes the form of sleet.</p> <p>➤ Raindrops, which leave the warmer air, encounter the colder air below.</p> <p>➤ As a result, they solidify and reach the ground as small pellets of ice, no larger than the raindrops from which they are formed.</p> <p>➤ Sleet has diameters of 5 mm or less. So, Option (b) is correct.</p>
<p>Snow</p> 	<p>➤ When condensation occurs below the freezing point (-0°C), the water vapour changes into tiny ice crystals.</p> <p>➤ These tiny ice crystals grow in size and form ice flakes, which become big and heavy and start falling on the ground.</p> <p>➤ This form of precipitation is called snowfall. Snowfall is very common in the Western Himalaya and mid and high latitude regions in winter. So, Option (c) is not correct.</p>

Due 	<ul style="list-style-type: none"> ➤ When moisture is deposited in the form of water droplets on the cooler surfaces of solid objects (rather than nuclei in air above the surface), such as stones, grass blades, and plant leaves, it is known as dew. ➤ The ideal conditions for its formation are clear sky, calm air, high relative humidity, and cold and long nights. ➤ For the formation of dew, it is necessary that the dew point is above the freezing point. So, Option (d) is not correct.
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ADDITIONAL INFORMATION:

TYPES OF RAINFALL	
About	<p>Rain is the precipitation in the form of liquid that falls from the clouds in the sky. It is the most important component of the hydrological cycle that recharges most of the freshwater bodies on the Earth's surface. Meteorologists have identified three different types of rainfall based on the process of cloud formation. These three types of rainfall are classified as follows:</p> <ul style="list-style-type: none"> ➤ Convective Rainfall ➤ Orographic Rainfall ➤ Cyclonic Rainfall
Convective Rainfall	<p>The air, being heated, becomes light and rises up in convection currents. As it rises, it expands and loses heat and consequently, condensation takes place and cumulus clouds are formed. With thunder and lightning, heavy rainfall takes place, but this does not last long. Such rain is common in the summer or in the hotter part of the day. It is very common in the equatorial regions and the interior parts of the continents, particularly in the Northern Hemisphere.</p> <div style="text-align: center;">  </div>
Orographic Rainfall	<p>Orographic rainfall occurs where the mountains act as barriers in the path of moisture-loaded air. Once the moisture-loaded air strikes the mountain, it rises, leading to its condensation and precipitation. Thus, rainfall is greater on the windward side of the mountain compared to the leeward side, or rain shadow area, of the mountain.</p>

	
Cyclonic Rainfall	A low-pressure area in the atmosphere with circular wind movement is known as a cyclone. The cyclonic rainfall is caused by the motion of a moist air parcel to the low-pressure area, mainly due to the pressure difference.

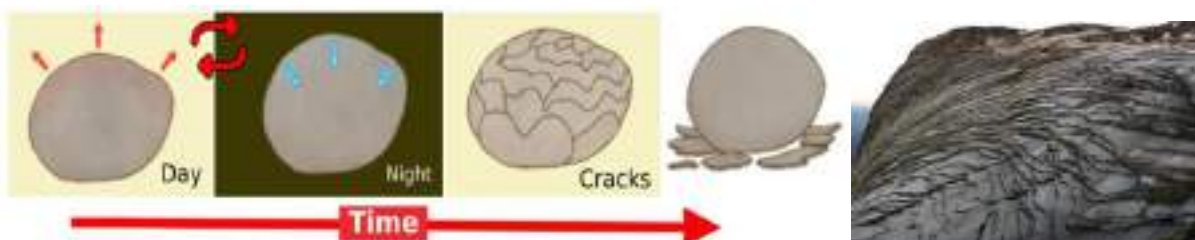
78. The term 'Exfoliation' denotes:

- (a) Angular fragments of rocks that are prised from mountain-sides and fall down the slope, where they are accumulated.
- (b) Slow, gradual but more or less continuous movement of soil down hillslopes.
- (c) Gradual splitting of surface layers of rounded boulders, one after another.**
- (d) Splitting of individual grains within rocks, which eventually fall off.

EXPLANATION:

Weathering describes the breaking down or dissolving of rocks and minerals on the surface of Earth. It is often divided into the processes of mechanical weathering, chemical weathering and biological weathering. Exfoliation is a physical weathering process.

- In deserts, rocks are exposed to the blazing sun during the day and are intensely heated. The outer layers expand much faster than the cooler interior of the rocks and tend to pull away from the rest.
- At nightfall, the temperature drops rapidly, and the outer layers contract more rapidly than the interior, creating internal stresses. Such stresses, repeated every day for months and years, cause the rocks to crack and split. Well-bedded and jointed rocks tend to split along the joints or cracks, breaking up into rectangular blocks.
- Rectangular blocks are thus gradually rounded by the splitting away of sharp corners. When the surface layers of rounded boulders gradually split off, the process is called onion peeling, because the various layers resemble the layers of an onion, peeled off one after another. The technical term for this process is exfoliation. **So, Option (c) is correct.**



ADDITIONAL INFORMATION:

WEATHERING AND MASS MOVEMENTS	
About	<p>Weathering: It is the gradual disintegration of rocks by atmospheric or weather forces. The work of weathering in breaking up the rocks is of two kinds, namely chemical and physical or mechanical weathering, but the processes involved in each are closely interrelated.</p> <p>Mass movement: It is the movement of weathered materials down a slope due to gravitational forces. The movement may be gradual or sudden, depending on the gradient of the slope, the weight of the weathered debris and whether there is any lubricating moisture supplied by rainwater. Several kinds of mass movement are distinguished.</p>
Screes Formation	<ul style="list-style-type: none"> ➤ In temperate latitudes, frost is a potent rock breaker. All rocks contain cracks and joints, or pore spaces, and after a shower, water or snow collects in such places. ➤ When the temperature drops at night or during the winter, this water freezes. When water freezes, it expands by one-tenth of its volume and exerts a bursting pressure of almost 140 kg per square cm (2,000 lb. to the square inch). Repeated freezing of this kind will deepen and widen the original cracks and crevices and break the rock into angular fragments. ➤ On mountain peaks, this process creates sharp pinnacles and angular outlines. Such peaks are described as frost-shattered peaks. Angular fragments of rocks are prised from mountain-sides or cliff faces and fall to the foot of the slope, where they accumulate to form screes.
Soil Creep	<ul style="list-style-type: none"> ➤ This is a slow, gradual, but more or less continuous movement of soil down hillslopes. ➤ The movement is not very noticeable, especially when the slope is fairly gentle or when the soil is well-covered with grass or other vegetation. ➤ Soil creep is most common in damp soils where the water acts as a lubricant so that individual soil particles move over each other and over the underlying rock. It is also found where continuous trampling by animals grazing on the slopes sets up vibrations which loosen the soil and cause it to move. ➤ Though the movement is slow and cannot readily be seen in action, the gradual movement tilts trees, fences, posts, and so on, which are rooted in the soil. ➤ The soil is also seen to accumulate at the foot of the slope or behind obstacles such as walls, where the weight of soil above may eventually burst.
Salt Weathering – Granular Disintegration	<ul style="list-style-type: none"> ➤ Salts in rocks expand due to thermal action, hydration and crystallisation. ➤ Many salts, such as calcium, sodium, magnesium, potassium, and barium, have a tendency to expand. Expansion of these salts depends on temperature and their thermal properties. ➤ High surface temperatures in deserts, ranging between 30 and 50°C, favour such salt expansion. ➤ Salt crystals in near-surface pores cause splitting of individual grains within rocks, which eventually fall off. This process of falling off individual grains may result in granular disintegration or granular foliation.

79. Consider the following statements:

1. Receives steady rainfall from the trade winds throughout the year.
2. The climatic region is prone to severe tropical cyclones.

Which among the following climates is described above?

- (a) Tropical Monsoon Climate
- (b) Tropical Marine Climate**
- (c) Natal Type Climate
- (d) China-type Climate

EXPLANATION:

The Tropical Marine Climate is experienced along the eastern coasts of tropical lands, receiving steady rainfall from the Trade Winds throughout the year.

Rainfall occurs by:

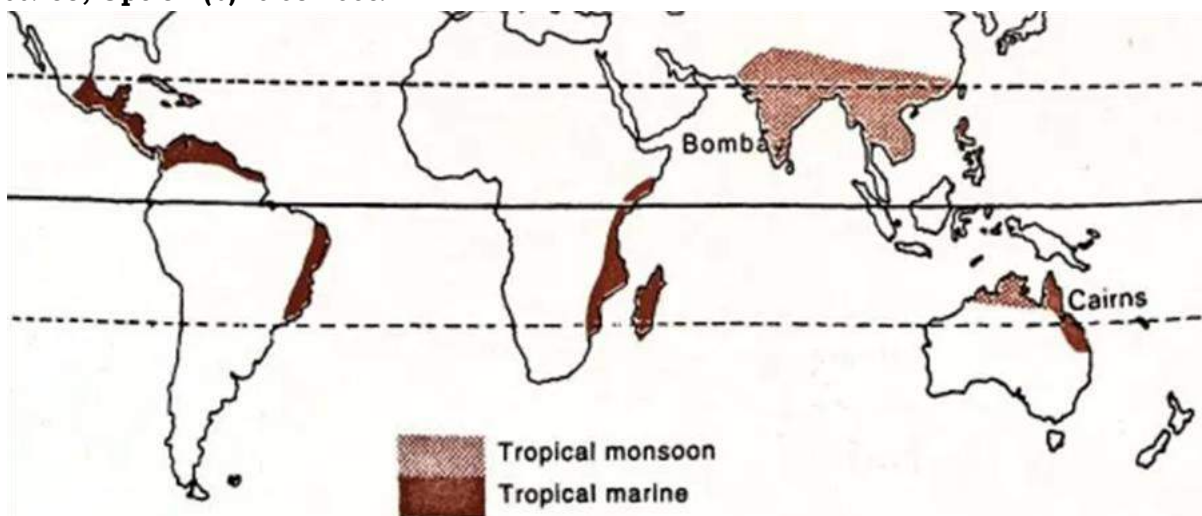
- Orographic uplift – when moist trade winds meet upland masses (e.g., eastern Brazil).
- Convectonal rainfall – due to intense daytime and summer heating.

Rainfall shows a tendency towards a summer maximum, similar to monsoon regions, but without any distinct dry period. The wettest months are January, February, March, and April (summer in the Southern Hemisphere). Approximately 70% of the annual rainfall is concentrated in these four summer months, though there is no month without rainfall.

Temperature range is typical of tropical latitudes:

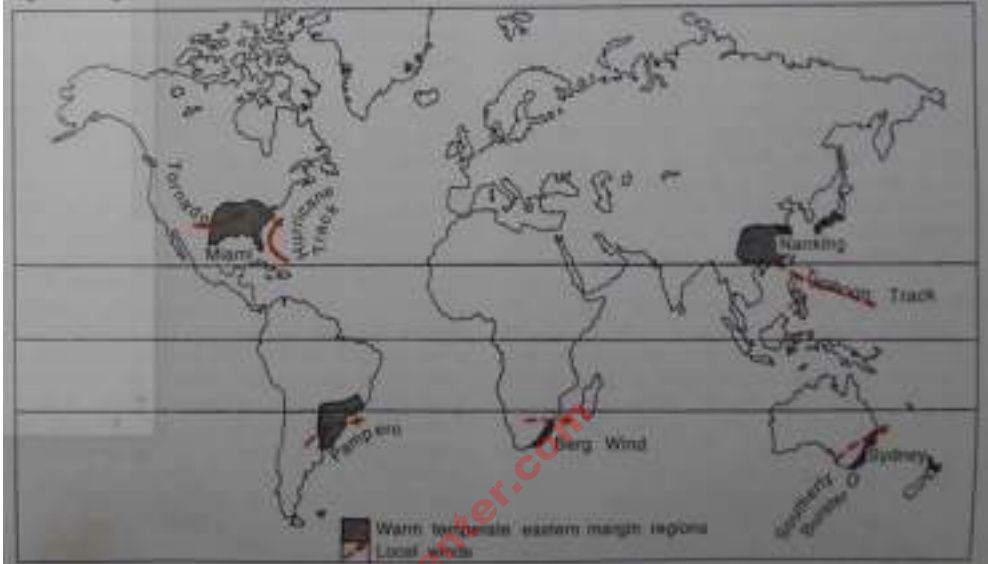
- Maximum: 82°F (January)
- Minimum: 70°F (July)
- Annual range: ~12°F

Due to the steady influence of the trades, this climate is favourable for habitation, but it is also prone to severe tropical cyclones, hurricanes, and typhoons. Thus, the Tropical Marine Climate receives steady rainfall from the trade winds throughout the year, and this region is prone to severe tropical cyclones. **So, Option (b) is correct.**



ADDITIONAL INFORMATION:

CLIMATES	
China/Natal type Climate	<p>China type of climate is found on the eastern margins of continents in warm temperate latitudes, just outside the tropics. It is sometimes referred to as the Natal type of climate.</p> <ul style="list-style-type: none"> ➤ Rainfall is more than moderate, anything from 25 inches to 60 inches.

	<ul style="list-style-type: none"> ➤ Another important feature is the fairly uniform distribution of rainfall throughout the year. ➤ There is rain every month, except in the interior of central China, where there is a distinct dry season. ➤ Rain comes either from convections sources or as orographic rain in summer, or from depressions in prolonged showers in winter. ➤ Local storms, e.g. typhoons, and hurricanes, also occur. 
Tropical Monsoon Climate	<p>A tropical monsoon climate is characterized by high temperatures, abundant rainfall, and a seasonal reversal of winds, primarily caused by the differential heating of land and sea.</p> <ul style="list-style-type: none"> ➤ In summer, land in Asia becomes very hot and creates low pressure, while the sea stays cooler. Winds cross the equator and bring heavy rains to India as the South-West Monsoon. ➤ In winter, land becomes very cold and creates high pressure, while Australia has low pressure. Winds blow out from Asia as the North-East Monsoon, and after crossing the equator, they reach Australia as the North-West Monsoon. The seasonal reversal of winds is the main feature of the monsoon climate.

80. In West Africa, the North-East Trades blow offshore from the Saharan Desert and reach the Guinea Coast as a dry, dust-laden wind. It is so dry that its relative humidity seldom exceeds 30 per cent. The wind provides a welcome relief from the damp air of the Guinea lands by increasing the rate of evaporation with resultant cooling effects. The wind is locally called:

- (a) Sirocco
- (b) Harmattan**
- (c) Khamsin
- (d) Simoom

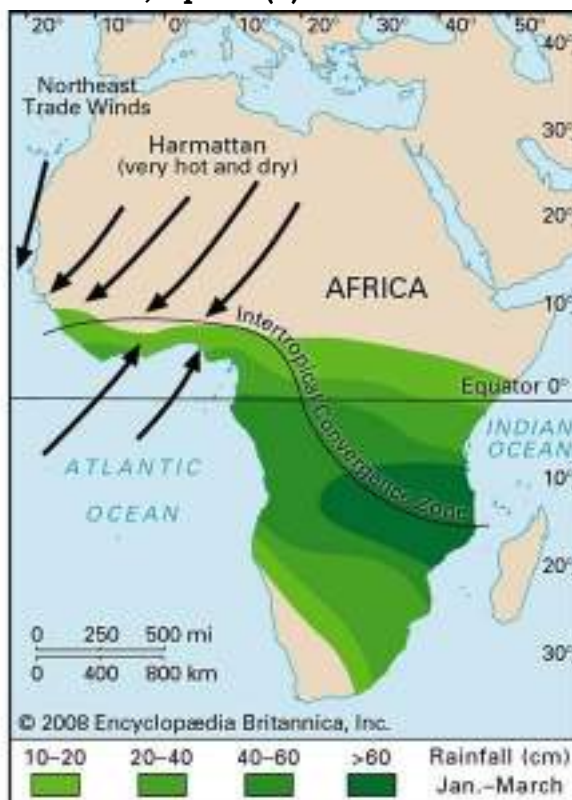
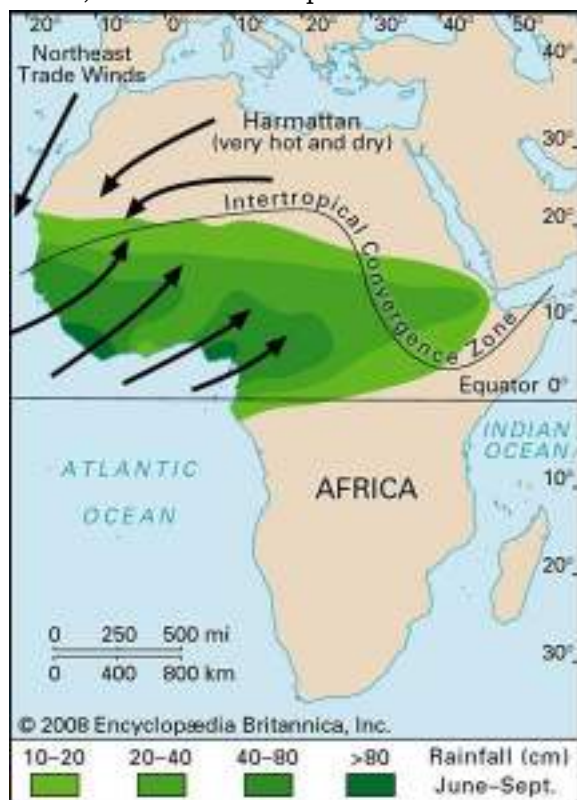
EXPLANATION:

Sirocco is a warm, dry and dusty local wind, which blows in northerly direction from Sahara Desert and after crossing the Mediterranean Sea, reaches even upto Italy and Spain. It becomes extremely warm and dry while descending through the northern slopes of the Atlas Mountain.

It is known as Khamsin in Egypt, Gibli in Libya, Chili in Tunisia, Simoom in Arabian Desert, Blood Rain in South Italy, Leveche in Spain and Gharbi in the Adriatic and Aegean Sea. **So, Options (a), (c) and (d) are not correct.**

In West Africa, the North-East Trades, in fact, blow offshore from the Sahara Desert and reach the Guinea coast as a dry, dust-laden wind, called locally the Harmattan. meaning 'The doctor'. It is so dry that its relative humidity seldom exceeds 30 per cent.

- The 'doctor' provides a welcome relief from the damp air of the Guinea lands by increasing the rate of evaporation with resultant cooling effects, but it is such a dry dusty wind that, besides ruining the crops, it also stirs up a thick dusty haze and impedes inland river navigation.
- Similar winds are called as "Brickfielders" in Victoria (Australia), "BlackRollers" in the Great Plains of USA, "Shamal" in Iraq and Norwester in New Zealand. **So, Option (b) is correct.**



ADDITIONAL INFORMATION:

LOCAL WINDS	
Recently in News	West Africa's hazardous winds: Harmattan from Sahara carries more than dust and microbes that cause respiratory infections and tuberculosis.
Harmattan	The Harmattan originates as a north-east trade wind from the Sahara Desert, strengthened by high-pressure systems over the Sahara and Azores, blowing towards the Gulf of Guinea.
Chinook	These are hot and dry winds that blow down the eastern slopes of Rocky Mountains of North America. The literal meaning of chinook is "snow eater" as it helps in the melting the snow. This wind blows during the wintertime and causes melting of snow in the Prairie region.
Foehn	These are hot dry winds like chinook that blow down the northern slopes of Alps. The temperature of these winds varies from 15° C to 20° C which also help in melting the snow, thus making pastures ready for animal grazing and help the grapes to ripe early.

Loo	These are hot and dry winds that blow over the northern plains of India during the months of May and June. They usually occur during the afternoons, and their direction is generally from west to east. Temperature of loo winds varies between 45° C to 50° C.
Mistral	These are cold and dry winds. They originate on the Alps and blow down the southern slopes of Alps towards France and Mediterranean Sea through Rhone valley. They lower temperature below the freezing point in areas of their influence.
Bora	Bora is a cold, dry, gusty northeasterly wind blowing from the Dinaric Alps to the Adriatic Sea. Speeds usually range 100–150 km/h, but can exceed 200 km/h. It causes sudden temperature drops and is hazardous for transport, especially shipping.
Blizzards	These are violent, stormy and extremely cold polar winds laden with dry snow and are prevalent in north and south Polar Regions, Siberia, Canada and some parts of USA.

81. Consider the following statements with respect to the Masai tribes of Africa:

1. They are settled cultivators who inhabit the central highlands of Kenya, Uganda and Tanzania.
2. They domesticate cattle and goats for both milk and meat.

Which of the statements given above is/ are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

EXPLANATION:

In the savanna lands of the tropics live many different tribes who are either cattle pastoralists like the Masai of the East African plateau or settled cultivators like the Hausa of northern Nigeria.

- The Masai tribe cattle pastoralists (not a settled cultivators) are a nomadic tribe who once wandered with their herds of cattle in the central highlands of East Africa - in Kenya, Tanzania and Uganda.

So, Statement 1 is not correct.

- The cattle kept by the Masai are the Zebu cattle with humps and long horns. They are treated with great respect and affection and are never slaughtered for food or for sale.
- Cattle are kept by every Masai family. They are considered far more valuable than anything else and are symbols of wealth. The richest man has the largest herds of cattle, leaving aside the sheep and goats which, to the Masai tribes, are of little significance.
- Cattle are used in payment for wives, and when the father of a family dies, the mother divides the livestock among the sons.
- The Masai will not slaughter the cattle for food, so from the agricultural. The Masai tribe's men drink the blood as well as the milk of their animals but do not kill them for meat. **So, Statement 2 is not correct.**



82. Consider the following statements:

Statement I : Southern Europe get most of their rainfall during winter.

Statement II : Pressure belts shift southward when the sun is overhead over the Tropic of Capricorn.

Which one of the following is correct with respect to the above statements?

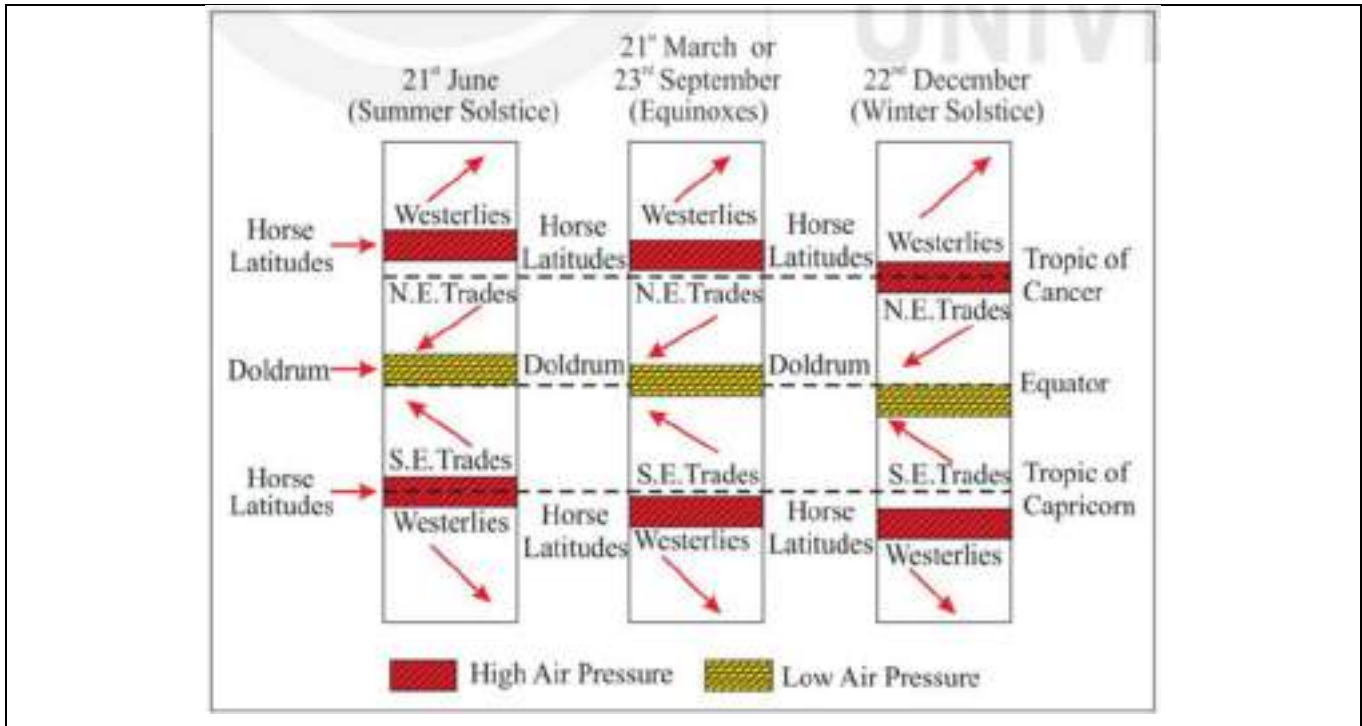
- (a) **Both Statement I and Statement II are correct, and Statement II explains Statement I**
- (b) Both Statement I and Statement II are correct, but Statement II does not explain Statement I
- (c) Statement I is correct, but Statement II is not correct
- (d) Statement I is not correct, but Statement II is correct

EXPLANATION:

Southern Europe experiences the Mediterranean Climate. Mild, wet winters as well as hot, dry summers characterise the Mediterranean climate.

- In summer, when the sun is overhead at the Tropic of Cancer, the belt of influence of the westerlies is shifted a little polewards. Rain-bearing winds are therefore not likely to reach the Mediterranean region. The prevailing Trade winds are offshore, and there is practically no rain. The air is dry; the heat is intense, and the relative humidity is low. Days are excessively warm, and prolonged droughts are common in the interior. At night, there is rapid radiation, but frosts are rare.
- In winter, when the sun is overhead at the Tropic of Capricorn, the belt of influence of the westerlies is shifted a little equatorward. This makes the prevailing Westerlies on-shore over southern Europe and brings widespread rains in the region. Most of the rainfall in the regions falls mostly in winter than in the summer as the prevailing trade winds are dry, offshore winds.

Therefore, pressure belts shift southward when the sun is overhead over the Tropic of Capricorn, which makes prevailing Westerlies on-shore and brings winter rain to Southern Europe. **Both Statement I and Statement II are correct, and Statement II explains Statement I.**



83. **Assertion (A) :** The Tarai belt is marshy and swampy with luxurious vegetation.

Reason (R) : Rivers re-emerge in the Tarai without properly defined channels, causing swampy conditions.

- (a) Both Assertion and Reason are true, and Reason is the correct explanation of Assertion
 (b) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion
 (c) Assertion is true, but Reason is false
 (d) Assertion is false, but Reason is true

EXPLANATION:

The Northern Plains of India have been formed by the extensive alluvial deposits brought down by the three major river systems—the Indus, the Ganga, and the Brahmaputra.

Extending for about 3,200 km from west to east with an average width of 150–300 km, these plains have an alluvial depth ranging between 1,000–2,000 m, making them one of the most fertile regions in the world. From north to south, the plains are divided into three distinct zones: the Bhabar, the Tarai and the alluvial plains.

Bhabar

- A narrow belt (8–10 km wide) lying parallel to the Shiwalik foothills.
- Here, streams and rivers descending from the Himalayas deposit coarse materials such as boulders and pebbles.
- Due to the porous nature of the sediments, rivers often disappear into the ground in this zone.

Tarai

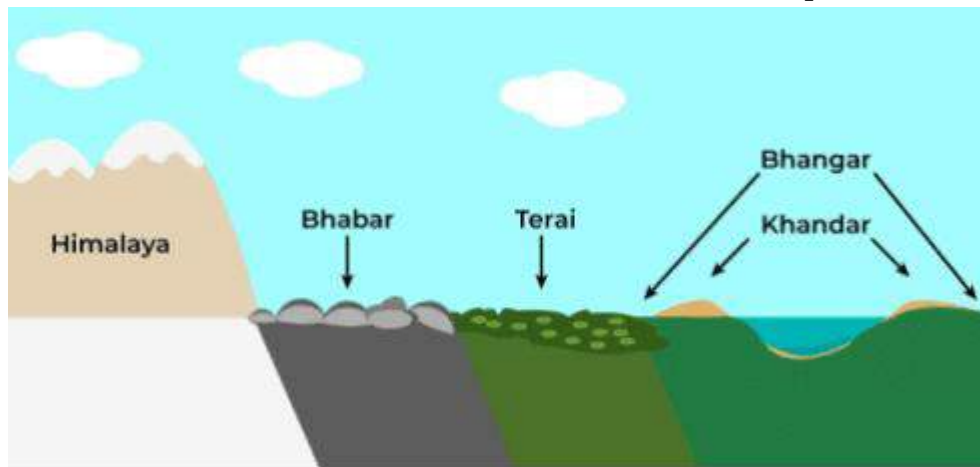
- Located south of the Bhabar, with a width of about 10–20 km.
- Streams and rivers re-emerge on the surface without well-defined channels, creating marshy and swampy conditions.
- The Tarai is rich in natural vegetation and provides habitat for a wide variety of wildlife.

Alluvial Plains

- The largest part of the Northern Plains, consisting of **fine alluvium** deposited by rivers.
- These plains are further subdivided into:

- Bhangar: The older alluvium, found at slightly higher elevations. Contains kankar (calcareous nodules) and represents relatively less fertile soil.
 - Khadar: The newer alluvium, deposited annually during floods along river courses. Highly fertile and intensively cultivated.
- These plains exhibit typical fluvial landforms such as:
- Sand bars
 - Meanders
 - Oxbow lakes
 - Braided channels

So, Both Assertion and Reason are true, and Reason is the correct explanation of Assertion



84. Consider the following:

1. Absence of shade is the distinct feature of this Climate.
2. These Climatic conditions don't suit grass growth.
3. Viticulture is the predominant occupation.

Which of the following climatic regions has the above characteristics?

- (a) British Climate
(b) Mediterranean Climate
 (c) Steppe climate
 (d) Siberian Climate

EXPLANATION:

The Warm Temperate Western Margin (Mediterranean) Climate is found in relatively few areas in the world. They are entirely confined to the western portion of continental masses, between 30° and 45° north and south of the equator. The basic cause of this type of Climate is the shifting of the wind belts.

Characteristics of Mediterranean Climate:

- Half of the year is dry.
- A dry, warm summer with offshore trades.
- A concentration of rainfall in winter with on-shore Westerlies.
- Bright, sunny weather with hot, dry summers and wet, mild winters.
- Trees with small, broad leaves are widely spaced and never very tall. Though there are many branches, they are short and carry few leaves. The absence of shade is a distinct feature of Mediterranean lands.
- Conditions in the Mediterranean do not suit grass, because most of the rain comes in the cool season when growth is slow.

- Viticulture is by tradition a Mediterranean occupation, and the regions bordering the Mediterranean Sea account for three-quarters of the world's production of wine. **So, Option (b) is correct.**

ADDITIONAL INFORMATION:

WORLD CLIMATES	
British Climate	<ul style="list-style-type: none"> ➤ The cool temperate western margins are under the permanent influence of the Westerlies throughout the year. ➤ They are also regions of much cyclonic activity, typical of Britain, and are thus said to experience the British type of Climate. ➤ The natural vegetation of this climatic type is deciduous forest. The trees shed their leaves in the cold season. This is an adaptation for protecting themselves against the winter snow and frost.
Steppe Climate	<ul style="list-style-type: none"> ➤ The term 'steppe vegetation' geographically refers to the scanty vegetation of the sub-arid lands of continental Eurasia. ➤ The temperate grasslands are ideal for extensive wheat cultivation. The cool, moist spring stimulates early growth, and the light showers in the ripening period help to swell the grains to ensure a good yield. ➤ The annual precipitation of the Steppe Climate can be expected to be light.
Siberian Climate	<ul style="list-style-type: none"> ➤ The Cool Temperate Continental (Siberian) Climate is experienced primarily in the Northern Hemisphere, where the continents within the high latitudes have a broad east-west spread. ➤ The Climate of the Siberian type is characterised by a bitterly cold winter of long duration, and a cool, brief summer. Spring and autumn are merely brief transitional periods.

85. Consider the following countries:

- I. Turkey
- II. Jordan
- III. Syria
- IV. Saudi Arabia
- V. Iraq
- VI. Iran

The Zagros mountains pass through how many of the above countries?

- (a) Only two
- (b) **Only three**
- (c) Only four
- (d) Only five

EXPLANATION:

The Zagros Mountains are a major mountain range in Central Asia, stretching about 1,500 km from eastern Turkey and northern Iraq across the Iranian Plateau to the Strait of Hormuz in southern Iran. Mount Dena, at 14,465 feet, is the highest peak.

The mountains are mostly made of limestone and shale from the Mesozoic and Paleogene periods, with some rocks dating back to the Precambrian. The range formed due to the collision of the Eurasian and Arabian tectonic plates, and the land continues to undergo tectonic changes.

The Zagros Mountains are 1250 km long and 160–360 km wide, with varied climates ranging from warm to cold. Vegetation is rich and diverse, including oak forests covering about 10 million hectares

and wild pistachio forests in the southeastern region. Therefore, the Zagros mountains pass through Turkey, Iran and Iraq. **So, Option (b) is correct.**



86. Consider the following statement:

1. All the sedimentary rocks have different strata of different types of sediments.
2. Most of the sedimentary rocks are ex-situ rocks.

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) **Both 1 and 2**
- (d) Neither 1 nor 2

EXPLANATION:

Sedimentary rocks are also called stratified or layered rocks because they have different layers or strata of different types of sediments.

The layering can be due to differences in colour of the material, differences in grain size, or differences in mineral content or chemical composition. All of these differences can be related to differences in the environment present during the depositional events. Sometimes layers are absent in some sedimentary rocks, for example, loess. **So, Statement 1 is correct.**

Sedimentary rocks are formed from sediments that result from the weathering and erosion of pre-existing rocks. These sediments are transported ("ex-situ") to new locations, where they accumulate and harden into rock. Unlike igneous and metamorphic rocks, which form deep within the Earth, sedimentary rocks are created on or near the Earth's surface.

The main processes involved in forming sedimentary rocks are:

- Weathering and Erosion – Wind, rain, and other forces break down rocks into smaller particles like sand or mud.
- Dissolution – Slightly acidic water chemically weathers rocks, breaking them down.
- Precipitation – Minerals form from chemicals that come out of water.
- Lithification – Sediments are compacted and cemented to form solid rock.

Together, these processes transform raw sediments into new sedimentary rocks.

So, Statement 2 is correct.

ADDITIONAL INFORMATION:

SEDIMENTARY ROCKS

About

Sedimentary rocks are formed from sediments that accumulate over long periods, usually in water. They are layered (stratified), with strata ranging from a few inches to many feet in thickness, and can be coarse or fine-grained, soft or hard. The sediments that form these rocks may be carried by rivers, glaciers, winds, or even animals.

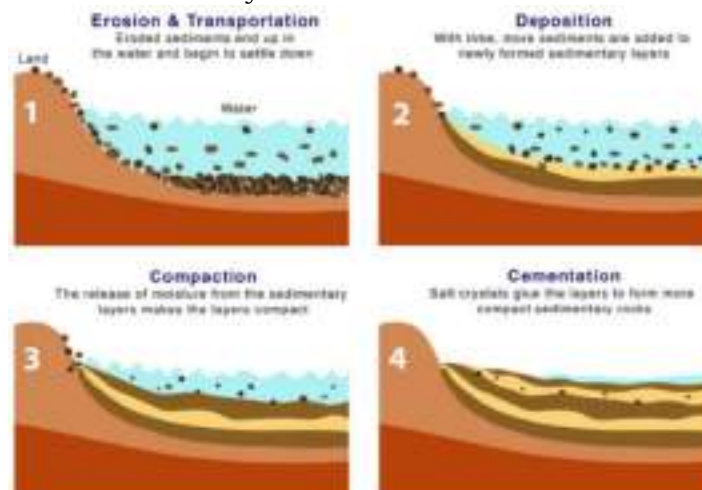
Sedimentary rocks are non-crystalline, often contain fossils of plants and animals, and are the most varied in their formation.

They are classified by age, with rocks formed in the same period grouped together.

- **Mechanically Formed Rocks:** These are formed from the accumulation and cementation of rock fragments. Sandstone is the most common type, made from sand grains (often quartz from granite) and used in construction. A coarse variety is called grit. When larger pebbles are cemented, the rock is called conglomerate (rounded pebbles) or breccia (angular fragments). Finer materials form clay (used for bricks), shale, or mudstone, while sand and gravel may remain uncemented.
- **Organically Formed Rocks:** These are made from the remains of living organisms. Limestones and chalk come from shells and corals. Carbonaceous rocks form from plant remains in swamps and forests; under pressure, they turn into peat, lignite, or coal, which are economically valuable.
- **Chemically Formed Rocks:** These form when minerals precipitate from solutions. Rock salt comes from dried-up seas or lakes, while gypsum (calcium sulphate) forms from the evaporation of highly saline lakes such as the Dead Sea.

FORMATION OF SEDIMENTARY ROCKS- STEP BY STEP PROCESS:

- **Weathering & Erosion** – Existing rocks break down into smaller particles (sediments) through physical, chemical, and biological processes caused by wind, water, ice, or temperature changes.
- **Transportation** – Agents like rivers, wind, glaciers, or waves carry these sediments away from their source.
- **Deposition** – When the transporting agents lose energy, sediments settle down in rivers, lakes, oceans, deserts, or deltas. The type of sediment depends on the environment.
- **Compaction** – Over time, layers of sediments pile up. The weight of upper layers compresses the lower ones, squeezing out pore spaces.
- **Cementation** – Minerals (like calcite, silica, or iron oxides) dissolved in groundwater fill the gaps between sediment grains, binding them together.
- **Lithification** – The combined processes of compaction + cementation transform loose sediments into solid sedimentary rock.
- **Diagenesis** – After lithification, further physical, chemical, or biological changes occur (e.g., new minerals forming, porosity changes), affecting rock properties
- **Layer Formation** – Continuous deposition forms layered structures (strata), each layer representing a period of Earth's history.



87. The Philadelphi corridor, recently in the news, connects which of the following regions?

- (a) United States and Canada
- (b) United States and Mexico
- (c) West Bank and Israel
- (d) Gaza and Egypt**

EXPLANATION:

The Philadelphi Corridor, a buffer zone on the border of the Gaza Strip and Egypt that is secured through special arrangements between Egypt and Israel, which occupied the Gaza Strip between 1967 and 2005.

The Philadelphi corridor is a ribbon of land about nine miles (14 km) in length and 100 meters wide along Gaza's border with Egypt, including the Rafah crossing. It was designated as a demilitarised border zone after the withdrawal of Israeli settlements and troops from Gaza in 2005 and runs from the Mediterranean to the Kerem Shalom crossing with Israel. The corridor lies on the northeastern corner of an area, primarily comprising the Sinai Peninsula.

The corridor was recently in the news, amid the Israel-Hamas War. **So, Option (d) is correct.**



88. Recently, Suweyda province in Syria caught the international attention for which one of the following reasons?

- (a) Discovery of rich deposits of rare earth elements
- (b) Israel captures through military action
- (c) Inter-ethnic violence**
- (d) Volcanic eruption

EXPLANATION:

Over 300 people have been killed in a week of violent clashes between Syria's Druze minority and Sunni Bedouin tribes in and around the southern city of Sweida, as government efforts to enforce a ceasefire falter and fears of wider conflict grow.

The Bedouins are traditionally nomadic, Arabic-speaking tribes who have inhabited the deserts of the Middle East and North Africa for centuries. In Syria, Bedouins have primarily lived in the expansive Al-Badia desert, which covers much of the country's south and east, including provinces like Sweida, Homs, and Deir ez-Zor.

- The Druze and Bedouins in southern Syria have shared a long and complicated history, sometimes as partners, sometimes as rivals. The Bedouins lived in the region long before the Druze arrived in the 17th and 18th centuries. Over time, the two communities built strong economic and social ties.
- Bedouins traded salt, helped herd livestock, and worked with Druze families in farming and transport. In return, the Druze offered access to goods, water, and markets. Their cultures influenced each other.
- The two groups have also fought side by side. During the Great Syrian Revolt against French rule in the 1920s, Druze and Bedouin fighters joined forces and won key battles.

Therefore, Suweyda province in Syria caught the international attention for Inter-ethnic violence between Druze and Bedouins. **So, Option (c) is correct.**



89. With reference to passion fruit, consider the following statements:

1. It is generally cultivated in tropical regions of the world.
2. It is native to the USA.

Which of the statements given above is/are correct?

- (a) 1 only**
 (b) 2 only
 (c) Both 1 and 2
 (d) Neither 1 nor 2

EXPLANATION:

Passion Fruit (*Passiflora edulis*) is a small-sized, round fruit with a unique appearance and exotic taste through its hard, wrinkled outer shell and soft, juicy inner flesh filled with abundant seeds.

It is grown mostly in tropical and sub-tropical parts of the world, and it is particularly important commercially grown in Australia, Hawaii, South Africa and Brazil.

In India, it is found to be growing wild in many parts of the Western Ghats, such as Nilgiris, Wayanad, Kodaikanal, Shevroys, Coorg and Malabar, as well as Himachal Pradesh and North Eastern States like Manipur, Nagaland and Mizoram. **So, Statement 1 is correct.**



Passion Fruit is native to Brazil and Ecuador (not the USA), where it is used for both medicinal purposes as a sedative and as a food source.

Passion fruit is grown nearly everywhere in the tropical belt, from South America to Australia, Asia, and Africa. South America is currently the largest producer of passion fruit. The total global supply of passion fruit is estimated at 8.52 lakh tons, with major producing countries comprising Brazil, Mexico, Ecuador, Australia, Zimbabwe, Kenya and Colombia. Over 95% of the production is the yellow form for juice extraction, while purple contributes predominantly to the fresh fruit trade. **So, Statement 2 is not correct.**

ADDITIONAL INFORMATION:

PASSION FRUIT (PASSIFLORA EDULIS)	
About	<ul style="list-style-type: none"> ➤ The fruit is valued for its pronounced flavour and aroma, which not only helps produce a high-quality squash but also flavours several other products. ➤ The juice of passion fruit, with an excellent flavour, is quite delicious, nutritious and liked for its blending quality. To enhance the flavour of the final produce, passion fruit juice is often mixed with juices of pineapple, mango, ginger, etc. The juice is extensively used in confectionery and the preparation of cakes, pies and ice cream. ➤ It is a rich source of Vitamin A and contains fair amounts of Sodium, Magnesium, Sulphur and Chlorides. ➤ Commercial Processing of yellow passion fruit yields 36% juice, 51% rinds and 11% seeds.
Varieties	Out of several species, purple passion fruit (<i>Passiflora edulis</i> Sims), Yellow Passion fruit (<i>Passiflora edulis</i> var. <i>flavicarpa</i>) and 'Kaveri' Hybrid passion fruit (Purple x Yellow) are of commercial importance in India.

90. With reference to recent data on migration and remittances from the Reserve Bank of India, consider the following statements:

1. Better job opportunities act as a Push factor in migration.
2. There is an increase in migration to the Gulf from India's Northern States compared to that of Southern States.
3. Southern States of India receive more remittances from the Gulf compared to Northern States.

How many of the above statements is/are correct?

- (a) Only one
(b) **Only two**
(c) All three
(d) None

EXPLANATION:

In India, numerous micro studies indicate that the landless poor constitute the majority of migrants.

- The main push factors, which may be enumerated as unemployment, underemployment, low wages, poverty, socio-political deprivation, land alienation, the penetration of the market economy, the decay of cottage industries, the mechanisation of agriculture, environmental degradation, and the loss of common property resources, have forced them to invent new sources for survival.
- Besides, the push factor, the urban pull factors such as better employment prospects, better wage expectation, formal sector job security, better living conditions, better urban facilities like health and education and better city amenities, etc, also encourage migration and remittances to a great extent.

Therefore, Better job opportunities act as a Pull factor in migration, not a push factor. **So, Statement 1 is not correct.**

So far, North America is the leading source region of remittances to India, followed by the Gulf countries and Europe, which are also major contributors.

- Northern States such as Bihar, Uttar Pradesh, Rajasthan, and West Bengal have continued to send large numbers of workers to the Gulf countries over the past decade.
- In contrast, States such as Tamil Nadu, Kerala, Andhra Pradesh, Telangana, and Punjab — historically major contributors of migrants to Gulf migration — have seen a considerable decline in the number of emigrants.

These stats clearly show that there is an increase in migration to the Gulf from India's Northern States compared to that of Southern States. **So, Statement 2 is correct.**

India's inward remittances data reveal

- An increasing share for States such as Maharashtra, which rose from 16.7% to 20.5%, Kerala from 19% to 19.7%, and Tamil Nadu from 8% to 10.4%.
- In contrast, States such as Uttar Pradesh, which already had a low share of 3.1% in 2016-17, saw a slight decline to 3% in 2023-24. Similarly, West Bengal, Rajasthan, and Bihar maintained consistently low shares, ranging between 1% and 3% during this period.

Therefore, the Southern States of India receive more remittances from the Gulf compared to the Northern States. **So, Statement 3 is correct.**

State	2016-17	2023-24
Maharashtra	16.7	20.5
Kerala	19	19.7
T.N.	8	10.4
Telangana	-	8.1
Karnataka	15	7.7
A.P.	4	4.4
Delhi NCT	5.9	4.3
Punjab	1.7	4.2
Gujarat	2.1	3.9
U.P.	3.1	3
Haryana	0.8	2.9
West Bengal	2.7	2.3
Rajasthan	1.2	1.5
Bihar	1.3	1.3
Uttarakhand	0.2	1.1

ADDITIONAL INFORMATION:

MIGRATION AND REMITTANCES

About	
	<ul style="list-style-type: none"> ➤ The number of blue-collar workers emigrating to the Gulf from southern States has declined. ➤ Kerala's numbers dropped from over 82,000 in 2014-16 to 60,000 in 2021-24, Tamil Nadu's from 1.3 lakh to 78,000, Telangana's from 69,000 to 35,000 and Andhra Pradesh's from 87,000 to 55,000. Punjab's reduced from 94,000 to 39,000. ➤ But migration from northern and eastern States remained high. The number of workers from Uttar Pradesh stayed above 4 lakh in both periods, while Bihar's remained over 2 lakh. Although migration from West Bengal and Rajasthan to the Gulf also declined, the scale of reduction was smaller compared to the southern States. ➤ The absolute number of Emigration Clearances (ECs) issued to workers from various States across three periods: 2014-16, 2017-20, and 2021-24. ECs are primarily required by blue-collar workers emigrating from India to the Gulf for employment.

State	2014-16	2017-20	2021-24
Maharashtra	30,489	25,561	22,812
Kerala	82,131	58,799	60,113
Tamil Nadu	1,37,837	1,04,191	78,528
Telangana	69,346	47,067	35,505
Karnataka	21,512	16,290	19,242
Andhra Pradesh	87,589	55,141	55,485
Delhi	5,158	4,191	4,999
Punjab	94,706	65,367	39,241
Gujarat	13,729	12,762	12,660
Uttar Pradesh	4,36,471	3,19,896	4,25,851
Haryana	5,504	4,719	4,221
West Bengal	1,31,990	1,01,654	98,822
Rajasthan	95,356	97,566	87,388
Bihar	2,11,910	1,97,949	2,17,335
Uttarakhand	9,276	8,397	11,143

91. With reference to aluminium, consider the following statements:

1. China is the world's leading producer with a ninety per cent share in global production.
2. It is used in the production of pharmaceuticals.
3. India's per capita consumption of aluminium is the highest in the world.

How many of the above statements is/are correct?

(a) Only one

(b) Only two

(c) All three

(d) None

EXPLANATION:

As per World Mineral Production, 2018-22, British Geological Survey, World production of aluminium was 67 million tonnes in 2022.

China continued to be the leading producer with a share of about 60%, followed by Russia (6%), Canada (4.47%), UAE (4%), India (3.46%) and Bahrain (2.39%).

Thus, China accounts for around 60% of global aluminium production, not 90%. **So, Statement 1 is not correct.**


Aluminium is the metal of choice for manufacturers of pharmaceutical products and medical devices. As a packaging material, aluminium is flexible and strong. Instruments made from aluminium are

easily cleaned and sterilised. Aluminium coatings add and improve properties to medical and dental devices. **So, Statement 2 is correct.**

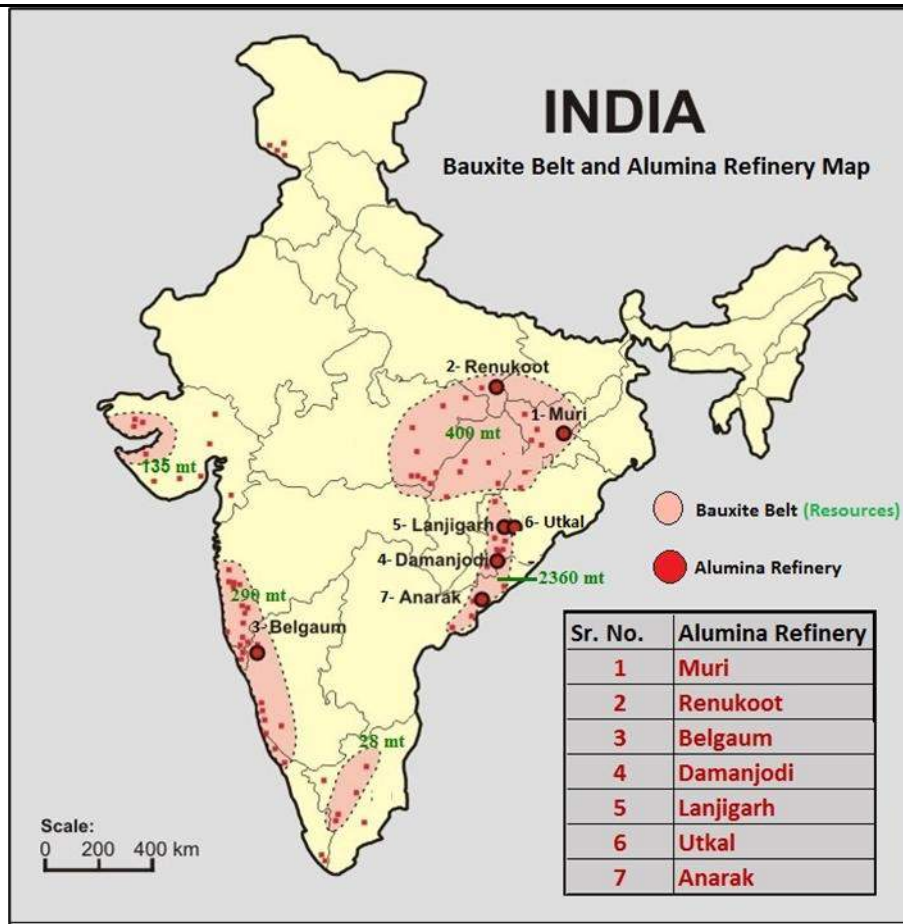
According to the Technology Vision Document 2035, India's per capita aluminium consumption is among the lowest in the world, at 2.2 kg compared to the global average of roughly 8 kg, and 22-25 kg in developed nations.

In India, aluminium was consumed mainly in the Electrical sector (48%), followed by Automobile & Transport sector (15%), Construction (13%), Consumer Durables (7%), Machinery & Equipment (7%), Packaging (4%) and others (6%). In the Electrical sector, aluminium is used in overhead conductors and power cables used in the generation, transmission, and distribution of electricity. Aluminium is also used in switchboards, coil windings, capacitors, etc. **So, Statement 3 is not correct.**

ADDITIONAL INFORMATION:

ALUMINIUM	
Recently in the News	India's aluminium vision document, outlining a roadmap to scale aluminium production sixfold by 2047, was unveiled at an international conference in Hyderabad on July 4, 2025. Also, the country's copper vision document, which anticipates a six-fold increase in demand by 2047 and calls for the addition of 5 million tonnes of smelting and refining capacity by 2030, was unveiled.
About 	<p>Aluminium (Al), a chemical element, is a lightweight silvery white metal of main Group 13 (IIIa, or boron group) of the periodic table.</p> <ul style="list-style-type: none"> ➤ Aluminium is the most abundant metallic element in Earth's crust and the most widely used nonferrous metal. ➤ Due to its chemical activity, aluminium never occurs in its metallic form in nature; however, its compounds are present to a greater or lesser extent in almost all rocks, vegetation, and animals. ➤ Aluminium is concentrated in the outer 16 km (10 miles) of Earth's crust, of which it constitutes about 8 per cent by weight; it is exceeded in amount only by oxygen and silicon.
Uses	<p>Aluminium is a valuable nonferrous metal and has gained importance due to its remarkable properties and capacity to form light alloys.</p> <ul style="list-style-type: none"> ➤ The aluminium metal and its alloys are being used on a large scale for various purposes, such as the manufacturing of aeroplanes, electrical appliances, building materials, trains and machines. ➤ Aluminium has gained immense industrial importance due to its relatively soft, lightweight, non-magnetic, durable, malleable, and ductile nature, as well as its corrosion resistance and relatively high electrical and thermal conductivity. ➤ Aluminium is being used for different purposes due to its light weight and has replaced copper in the electrical industry, iron and steel in the transport industry. ➤ The powdered form of the metal is used in the paints and pigments industry. <p>It also acts as a good reducing agent and is used in the making of several metal alloys.</p>
Occurrence	Aluminium occurs in igneous rocks chiefly as aluminosilicates in feldspars, feldspathoids, and micas; in the soil derived from them as clay; and upon further weathering as bauxite and iron-rich laterite.

ALUMINIUM IN INDIA



92. The eye of the Tropical cyclone has:

- (a) **High temperature and low pressure**
- (b) High temperature and high pressure
- (c) Low temperature and low pressure
- (d) Low temperature and high pressure

EXPLANATION:

Tropical cyclones are violent storms that originate over oceans in tropical areas and move over to the coastal areas, bringing about large-scale destruction caused by violent winds, very heavy rainfall and storm surges.

A mature tropical cyclone is characterised by the strong spirally circulating wind around the centre, called the eye. It is a central region of clear skies, high temperatures, and low atmospheric pressure in comparison with wall of the cyclone.

Typically, atmospheric pressure at the surface of Earth is about 1,000 millibars. At the centre of a tropical cyclone, however, it is typically around 960 millibars, and in a very intense “super typhoon” of the western Pacific it may be as low as 880 millibars. In addition to low pressure at the centre, there is also a rapid variation of pressure across the storm, with most of the variation occurring near the centre. This rapid variation results in a large pressure gradient force, which is responsible for the strong winds present in the eyewall. **So, Option (a) is correct.**

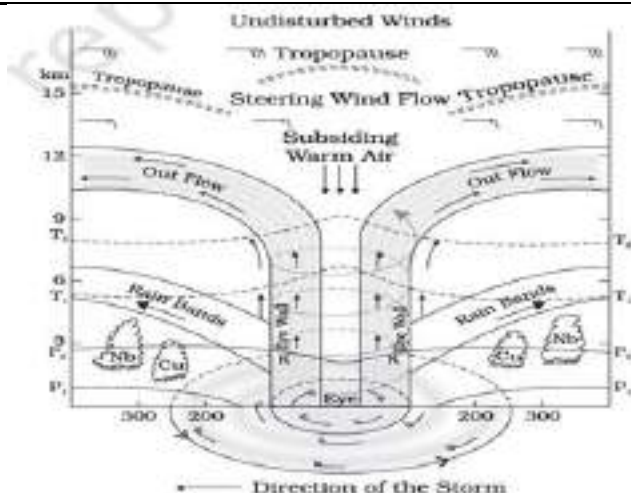


Figure 9.10 : Vertical section of the tropical cyclone (after Rama Santry)

ADDITIONAL INFORMATION:

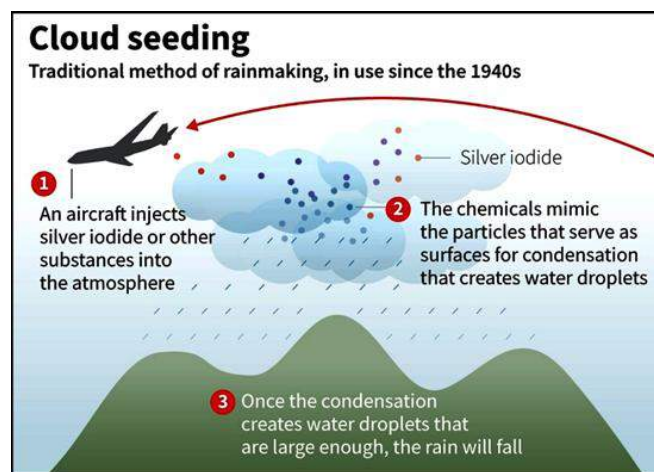
TROPICAL CYCLONE	
About	<p>The word cyclone has been derived from the Greek word ‘cyclos’, which means ‘coiling of a snake’.</p> <p>A tropical cyclone (TC) is a rotational low-pressure system in the tropics when the central pressure falls by 5 to 6 hPa from the surrounding and the maximum sustained wind speed reaches 34 knots (about 62 kmph). It is a vast, violent whirl of 150 to 800 km, spiralling around a centre and progressing along the surface of the sea at a rate of 300 to 500 km a day.</p> <p>They are known as Cyclones in the Indian Ocean, Hurricanes in the Atlantic, Typhoons in the Western Pacific and South China Sea, and Willy-willies in the Western Australia.</p>
Conditions	<p>Tropical cyclones originate and intensify over warm tropical oceans. The conditions favourable for the formation and intensification of tropical storms are:</p> <ul style="list-style-type: none"> ➤ Large sea surface with temperature higher than 27° C; ➤ Presence of the Coriolis force; ➤ Small variations in the vertical wind speed; ➤ A pre-existing weak low-pressure area or low-level-cyclonic circulation; ➤ Upper divergence above the sea level system.
Eye	<p>A mature tropical cyclone is characterised by the strong spirally circulating wind around the centre, called the eye.</p> <ul style="list-style-type: none"> ➤ The diameter of the circulating system can vary between 150 and 250 km. The eye is a region of calm with subsiding air. Around the eye is the eye wall, where there is a strong spiralling ascent of air to greater height reaching the tropopause. ➤ The wind reaches maximum velocity in this region, reaching as high as 250 km per hour. Torrential rain occurs here. From the eye wall rain bands may radiate and trains of cumulus and cumulonimbus clouds may drift into the outer region. ➤ The diameter of the storm over the Bay of Bengal, the Arabian Sea and the Indian Ocean is between 600 and 1200 km. ➤ The system moves slowly, about 300 - 500 km per day. ➤ The cyclone creates storm surges, and they inundate the coastal lowlands. The storm peters out on the land.

93. Cloud seeding is a method of intentional weather modification used in attempts to

- (a) disperse fog
- (b) suppress hail
- (c) Produce precipitation**
- (d) disperse clouds

EXPLANATION:

Cloud seeding is a weather modification technique that helps a cloud's ability to produce precipitation (rain) or snow. The process includes 'seeding' existing clouds with silver iodine, which is like natural ice crystals. Tiny ice nuclei are introduced into certain types of subfreezing clouds, which thereby provide a base for snowflakes to form. Thereafter, the newly formed snowflakes grow and fall from the clouds to the Earth. **So, Option (c) is correct.**



ADDITIONAL INFORMATION:

CLOUDS	
About	<p>Clouds are made up of water vapor (gas), tiny water droplets (liquid water), and ice particles (frozen water) within the atmosphere. Water molecules can take many forms depending on the atmospheric conditions. Water molecules commonly become "supercooled" in colder and/or mixed phase clouds due to the surrounding temperatures.</p> <p>There are three types of clouds:</p> <ul style="list-style-type: none"> ➤ All Liquid clouds: exist entirely of liquid water molecules at temperatures of or around 32 F ➤ Ice-Crystal clouds: exist entirely of ice crystals (such as a cirrus cloud) ➤ Mixed-Phase clouds: made up of both liquid AND ice ("Mixed"); have some portions with temperatures 14 to
Cloud Seeding	<p>Cloud seeding is often seen as a 'silver bullet' for weather modification.</p> <ul style="list-style-type: none"> ➤ The concept of cloud seeding was discovered by Vincent Schaefer in 1946. ➤ It involves adding silver iodide to clouds, helping form ice crystals and causing water to turn into rain or snow. ➤ The goal is to increase precipitation by ensuring more rain reaches the ground compared to the amount of water vapour in the clouds.

94. Which one of the following countries is/are landlocked?

1. North Macedonia
2. Moldova
3. Bulgaria
4. Hungary

Select the correct option using the code given below:

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

EXPLANATION:

Landlocked country, an independent sovereign state that does not have direct access to an ocean, such as the Atlantic, or to a sea that is not landlocked, such as the Mediterranean. Countries such as Kazakhstan, in Central Asia, that only have access to a landlocked sea such as the Caspian are considered landlocked.

- North Macedonia, landlocked country of the south-central Balkans. It is bordered to the north by Kosovo and Serbia, to the east by Bulgaria, to the south by Greece, and to the west by Albania. The capital is Skopje.
- North Macedonia, The Republic of North Macedonia is located in the northern part of the area traditionally known as Macedonia.

So, Macedonia is a landlocked country. **So, Statement 1 is correct.**



Moldova is a country lying in the northeastern corner of the Balkan region of Europe. Its capital city is Chişinău, located in the south-central part of the country. It is a landlocked country bordering Ukraine and Romania - emerged as an independent republic following the collapse of the Soviet Union in 1991. It is one of Europe's poorest countries, with its economy relying heavily on agriculture. Two-thirds of Moldovans are of Romanian descent, and the two countries share a common cultural heritage.

So, Statement 2 is correct.



Bulgaria is a country situated in the eastern part of the Balkan Peninsula in southeastern Europe. Founded in the 7th century, Bulgaria is one of the most ancient countries in Europe.

- The country is bounded by Romania to the north, the Black Sea to the east, Turkey and Greece to the south, North Macedonia to the southwest, and Serbia to the west.
- Its capital city, Sofia, is in a mountainous basin in the west. Bulgaria has a complex drainage pattern characterized, with the notable exception of the Danube, by relatively short rivers.
- The major rivers are the Maritsa (Marica), Iskŭr, Struma, Arda, Tundzha, and Yantra. Overall, more than half of the runoff drains to the Black Sea, and the rest flows to the Aegean Sea.

Therefore, Bulgaria is not landlocked. **So, Statement 3 is not correct.**



Hungary, landlocked country of central Europe and has no coastline. The capital is Budapest. It shares long land border with 7 countries – Slovakia and Austria to the north, Ukraine and Romania to the east, Slovenia to the west, and Croatia and Serbia to the south.

So, Statement 4 is correct.



ADDITIONAL INFORMATION:

LANDLOCKED COUNTRIES	
About	<ul style="list-style-type: none"> ➤ There are currently 44 landlocked countries. The largest by area is Kazakhstan, in Central Asia, while the smallest is the Vatican, in Europe, surrounded by the capital of Italy, Rome. ➤ Landlocked Developing Country: ➤ Lack of territorial access to the sea, isolation from world markets and high trade costs impose serious constraints on the development of Landlocked Developing Countries (LLDCs). ➤ These are the countries classified as Landlocked Developing Countries: <ul style="list-style-type: none"> • Afghanistan, Armenia, Azerbaijan, Bhutan, Plurinational State of Bolivia, Botswana, Burkina Faso, Burundi, Central African Republic, Chad, Eswatini, Ethiopia, Kazakhstan, Kyrgyzstan, Lao PDR, Lesotho, Malawi, Mali, Mongolia, Nepal, Niger, North Macedonia, Paraguay, Republic of Moldova, Rwanda, South Sudan, Tajikistan, Turkmenistan, Uganda, Uzbekistan, Zambia, and Zimbabwe.
Double-Landlocked	<p>Two countries—Liechtenstein and Uzbekistan—are double-landlocked, making them the only ones to be exclusively surrounded by other landlocked countries.</p> <ul style="list-style-type: none"> ➤ The Liechtenstein is in Europe and is surrounded by Austria and Switzerland. ➤ The Uzbekistan is in Asia and borders Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, and Turkmenistan.

95. Consider the following statement:

1. All the lakes are situated above the mean sea level.
2. The Aral Sea and the Caspian Sea are examples of lakes of Tectonic origin.

Which of the statements given above is/are **NOT** correct?

- (a) **1 only**
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

EXPLANATION:

A lake is any relatively large body of slowly moving or standing water that occupies an inland basin of appreciable size. They occupy the hollows of the land surface in which water accumulates. They vary tremendously in size, Shape, depth and mode of formation. The tiny ones are no bigger than ponds or pools, but the large ones are so extensive that they merit the name of seas, e.g. the Caspian Sea.

There are lakes situated below the mean sea level. Some of them are:

- The Dead Sea, a Saline Lake between Israel and Jordan, is 400 meters below sea level.
- Lake Assal, Djibouti – 155 meters below mean sea level.
- Salton Sea, United States - 69 meters below sea level.
- Sea of Galilee, Israel – 209 meters below sea level.

So, Statement 1 is not correct.

Due to the warping, sagging, bending and fracturing of the Earth's crust, tectonic depressions occur. Such depressions give rise to lakes of immense size and depth. They include

- Lake Titicaca, occupying a huge depression in the intermont plateau of the Andes, 12500 feet above sea level, is the highest lake in the world.
- The Caspian Sea, the largest lake, is almost 5 times larger than its nearest rival, Lake Superior.
- The Aral Sea, situated between Kazakhstan and Uzbekistan, is a tectonic lake.

So, Statement 2 is correct.

ADDITIONAL INFORMATION:

TYPES OF LAKES	
Lakes Formed by Earth Movements	<ul style="list-style-type: none"> ➤ Rift valley lakes: Due to faulting, a rift valley is formed by the sinking of land between two parallel faults, deep, narrow and elongated in character. ➤ Water collects in these troughs, and their floors are often below sea level. ➤ The best-known example is the East African Rift Valley, which runs through Zambia, Malawi, Tanzania, Kenya and Ethiopia and extends along the Red Sea to Israel and Jordan over a total distance of 3,000 miles. ➤ It includes such lakes as Lakes Tanganyika (4,700 feet deep, the world's deepest lake), Malawi, Rudolf, Edward, Albert, as well as the Dead Sea, 1,286 feet below mean sea level, the world's lowest lake.
Lakes Formed by Glaciation	<p>Cirque lakes or tarns:</p> <ul style="list-style-type: none"> ➤ A glacier on its way down leaves behind circular hollows in the heads of the valleys up in the mountains. ➤ Such hollows are the armchair-shaped cirques or corries. ➤ Their over-deepened floors may be filled with water to become cirque lakes, e.g. Red Tarn in the English Lake District. ➤ Those that occupy glacial troughs are long and deep and are termed ribbon lakes, e.g. Lake Ullswater. <p>Kettle Lakes:</p> <ul style="list-style-type: none"> ➤ These are depressions in the outwash plain left by the melting of masses of stagnant ice. ➤ They are irregular because of the uneven morainic surface and are never of any great size or depth, e.g. the meres of Shropshire in England, and the kettle-lakes of Orkney in Scotland. <p>Rock-hollow lakes:</p> <ul style="list-style-type: none"> ➤ These are formed by ice-scouring when valley glaciers or ice sheets scoop out hollows on the surface. ➤ Such lakes of glacial origin are abundant in Finland; indeed, the Finns call their country Suomi – the land of Lakes. It is said that there are over 35,000 glacial lakes in Finland. <p>Lakes due to morainic damming of valleys:</p> <ul style="list-style-type: none"> ➤ Valley glaciers often deposit morainic debris across a valley, resulting in lakes when water accumulates behind the barrier. ➤ Both lateral and terminal moraines are capable of damming valleys, e.g. Lake Windermere of the Lake District, England.

96. The popular cotton and corn belts of the USA experience which one of the following climates?

- (a) **The Warm Temperate Eastern Margin Climate**
 (b) The Savanna or Sudan Climate
 (c) Cool Temperate Western Margin Climate
 (d) The Warm Temperate Western Margin Climate

EXPLANATION:

The Warm Temperate Eastern Margin Climate occurs on the eastern margins of continents and is characterized by:

- Warm, moist summers and cool, dry winters.
- Strong maritime influence, causing a moderate annual temperature range.

- Mean monthly temperature between 40°F and 78°F.
 - Average summer temperature: 27.8°C; average winter temperature: 20°C.
 - Annual rainfall: 105–148 cm, with maximum in Miami/New Orleans and minimum in Charleston.
- This region is agriculturally important, especially for the cotton and corn belts of the USA, with extensive cultivation of cotton and maize. **So, Option (a) is correct.**

The following are the sub-types of warm temperate eastern margin climate:

China Type (Temperate Monsoonal)

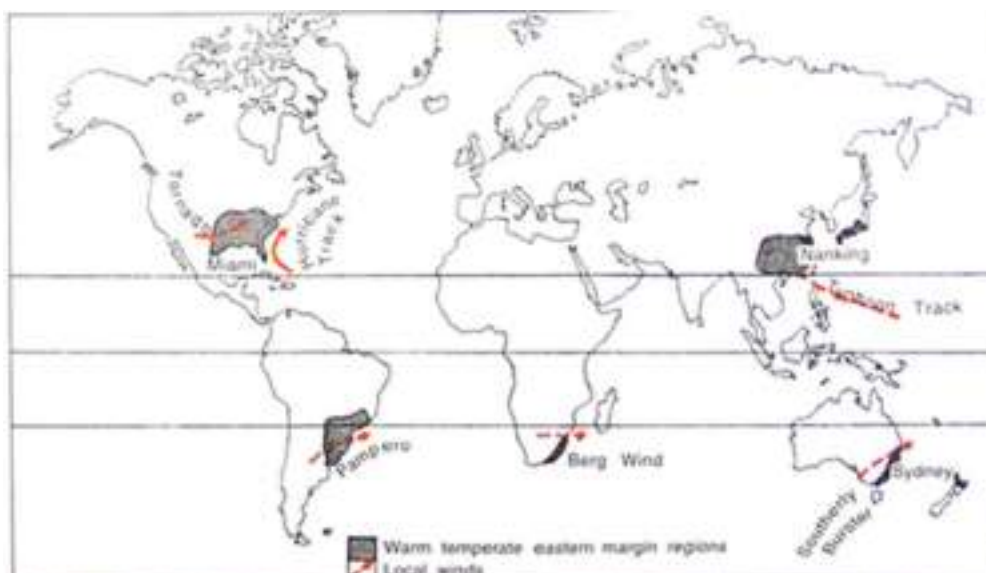
- Found in Central and North China, and southern Japan.
- Strong monsoonal characteristics.

Gulf Type (Slight Monsoonal)

- Found in the southeastern United States (Florida, New Orleans, Alabama).
- Similar to Central China climate but with weaker monsoon influence.

Natal Type (Non-Monsoonal)

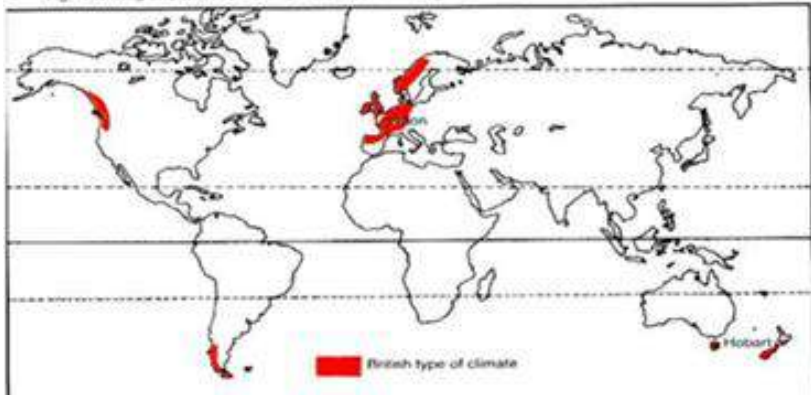
- Found in the southern hemisphere: Natal (South Africa), eastern Australia, southern Brazil, Paraguay, Uruguay, and northern Argentina.
- No significant monsoon influence.

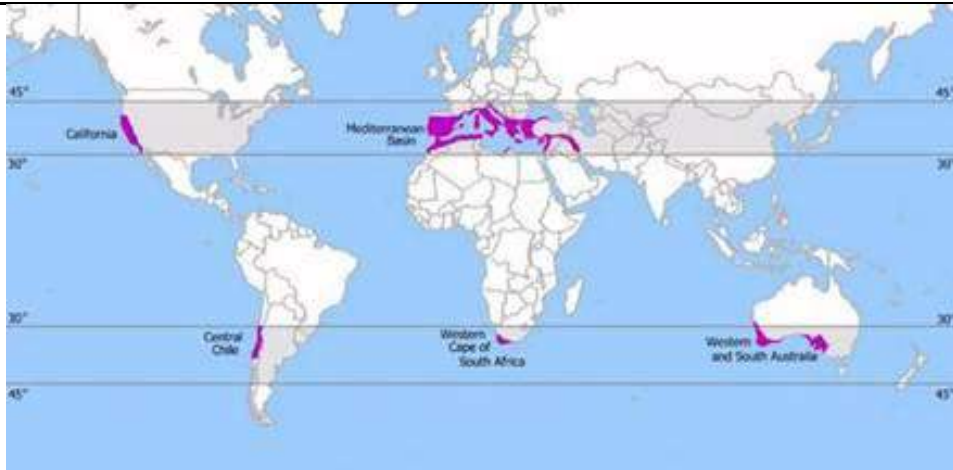


ADDITIONAL INFORMATION:

CLIMATIC CLASSIFICATION

<p>The Savanna or Sudan Climate</p>	<p>Tropical wet and dry or Savanna Climate is typically located between 5° and 20° latitudes on either side of the equator. The region between 5° and 10° North and South is called woodland savanna, whereas 10° to 15° North and South are parkland, and 15° to 20° North and South are grassland savanna. Savanna is flanked by a hot desert in the west and by the monsoonal climate in the east. It is a transitional zone between the wet equatorial in the south and the semi-arid Steppe in the north. It is also known as the Sudan type of climate.</p> <ul style="list-style-type: none"> ➤ This type of climatic region is characterized by an alternate hot rainy season and cool dry season. ➤ The annual average rainfall varies from 100 to 150 cm. ➤ Savanna grasses with patches of trees dominate this climatic region. ➤ This is also known as the natural zoo of the world and the land of big game.
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	<ul style="list-style-type: none"> ➤ Savanna is a region of typical birds that run but don't fly, like an ostrich in Africa, an emu in Australia, and is also home to the Kangaroo, Giraffe, Zebra, etc. ➤ Savanna is the land of many different tribes who are either cattle pastoralists, like the Masai of the East African plateau, or settled cultivators, like the Hausa of northern Nigeria.
Cool Temperate Western Margin Climate	<p>The cool temperate western margins are under the permanent influence of the Westerlies all-round the year. They are also regions of much cyclonic activity, typical of Britain, and are thus said to experience the British type of climate.</p> <ul style="list-style-type: none"> ➤ In the southern hemisphere, the climate is experienced in southern Chile, Tasmania and most parts of New Zealand, particularly in South Island. ➤ The mean annual temperatures are usually between 40°F. and 60°F. ➤ The natural vegetation of British type of climatic type is deciduous forest. The trees shed their leaves in the cold season. <p style="text-align: center;">Fig. 147 Regions with Cool Temperate Western Margin Climate (British type).</p> 
The Warm Temperate Western Margin Climate	<p>The warm temperate western margin (Mediterranean region) is also called as dry summer subtropical climate. It is entirely confined to the western portion of the continental masses between 30 °C and 45 OC North and South.</p> <ul style="list-style-type: none"> ➤ The five Mediterranean climate regions of the world are California, Central Chile, the Mediterranean Basin, South Africa's Western Cape, and Western and South Australia. ➤ This climatic region occupies only 1.7% of the total land area of the world. ➤ The Mediterranean is the only climatic region of the world that receives rainfall only in winter. ➤ This climatic region is famous for Orchard farming as known as the world's Orchard lands. It is famous for citrus fruits like Oranges which have different names in their area of production due to distinct shape, size, taste, and quality. ➤ This region is also known for olive tree and wheat farming; Mediterranean region produces the best-quality wines which include Sherryn in southern Spain, Port wine in Portugal, Chianti, Asti, and Marsala from different parts of Italy. ➤ Among the famous wine-producing regions, champagnein the Paris basin, Bordeaux in the Garomme Basin, and Burgandy are located in the Rhone-Saone valley.



97. Select the correct pair of cities of automobile industry of the world.

- (a) Detroit, Turin, Oslo, Windsor
- (b) Windsor, Turin, Coventry, Oslo
- (c) Coventry, Detroit, Milan, Oslo
- (d) Windsor, Turin, Coventry, Chennai**

EXPLANATION:

The following places are a city of automobile industry of the world:

Detroit, USA – Known as the “Motor City.”

- Automobile industry began in the late 19th century.
- Henry Ford introduced the assembly line in 1914, making Detroit the automobile capital of the world.

Turin, Italy – Called “Italy’s Detroit.”

- Founded 125 years ago.
- Major hub of Europe’s automobile industry.
- Fiat became Italy’s largest company.

Windsor, Canada – One of the world’s leading automobile producers.

- Ranked fourth in the world in car and truck output.

Coventry, UK – Known as the UK’s “Motor City.”

- By the 1950s, had the world’s second-largest car-making industry.
- Leading car exporter.
- Migrants flocked for well-paid work; weekly earnings were 24% above the national industrial average (1959–1963).

Chennai, India – Called the “Detroit of South Asia.”

- Key hub for vehicle production, exports, and component manufacturing.
- Growth supported by decades of infrastructure and industrial investment.

The following are the cities that are not considered automobile industry hubs:

Oslo, Norway – Leading in electric vehicle adoption, not manufacturing.

- 50% of new cars sold in 2017 were electric; >60% in 2018.

Milan, Italy – Financial and commercial center.

- Known for service industries and fashion, not automobile manufacturing.

Therefore, the correct pair of cities of automobile industry of the world is Windsor, Turin, Coventry, Chennai. **So, Option (d) is correct.**

98. Consider the following rows:

S. NO.	Type of Earthquake Wave	Medium of Propagation	Shadow Zone
1.	P-wave	Solid and liquid only	145° to 180°
2.	S-wave	Solid only	105° to 180°

Which of the rows given above is/are correctly matched:

- (a) 1 only
- (b) 2 only**
- (c) Both 1 and 2
- (d) Neither 1 nor 2

EXPLANATION:

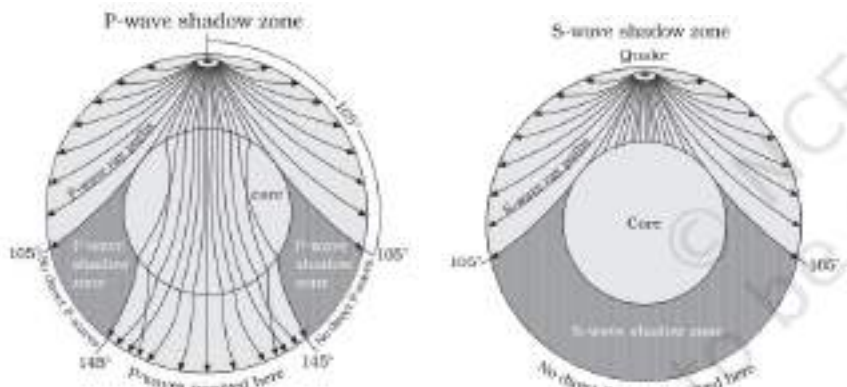
Earthquake waves are basically of two types — body waves and surface waves. Body waves are generated due to the release of energy at the focus and move in all directions travelling through the body of the earth.

There are two types of body waves. They are called P and S-waves.

- P-waves move faster and are the first to arrive at the surface. These are also called primary waves. The P-waves are similar to sound waves. They travel through gaseous, liquid and solid materials.
- S-waves arrive at the surface with some time lag. These are called secondary waves. An important fact about S-waves is that they can travel only through solid materials. This characteristic of the S-waves is quite important. It has helped scientists to understand the structure of the interior of the earth.

Earthquake waves get recorded in seismographs located at far off locations. However, there exist some specific areas where the waves are not reported. Such a zone is called the 'shadow zone'.

- Seismographs located at any distance within 105° from the epicentre, recorded the arrival of both P and S-waves. However, seismographs located beyond 145° from epicentre, record the arrival of P-waves, but not that of S-waves. Thus, a zone between 105° and 145° from epicentre was identified as the shadow zone for both the types of waves.
 - The entire zone beyond 105° does not receive S-waves. So, the shadow zone of S-waves is beyond 105° i.e., 105° to 180°. **So, Row 2 is correct.**
 - The shadow zone of P-waves appears as a band around the earth between 105° and 145° away from the epicentre. **So, Row 1 is not correct.**
 - The shadow zone of S-wave is much larger than that of the P-waves. The shadow zone of S-waves is not only larger in extent, but it is also a little over 40 per cent of the earth surface.



ADDITIONAL INFORMATION:

CHARACTERISTICS OF SEISMIC WAVES	
Body Waves	<ul style="list-style-type: none"> ➤ The body waves interact with the surface rocks and generate a new set of waves called surface waves. These waves move along the surface. ➤ The velocity of waves changes as they travel through materials with different densities. The denser the material, the higher the velocity. Their direction also changes as they reflect or refract when coming across materials with different densities.
Primary (P) Waves	<ul style="list-style-type: none"> ➤ Fastest wave and reaches first at the surface. ➤ Travels in solid, liquid and gas medium of matters. ➤ High velocity is in solid, becomes less in liquid and very slow in gas state of matter. ➤ Increase in density of rocks, velocity increases and vice versa. ➤ Change in the state of matter from solid to viscous or liquid, its velocity decreases even if the density is more. ➤ Velocity of P waves varies from 5.5 km per second at or near the surface to 13.0 km per second in the deep interior.
Secondary (S) Waves	<ul style="list-style-type: none"> ➤ Its velocity is lesser than Primary (P) waves. So, it is recorded after P waves on the seismograph. ➤ Travels only through the solid state of matter. ➤ Increase in density of rocks, velocity increases and vice versa. ➤ Once the state of matter changes from solid to viscous, its velocity is reduced. But when the rocks are melted, they disappear completely. ➤ Velocity of S waves varies from 3.25 km per second at or near the surface to 7.0 km per second in the interior.
Surface/ Long (L) waves	<ul style="list-style-type: none"> ➤ Its velocity is lesser than P and S waves. So, it is recorded after P and S waves on the seismograph. ➤ Travels only through the solid state of matter. ➤ Velocity varies from 2.0 to 4.4 km per second.

99. Consider the following statements:

1. Monazite is used in the production of Rare-Earth Elements (REEs) in India.
2. Monazite is only found on the coasts of India.
3. Neodymium is an REE that can be extracted from monazite reserves.
4. India extracts Neodymium and Praseodymium with more than ninety per cent purity.

How many of the above statements is/are correct?

- (a) Only one
- (b) Only two
- (c) **Only three**
- (d) All four

EXPLANATION:

Rare Earth Elements (REEs) are a group of 17 metals vital for modern technologies, including high-performance magnets, electronics, clean energy systems, and advanced defence applications. India holds an estimated 6.9 million metric tons of REE reserves, ranking fifth in the world. Monazite is India's principal ore for producing Rare Earth Elements (REEs), which contain 55–60% total REE oxides. Overall, India has around 13.07 million tonnes of REE resources, mostly concentrated in these monazite deposits. **So, Statement 1 is correct.**

Monazite deposits are widespread, found primarily in Brazil, South Africa, China, India, Australia, Malaysia, Sri Lanka, Thailand and the United States.

In India, Monazite is classified as a prescribed substance under the Atomic Energy Act, 1962. It is usually found mixed with other heavy minerals like ilmenite, rutile, and zircon, and makes up about 0.4% to 4.3% of the total heavy minerals in both beach and inland placer deposits of India (not only in coast of India). **So, Statement 2 is not correct.**

Monazite contains varying amounts of REE, usually cerium, lanthanum, and neodymium.

Neodymium is a rare earth element occurs in the minerals monazite and bastnasite and is a product of nuclear fission. Liquid-liquid separation or ion-exchange techniques are employed for separation and purification of neodymium.

India currently extracts only neodymium and praseodymium at up to 99.9% purity. These elements occur in trace quantities — between 0.0011% and 0.012% — in beach sand minerals. **So, Statements 3 and 4 are correct.**

ADDITIONAL INFORMATION:

RARE EARTH ELEMENTS	
About	<p>The term "rare earth" comes from the oxide-type minerals (earths) in which they were first identified, such as gadolinite from a mine in Ytterby, Sweden.</p> <ul style="list-style-type: none"> ➤ Rare Earths are a group of 17 elements, starting with lanthanum in the periodic table, and also including scandium and yttrium. ➤ They are moderately abundant in the Earth's crust but are rarely found in concentrations high enough for easy economic extraction. ➤ REEs have critical applications in defence, electronics, and energy systems. <ul style="list-style-type: none"> • For example, magnets made from rare earths are many times stronger than conventional ones. ➤ Along with energy-critical elements (ECEs) like lithium, which is widely used in batteries, REEs are considered strategic resources essential for sustainable energy systems. ➤ The 17 REEs consist of: scandium (Sc), yttrium (Y), and 15 lanthanides (atomic numbers 57–71): lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), promethium (Pm), samarium (Sm), europium (Eu), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb), and lutetium (Lu). ➤ The lanthanides are divided into two groups: <ul style="list-style-type: none"> • Light REEs (57–63): La, Ce, Pr, Nd, Pm, Sm, Eu • Heavy REEs (64–71): Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu <p>REEs share important properties: high density, high melting points, excellent electrical conductivity, and strong thermal conductance. Some rare-earth minerals also contain thorium and uranium, but these are not essential components.</p>
