

1. D

All waters in nature, whether rain water or ocean water, contain dissolved mineral salts. Salinity is the term used to define the total content of dissolved salts in sea water. Factors affecting ocean salinity are mentioned below:

- The salinity of water in the surface layer of oceans depends mainly on evaporation and precipitation.
- Surface salinity is greatly influenced in coastal regions by the fresh water flow from rivers, and in Polar Regions by the processes of freezing and thawing of ice.
- Wind, also influences salinity of an area by transferring water to other areas.
- The ocean currents contribute to the salinity variations. Salinity, temperature and density of water are interrelated. Hence, any change in the temperature or density influences the salinity of water in an area.

2. C

Oceanic and atmospheric Rossby waves — also known as planetary waves — naturally occur largely due to the Earth's rotation. These waves affect the planet's weather and climate.

- Waves in the ocean come in many different shapes and sizes.
- Slow-moving oceanic Rossby waves are fundamentally different from ocean surface waves.
- Unlike waves that break along the shore, Rossby waves are huge, undulating movements of the ocean that stretch horizontally across the planet for hundreds of kilometers in a westward direction.
- They are so large and massive that they can change Earth's climate conditions.
- Along with rising sea levels, King Tides, and the effects of El Niño, oceanic Rossby waves contribute to high tides and coastal flooding in some regions of the world

3. A

In 1865, the Danish geologist and mineralogist Johan Georg Forchhammer, with the help of naval and civilian collaborators, collected numerous samples of seawater from the Northern Atlantic and the Arctic Ocean. He wanted to determine why the salinity (or "saltiness") of seawater varies in

different areas of the ocean.

- Forchhammer put the samples through a detailed series of chemical analyses and found that the proportions of the major salts in seawater stay about the same everywhere.
- This constant ratio is known as Forchhammer's Principle, or the Principle of Constant Proportions.
- In addition to this principle, Forchhammer is credited with defining the term salinity to mean the concentration of major salts in seawater.
- Forchhammer's discovery helped scientists understand that salinity levels in seawater vary due to the addition or removal of fresh water, rather than differing amounts of salt minerals in the water.
- The principle is still applied today in marine research, and provides a simple way to estimate salinity and trace the mixing of water masses in the global ocean.

4. C



5. B

On December 11, 2019, the South Pacific Archipelago of Bougainville voted to become independent of Papua New Guinea.

- Around 98% of 1,81,067 voters voted to get independent from Papua New Guinea. It is the largest island of the Solomon Islands Archipelago.
- The island has the world's largest copper deposits. The most widely spoken language in the country is Halia.
- The country is yet to prove its recognition in the United Nations.

6. A

The Great Lakes are, from west to east: Superior, Michigan, Huron, Erie and

Ontario.

- They are a dominant part of the physical and cultural heritage of North America.
- Shared with Canada and spanning more than 750 miles (1,200 kilometers) from west to east, these vast inland freshwater seas provide water for consumption, transportation, power, recreation and a host of other uses.
- The Great Lakes are one of the world's largest surface freshwater ecosystems.

7. B

There are four main types of estuaries, based on how they were formed.

- Bar-built estuaries form when a shallow lagoon or bay is protected from the ocean by a sand bar, delta or island.
- Coastal plains estuaries are formed when the rising sea fills existing river valleys.
- Tectonic estuaries are caused by the folding of land surfaces due to volcanic activity.
- Fjord and Ria estuaries are drowned river valleys where the river valley was originally formed by glacial action.

8. A

According to the scientists, including those from NASA's Jet Propulsion Laboratory in the US, a sea-water current called the Beaufort Gyre keeps the polar environment in balance by storing fresh water near the surface of the Arctic Ocean.

- Wind blows the gyre in a clockwise direction around the western Arctic Ocean, north of Canada, where it naturally collects fresh water from the melting of glaciers, and river runoff.
- The researchers said this fresh water is important in the Arctic since it floats above the warmer, salty water, and helps protect the sea ice from melting – in turn regulating the Earth's climate.
- As the fresh water is slowly released by the gyre into the Atlantic Ocean over a period of decades, it allows the Atlantic Ocean currents to carry it away in small amounts.
- However, since the 1990s, the researchers said, the gyre has accumulated a large amount of fresh water – 8,000 cubic kilometres – or almost twice the volume of Lake Michigan in the US.
- According to the new study, the cause of this

gain in freshwater concentration is the loss of sea ice in summer and autumn.

- Due to this decades-long decline of the Arctic's summertime ice cover, the Beaufort Gyre is more exposed to the wind, which has spun the gyre faster, trapping the fresh water in its current.

9. C

The Atlantic Meridional Overturning Circulation (AMOC) is a large system of ocean currents that carry warm water from the tropics northwards into the North Atlantic.

- The AMOC is a large system of ocean currents, like a conveyor belt, driven by differences in temperature and salt content – the water's density.
- As warm water flows northwards it cools and some evaporation occurs, which increases the amount of salt.
- Low temperature and a high salt content make the water denser, and this dense water sinks deep into the ocean.
- The cold, dense water slowly spreads southwards, several kilometres below the surface (As that water cools and sinks it drives a slow circulation of the oceans that is critical to global climate, affecting the location of droughts and frequency of hurricanes).
- Eventually, it gets pulled back to the surface and warms in a process called "upwelling" and the circulation is complete.
- This global process makes sure that the world's oceans are continually mixed, and that heat and energy are distributed around the earth. This, in turn, contributes to the climate we experience today.
- As that water cools and sinks it drives a slow circulation of the oceans that is critical to global climate, affecting the location of droughts and frequency of hurricanes.
- It also stores heat-trapping carbon dioxide deep in the ocean.

10. C

THE KUROSHIO IS a warm northeasterly ocean current off the coast of Japan. This current is also called the gulf stream of the Pacific or Japan Current.

- Kuroshio means "the black stream" in Japanese, named after the deep ultramarine color of the high salinity water, which is found flowing north of the current's axis.
- The system includes the following branches: Kuroshio, up to 35 degrees N; Kuroshio

extension, extending eastward into two branches up to 160 degrees E longitude;

- North Pacific current, a further eastward continuation, which throws branches to the south as far as 150 degrees W;
- Tsushima current, branches of the main current that run into the Japan Sea, along the west coast of JAPAN;
- And Kuroshio counter-current, the large swirl or eddy on the east and south east of the Kuroshio.

11. B

About 71 per cent of the planetary water is found in the oceans. The remaining is held as freshwater in glaciers and icecaps, groundwater sources, lakes, soil moisture, atmosphere, streams and within life. Nearly 59 per cent of the water that falls on land returns to the atmosphere through evaporation from over the oceans as well as from other places. The remainder runs-off on the surface, infiltrates into the ground or a part of it becomes glacier.

Table 13.1 : Water on the Earth's surface

Reservoir	Volume (Million Cubic km.)	Percentage of the Total
Oceans	1,370	97.25
Ice Caps and Glaciers	29	2.05
Groundwater	9.5	0.68
Lakes	0.125	0.01
Soil Moisture	0.065	0.005
Atmosphere	0.013	0.001
Streams and Rivers	0.0017	0.0001
Biosphere	0.0006	0.00004

12. D

The ocean floors can be divided into four major divisions:

- The Continental Shelf;
- The Continental Slope;
- The Deep Sea Plain;
- The 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.

13. C

Scientists estimate that 50-80% of the oxygen production on Earth comes from the ocean.

- The majority of this production is from oceanic plankton — drifting plants, algae, and some bacteria that can photosynthesize.
- One particular species, Prochlorococcus, is the smallest photosynthetic organism on Earth.

- But this little bacteria produces up to 20% of the oxygen in our entire biosphere.
- That's a higher percentage than all of the tropical rainforests on land combined.
- It's important to remember that although the ocean produces at least 50% of the oxygen on Earth, roughly the same amount is consumed by marine life.
- Like animals on land, marine animals use oxygen to breathe, and both plants and animals use oxygen for cellular respiration.
- Oxygen is also consumed when dead plants and animals decay in the ocean.

14. C

A massive "dead zone" in the Arabian Sea is the largest in the world, a new study reveals.

- Dead zones are oxygen-starved ocean regions where few organisms can survive.
- They emerge in ocean depths ranging from 650 to 2,600 feet (200 to 800 meters), when influxes of chemical nutrients — typically from human pollution — spur algae growth, which sucks up oxygen.
- A significant oxygen-deprived region has bloomed in the Gulf of Oman for decades, but it was last surveyed in the 1990s.
- The Gulf of Oman, which spans 70,000 square miles (181,000 square kilometers), connects the Arabian Sea to the Persian Gulf.
- It has long been off-limits to researchers because of the region's political instability and the threat of ocean piracy.
- For eight months, these AUVs gathered data on oxygen levels, and then transmitted their readings to the scientists via satellite.

- a. Researchers then used computer models to visualize the ocean currents that circulated oxygen around the gulf from the Arabian Sea.
- They found that the oxygen-poor region had grown dramatically, and the scant oxygen formerly held in the depleted zone — based on data from the 1990s — had drained significantly, leaving bigger areas with no oxygen at all.

15. B

Namib Desert: the Namib Desert is a direct result of the Benguela Current.

- Seamounts near to the coastline beneath the Atlantic's surface cause the icy Benguela River to flow very close to the Namibian coast.
- This causes a harsh coastal climate with very little rainfall.

Atacama Desert: Cold ocean currents contribute to the formation of coastal deserts.

- Air blowing toward shore, chilled by contact with cold water, produces a layer of fog. This heavy fog drifts onto land.
- The Atacama Desert, on the Pacific shores of Chile, is a coastal desert.
- Some areas of the Atacama are often covered by fog. But the region can go decades without rainfall. In fact, the Atacama Desert is the driest place on Earth.

Gobi Desert: Interior deserts, which are found in the heart of continents, exist because no moisture-laden winds reach them.

- By the time air masses from coastal areas reach the interior, they have lost all their moisture. Interior deserts are sometimes called inland deserts.
- The Gobi Desert, in China and Mongolia, lays hundreds of kilometers from the ocean. Winds that reach the Gobi have long since lost their moisture.
- The Gobi is also in the rain shadow of the Himalaya Mountains to the south

16. D
17. B
18. C
19. B
20. D
21. B
22. A
23. C
24. B
25. A
26. A
27. B
28. A
29. B
30. C
31. D
32. B
33. C
34. B
35. B

- Major coalfields of the world are:
 - North America
 - o Pennsylvania anthracite field
 - o Appalachian bituminous field
 - o Eastern Illinois field – Illinois, Indiana and Kentucky

- o Western interior field – Iowa, Missouri, Oklahoma
- o Gulf province – Texas, Alabama and Arkansas
- o Rocky mountain province- Utah, Colorado, Wyoming, Montana, new Mexico
- o Canada – Prairies, British Columbia coalfields, Nova Scotia Coal fields
- o The largest coal mine in the world by reserves is the North Antelope Rochelle coal mine in the Powder River Basin of Wyoming, US. The mine was estimated to contain more than 1.7 billion tonnes of recoverable coal as of December 2018. Hence pair 1 is not correctly matched.

- Europe
 - o Donetz coal basin (anthracite and high grade bituminous coal)
 - o Moscow-Tula coalfields
 - o Kuznetsk coal basin
 - o Karaganda field
 - o Silesia coal fields
 - o Ruhr area of Germany. Hence pair 2 is correctly matched.
 - o Other coal fields in Urals, Taimyr fields of the Arctic, deposits of the Caucasus mountains.
- Asia
 - o China – Shanxi, Fushun, Inner Mongolia, Kansu. Hence pair 4 is not correctly matched.
 - o Japan – Chikugo coalfield, Ishikari coalfield
 - o India – Damodar valley, Raniganj, Bokaro, Jharia, Singareni. Singareni is in Telangana.
 - o Pakistan - Quetta, Kalabagh and Thar coalfields
 - Australia – Bowen Basin coalfield, Galilee Basin coalfield, South Maitland coalfield, Sydney Basin coalfield, and Latrobe valley coalfield. Hence pair 3 is correctly matched.

36. A
37. B

Inland Waterways: Rivers, canals, lakes, and coastal areas have been essential waterways since time immemorial. Boats and steamers are used as means of transport for cargo and passengers. The development of inland waterways is dependent on the navigability width and depth of the channel, continuity in the water flow, and transport technology in use.

o The Rhine Waterways: The Rhine flows through Germany and the Netherlands. It flows from two

small headways in the Alps of east-central Switzerland north and west to the North Sea, into which it drains through the Netherlands. The Ruhr river joins the Rhine from the east. It flows through a rich coalfield and the whole basin has become a prosperous manufacturing area. Dusseldorf is the Rhine port for this region. This waterway is the world's most heavily used. Hence pair 1 is correctly matched.

o The Danube Waterway: This important inland waterway serves Eastern Europe. The Danube river rises in the Black Forest and flows eastwards through many countries. It is navigable up to Taurna Severin. The chief export items are wheat, maize, timber, and machinery.

o The Volga Waterway: Russia has a large number of developed waterways, of which the Volga is one of the most important. It drains into the Caspian Sea. The Volga-Moscow Canal connects it with the Moscow region and the Volga-Don Canal with the Black Sea. Hence pair 2 is not correctly matched.

o The Great Lakes – St. Lawrence Seaway: The Great Lakes of North America Superior, Huron Erie, and Ontario are connected by Soo Canal and Welland Canal to form an inland waterway. The estuary of the St. Lawrence River, along with the Great Lakes, creates a unique commercial waterway in the northern part of North America. The ports on this route like Duluth and Buffalo are equipped with all facilities of ocean ports. As such large oceangoing vessels are able to navigate up the river deep inside the continent to Montreal.

o The Mississippi Waterways: The Mississippi-Ohio waterway connects the interior part of the U.S.A. with the Gulf of Mexico in the south. Large steamers can go through this route up to Minneapolis. Hence pair 3 is correctly matched.

38. B

39. D

Northern Ireland Protocol: The Northern Ireland Protocol is a post-BREXIT agreement that created a trade border between Northern Ireland and the rest of the United Kingdom (UK).
o The protocol was an integral part of the 2019 BREXIT agreement signed between the UK and the European Union (EU).

o Under the protocol:

✓ Northern Ireland remains in the EU single market.

✓ Trade-and-customs inspections of goods coming from Great Britain take place at Northern Ireland ports along the Irish Sea.

• The United Kingdom (UK) is made up of England, Scotland, Wales, and Northern Ireland. Hence option (d) is the correct answer.

Apart from England, These countries have their own devolved governments, each with varying powers.

o Ireland (also known as the Republic of Ireland) is a sovereign state which is a part of the European Union (EU) and is not a part of the UK.
o During Brexit Voting, England and Wales voted in favor of exit from the EU. Scotland and Northern Ireland voted in favor of staying in the EU.

o Geographically, the United Kingdom includes the island of Great Britain, the northeastern part of the island of Ireland, and many smaller islands. Northern Ireland is the only part of the United Kingdom that shares a land border with another sovereign state—the Republic of Ireland.

40. C.

Sardinia is the second-largest island in the Mediterranean Sea, after Sicily. It is located west of the Italian Peninsula, north of Tunisia and immediately south of the French island of Corsica. Hence pair 1 is correctly matched.

• Zanzibar Island, also known as Unguja, is by far the largest and most famous of the islands that make up the Zanzibar Archipelago located in Indian ocean. Hence pair 2 is not correctly matched.

- Vancouver Island is an island lying off southwestern mainland British Columbia, Canada in Pacific ocean. Hence pair 3 is correctly matched.
 - o With an area of 12,079 square miles (31,285 square km), it is the largest island on the Pacific coast of North America.
 - Vancouver Island is separated from mainland Canada by the straits of Georgia, Johnstone, and Queen Charlotte and from the United States by Juan de Fuca Strait.
 - o The island, averaging 50 miles (80 km) in width and extending for 285 miles (460 km) along a northwest–southeast axis paralleling the mainland, is actually the top of a partially submerged mountain system.
41. b. IB,IIA,IIID,IVC
42. C
43. B
44. B
45. C
46. C
47. A
48. B
- Advection is the term applied to horizontal heat transfer. Ocean current is an example/agent of advection as it is the horizontal movement of surface water. The first statement is not correct as fog which develops when moist air flows over a cold ocean current is a case of advection fog. Radiation fog: If the air temperature falls below the dew point because the air is in contact with a cold surface, and provided the air is still and contains hygroscopic nuclei, then a fog develops. This is called radiation fog. This kind of fog is likely to occur on a cold, clear, calm night, usually in the middle latitudes. Therefore, the correct answer is (b).
49. B
- Galapagos Island is an island group of the eastern Pacific Ocean, administratively a province of Ecuador. The government of Ecuador designated part of the Galapagos a wildlife sanctuary in 1935, and in 1959 the sanctuary became the Galapagos National Park. In 1978 the islands were designated a UNESCO World Heritage site, and in 1986 the Galapagos Marine Resources Reserve was created to protect the surrounding waters.
50. B
51. C
52. A
53. B
54. A
55. B
56. B
57. B
58. A **Explanation:**
Old Faithful is a cone geyser in Yellowstone National Park in Wyoming, United States. It was named in 1870 during the Washburn–Langford–Doane Expedition and was the first geyser in the park to be named. It is a highly predictable geothermal feature and has erupted every 44 minutes to two hours since 2000.
59. C
60. C
61. D
62. D
63. C
64. C
65. Answer: B
The Nordic Region consists of Denmark, Norway, Sweden, Finland, and Iceland, as well as the Faroe Islands, Greenland, and Åland. While, the term 'Scandinavia' is commonly used for Denmark, Norway and Sweden.
66. C
67. B
68. C
69. C
Yugoslavia, Greece, Romania and Albania, situated on the coast of Black Sea and Mediterranean Sea are called 'Balkan states'. Hence, C is the correct option.
70. D
71. A
72. Ans. (a) Strait of Gibraltar
Explanation – The Strait of Gibraltar is called the gateway to the Mediterranean Sea. This strait separates the continent of Europe from the continent of Africa and connects the Mediterranean Sea to the Atlantic Ocean.
73. Ans. (b) Bab-el-Mandeb Strait
Explanation – The Bab-el-Mandeb Strait is called the "Gate of Tears". This strait separates the continent of Africa from the continent of Asia and connects the Red Sea and the Gulf of Aden
74. **Ans. (d) Sudan**
Explanation – The Atlas Mountains are located in the northwestern part of the continent of Africa. It is spread in Morocco, Algeria, and Tunisia.

75. Ans. (d) Tanganyika Lake
 Explanation – The deepest lake in the continent of Africa is Tanganyika. It is the second deepest lake in the world after Lake Baikal.
76. D
 77. D
 78. A
 79. B
 80. B
 81. C
 82. D



83. C
 84. C The Karimata Strait which is also spelled Carimata or Caramata is the wide strait that connects the South China Sea to the Java Sea, separating the Indonesian islands of Sumatra and Borneo (Kalimantan). It is bordered by the Belitung island (off Sumatra's eastern coast) in the west and Borneo in the east. It is the widest strait that connects the South China Sea and the Java Sea (other straits include the Bangka and Gaspar Straits), but its numerous islands and reefs reduce its navigability. Its weather and current is influenced by the annual southeast and northwest monsoon.
85. B



86. A
 Borneo is the third-largest island in the world and the largest in Asia.[note 1] At the geographic centre of Maritime Southeast Asia, in relation to major Indonesian islands, it is located north of Java, west of Sulawesi, and east of Sumatra. The island is politically divided among three countries: Malaysia and Brunei in the north, and Indonesia to the south.[1] Approximately 73% of the island is Indonesian territory. In the north, the East Malaysian states of Sabah and Sarawak make up about 26% of the island. Additionally, the Malaysian federal territory of Labuan is situated on a small island just off the coast of Borneo. The sovereign state of Brunei, located on the north coast, comprises about 1% of Borneo's land area. A little more than half of the island is in the Northern Hemisphere including Brunei and the Malaysian portion, while the Indonesian portion spans both the Northern and Southern hemispheres.

87. C
 88. A
 89. C
 90. C
 91. B
 92. C
 93. A
 94. D
 95. B
 96. B
 97. B
 98. B
 99. B
 100. B