Ocean Currents

Exercise

Q. 1. A. Choose the correct option:

In which ocean does the Labrador current flow?

A. Pacific
B. South Atlantic
C. North Atlantic
D. Indian

Answer : Labrador is cold oceanic current originating in Arctic Ocean and flowing south along the coast of Labrador, Canada. Other ocean currents include Gulf Stream, East Greenland current, Florida current, etc.

Pacific Ocean: Ocean currents in Pacific include Oyashio, Kuyoshio, Humboldt, California, etc.

South Atlantic: Ocean currents in South Atlantic include Brazil current, Falkland current, etc.

Indian Ocean: Ocean currents in Indian Ocean include Somali current, Madagascar current, West Australian current, Agulhas current, etc.

Q. 1. B. Choose the correct option:

Which current out of the following flows in the Indian Ocean?

A. East Australian Current
B. Peru current
C. South Polar current
D. Somali current

Answer : Somali current flows in the Indian Ocean. Peru and east Australian Current flow in the Pacific Ocean. South Polar current flows in the Southern Ocean.

North Atlantic: ocean currents in North Atlantic include Labrador Current, Gulf Stream, East Greenland current, Florida current, etc.

Pacific Ocean: Ocean currents in Pacific include Oyashio, Kuyoshio, Humboldt, California, etc.

South Atlantic: Ocean currents in South Atlantic include Brazil current, Falkland current, etc.

Indian Ocean: Ocean currents in Indian Ocean include Somali current, Madagascar current, West Australian current, Agulhas current, etc.

Q. 1. C. Choose the correct option:

Which factor out of the following does not affect the region along the coast?

A. Precipitation
B. Temperature
C. Land breezes
D. Salinity

Answer : Salinity doesn't affect the region along the coast as much as the other factors.

Along the coast, precipitation is more due to more availability of water. Temperature along the coast is not extreme as sea acts as a moderating factor. Land breezes are breezes blowing towards the sea from the land.

Q. 1. D. Choose the correct option:

Which of the following occurs in the area where the cold and warm currents meet?

A. High temperature
B. Snow
C. Low temperature
D. Thick fog

Answer : When warm air from warm ocean current blows over the cold Current, water vapor condenses, resulting in the formation of a thick fog.

Q. 1. E. Choose the correct option:

Which of these following currents flows from the northern polar region upto Antarctica?

A. Warm ocean currents
B. Surface ocean currents
C. Cold ocean currents
D. Deep ocean currents

Answer : Deep ocean currents are those water currents which flow beyond the depth of 500m. They are driven by density and temperature gradients. This process is known as thermohaline circulation.

Warm ocean currents: They flow away from the equatorial region on the western side of ocean basins towards the poles. They are warmer than the surrounding water and so they are called warm currents.

Surface ocean currents: The water at the ocean surface is moved primarily by winds that blow in certain patterns because of the Earth's spin and the Coriolis Effect. Winds are able to move the top 400 meters of the ocean creating surface ocean currents.

Cold ocean currents: The ocean currents that flow from the polar areas towards the Equator are cooler compared to the surrounding water, so they are called cold currents. They are usually found on the west coast of the continents in the low and middle latitudes in both the hemispheres and on the east coast in the middle latitudes.

Q. 2. A. Examine the given statements and correct the wrong ones.

Ocean currents give specific direction and velocity to the water

Answer : True

Ocean currents are the horizontal continuous flow of a mass of water from one place to another. They acquire a specific direction and velocity due to differences in temperature, density, planetary winds, rotation of the earth, continental structure etc.

Q. 2. B. Examine the given statements and correct the wrong ones.

The deep ocean currents flow with high velocity

Answer : False

Deep ocean water constitutes about 90% of the ocean water. Unlike, surface ocean currents which are driven by high-speed planetary winds, deep ocean water is driven by differences in temperature and density. Thus, the velocity of deep ocean currents is low compared to surface currents. The redistribution of the ocean water through the movement of Deep Ocean current is a continuous process and it takes around 500 years to complete one cycle of redistribution of ocean water.

Q. 2. C. Examine the given statements and correct the wrong ones.

Generally, surface ocean currents are formed in the equatorial regions.

Answer : False

Surface ocean currents move from equator to the poles and vice versa. They are of two types: Warm ocean current and cold ocean current. Warm ocean current move from equator to poles and cold ocean currents move from poles to equator.

Q. 2. D. Examine the given statements and correct the wrong ones.

Ocean currents hold great importance for human life.

Answer : True

Ocean currents hold great importance for human life due to the foll. reasons:

1. Ocean currents involve the transfer of heat energy from heat surplus regions to heat deficit regions.

2. The presence of warm water currents along western Europe in winter ensures that ports do not freeze.

3. The mixing of cold and warm water currents results into formation of large fishing grounds.

4. The speed and direction of ocean currents are also utilized for the easy movement of ships using less fuel.

Q. 2. E. Examine the given statements and correct the wrong ones.

The movement of icebergs is not dangerous for water transport.

Answer : False

Ocean currents are the horizontal continuous flow of a mass of water from one place to another. Cold ocean current flow from poles to the equator. In this process, there are chances that iceberg gets carried along the current and coming in way of marine routes posing danger to ships.

Q. 2. F. Examine the given statements and correct the wrong ones.

Water becomes warm near Brazil due to ocean currents. On the other hand, it becomes cold near the African coast.

Answer : True

Water becomes warm near Brazil due to the presence of warm Brazil ocean current near the Brazil coast. The Benguela current is a cold ocean current which makes the southwestern coast of Africa cold.

Q. 3. A. Explain the effect of -

Warm ocean currents on climate

Answer : Ocean currents are the horizontal continuous flow of a mass of water from one place to another. Ocean currents involve the transfer of heat energy from heat surplus regions to heat deficit regions. As a result, the climate of the region in the vicinity to the ocean current is affected. In cold regions where warm ocean currents flow, the climate becomes warmer. For instance, the presence of warm water currents along western Europe in winter ensures that ports do not freeze.

Q. 3. B. Explain the effect of -

Cold ocean currents on the movement of icebergs

Answer : Ocean currents are the horizontal continuous flow of a mass of water from one place to another. They are of 2 types – warm and cold ocean current. Cold ocean current flows from poles to the equator. In this process, there are chances that iceberg from the polar areas gets carried along the current. This, in turn, poses threat to marine routes where frequent movement of ships takes place.

Q. 3. C. Explain the effect of -

The shape of the coast line on ocean currents.

Answer : Ocean currents are the horizontal continuous flow of a mass of water from one place to another. The shape and position of coastline play a crucial role in guiding the direction of ocean currents.

Q. 3. D. Explain the effect of -

Meeting of warm and cold ocean currents

Answer : Ocean currents are the horizontal continuous flow of a mass of water from one place to another. They are of 2 types – warm and cold ocean current. The meeting of cold and warm currents results into a meeting of the overlying warm air and cold air. The warm air meeting the colder air will cool the warm air below its dew point resulting in the formation of a thick fog. This meeting point of ocean currents also provides a rich ground for fishing due to the abundant presence of plankton.

Q. 3. E. Explain the effect of -

The transportational capacity of ocean currents

Answer : Ocean currents are the horizontal continuous flow of a mass of water from one place to another. They are driven by numerous factors like differences in density and temperature, planetary winds etc. The redistribution of the ocean water through the movement of deep ocean current is a continuous process and it takes around 500 years to complete one cycle of redistribution of ocean water.

Q. 3. F. Explain the effect of -

Deep ocean currents

Answer : Deep ocean currents are those water currents which flow beyond the depth of 500m. They are driven by density and temperature gradients. They constitute about 90% of the ocean water. The redistribution of the ocean water through the movement of deep ocean current is a continuous process and it takes around 500 years to complete one cycle of redistribution of ocean water. Redistribution of nutrients takes place when warm water is transferred to the bottom from the surface and the nutrient-rich cold water is circulated to the surface.

Q. 4. A. Look at the map of ocean currents and answer the following:

How does the Humboldt current affect the climate of the South American coast?

Answer : Ocean currents are the horizontal continuous flow of a mass of water from one place to another. They are of 2 types – warm and cold ocean current. Ocean currents flowing along the coastline have an impact on its climate. Humboldt current is a cold ocean current flowing towards the north along the west coast of South America from the southern part of Chile to northern Peru. Thus, it brings cold water into warm water areas of northern Peru having a cooling influence in the climates of these regions. There is also dryness in the region due to cold current because cool marine air has low moisture holding capacity causing little or no precipitation.

Q. 4. B. Look at the map of ocean currents and answer the following:

In which oceans are counter equatorial currents not observed and why?

Answer : Counter equatorial currents are an eastward flow of oceanic water near the equator due to the impact of trade winds or easterlies. The pattern of these ocean currents is prominent in Pacific and Atlantic Ocean but different in Indian ocean due to monsoon. The prevalence of monsoonal winds in the Indian Ocean region has a considerable impact on the direction of ocean currents. The ocean current flows in the clockwise direction in summer in the northern part of the Indian ocean while in winter they flow in the opposite direction due to the reversal of monsoon winds.

Q. 4. C. Look at the map of ocean currents and answer the following:

Which currents are absent in northern part of the Indian Ocean and why?

Answer : Ocean currents are the horizontal continuous flow of a mass of water from one place to another. They are of 2 types – warm and cold ocean current. The cold currents are absent in the northern part of the Indian Ocean. Cold ocean current flows from polar region to equator. The Indian Ocean is land-locked in the North. Hence, no cold current can enter the north part of the Indian ocean.

Q. 4. D. Look at the map of ocean currents and answer the following:

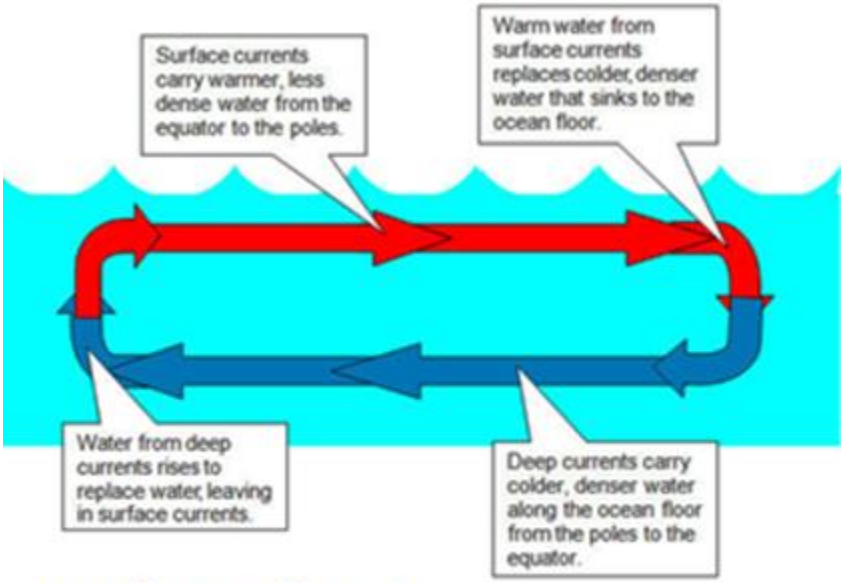
In which regions do the cold and warm ocean currents meet?

Answer : Ocean currents are the horizontal continuous flow of a mass of water from one place to another. They are of 2 types – warm and cold ocean current. The meeting of cold and warm currents results in the formation of thick fog. Labrador Current meets the Gulf Stream off the coast of Newfoundland. The regions where warm and cold ocean currents meet are also rich in fishing grounds. Example: Grand Bank near the North American coast in the Atlantic Ocean and Dogger Bank near the European coast.

Q. 5. A. Answer the following questions:

What are the reasons responsible for the formation of deep ocean currents?

Answer : Deep ocean currents are those water currents which flow beyond the depth of 500m. They constitute about 90% of the ocean water. They are driven by density and temperature gradients. This is also known as thermohaline circulation. The difference in temperatures of various parts of the ocean results into formation of the deep-sea currents. Warm water that has lower density comes to the surface of the sea while the Coldwater with high density goes down.



Circulation of ocean currents

Q. 5. B. Answer the following questions:

What is the reason behind the dynamics of the ocean water?

Answer : Ocean water is not still. There is continuous vertical and horizontal movement of water. The horizontal continuous flow of a mass of water from one place to another gives rise to an ocean current. Many factors are responsible for this movement of water. They are driven by density, temperature gradients, planetary winds etc. Due to uneven heating of the earth, surplus heat is accumulated at the equator which is then transferred to poles through ocean currents. The direction of flow of ocean current is also dependent on the continental structure and the rotation of the earth. The shape and position of coastline play a crucial role in guiding the direction of ocean currents. The rotation of earth results in ocean currents to move in the clockwise direction in the northern hemisphere and anti-clockwise in the southern hemisphere.

Q. 5. C. Answer the following questions:

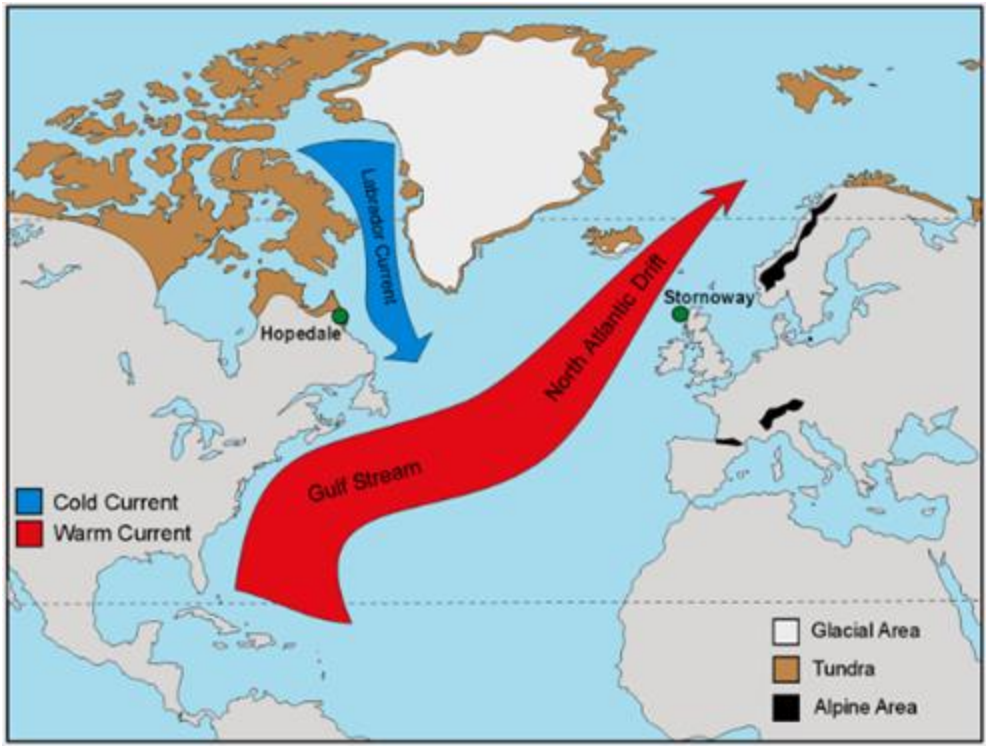
How do winds give direction to the ocean currents?

Answer : Ocean currents are the horizontal continuous flow of a mass of water from one place to another. The planetary winds are one of the factors responsible for the movement and direction of ocean current. These currents are pushed to long distances due to the wind. The direction of ocean currents in mid-latitudes is determined by westerlies. As a result, ocean current at mid-latitude flows from west to east. Similarly, the ocean currents near the equator flow from east to west under the influence of trade winds.

Q. 5. D. Answer the following questions:

Why do the ports in the eastern coast of Canada freeze in winter?

Answer : Ocean currents are the horizontal continuous flow of a mass of water from one place to another. They are of 2 types – warm and cold ocean current. Ocean currents flowing along the coastline have an impact on its climate. Labrador is cold oceanic current originating in Arctic Ocean and flowing south along the coast of Labrador, Canada. Thus, these waters are cold and tend to freeze up the ports early in the winter.



Activity

Q. 1. Look for more funny and interesting information related to ocean currents.

Answer : Ocean currents are driven by wind, water density differences, and tides. They are very important in determining the climates of the continents, especially those regions bordering on the ocean. Currents are also important for marine life because they transport creatures around the world and affect the water temperature in ecosystems. Types of ocean currents:

1. Surface water currents

2. Deep water currents

3. Tidal currents

4. Coastal currents.

Intext Questions

Q. 1. When does any material flow?

Answer : Materials can flow in any number of ways. The flow and motion of materials, especially liquids is dealt in classical physics through quantum mechanics or relativity. The study of liquids comes under fluid dynamics which is again divided into hydrodynamics (flow of water) and aerodynamics (flow of air).

Fluids consist of both liquids and gaseous components as they constantly change shape when a force is exerted on them. Gases are compressible as they can either spread out or compress to fill in the volume of space available. But liquids are non-compressible as they do not compress or spread out and fill the volume of space completely.

Most of the materials flow because its particles and molecules do not form a rigid and definite arrangement at normal temperature and pressure. Changes in temperature and pressure can be the main reasons for the flow of materials. Liquids flow but stay together in the same form and shape because of the existence of attraction between the molecules and particles. Since these attractions are weak in liquids, there is greater space between the particles. Thus they flow with changes in temperature and pressure. In the case of most gaseous components, flow and movement occur due to the pressure difference. When there is a region of high pressure (more molecules and particles at a lesser space), they attempt to break free and move to a region with low pressure (fewer particles and molecules). This difference in pressure is the basis of the movement of gaseous components.

Q. 2. What happens exactly when it flows?

Answer : The flow of materials can be through gaseous components or liquid components. The flow of materials in any particular direction can lead to the formation of currents in the region. In the case of liquids, the material flow can result in the formation of ocean currents and waves in the seas and oceans. This can have far-reaching impacts on the ecological system. They contribute to cloud formation and development of rainfall in many regions. They are also responsible for the formation of various structures like rocks and cliffs on the ocean floor.

The flow and circulation of gaseous particles and materials also have implications in the ecological system. The flow of air and other gaseous and particulate matter through the atmosphere determines the level of temperature, pressure, and humidity of the atmosphere. It also plays an important role in the formation of low-pressure and high-pressure networks throughout the atmosphere and influences the weather and climate in any region.

Thus, the flow of materials affects the temperature, pressure, humidity, weather, climate and other geographical factors in any region.

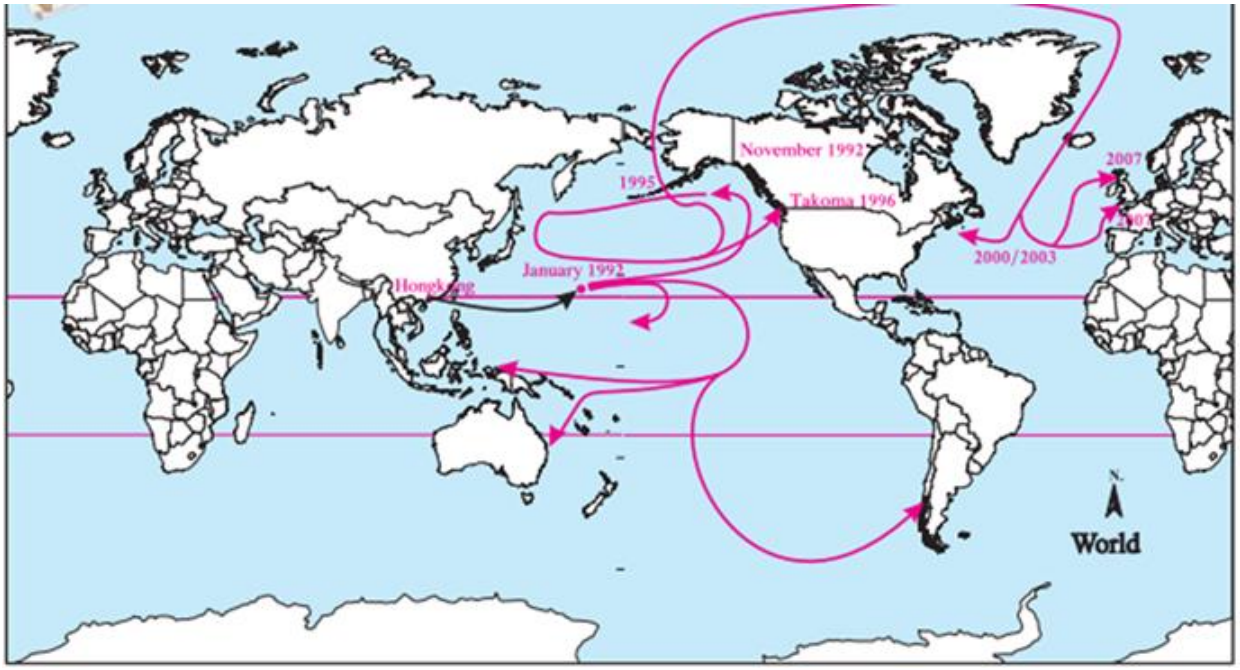
Q. 3. Which anomalies in the material is responsible for the initiation of the flow?

Answer : Materials can flow in any number of ways. The flow and motion of materials, especially liquids is dealt in classical physics through quantum mechanics or relativity. The study of liquids comes under fluid dynamics which is again divided into hydrodynamics (flow of water) and aerodynamics (flow of air).

Fluids consist of both liquids and gaseous components as they constantly change shape when a force is exerted on them. Gases are compressible as they can either spread out or compress to fill in the volume of space available. But liquids are non-compressible as they do not compress or spread out and fill the volume of space completely. Most of the materials flow because its particles and molecules do not form a rigid and definite arrangement at normal temperature and pressure.

This is the basic property of materials that allow it to flow as against the solids where the particles and molecules are strongly and rigidly bounded together.

Q. 4. A very strange incident occurred in the Pacific Ocean in the year 1992. A cargo ship sailed towards America from Hong Kong. While travelling through the Pacific Ocean, near the Hawaii Islands, a container full of toys fell into the ocean and broke. Around 28000 rubber toys started floating on the ocean. This incident occurred on 10th January 1992. Now a strange thing happened. After around 10 months, on 16th November 1992, some of these toys reached the coast of Alaska. Some of them crossed the Bering Strait and moved up to the Arctic Ocean by the year 2000. Some of them also floated to the Atlantic Ocean from the Arctic. Some of these reached the eastern coast of America in 2003 and some of the toys had even reached the European coast by 2007. From the Hawaii Islands, some toys took the route to Australia! See figure 5.2 and 5.3. Why did the toys travel in this way?



Answer : The toys travelled in this pattern because of the movement of ocean currents. Ocean current is a permanent and continuous movement of water in the earth's oceans. The ocean water consists of two layers- surface water and deep sea. The surface currents and surface circulation account for only 10% of the movement in oceans. It is the deep water circulation that constitutes for the rest 90% of the movements in the oceans.

Ocean currents can either be towards the north or towards the south. They flow from the equator towards the poles or from the poles towards the equator. The currents from the poles are generally cooler, while the equator has warmer currents. The ocean can also have massive loops of water, generally called as gyres. They are generally found in the Pacific Ocean, the Atlantic Ocean, and the Indian Ocean.

The tides, gyres, and waves superimposed on the ocean currents are responsible for the movement of water and the toys in a circulating manner.