

# Hydrosphere

## Exercises

### I. Short Answer Questions

#### Question 1.

Name the three ways in which movement of ocean water takes place.

#### Answer:

Oceanic water movement is affected by the rotation of the earth e.g. earth's movement from west to east compels water to move from east to west as North and South equatorial current along with a contour equatorial current. Secondly, the direction of planetary winds motivates currents as the trade winds push forcefully towards polewards and afterwards by the Westerlies towards North East as warm currents touching North American eastern and European Western coast. Thirdly, the level of salinity makes the water to move less saline water to move saline water.

#### Question 2.

What are tides ? Name one factor that causes tides.

#### Answer:

Tides are the rise and fall of sea water due to gravitational forces of the sun and the moon. Tides are mainly caused by the centrifugal and centripetal forces of the earth and the moon.

#### Question 3.

What is the time interval between tides ? Name the factors responsible for this time interval ?

#### Answer:

On account of the continuous rotation of the earth and revolution of the moon around the earth, whenever the moon comes in the front of the earth, tide takes place at an interval of 24 hours and 52 minutes and at the same time on the opposite side of the earth the interval is of 12 hours and 26 minutes.

#### Question 4.

What are Spring and Neap tides ?

#### Answer:

When the gravitational forces of the sun and the moon work together to attract the earth due to being in a straight line, high tides or Spring tides are caused. When the sun and the moon are in right angle with respect to the earth, Neap tides or low tides are caused.



**Question 5.**

Name two types of ocean currents based on their temperature.

**Answer:**

There are two types of ocean currents e.g., warm and cold currents. The current which flows from warm tropical region to cooler temperate and polar region is called warm current and the current flowing from polar areas towards temperate and equatorial regions is called cold current, e.g. Gulf stream is a warm current and Labrador current is called cold current.

**Question 6.**

For what is the Gulf Stream famous?

**Answer:**

The Gulf Stream is a powerful warm ocean current affecting the climate of eastern coast of North America and western coast of Europe and it is an important source of tidal energy.

**Question 7.**

What happens when warm and cold currents meet ?

**Answer:**

By meeting the warm and cold currents, large amount of fog is created, which controls the temperature conditions in the fishing regions of the meeting grounds.

**Question 8.**

What is meant by 'salinity' of ocean water ?

**Answer:**

Salinity is the amount of sodium in the oceanic water. It is 35%.

**Question 9.**

Name the factors responsible for subsurface movement of ocean waters.

**Answer:**

The factors responsible for ocean currents are the rotation of the earth, difference in salinity, temperature and the prevailing winds.

**Question 10.**

State the relationship between temperature and density of ocean water.

**Answer:**

High temperature near the equatorial belt and landlocked seas leads to higher salinity or higher density of ocean water.

**Question 11.**

State one difference between waves and tides.

**Answer:**

Waves are the oscillatory (to and fro) movements in the oceanic water, but tides are particular turbulent motion of the oceanic water due to gravitational forces (centrifugal



and centripital) working together with the earth and the moon which makes the waves of the ocean jumping upto several metres resulting in a typical phenomenon of violent waves i.e. tides.

**Question 12.**

How do evaporation and precipitation cause movement of ocean water.

**Answer:**

High amount of evaporation increases salinity of oceanic water and excess of precipitation makes water less saline. So the heavy saline water sinks down and the lighter water flows towards it to take its place as ocean current.

**Question 13.**

How is the rotation of the earth responsible for influencing the direction of currents ?

**Answer:**

The earth rotates from west to east. So, according to the first Law of Motion, the ocean currents start to flow from east to west as opposite direction, e.g. the North and South Equatorial currents flow from east to west.

**Question 14.**

Name the factors originating within the sea which cause ocean currents.

**Answer:**

The amount of salinity in the oceans in different parts is quite different. So the more saline water start to sink downwards and the less saline water runs to take its place on the surface, e.g., the ocean current flows from Atlantic ocean towards the Mediterranean sea.

## **II. Give reasons for the following**

**Question 1.**

There are two high and two low tides in a day.

**Answer:**

The rotation of the Earth results in every meridian coming into the position of two high tides and two low tides very nearly every 24 hours.

**Question 2.**

Each day a tide is delayed by 26 minutes.

**Answer:**

Each day a tide is delayed by 26 minutes because the moon also rotates on its axis (west to east) while revolving round the earth. Since the earth rotates from west to east, the tide centre shifts westward. When the tide centre completes one round, the moon's position is ahead of the tide centre by that time. The moon also revolves round the earth, with the result, the tide centre takes another 52 minutes to come under the moon. Thus, a particular tide centre takes 24 hours 52 minutes to come under the moon but by

that time there is another tide at the opposite side of the referred tide centre and this happens after 12 hours 26 minutes.

### Question 3.

Warm currents produce a milder climate.

#### Answer:

Warm currents of Gulf Stream has made the climate of eastern North America and Western Europe mild and pleasant for ideal industrial life and developed oceanic routes for trade. In the same way warm Kuroshio current has made Japan a progressive country by leading in fishing occupation supporting the economy of Japan, Apart from this violent storms also follow the meeting places of warm and cold currents, e.g., Hurricanes in America and typhoons in China and Japan.

### Question 4.

The eastern coasts of USA are comparatively cold.

#### Answer:

Due to the cooling effect of Labrador current keeps these coasts comparatively cold.

### Question 5.

The waters of the Oyashio Current form the richest fishing grounds in the world.

#### Answer:

Due to meeting with warm Kuroshio current creates large amount of fog regulating the ideal temperature for fish and the remarkable efforts of Japanese for fishing occupation makes this region the leading fishing grounds of the world.

### Question 6.

There is heavy rainfall in Queensland but the Atacama desert is arid.

#### Answer:

Queensland's coast is touched by the warm east Australian current and gets heavy rainfall by trade winds from sea towards land, but Atacama desert is touched by cold Peruvian current and the westerlies blowing from land towards sea make Atacama the cold driest desert in the world.

### Question 7.

The coasts of Norway are not frozen in winter whereas its adjoining coasts are frozen for most parts of the year.

#### Answer:

The Western coast of Norway are not frozen in winter due to the warm effect of Gulf Stream or the North Atlantic Drift touching the coast.



### Question 8.

Rich fishing grounds are located on the Pacific coast of North America.

#### Answer:

The Pacific coast of North America affected by the warm Kuroshio current are the famous fishing grounds of salmon fish mainly shared by Canada.

### III. Long Answer Questions

**PQ. Differentiate between the three movements of ocean water-waves, tides and currents.**

#### Answer:

Waves are oscillatory movement in water, manifested by an alternate rise and fall of the sea surface. Every wave has a wavelength, velocity, height and wave period. The rise and fall of sea water due to gravitational forces of the sun and the moon are called tides. The sea waves produced by tides are called tidal waves. Ocean currents are large masses of surface water that circulate in regular patterns around the ocean. It is of two types warm and the cold.

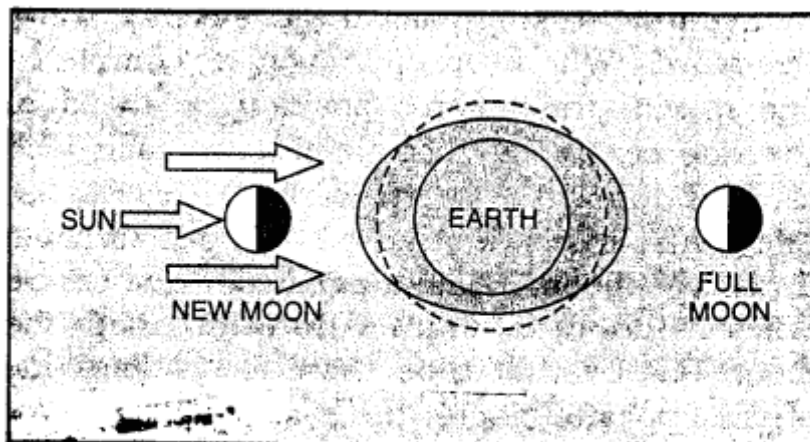
### Question 1.

Discuss the origin of tides. Illustrate the formation of Spring Tides.

#### Answer:

The tides have their origin in the gravitational forces of the sun and the moon. The earth rotates from west to east and revolves round the sun following an elliptical orbit. Similarly, the moon, rotates from west to east and revolves round the earth along an elliptical orbit.

**Spring Tides :** Very high tides are caused when the sun and the moon and the earth are almost in the same line. Such high tides are called Spring Tides. The gravitational forces of the sun and the moon work together with combined force and thus a high tide is caused. The height of such Spring Tides is 20 per cent more than that of the normal tides. Such tides take place twice every month (during the full moon and the new moon) and their timing is fixed.



Full moon and new moon and high tides



### Question 2.

Differentiate between High Tides and Low Tides.

**Answer:**

**High Tides :**

1. When the sun and the earth and the moon are in the same line.
2. Caused when all the gravitational forces work together.
3. Occurs at the time of Full moon and new moon.

**Low Tides :**

1. When the sun and the earth and the moon are at the position of right angles.
2. Caused when the gravitational forces of the sun work against each other.
3. Occurs during the 8th day of each fortnight of a month.

### Question 3.

Describing the types of ocean currents, state and factors responsible for causing the currents.

**Answer:**

Ocean currents are warm and cold according to the temperature. Ocean currents are caused by the rotation of the earth, force of prevailing winds, amount of salinity and the presence of the continental ejections etc.

### Question 4.

Describe the circulation pattern of the following three ocean currents.

- (a) Labrador Current of the Atlantic Ocean.
- (b) The Kuroshio current
- (c) Oyashio Current of the Pacific Ocean.
- (d) The North Atlantic Drift.

**Answer:**

(a) Labrador Current originates from the Arctic ocean along the coast of Labrador and passes touching Newfoundland continuing southwards along the coast of Nova Scotia. It is joined by West Greenland and Baffin Island Current. It meets the warm Gulf Stream Current at the Grand Banks, making this region the famous fishing bank.

(b) The Kuroshio current – is a strong western boundary current in the western north Pacific Ocean. It begins off the east coast of Taiwan and flows north-eastward past Japan, where it merges with the easterly drift of the North Pacific Current. It is analogous to the Gulf Stream in the Atlantic Ocean, transporting warm, tropical water northward towards the polar region. It is also sometimes known as the Black Stream — the English translation of Kuroshio, and an allusion to the deep blue of its water — and also as the Japan Current.



(c) Oyashio Current is a cold current colliding with warm Kuroshio current along the eastern coast of Japan. It originates in the Arctic ocean and passes through the Bering strait proceeding towards south.

(d) The North Atlantic Drift : It is the eastern extension of Gulf Stream to Europe as a warm current.

### Question 5.

Trace the origin and flow of the Gulf Stream. What is the effect of this current on the coasts of North America and Western Europe ?

#### Answer:

**Gulf Stream** – The Gulf Stream is one of the largest warm currents. It originates from the Gulf of Mexico (about 20°N) and moves in a north-easterly direction along the eastern coast of North America. The average speed is about 33 km per day and its average width is -about 70 km. Under the impact of the Westerlies, this warm current reaches the western coast of Europe (about 70°N latitude). The general direction of flow of the Gulf Stream, north of 30° N latitude, is northward. Near Newfoundland, its water mixes with the cold water of the Labrador Current, which forms very dense fog. The foggy conditions around Newfoundland hamper the navigation of ships. From here, the Gulf Stream moves north eastwards. This current gradually widens and its speed decreases. It becomes a prominent, slow-moving current known as the North Atlantic Drift. Near western Europe, it splits into two parts. One part moves northwards, past UK and Norway, while the other part is deflected southwards as the cold Canary Current. The warm water of the Gulf Stream modifies the weather conditions off the eastern coast of North America and the western coast of Europe.

### Question 6.

Describe four major effects of currents.

#### Answer:

Major effects of currents are visualised by the distinct effect of the Warm Gulf Stream on the climate of eastern. North . American region and the western region of Europe and the oceanic trade routes joining the most industrialised regions of the world. On the other hand cold current of Benguela keeps the South African Western Coast mild and cool. Kuroshio warm current keeps the eastern coast of Japan ideal for fishing.

