

Chapter 12

Water (Oceans)

Very Short Answer Type Questions

1.What are guyots?

Answer:

It is a flat topped seamount. They show evidences of gradual subsidence through stages to become flat topped submerged mountains. It is estimated that more than 10,000 seamounts and guyots exist in the Pacific Ocean alone.

2.What is a seamount?

Answer:

It is a mountain with pointed summits, rising from the seafloor that does not reach the surface of the ocean. Seamounts are volcanic in origin. These can be 3,000 – 4,500 m tall. The Emperor seamount, an extension of the Hawaiian Islands in the Pacific Ocean, is a good example.

3.What are deep sea plains?

Answer:

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.

4.What are ocean deeps or trenches?

Answer:

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.

5.Explain about mid-oceanic ridges.

Answer:

A mid-oceanic ridge is composed of two chains of mountains separated by a large depression. The mountain ranges can have peaks as high as 2,500 m and some even reach above the ocean's surface. Iceland, a part of the mid- Atlantic Ridge, is an example.

6.What is atoll?

Answer:

These are low islands found in the tropical oceans consisting of coral reefs surrounding a central depression. It may be a part of the sea (lagoon), or sometimes form enclosing a body of fresh, brackish, or highly saline water.

7.What is shelf break?

Answer:

The shelf typically ends at a very steep slope, called the shelf break.

8.In how many parts can ocean floor be divided?

Answer:

The ocean floors can be divided into four major divisions:

- the Continental Shelf;
- the Continental Slope;
- the Deep Sea Plain;
- the Oceanic Deeps.

9.What minor relief features are found in ocean floors except major divisions?

Answer:

Apart from the major relief features of the ocean floor, some minor but significant features predominate in different parts of the oceans. It includes like ridges, hills, seamounts, guyots, trenches, canyons, etc.

10.What is continental slope?

Answer:

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.

11.What are submarine canyons? Name the best submarine canyon in the world.

Answer:

These are deep valleys, some comparable to the Grand Canyon of the Colorado river. They are sometimes found cutting across the continental shelves and slopes, often extending from the mouths of large rivers. The Hudson Canyon is the best known submarine canyon in the world.

12.Name the areas of the world with highest salinity.

Answer:

Highest salinity in water bodies are Lake Van in Turkey, Dead Sea, Great Salt Lake.

13.In which latitude is salinity highest?

Answer:

The highest salinity is recorded between 15° and 20° latitudes.

Short Answer Type Questions

1.Explain the factors affecting salinity of sea water.

Answer:

Factors affecting ocean salinity are as follows:

- Evaporation and precipitation: The salinity of water in the surface layer of oceans depend mainly on evaporation and precipitation.
- Fresh water: 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: It also influences salinity of an area by transferring water to other areas.
- Ocean current: The ocean currents contribute to the salinity variations.
- Temperature: 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.Explain the relief features of ocean.

Answer:

The oceans are confined to the great depressions of the earth's outer layer. The oceans, unlike the continents, merge so naturally into one another that it is hard to demarcate them. The geographers have divided the oceanic part of the earth into five oceans, namely the Pacific, the Atlantic, the Indian, Southern ocean and the Arctic. The various seas, bays, gulfs and other inlets are parts of these four large oceans. A major portion of the ocean floor is found between 3-6 km below the sea level. The 'land' under the waters of the oceans, that is, the ocean floor exhibits complex and varied features as those observed over the land. The floors of the oceans are rugged with the world's largest mountain ranges, deepest trenches and the largest plains. These features are formed, like those of the continents, by the

3.Explain the components and process of hydrological cycle.

Answer:

Components of water cycle includes water storage in oceans, atmosphere, ice and snow, groundwater and water bodies. The processes of the water cycle vary in different components. In water stored in oceans evaporation, evapotranspiration and sublimation takes place. In water, in the atmosphere condensation and precipitation takes place. In water stored in ice and snow there is snowmelt runoff to streams. In surface runoff, there is stream flow freshwater storage and infiltration. In groundwater storage, groundwater discharge springs occurs.

4.Differentiate between continental shelf and continental slope.

Answer:

Continental shelf:

- It is an extended margin of each continent occupied by shallow sea, gulfs, etc. It is a submerge part of the land adjoining the coast.
- It is shallow and is about 800m deep with an average gradient 1° or even less.
- Its edges extended upto the depth of 150-200 m. ‘
- It contains the sediments deposited with land its average width is 80km.
- The largest continental shelf is a Siberian shelf in Arctic Ocean which stretches upto 1500 km of width.
- About one-fourth of the petroleum is produced from oil wells on the continental shelves.
- It is important for coastal transport and trade.

Continental slopes:

- It represents the edge of continental block.
- It connects continental shelf and ocean basin.
- The depth varies from 200-300 m.
- Its average gradient is $2-5^{\circ}$.
- It has a steep slope linking continental shelf and deep sea floor lying at an average depth of 3600 m.
- Canyons are formed here.

5. Write a short note on variation in salinity.

Answer:

The salinity for normal open ocean ranges between 33% and 37%. In the land locked Red Sea, it is as high as 41%, while in the estuaries and the Arctic, the salinity fluctuates from 0 – 35 %, seasonally. In hot and dry regions, where evaporation is high, the salinity sometimes reaches to 70%. Salinity decreases from 35% – 31% on the western parts of the northern hemisphere because of the influx of melted water from the Arctic region. In the same way, after 15° – 20° south, it decreases to 33%.

The average salinity of the Atlantic Ocean is around 36%. The highest salinity is recorded between 15° and 20° latitudes. Maximum salinity (37%) is observed between 20° N and 30° N and 20° W—60° W. It gradually decreases towards the north. The North Sea, in spite of its location in higher latitudes, records higher salinity due to more saline water brought by the North Atlantic Drift. Baltic Sea records low salinity due to influx of river water in large quantity. Highest salinity is found in water bodies as Lake Van in Turkey, Dead Sea, Great Salt Lake.

6. Why do we call the earth a Blue Planet?

Answer:

Water is an essential component of all life forms that exist over the surface of the earth. The creatures on the earth are lucky that it is a water planet, otherwise we all would have no existence. Water is a rare commodity in our solar system. There is no water on the sun or anywhere else in the solar system. The earth, fortunately has an abundant supply of water on its surface. Hence, our planet is called the ‘Blue Planet’.

7. What is a continental margin?

Answer:

The continental margin is the extended portion 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. The shelf typically ends at a very steep slope, called the shelf break. The width . of the continental shelves vary 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.

8. List out the deepest trenches of various oceans.

Answer:

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. Some important trenches of the world are as follows:

- Mariana Trench: It is the world's deepest trench. It lies in Pacific Ocean. It is 11034 km below the ocean.
- Puritonko Trench: It is deepest trench in Atlantic Ocean.
- Sunda Trench: It is deepest trench in Indian Ocean.

9. What is a thermocline?

Answer:

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.

10. When you move into the ocean what thermal layers would you encounter? Why the temperature varies with depth?

Answer:

The temperature structure of oceans over middle and low latitudes can be described as a three-layer system from surface to the bottom.

- The first layer represents the top layer of warm oceanic water and it is about 500m thick with temperatures ranging between 20° C 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 upto the deep ocean floor. In the Arctic and Antarctic circles, the surface water temperatures are close to 0° C and so the temperature variation with the depth is very slight.

11.What is salinity of sea water?

Answer:

Salinity is the term used to define the total content of dissolved salts in sea water. It is calculated as the amount of salt (in gm) dissolved in 1,000 gm (1 kg) of seawater. It is usually expressed as parts per thousand (%) or ppt. Salinity is an important property of sea water. Salinity of 24.7% has been considered as the upper limit to demarcate 'brackish water'. Salinity changes with depth, but the way it changes depends upon the location of the sea. Salinity at the surface increases by the loss of water to ice or evaporation, or decreases by the input of fresh water, such as from the rivers. Salinity at depth is very much fixed, because there is no way that water is 'lost', or the salt is 'added.'

Long Answer Type Questions

1.The average temperature of water on oceans floor keeps on falling from equator to poles systematically. Explain.

Answer:

The average temperature of surface water of the- oceans is about 27°C and it gradually decreases from the equator towards the poles. The rate of decrease of temperature with increasing latitude is generally 0.5°C per latitude. The average temperature is around 22°C at 20° latitudes, 14° C at 40° latitudes and 0° C near poles.

The oceans in the northern hemisphere record relatively higher temperature than in the southern hemisphere. The highest temperature is not recorded at the equator but slightly towards north of it.

The average annual temperatures for the northern and southern hemisphere are around 19° C and 16° C respectively. This variation is due to the unequal distribution of land and water in the northern and southern hemispheres.

2.Explain about horizontal distribution of salinity.

Answer:

Horizontal distribution of salinity:

- The salinity for normal Open Ocean ranges between 33% and 37%. In the land locked Red Sea records higher salinity due to high evaporation.
- Salinity is, however, very low in Black Sea due to enormous fresh water influx by rivers.
- The average salinity of the Indian Ocean is 35 %.
- The low salinity trend is observed in the Bay of Bengal due to influx of river water.
- On the contrary, the Arabian Sea shows higher salinity due to high evaporation and low influx of fresh water.

3.Explain about vertical distribution of salinity.

Answer:

Vertical distribution of salinity

- Salinity changes with depth, but the way it changes depends upon the location of the sea. Salinity at the surface increases by the loss of water to ice or evaporation, or decreased by the input of fresh waters, such as from the rivers.
- Salinity at depth is very much fixed, because there is no way that water is 'lost', or the salt is 'added.'
- There is a marked difference in the salinity between the surface zones and the deep zones of the oceans. The lower salinity water rests above the higher salinity dense water.
- Salinity, generally, increases with depth and there is a distinct zone called the halocline, where salinity increases sharply.
- Other factors being constant, increasing salinity of seawater causes its density to increase. High salinity seawater, generally, sinks below the lower salinity water. This leads to stratification by salinity.

4.Explain about vertical distribution of temperature.

Answer:

The temperature structure of oceans over middle and low latitudes can be described as a three-layer system from surface to the bottom.

- The first layer represents the top layer of warm oceanic water and it is about 500 m 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 upto 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.

5.Explain the features of the deep sea plains, submarine ridges, ocean deeps and seamount.

Answer:

Abyssal plains (the deep sea plains):

- These are the world's flattest and smoothest regions.
- About 40% of the oceanic floor is flat.
- It is formed accumulation of sediments on the sea floor.
- Its depth varies from 3000-6000 m.

Submarine ridges:

- Oceanic floors have submarine narrow and elongated ridges.
- They resemble mountain ridges on the earth surface.
- Peak of these ridges may rise above the sea level to form islands.
- Eg-Philippines Ice land is a mid-Atlantic ridge.

Oceanic deeps of submarine trenches:

- Deep narrow steep sided depression is found along the abyssal plain.
- The depth of these trenches may vary from 6,000 to 11,000 m. Example, Marina trenches is the deepest trench in Pacific Ocean.
- Trenches are formed as a result of tectonic forces and normally occur along the marines of Pacific Ocean.
- They occur at the base of the continental slopes and along the island area. Normally associated with volcanoes and strong earthquake.
- There are 32 trenches in Pacific Ocean, 19 in Atlantic Ocean and just 6 in Indian Ocean.

Seamount:

- It is the mount with a pointed submit rising from the sea floor but do not reach the surface of ocean. For example
 - Emperor seamount, an extension of Hawaiian islands in Pacific Ocean
 - The tallest seamount between Soman and New Zealand.

Seamounts are volcanic in origin and can be 3000 to 4500 m tall.

6.How are various elements of the hydrological cycle interrelated?

Answer:

Water is a cyclic resource. It can be used and re-used. Water also undergoes a cycle from atmosphere, land surface and sub surface and the organisms. 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. The renewable water on the earth is constant while the demand is increasing tremendously. This leads to water crisis in different parts of the world :— spatially and temporally. The pollution of river waters has further aggravated the crisis.

7.Examine the factors that influence the temperature distribution of the oceans.

Answer:

The factors which affect the distribution of temperature of ocean water are explained below:

- 1. Latitude:** The temperature of surface water decreases from the equator towards the poles because the amount of insolation decreases poleward. The enclosed seas in the low latitudes record relatively higher temperature than the open seas; whereas the enclosed seas in the high latitudes have lower temperature than the open seas.
- 2. Unequal distribution of land and water:** The oceans in the northern hemisphere receive more heat due to their contact with larger extent of land than the oceans in the southern hemisphere.
- 3. Prevailing wind:** The winds blowing from the land towards the oceans drive warm surface water away from the coast resulting in the upwelling of cold water from below. As a result, there is longitudinal variation in the temperature. On the contrary, the onshore winds pile up warm water near the coast and this raises the temperature.

4. Ocean currents: Warm ocean currents raise the temperature in cold areas while the cold currents decrease the temperature in warm ocean areas. Gulf stream raises the temperature near the eastern coast of North America and the West Coast of Europe while the Labrador current (cold current) lowers the temperature near the north-east coast of North America.

5. Salinity: Saline water absorbs more heat and its temperature rises much higher than fresh water.

All these factors influence the temperature of the ocean currents locally.

8. “Ocean seems to be water body but it has many types of landforms within it”. Justify the statements by giving some examples.

Answer:

The statement is absolutely right. Like the surface of the earth ocean floor is neither level or flat, it is undulating and varying. It comprises of different types of landforms below it. Some of these are:

- **Continental shelf:** It is an extended margin of each continent occupied by shallow sea, gulfs, etc. It is a submerged part of the land adjoining the coast.
- **Continental slopes:** It represents the edge of continental block. It connects continental shelf and ocean basin. The depth varies from 200-300 m.
- **Abyssal Plains (The Deep Sea Plains):** These are the world's flattest and smoothest regions. About 40% of the oceanic floor is flat. It is formed by accumulation of sediments on the sea floor. Its depth varies from 3000-6000m.
- **Sub Marine Ridges:** Oceanic floors have sub-marine narrow and elongated ridges. They resemble mountain ridges on the earth surface. Peak of these ridges may rise above the sea level to form islands. Eg- Mid-Atlantic ridge.
- **Oceanic deeps or sub-marine trenches:** Deep narrow steep sided depression found along the abyssal plain. The depth of these trenches may vary from 6,000 to 11,000 m. Example, Mariana trenches is the deepest trench in Pacific Ocean.

9.Explain hydrological cycle.

Answer:

The hydrological cycle is a conceptual model that describes the storage and movement of water between the biosphere, atmosphere, lithosphere, and the hydrosphere. Water on our planet can be stored in any one of the following major reservoirs: atmosphere, oceans, lakes, rivers, soils, glaciers, snowfields, and groundwater. Water moves from one reservoir to another by way of processes like evaporation, condensation, precipitation, deposition, runoff, infiltration, sublimation, transpiration, melting, and groundwater flow. The oceans supply most of the evaporated water found in the atmosphere. Of this evaporated water, only 91% of it is returned to the ocean basins by way of precipitation. The remaining 9% is transported to areas over landmasses where climatologically factors induce the formation of precipitation. The resulting imbalance between rates of evaporation and precipitation over land and ocean is corrected by runoff and groundwater flow to the oceans.

Map Skills

1.Show7 spatial distribution of surface temperature in degree celsius on a physical map of the world.

Answer:

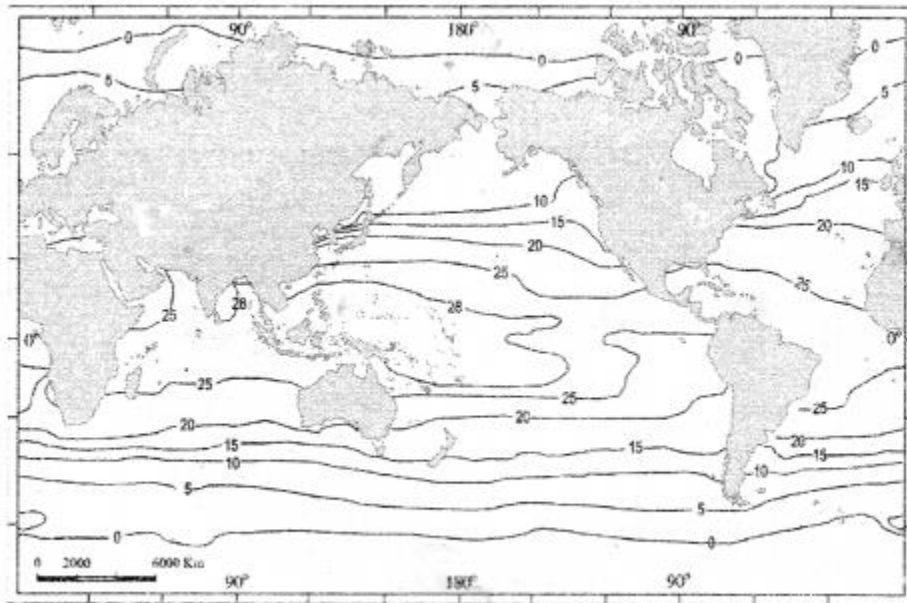


Fig: Spatial pattern of surface temperature (C) of the oceans.

2. Show on a physical map of the world, surface salinity of the different oceans.

Answer:

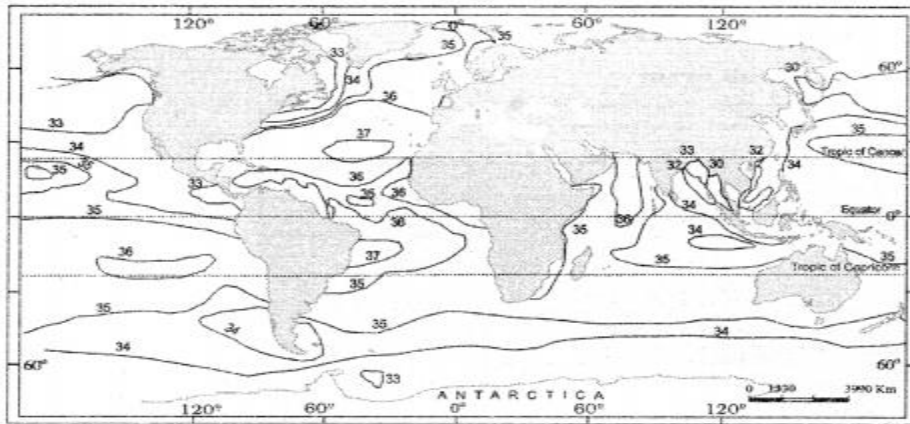


Fig: Surface salinity of the World's Oceans.

3. Show on a physical map of the world, mid oceanic ridges.

Answer:

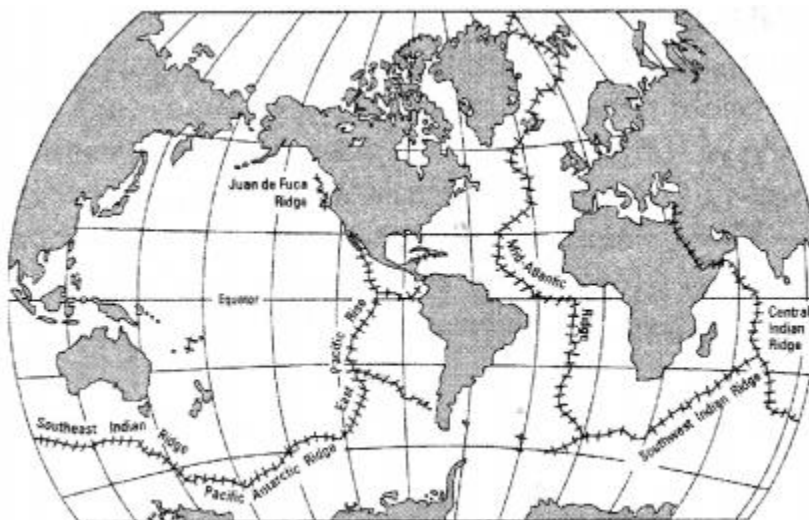


Fig: Mid Oceanic ridges on a physical map of the world.

4. Locate trenches on the map of the world.

Answer:

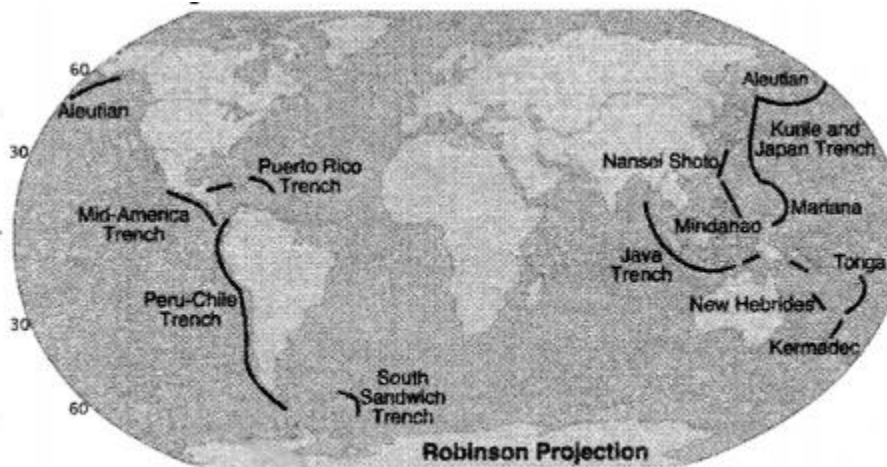


Fig: Trenches of the world.

5. Show different types of ocean floors.

Answer:

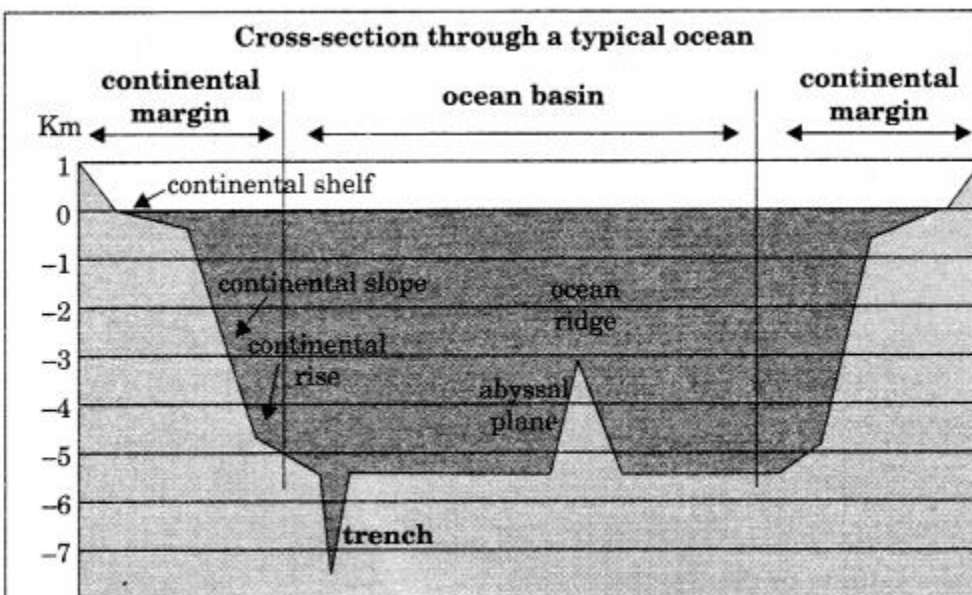


Fig: Types of Ocean Floors.

Multiple choice questions.

1.It is a flat topped seamount. What is it called?

- (a) Mid ocean ridges
- (b) Deep sea
- (c) Guyots
- (d) Shelf.

Answer:

- (c) Guyots

2.These areas are the deepest parts of the oceans. What are these?

- (a) Mid ocean ridges
- (b) Deep sea
- (c) Continental shelf
- (d) Trenches.

Answer:

- (d)Trenches

3.Salinity of what level has been considered as the upper limit to demarcate “brackish water?”

- (a) 22.3%
- (b) 24.7%
- (c) 15.8%
- (d) 20.4%.

Answer:

- (b) 24.7%

4.What is average temperature of surface water of the oceans?

- (a) 22°C
- (b) 27°C
- (c) 30°C
- (d) 35°C.

Answer:

- (6) 27°C

5.What is the depth of deep sea plains?

- (a) between 1000 metre to 3000 metre
- (b) between 2000 metre to 3000 metre
- (c) between 3000 metre to 4000 metre
- (d) between 3000 metre to 6000 metre.

Answer:

- (d) between 3000 metre to 6000 metre

6.Which ocean has maximum number of trenches?

- (c) Indian ocean
- (b) Atlantic ocean
- (c) Pacific ocean
- (d) Arctic ocean.

Answer:

- (c) Pacific Ocean

7.What is composed of two chains of mountains separated by a large depression?

- (a) Mid ocean ridges
- (b) Deep sea
- (c) Guyots
- (d) Shelf.

Answer:

- (a) Mid Ocean ridges

8.What is the average salinity of the Atlantic Ocean?

- (a) 35%
- (b) 40%
- (c) 32%
- (d) 36%.

Answer:

- (d) 36%

9.What is the average salinity of the Indian Ocean?

- (a) 35%
- (b) 40%
- (c) 32%
- (d) 36%.

Answer:

- (c) 35%

10.Which of the following is not an ocean?

- (a) Indian ocean
- (b) Atlantic ocean
- (c) Pacific ocean
- (d) Antarctica ocean.

Answer:

- (d) Antarctica ocean

11.Which of the following element is not there in salts existent of ocean water?

- (a) Chlorine
- (b) Sodium
- (c) Sulphate
- (d) Iodine.

Answer:

- (d) Iodine

12.What is the second layer of salinity of ocean called?

- (a) Thermocline
- (b) Mid land
- (c) Continental shelf
- (d) Deep sea.

Answer:

- (a) Thermocline

13. Identify the element which is not a part of the hydrological cycle:

- (a) Evaporation
- (b) Hydration
- (c) Precipitation
- (d) Condensation.

Answer:

- (b) Hydration

14. The average depth of continental slope varies between:

- (a) 2-20 m
- (b) 200-2,000 m
- (c) 20-200 m
- (d) 2,000-20,000 m.

Answer:

- (b) 200-2000 m

15. Which one of the following is not a minor relief feature in the oceans:

- (a) Seamount
- (b) Atoll
- (c) Oceanic Deep
- (d) Guyot.

Answer:

- (b) Atoll

16. Salinity is expressed as the amount of salt in grams dissolved in sea water per:

- (a) 10 gm
- (b) 1,000 gm
- (c) 100 gm
- (d) 10,000 gm.

Answer:

- (b) 1,000 gm

17. Which one of the following is the smallest ocean:

- (a) Indian Ocean
- (b) Arctic Ocean
- (c) Atlantic Ocean
- (d) Pacific Ocean.

Answer:

- (b) Arctic Ocean.