UGC-NTA NET/SET/JRF-JUNE 2020

PAPER- II

GEOGRAPHY

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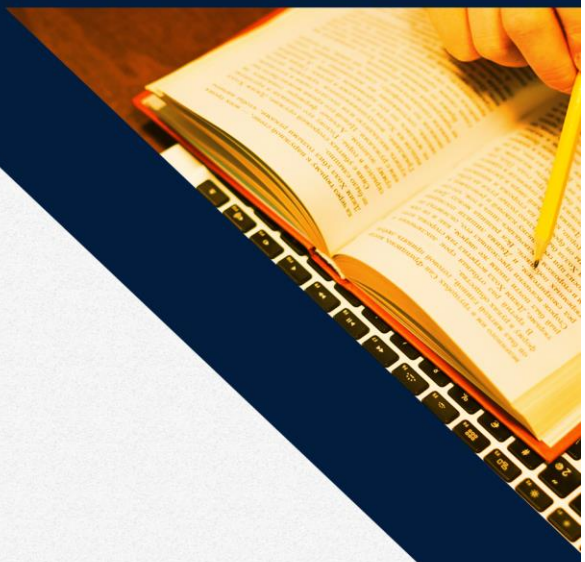

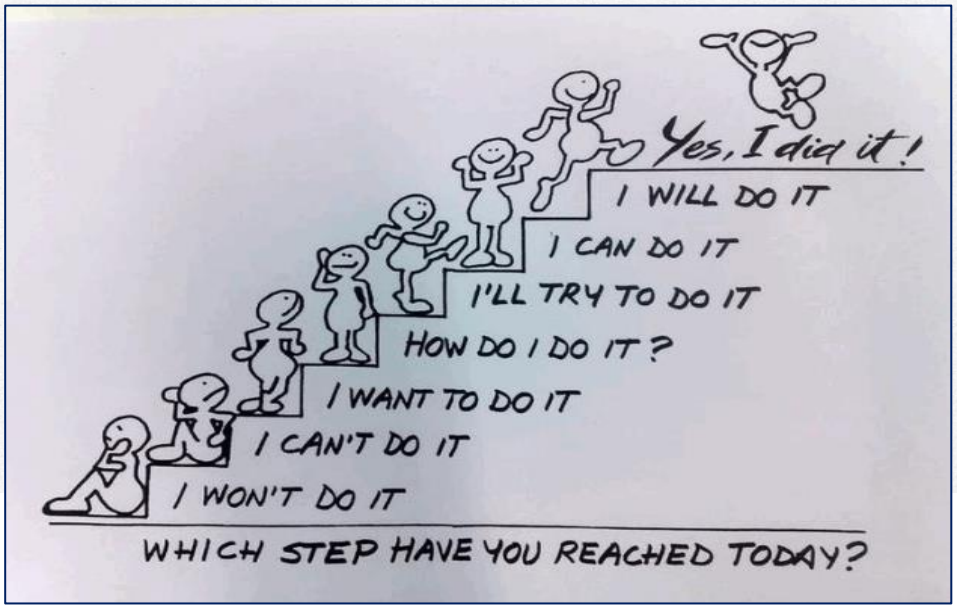

UNIT –3: OCEANOGRAPHY

SYLLABUS

Sub Unit – 1: Oceanic Bottom relief

SL NO.	TOPICS
1	3.1.1 Introduction:
2	3.1.2 Some theories on origin of oceans:
3	3.1.2.1 Continental drift theory:
4	3.1.2.2 Sea floor spreading theory:
5	3.1.2.3 Plate tectonic theory:
6	3.1.3 Ideal cross section of the ocean floor:
7	continental slope:
8	continental shelves:
9	continental rise:
10	deep ocean basins:
11	abyssal plain:
12	abyssal hills:
13	seamounts and guyots:
14	deep ocean trenches:
15	Mid-oceanic ridges:
16	3.1.4 Bottom topography of Pacific ocean:
17	3.1.5 Bottom topography of Atlantic ocean:
18	3.1.6 Bottom topography of Indian ocean:
19	3.1.7 Bottom topography of Arctic ocean:
20	3.1.8 Tsunami:

Sub Unit – 2:Physical and chemical composition of Oceanic Water

SL NO.	TOPICS
21	3.2.1 Density of ocean water:
22	3.2.2 Temperature distribution of ocean water:
23	3.2.3 Salinity of ocean water:
24	3.2.3.1 Origin of salinity:
25	3.2.3.2 Impact of salinity on characteristics of ocean water:
26	3.2.3.3 Salinity of different seas and oceans:
27	Brine:

Sub Unit – 3: Tides and Oceanic waves

SL NO.	TOPICS
28	3.3.1 Tides:
29	Sun's Tidal Effect:
30	Types of tidal ranges:
31	Apogee and perigee:
32	3.3.2 Components of waves:
33	3.3.2.1 Origin of ocean waves:
34	A) Geometry of ocean waves:
35	B) Relation between wind and waves:
36	C) Wave motion
37	D) Rotation of water particulars in sea waves
38	E) Motion of wave form
39	F) Breakers:
40	3.3.2.2 Wave types:
41	3.3.3 Classification of shore lines:
42	3.3.3.1 Fore shore:
43	3.3.3.2 Back shore:

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Sub Unit – 4: Oceanic currents

Sub Unit – 5: Oceanic deposition

Section – 1: Unit at a Glance

Sub Unit – 1: Oceanic Bottom relief

The ***Challenger*** **expedition** was done by the Royal Society of London in 1872 to 1876. It was a scientific program that made many discoveries to lay the foundation of Oceanography.

Continental drift theory:

In 1914 A. Wegner introduces the theory. He believed one united landmass (Pangea) and an ocean mass (Panthalassa) were present in past. Pangea divided into different continents. Those are floated over oceans by tidal force. At last those continents and oceans make the present form of the planet.

Sea floor spreading theory:

In 1960, Professor Herry Hess and Robert W. Ditz introduce the concept. Seafloor spreading is a process that occurs at mid-ocean ridges, where new oceanic crust is formed through volcanic activity and then gradually moves away from the ridge.

Plate tectonic theory:

The word 'Plate' first time used by J. T. Wilson in 1965. In 1967 Makenzie and Parker discuss elaborately about plate. W. J. Morgan and Le Pichon discussed about plate tectonic in 1968. Lithosphere is formed by seven large and many medium to small plates. Plate Tectonic is a scientific concept. Plate can float on Asthenosphere. Asthenosphere is in semi liquid to liquid state.

Ideal cross section of the ocean floor:

An oceanic basin may is covered by seawater. Geologically, there are other undersea geomorphological features such as –**continental shelves, continental slope, continental rise, deep ocean basins, abyssal plain, abyssal hills, seamounts and guyots, deep ocean trenches, Mid-oceanic ridges.**

Bottom topography of Pacific ocean:

It covers an area of 165,250,000 square kilometers. It covers 46% of Earth's water surface.

A. **Oceanic Ridges:**
   Albatross, Coco, Hawaii rise, Chuthum rise, Lord Ho rise etc.
B. **Deep ocean basins:**
   Allusion, Philippine, West Carolyn, East Carolyn, Fiji, East Australian, South Australian, South-east Pacific, South-west Pacific, Pacific-Antarctic etc.
C. **Deep ocean trenches:**
   Allusion trench, Qurile and Japan Trench, Philippine Trench, Nero or Mariana Trench, Peru-Chili Trench, Challenger, Aldrich etc.

Bottom topography of Atlantic ocean:

It covers approximately 20 percent of earth’s surface and about 29 percent of its water surface area.

A. **Oceanic Ridges:**
Mid oceanic Ridge(Almost 3 km above pertaining to the Mid-Atlantic Ridge from the floor of Atlantic Ocean)

B. **Deep ocean basins:**
Labredor, North east Atlantic, North west Atlantic, Cape Verde, Gini, Brazil, South East Atlantic, Argentina, Agulhas, Atalntic-Indian-Antarctica etc.

C. **Deep ocean trenches:**
South Sandwich Trench, Puerto Rico Trench etc.
Allusion trench,

Bottom topography of Indian ocean:

The Indian Ocean is the third-largest of the world's oceanic divisions, covering 70,560,000 km^2 and 19.8% of the water on the Earth's surface. It is bounded by Asia to the north, Africa to the west, and Australia to the east. To the south it is bounded by the Southern Ocean or Antarctica.

A. **Oceanic Ridges:**
Carlsberg, Lakshadweep and Maldives, Madagascar,

B. **Deep ocean basins:**
Arab, Oman, Somali, Mauritius, Natal, Agulhas, Indian –Antarctic, Andaman, East Indian Arctic Basin etc.

C. **Deep ocean trenches:**
Sunda Trench,

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Bottom topography of Arctic ocean:

The **Arctic Ocean** is the smallest and shallowest of the world's major oceans. It is also known as the coldest of all the oceans.

D. **Oceanic Ridges:**
East Zan Mayen ridge, Pits Bergen ridge, Lomonosov ridge, Trans current fault ridge etc.

E. **Deep ocean basins:**
Greenland basin, Norway Basin, northern Polar basin.

Tsunami:

A series of waves in a water body caused by the displacement of a large volume of water, generally in an ocean caused by Earthquakes, volcanic eruptions and other underwater explosions is called **Tsunami.**

Sub Unit – 2:Physical and chemical composition of Oceanic Water

Density of ocean water:

Ocean water density varies throughout the globe. it depends upon temperature. Polar water is much denser than equatorial water. Generally, fresh water achieves great density in 4°C.

Temperature distribution of ocean water:

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.

Salinity of ocean water:

NaCl is the maximum content in sea water.

Impact of salinity on characteristics of ocean water:

a) Density of ocean water
b) Freezing limitation of ocean water
c) Evaporating process of oceanic water

Brine:

A brine pool is a large area of brine on the ocean basin. These pools are bodies of water that have a salinity three to eight times greater than the surrounding ocean. For deep-sea brine pools, the source of the salt is the dissolution of large salt deposits through salt tectonics. Liquid ocean water has an average salinity of 35 parts per thousand. New ice such as nilas has the highest average salinity (12–15 parts per thousand); as ice grows thicker during the course of the winter, the average salinity of the entire ice thickness decreases as brine is lost from the ice. The temperature of the surface of the Arctic Ocean is fairly constant, near the freezing point of seawater. Because the Arctic Ocean consists of saltwater, the temperature must reach −1.8 °C (28.8 °F) before freezing occurs.

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Sub Unit – 3: Tides and Oceanic waves

Tides:

Tides are the rise and fall of sea levels caused by the combined effects of the gravitational forces exerted by the Moon and the Sun, and the rotation of the Earth.

Components of waves:

1. Crest: it's the top of the wave - the highest point of any wave.
2. Trough: the lowest region of a wave; the opposite of the crest.
3. Wavelength:
4. Wave height:

Origin of ocean waves:

G) **Geometry of ocean waves:**
H) **Relation between wind and waves:**
I) **Wave motion**
J) **Rotation of water particulars in sea waves**
K) **Motion of wave form**
L) **Breakers:**

Wave types:

When a wave breaks, water is washed up the beach. This is called the swash . Then the water runs back down the beach, which is called the **backwash** . With a constructive wave, the swash is stronger than the **backwash**. With a destructive wave, the **backwash** is stronger than the swash.

Sub Unit – 4: Oceanic currents

Ocean currents:

Ocean currents are two types : 1) Vertical ocean currents and 2) Horizontal ocean currents.

Factors controlling ocean currents:

A) **Horizontal currents:**

Gravitational forces, Deflective force due to Earth rotation, Atmospheric pressure and its variations, Wind and friction forces, Precipitation, Nature of evaporation and insolation, Pressure gradient, Temperature differences, Salinity, Direction and shape of coast lines, Seasonal variation, bottom topography of ocean, depth of ocean.

B) Vertical Current:

Ekman Spiral, Langmour Circulation, Geostrophic flow of ocean water

Ocean currents of Pacific ocean:

A) Northern Pacific Ocean surface

currents or gyre:

1. Kuroshio current
2. Northern Pacific current
3. California Current
4. North equatorial current

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B) Southern Pacific Ocean surface

currents or gyre:

1. East Australian current
2. South pacific current
3. Peru current (Humboldt current)
4. South equatorial current

Ocean currents of Atlantic ocean:

A)Northern Atlantic Ocean surface currents or gyre:

1. Qurile current
2. Gulf stream
3. North equatorial current

B)Southern Atlantic Ocean surface currents or gyre:

5. Benguela
6. South atlantic current
7. Brazil
8. South equatorial current

Ocean currents of Indian ocean:

Monsoon current
South Indian current
West austrelian current etc.

Sea level rises:

Global warming is the increase in the average temperature of the Earth's near-surface air and the oceans ever since the mid-twentieth century. The temperature is rising day by day. Between 1880 and 2012, the global average surface temperature increased by 0.85°C. Since 1979 the rate of warming has approximately doubled.

Effects: Ongoing effects include **rising sea levels** due to thermal expansion and melting of glaciers and ice sheets, and warming of the ocean surface, leading to increased temperature stratification. Over the past century world sea levels has risen by around 15 cm. Other possible effects include large-scale changes in ocean circulation. Global climate change is also an effect.

Ocean acidification:

Ocean water is slightly basic in nature. Due to increase of atmospheric carbon dioxide, it dissolves with water and increase pH value of ocean water. As a result calcium carbonate related plant and animals are in danger.

Sub Unit – 5: Oceanic deposition

Corals reefs:

A *coral reef* is an underwater ecosystem characterized by *reef*-building *corals*. *Reefs* are formed of colonies of *coral* polyps held together by calcium carbonate. Most *coral reefs* are built from stony *corals*, whose polyps cluster in groups. Sequences of coral development are Volcanic-coral Island, Fringe Reef, Barrier Reef and Atolls. Warm water temperature: Reef-building corals require warm water conditions to survive. Different corals living in different regions can withstand various temperature fluctuations. However, corals generally live in water temperatures of 68–90° F or 20–32° C.

Theories of formation Corals reefs:

1. Subsidence theory of Darwin
2. Static-water theory by Murry
3. Glacial control theory by Daly
4. Concept of W.M.Davis

Ocean deposits:

The sediments derived from weathering and erosion of continental rocks are transported to the oceans by rivers, winds etc. Volcanic eruptions also provide sediments.

1. On the Basis of Location:
   (A) Pelagic deposits:
   (B) Terrigenous deposits:
2. On the Basis of Depth:
   (A) Deep sea deposits (Below 100 fathoms):
   (a) Pelagic Deposits:
   (b) Terrigenous Deposits:
   (B) Shallow sea deposits (between low tide water and 100 fathoms):
   (c) Littoral deposits (Between high and low tide water):
3. Classification on the Basis of Origin of Sediments:
   (1) Littoral deposits (derived from land)):
   (2) Hemipelagic deposits (Partly from land and partly from marine origin):
   (3) Eupelagic deposits (Of marine and cosmic origin):

Section – 2: Key Statements

Every candidates appearing for NET/SET examination should follow these key (main) points those can help them a better understanding regarding this unit very quickly.

Basic Key Statements: continental drift (3.1.2.1), Pangea(3.1.2.1), Panthalasa(3.1.2.1), jig-saw-fit(3.1.2.1), pole wondering(3.1.2.1), Island arc(3.1.2.1), sea floor spreading(3.1.2.2), mid-oceanic ridge(3.1.2.2), Paleomagnetic evidence(3.1.2.2), Plate tectonic(3.1.2.3), continental plate(3.1.2.3), oceanic plate(3.1.2.3), destructive plate(3.1.2.3), constructive plate(3.1.2.3), Transverse plate(3.1.2.3), continental shelves(3.1.3), continental slope(3.1.3), continental rise(3.1.3), abyssal plain(3.1.3), abyssal hills(3.1.3), seamounts(3.1.3), guyots(3.1.3), ocean trenches(3.1.3), mid oceanic ridge(3.1.3), Pacific ocean(3.1.4), Atlantic ocean(3.1.5), Indian ocean(3.1.6), Arctic ocean(3.1.7), tsunami(3.1.8), density of ocean water(3.2.1), salinity(3.2.3), saltwater(3.2.3.3), tides(3.3.1), gravity(3.3.1), apogee(3.3.1), perigee(3.3.1), wave(3.3.2), crest(3.3.2), trough(3.3.2), wavelength(3.3.2), wave height(3.3.2), wave motion(3.3.2), swash(3.3.2.2), backwash(3.3.2.2), foreshore(3.3.3.1),backshore(3.3.3.2), oceanic current(3.4.1), Kuroshio current(3.4.2.2), California Current(3.4.2.2), East Australian current(3.4.2.2), Peru current(3.4.2.2), Humboldt current(3.4.2.2), Qurile current(3.4.2.3), Gulf stream(3.4.2.3), Brazil current(3.4.2.3), Benguela Current(3.4.2.3), global warming(3.4.4), sea level rising(3.4.4), coral reef(3.5.1), littoral zone(3.5.1), macrophytes(3.5.1), Pelagic deposits(3.5.2), Terrigenous deposits(3.5.2), Shallow sea deposits(3.5.2), Littoral deposits(3.5.2), Hemipelagic deposits(3.5.2), Eupelagic deposits(3.5.2),

Standard Key Statements: challenger expedition(3.1.1), Glomar challenger(3.1.2.2), turbidity current theory(3.1.3), focus(3.1.8), epicenter(3.1.8), Brine(3.2.3.3), Sun's tidal effect(3.3.1), micro-tidal(3.3.1), meso-tidal(3.3.1), macro-tidal(3.3.1), breaker(3.3.2), ocean acidification(3.4.5),

Advanced Key Statements: Subduction(3.1.2.3), sinistral motion(3.1.2.3), dextral motion(3.1.2.3), Ekman spiral(3.4.1.1), Longmour circulation(3.4.1.1), Geostrophic flow(3.4.1.1), upwelling(3.4.1.1),

[N.B. – Values in parenthesis are the reference number]

Section – 3: Key Facts and Figures

Sub Unit – 1:

Oceanic Bottom relief

3.1.9 Introduction:

An ocean is a large area of water between continents. Oceans are very big and they join smaller seas together. Together, the oceans are like one "ocean", because all the "oceans" are joined. Oceans cover 72% of our planet and rest remains in Continents.

The ***Challenger*** **expedition** was done by the Royal Society of London in 1872 to 1876. It was a scientific program that made many discoveries to lay the foundation of oceanography.

3.1.10 Some theories on origin of oceans:

3.1.10.1 Continental drift theory:

In 1914 A. Wegner introduces the theory. He believed one united landmass (Pangea) and an ocean mass (Panthalassa) were present in past. Pangea divided into different continents. Those are floated over oceans by tidal force. At last those continents and oceans make the present form of the planet.

Evidences:

1. Jig-saw-fit
2. location of Glacier of Post Carbiniferous
3. Fossil study
4. Evidence of formation of mountains
5. Pole Wandering
6. Presence of Island Arc

3.1.10.2 Sea floor spreading theory:

In 1960, Professor Herry Hess and Robert W. Ditz introduce the concept. Seafloor spreading is a process that occurs at mid-ocean ridges, where new oceanic crust is formed through volcanic activity and then gradually moves away from the ridge.

Evidences:

1. Ocean floor sampling by Glomar challenger (American National Science Foundation and University of California Scripps Institution of Oceanography and built by Levingston Shipbuilding Company in Texas.)
2. Study of the deposited materials in ocean floor. Oceanic crust is denser than continental crust.
3. Higher proportion of radioactive elements are present in Continents than ocean floor.
4. Presence of earthquake centers in ocean floor.
5. Paleomagnetic evidence by F. J. Vine and D. H. Mathews.

3.1.10.3 Plate tectonic theory:

The word 'Plate' first time used by J. T. Wilson in 1965. In 1967 Makenzie and Parker discuss elaborately about plate. W. J. Morgan and Le Pichon discussed about plate tectonic in 1968. Lithosphere is formed by seven large and many medium to small plates. Plate Tectonic is a scientific concept. Plate can float on Asthenosphere. Asthenosphere is in semi liquid to liquid state.

1. Types of plates:

A) Continental plates

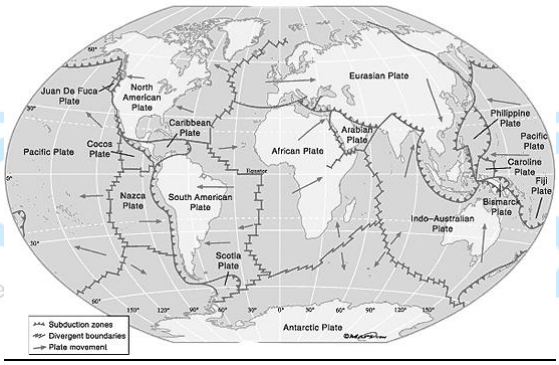
B) Oceanic plates

2. Types of plate boundaries:

A) Destructive plate boundaries - Himalaya

B) Constructive plate boundaries- Mid-oceanic ridge of Atlantic Ocean

C) Transverse plate boundaries – San Andrean fault(dextral motion)



Subduction zone, Divergent Boundaries and plate movement direction

Subduction: it is a geological process that takes place at destructive plate boundary.
Sinistral motion-leftside towards to the observer.
dextral motion-rightside towards to the observer.

3.1.11 Ideal cross section of the ocean floor:

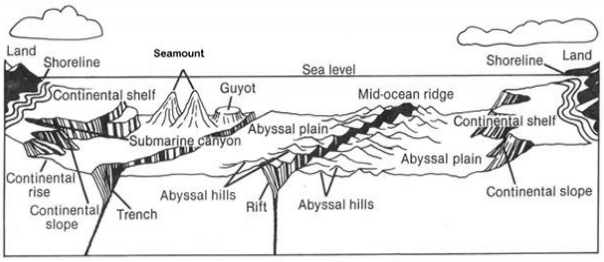
An oceanic basin may is covered by seawater. Geologically, there are other undersea geomorphological features such as –

1. **continental shelves:**

A continental shelf is a portion of a continent that is submerged under an area of relatively shallow water known as a shelf sea.

2. **continental slope:**

It descends at an average angle in excess of 4° from the shelf break at the edge of the continental shelf to the beginning of the ocean basins.



Different types of landforms under the ocean

A submarine canyon is a steep-sided valley cut into the seabed of the continental slope, sometimes extending well onto the continental shelf, having nearly vertical walls.

A **turbidity current** is most typically an underwater current of usually rapidly moving, sediment laden water moving down a slope. Heezen and Ewing (1952) studied this event.

3. **continental rise:**

It is a sediment underwater feature found between the continental slope and the abyssal plain.

4. **deep ocean basins:**

a) **abyssal plain:**

It is an underwater plain on the deep ocean floor, usually found at depths between 3,000 metres and 6,000 metres. It is lying between the foot of a continental rise and a mid-ocean ridge

b) **abyssal hills:**

An abyssal hill is a small hill that rises from the floor of an abyssal plain. Abyssal hills have relatively sharply defined edges and climb to heights of no more than a few hundred meters.

c) **seamounts and guyots:**

A seamount is a large geologic landform that rises from ocean floor.

d) deep ocean trenches:

Oceanic trenches are topographic depressions of the sea floor, relatively narrow in width, but very long.

5. Mid-oceanic ridges:

A mid-ocean ridge is a seafloor mountain system formed by plate tectonics. It typically has a depth of ~ 2,600 meters and rises about two kilometers above the deepest portion of an ocean basin.

3.1.12 Bottom topography of Pacific ocean:

The Pacific Ocean is the largest and deepest ocean in the Earth. It extends from the Arctic Ocean in the north to the Southern Ocean in the south and is bounded by the continents of Asia and Australia in the west and the two Americas in the east. It covers an area of 165,250,000 square kilometers. It covers 46% of Earth's water surface.

D. Oceanic Ridges:
Albatross, Coco, Hawaii rise, Chuthum rise, Lord Ho rise etc.

E. Deep ocean basins:
Allusion, Philippine, West Carolyn, East Carolyn, Fiji, East Australian, South Australian, South-east Pacific, South-west Pacific, Pacific-Antarctic etc.

F. Deep ocean trenches:
Allusion trench, Qurile and Japan Trench, Philippine Trench, Nero or Mariana Trench, Peru-Chili Trench, Challenger, Aldrich etc.

3.1.13 Bottom topography of Atlantic ocean:

The Atlantic Ocean is the second largest of the world's oceans, with an area of about 106,460,000 square kilometers. It covers approximately 20 percent of earth's surface and about 29 percent of its water surface area.

F. Oceanic Ridges:
Mid oceanic Ridge(Almost 3 km above pertaining to the Mid-Atlantic Ridge from the floor of Atlantic Ocean)

G. Deep ocean basins:
Labredor, North east Atlantic, North west Atlantic, Cape Verde, Gini, Brazil, South East Atlantic, Argentina, Agulhas, Atalntic-Indian-Antarctica etc.

H. Deep ocean trenches:
South Sandwich Trench, Puerto Rico Trench etc.

Allusion trench,

3.1.14 Bottom topography of Indian ocean:

The Indian Ocean is the third-largest of the world's oceanic divisions, covering 70,560,000 km^2 and 19.8% of the water on the Earth's surface. It is bounded by Asia to the north, Africa to the west, and Australia to the east. To the south it is bounded by the Southern Ocean or Antarctica.

D. Oceanic Ridges:

Carlsberg, Lakshadweep and Maldives, Madagascar,

E. Deep ocean basins:

Arab, Oman, Somali, Mauritius, Natal, Agulhas, Indian –Antarctic, Andaman, East Indian Arctic Basin etc.

F. Deep ocean trenches:

Sunda Trench,

3.1.15 Bottom topography of Arctic ocean:

The **Arctic Ocean** is the smallest and shallowest of the world's major oceans. It is also known as the coldest of all the oceans.

I. Oceanic Ridges:

East Zan Mayen ridge, Pits Bergen ridge, Lomonosov ridge, Trans current fault ridge etc.

J. Deep ocean basins:

Greenland basin, Norway Basin, northern Polar basin.

3.1.16 Tsunami:

An earthquake is shaking of earth, resulting of sudden release of energy stored in Lithosphere. It releases seismic waves(P,S,L waves).

Focus is the location where the earthquake originates.

Epicenter is a point on the Earth's surface just above the focus. The Richter magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismometer. In seismograph reading difference between 5 and 4, it gives 10 times greater reading from 4. At the same time it releases 31.6 times larger energy from 4.

A series of waves in a water body caused by the displacement of a large volume of water, generally in an ocean caused by Earthquakes, volcanic eruptions and other underwater explosions is called **Tsunami.**

Sub Unit – 2:

Physical and chemical composition of Oceanic Water

3.2.4 Density of ocean water:

Ocean water density varies throughout the globe. it depends upon temperature. Polar water is much denser than equatorial water. Generally, fresh water achieves great density in 4°C. At sea level, air is 784 times less dense than water. Expressed in another way, a volume of air at sea level has 0.1275% of the density of the same volume of water. Ocean water is denser because of the salt. Density of ocean water at the sea surface is about 1027 kg/m^3. There are two major factors specify density of the ocean water are – a) temperature and b) salinity.

Temp (°C)	**Density** pure water (g/cm^3)
0 (solid)	0.9150
0 (liquid)	0.9999
4	1.0000
20	0.9982
40	0.9922
60	0.9832
80	0.9718

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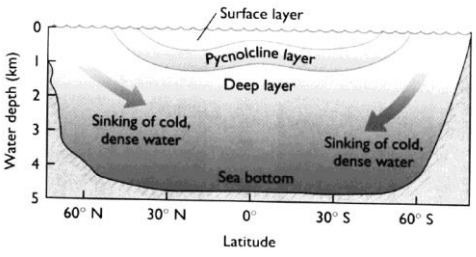
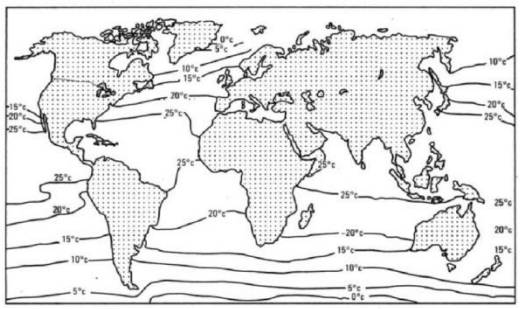
3.2.5 Temperature distribution of ocean water:

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.



Vertical tempearure distribution



Horizontal distribution of temperature

3.2.6 Salinity of ocean water:

NaCl is the maximum content in sea water.

3.2.6.1 Origin of salinity:

a) River water
b) Under water volcanic eruption
c) Materials by wind flow
d) Evaporation
e) Biosphere of ocean water and static state of oceanic water
f) Residence time of salt

3.2.6.2 Impact of salinity on characteristics of ocean water:

d) Density of ocean water
e) Freezing limitation of ocean water
f) Evaporating process of oceanic water

3.2.6.3 Salinity of different seas and oceans:

Salinity, g/kg (‰)	Name	Type	Region or countries
337	Dead Sea	Salt lake	Israel, Jordan, West Bank
38	Mediterranean Sea	Mediterranean sea	Southern Europe, Levant, North Africa
36–41	Red Sea	Mediterranean sea	Egypt, Sudan, Arabian Peninsula, Horn of Africa
34–36	World Ocean	Ocean	Worldwide
28–32	Beaufort Sea	Marginal Sea	North of Alaska and Canada
0.13–31.73	Chilika Lake	Lagoon	India
13–23	Black Sea	Mediterranean sea	Eastern Europe, Turkey
23	Lake Van	Salt lake	Turkey
12.5	Caspian Sea	Inland sea	Central Asia
10	Baltic Sea	Marginal Sea	Northern Europe

Brine:

A brine pool is a large area of brine on the ocean basin. These pools are bodies of water that have a salinity three to eight times greater than the surrounding ocean. For deep-sea brine pools, the source of the salt is the dissolution of large salt deposits through salt tectonics. Liquid ocean water has an average salinity of 35 parts per thousand. New ice such as nilas has the highest average salinity (12–15 parts per thousand); as ice grows thicker during the course of the winter, the average salinity of the entire ice thickness decreases as brine is lost from the ice. The temperature of the surface of the Arctic Ocean is fairly constant, near the freezing point of seawater. Because the Arctic Ocean consists of saltwater, the temperature must reach −1.8 °C (28.8 °F) before freezing occurs.

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Sub Unit – 3:

Tides and Oceanic waves

3.3.4 Tides:

Tides are the rise and fall of sea levels caused by the combined effects of the gravitational forces exerted by the Moon and the Sun, and the rotation of the Earth. The highest tides in the world can be found in Canada at the Bay of Fundy, which separates New Brunswick from Nova Scotia.

Sun's Tidal Effect:

Even though the Sun is 391 times as far away from the Earth as the Moon, its force on the Earth is about 175 times as large. Yet its tidal effect is smaller than that of the Moon because tides are caused by the difference in **gravity** field across the Earth.

Types of tidal ranges:

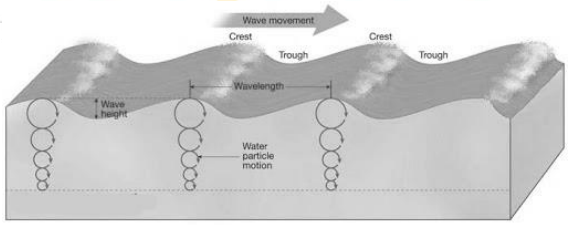
Micro-tidal, when the tidal range is lower than 2 metres.
Meso-tidal, when the tidal range is between 2 metres and 4 metres.
Macro-tidal, when the tidal range is higher than 4 metres.

Apogee and perigee:

It is refer to the distance from the Earth to the moon. Apogee is the farthest point from the earth. Perigee is the closest point to the earth and it is in this stage that the moon appears larger.

3.3.5 Components of waves:

1. Crest: it's the top of the wave - the highest point of any wave.
2. Trough: the lowest region of a wave; the opposite of the crest.
3. Wavelength:
4. Wave height:



Different parts of wave

3.3.5.1 Origin of ocean waves:

M) Geometry of ocean waves:

5. Length of waves
6. Height of waves
7. Wave time of frequency

N) Relation between wind and waves:

1. Velocity of wind

2. Duration of wind
3. Fetch
4. Original state of sea
5. Sea waves and Beauford's scale of wind.

O) Wave motion
P) Rotation of water particulars in sea waves
Q) Motion of wave form
R) Breakers:

1. Spilling breaker
2. Plunging breaker
3. Surging breaker

3.3.5.2 Wave types:

When a wave breaks, water is washed up the beach. This is called the swash . Then the water runs back down the beach, which is called the **backwash** . With a constructive wave, the swash is stronger than the **backwash**. With a destructive wave, the **backwash** is stronger than the swash.

3.3.6 Classification of shore lines:

A shore or a shoreline is the fringe of land at the edge of a large body of water, such as an ocean, sea, or lake.

3.3.6.1 Fore shore:

The intertidal zone, also known as the foreshore or seashore, is the area that is above water level at low tide and underwater at high tide (in other words, the area within the tidal range).

3.3.6.2 Back shore:

The backshore is dry under normal conditions, is often characterized by bears and is without vegetation. The backshore is only exposed to waves under extreme events with high tide and storm surge

Sub Unit – 4:

Oceanic currents

3.4.2 Ocean currents:

Ocean currents are two types : 1) Vertical ocean currents and 2) Horizontal ocean currents.

3.4.1.1 Factors controlling ocean currents:

A) **Horizontal currents:**

1) Controlling factors of ocean currents:

a) Gravitational forces

b) Deflective force due to Earth rotation

2) factors except oceans:

a) Atmospheric pressure and its variations

b) Wind and friction forces(2% of the speed of ocean current creating by prevailing wind.)

c) Precipitation

d) Nature of evaporation and insolation.

3) factors of ocean water:

a) Pressure gradient

b) Temperature differences

c) Salinity

4) changing factors of ocean currents:

a) Direction and shape of coast lines

b) Seasonal variation

c) bottom topography of ocean

d) depth of ocean

B) Vertical Current:

a) Ekman Spiral

b) Langmour Circulation

c) Geostrophic flow of ocean water

The vertical movement of cold water from deeper oceanic layers to replace warmer surface water is called as Upwelling.

The Equatorial Counter Current is an eastward flowing, wind-driven current which extends to depths of 100-150m in the Atlantic, Indian, and Pacific Oceans.

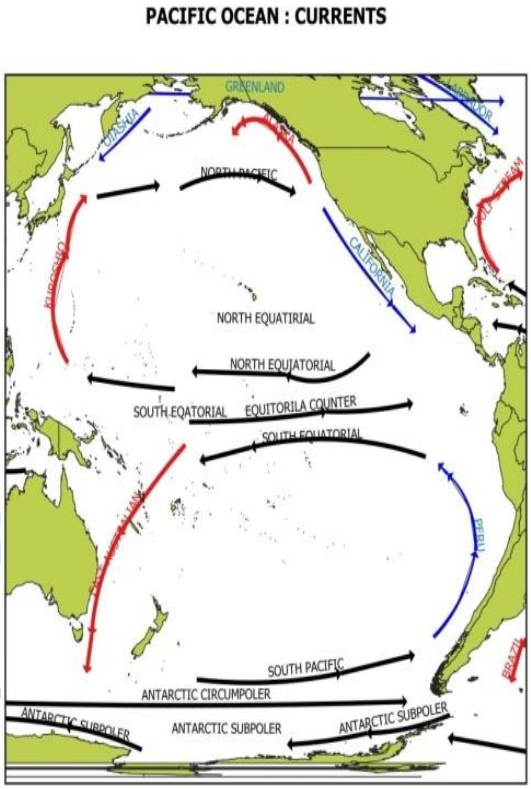
3.4.5.2 Ocean currents of Pacific ocean:

C) Northern Pacific Ocean surface currents or gyre:

5. Kuroshio current
6. Northern Pacific current
7. California Current
8. North equatorial current

D) Southern Pacific Ocean surface currents or gyre:

9. East Australian current
10. South pacific current
11. Peru current (Humboldt current)
12. South equatorial current



3.4.5.3 Ocean currents of Atlantic ocean:

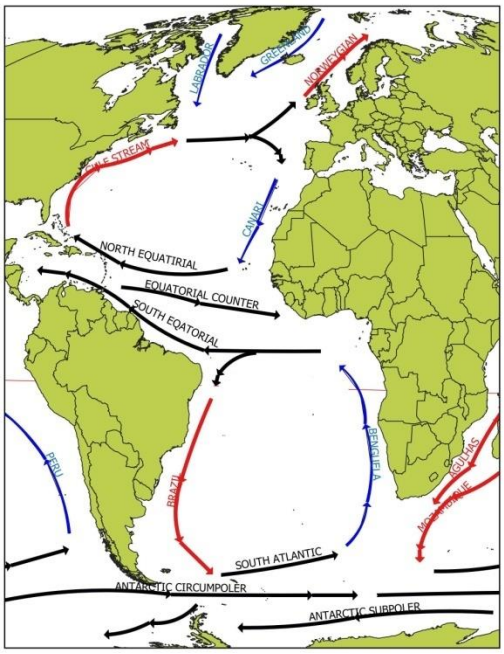
E) Northern Atlantic Ocean surface currents or gyre:

4. Qurile current
5. Gulf stream
6. North equatorial current

F) Southern Atlantic Ocean surface currents or gyre:

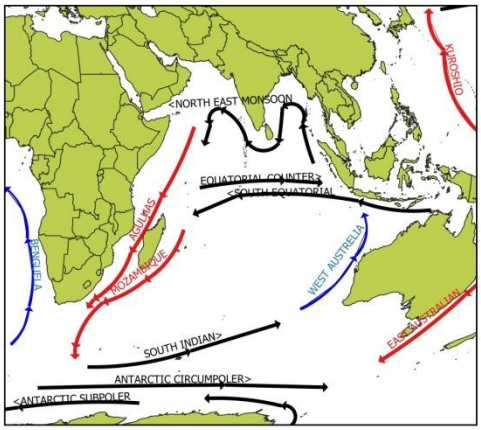
13. Benguela Current
14. South Atlantic current
15. Brazil current
16. South equatorial current

ATLANTIC OCEAN : CURRENTS



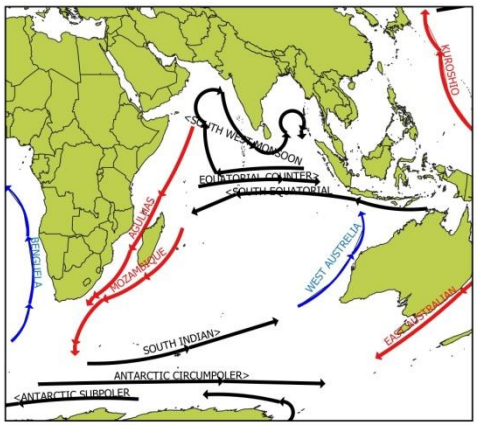
3.4.5.4 Ocean currents of Indian ocean:

INDIAN OCEAN : CURRENTS



DURING NORTH EAST MONSOON

INDIAN OCEAN : CURRENTS



DURING SOUTH WEST MONSOON

3.4.6 Impact of ocean currents:

1. Controlling climate
2. Ice free port
3. Rainfall
4. Snowfall
5. Rough weather
6. Formation of banks
7. Fishing ground
8. iceberg

3.4.7 Sea level rises:

Global warming is the increase in the average temperature of the Earth's near-surface air and the oceans ever since the mid-twentieth century. The temperature is rising day by day. Between 1880 and 2012, the global average surface temperature increased by 0.85°C. Since 1979 the rate of warming has approximately doubled.

Cause : Human activity since the Industrial Revolution has increased the amount of greenhouse gases in the atmosphere, leading to increased radioactive forcing from CO_2, methane, tropospheric ozone, CFCs, and nitrous oxide. It causes green house effect.

Effects: Ongoing effects include **rising sea levels** due to thermal expansion and melting of glaciers and ice sheets, and warming of the ocean surface, leading to increased temperature stratification. Over the past century world sea levels has risen by around 15 cm. Other possible effects include large-scale changes in ocean circulation. Global climate change is also an effect.

3.4.8 Ocean acidification:

Ocean water is slightly basic in nature. Due to increase of atmospheric carbon dioxide, it dissolves with water and increase pH value of ocean water. As a result calcium carbonate related plant and animals are in danger.

Sub Unit – 5:

Oceanic deposition

3.5.3 Corals reefs:

A *coral reef* is an underwater ecosystem characterized by *reef*-building *corals*. *Reefs* are formed of colonies of *coral* polyps held together by calcium carbonate. Most *coral reefs* are built from stony *corals*, whose polyps cluster in groups. Sequences of coral development are Volcanic-coral Island, Fringe Reef, Barrier Reef and Atolls. Warm water temperature: Reef-building corals require warm water conditions to survive. Different corals living in different regions can withstand various temperature fluctuations. However, corals generally live in water temperatures of 68–90° F or 20–32° C.

The littoral zone is the near shore area where sunlight penetrates all the way to the sediment and allows aquatic plants (macrophytes) to grow. Absorption and decomposition of CO_2 in ocean water beyond desired level, there will be growth of Phytoplankton.

3.5.3.1 Theories of formation Corals reefs:

1. Subsidence theory of Darwin
2. Static-water theory by Murry
3. Glacial control theory by Daly
4. Concept of W.M.Davis

3.5.4 Ocean deposits:

The sediments derived from weathering and erosion of continental rocks are transported to the oceans by rivers, winds etc. Volcanic eruptions also provide sediments.

1. On the Basis of Location:

(A) Pelagic deposits:

(1) Red clay,
(2) Radiolarian ooze,
(3) Diatom ooze,
(4) Globigerina ooze, and
(5) Pteropod ooze.

(B) Terrigenous deposits:

(1) Blue mud,
(2) Red mud,
(3) Green mud,
(4) Coral mud,
(5) Volcanic mud,
(6) Gravel, and
(7) Sand.

2. On the Basis of Depth:

(A) Deep sea deposits (Below 100 fathoms):

(a) Pelagic Deposits:
(1) Red clay,
(2) Radiolarian ooze,
(3) Diatom ooze,
(4) Globigerina ooze, and
(5) Pteropod ooze.
(b) Terrigenous Deposits:
(1) Blue mud,
(2) Red mud,
(3) Green mud,
(4) Coral mud, and
(5) Volcanic mud.
(B) Shallow sea deposits (between low tide water and 100 fathoms):
(1) Gravels,
(2) Sands, and
(3) Mud.
(c) Littoral deposits (Between high and low tide water):
(1) Gravels,
(2) Sands,
(3) Mud.

3. Classification on the Basis of Origin of Sediments:
(1) Littoral deposits (derived from land)):
(i) Shore deposits.
(ii) Shelf deposits.
(2) Hemipelagic deposits (Partly from land and partly from marine origin):
(i) Green mud.
(ii) Volcanic mud.
(iii) Coral mud.
(3) Eupelagic deposits (Of marine and cosmic origin):
(i) Red clay.
(ii) Radiolarian ooze.
(iii) Globigerina ooze.
(iv) Pteropod ooze.

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Previous Year Question

UNIT – 3
Sub Unit - 1
December - 14

1. The Challenger Expedition of 1874 was headed by the country :
(A) United States of America
(B) United Kingdom
(C) U.S.S.R.
(D) India

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	19	B	3.1.1
2.	19	B	
3.	23	A	

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December - 15

1. Which one of the following is correct arrangement of oceans in ascending order of their sixe ?
(A) Indian - Arctic - Atlantic - Pacific
(B) Arctic - Indian - Atlantic - Pacific
(C) Pacific - Atlantic - Indian - Arctic
(D) Atlantic - Pacific - Arctic – Indian

2. Over the past century world sea levels has risen by around :
(A) 15 cm
(B) 25 cm
(C) 35 cm
(D) 45 cm

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	19	B	3.1.4,3.1.5,3.16,3.1.7
2.	23	A	3.4.4

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July - 16

1. Identify the correct statement pertaining to the Mid-Atlantic Ridge from the floor of Atlantic Ocean among the following :

(A) Almost 3 km above

(B) Almost 4 km above

(C) Almost 5 km above

(D) Almost 6 km above

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	11	A	3.1.5

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January - 17

1. The general depth of abyssal plains varies between
(A) 1000 – 6000 metres
(B) 2000 – 6000 metres
(C) 3000 – 6000 metres
(D) 4000 – 6000 metres

2. Match **List – I** with **List – II** and select the correct answer from the codes given below :

List – I (Ocean Deeps)	**List – II (Location)**
I. Challenger	A. South Pacific
II. Aldrich	B. North Atlantic
III. Romanche	C. North Pacific
IV. Nares	D. South Atlantic

Codes :

	(a)	**(b)**	**(c)**	**(d)**
(A)	iii	i	iv	ii
(B)	iv	iii	ii	i
(C)	i	ii	iii	iv
(D)	ii	iv	i	iii

3. Which one of the following is the correct average slope angle of continental slope ?
(A) 2º
(B) 4º
(C) 6º
(D) 8º

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	10	C	3.1.3
2.	11	A	3.1.4,3.1.5
3.	20	B	3.1.3

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July - 18

1. Which one of the following scholars is the proponent of the turbidity Current Theory on origin of submarine Canyons ?
(A) Salin
(B) Gregory
(C) Daly
(D) Harry Hen

2. Match the **List - I**with**List - II** and select the correct answer from the code given below :

List - I (Ocean Trench)	**List - II** (Depth in meters)
(a) Tonga	(i) 7760
(b) Kuril Kamchatka	(ii) 10540
(c) Philippine	(iii) 10880
(d) Romanche	(iv) 10500

Code :

	(a)	**(b)**	**(c)**	**(d)**
(A)	i	ii	iii	iv
(B)	iii	iv	ii	i
(C)	iv	iii	i	ii
(D)	ii	i	iv	iii

3. Which one of the following sequences is the correct one in a littoral zone from land to sea ?
(A) Backshore, Foreshore, Nearshore, Offshore
(B) Foreshore, Backshore, Nearshore, Offshore
(C) Offshore, Nearshore, Foreshore, Backshore
(D) Nearshore, Offshore, Backshore, Foreshore

Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	8	C	3.1.3
2.	21	B	3.1.4,3.1.5
3.	24	A	3.3.3

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Sub Unit - 2

June - 14

1. Given below are two statements, one labelled as Assertion (A) and the other labelled as Reason (R). Select your answer from the codes given below :
Assertion (A) : Oceanic salinity is low in the equatorial region.
Reason (R) : Equatorial region is characterized by heavy rainfall, cloudiness and humidity.
Codes :
(A) Both (A) and (R) are true and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true and (R) is not correct explanation of (A).
(C) (A) is true but (R) is false.
(D) (A) is false but (R) is ture

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	22	A	3.2.3

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December - 14

17. The term “brine” is applicable to
(A) Arabian Sea
(B) Baltic Sea
(C) China Sea
(D) Sargasso Sea

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	17	B	3.2.3.3

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June - 15

1. The ocean water was iceberg free during the era :
(A) Archaean
(B) Paleoxoic
(C) Cenoxoic
(D) Mesoxoic

2. The salinity of sea ice ranges from :
(A) 0 - 3%
(B) 3 - 10%
(C) 11 - 17%
(D) 28 - 35%

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	18	D	3.2
2.	19	A	3.2.3.3

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December - 15

1. Which one of the following lakes/sea kas the highest salinity in the world ?
(A) Pachpadra Lake
(B) Sambhar Lake
(C) Lake - Vane
(D) Dead Sea

2. Maximum density of sea water is at temperature :
(A) 2°C
(B) 4°C
(C) 6°C
(D) 25°C

3. Match **List - I**with**List - II** and select the correct answer from the codes given below :

List - I	**List - II**
(Ocean depths)	**(Thermal layers)**
(a) 0 - 500 metres	(i) Cold
(b) 500 - 1000 metres	(ii) Cool
(c) 1000 - 1500 metres	(iii) Warm
(d) > 1500 metres	(iv)T hermocline

Codes :

(a)	**(b)**	**(c)**	**(d)**
(A) i	ii	iii	iv
(B) ii	iii	iv	i
(C) iv	ii	iii	i
(D) ii	iv	i	iii

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	13	C	3.2.3.3
2.	18	B	3.2.1
3.	21	A	3.2.2

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July - 16

1. Identify the correct statement regarding variation in density of ocean water and air at the same temperature.
(A) Ocean water is 800 times more denser than air.
(B) Ocean water is 600 times more denser than air.
(C) Ocean water is 400 times more denser than air.
(D) Ocean water is 200 times more denser than air.

2. Eustatic sea level appears to have fallen in the Neogene, possibly as a result of
(A) the Continental Drift
(B) the Sea Floor Spreading
(C) the growth of the Antarctic ice sheet
(D) the Alpine Orogency

3. Which one of the following salts has its maximum content in sea water ?
(A) NaCl (Sodium Chloride)
(B) KCl (Potassium Chloride)
(C) MgCl (Magnesium Chloride)
(D) BaCl (Barium Chloride)

4. Given below are two statements, one is labelled as **Assertion (A)** and other labelled as **Reason (R).**Select your answer from the codes given below.
Assertion (A):The process of photosynthesis is limited within 200 m depth of sea water.
Reason (R) : No carbon (C) is available beyond the depth of 200 m.
Codes :
(A) Both (A) and (R) are true and (R) is correct explanation of (A).
(B) Both (A) and (R) are 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.

Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	14	A	3.2.1
2.	11	C	Question from glacial and time scale
3.	12	A	3.2.3
4.	24	C	3.5.1

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January - 17

1. In Indian Ocean between 0° - 10° N and 0° - 10° S latitudinal zones, the temperature variations is of about –

(A) 3 °C

(B) 2 °C

(C) 1 °C

(D) 0 °C

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	9	C	3.2.2

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November - 17

1. Which one of the following regions is with high ocean water salinity ?
(A) Equatorial
(B) Polar
(C) Subtropical
(D) Subpolar

2. Which one of the following values of temperature is correct for the average freezing point forseawater in Arctic and Antarctic seas ?
(A) 2°C
(B) 0°C
(C) −2°C
(D) −10°C

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	11	C	3.2.2,3.2.3
2.	17	C	3.2.3.3

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July - 18

1. Given below are the two statements, one labelled as **Assertion (A)** and the other labelled as**Reason (R)**. Select your answer from the code given below :
Assertion (A) : In low latitudes, sea water in the deep cold zone does not freeze.
Reason (R) : The deep sea water does not remain under intense pressure because of its high salinity.
Code :
(A) Both (A) and (R) are true and (R) is the correct explanation of (A).
(B) Both (A) and (R) are 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.

2. Which one of the followings is the correct average range of worldwide variations in sea water salinity ?
(A) 34% to 37%
(B) 27% to 29%
(C) 37% to 39%
(D) 21% to 26%

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	25	C	3.2.2,3.2.3
2.	26	A	3.2.3

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Sub Unit - 3

December - 15

1. Ocean waves obtain their energy from :
(A) Solar system
(B) Hot spring
(C) River water
(D) Blowing wind

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Text with Technology

Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	22	D	3.3.2.1

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Text with Technology

July - 16

1. Which one of the following bays has the highest tides in the world ?
(A) Bay of Bengal
(B) Hudson Bay
(C) Bay of Fundy
(D) Bay of Khambat

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Text with Technology

Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	15	C	3.3.1

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November - 17

1. Given below are two statements, one labelled as **Assertion (A)** and the other labelled as

Reason (R). Select your answer from the code given below :
Assertion (A) : The moon produces greater percentage of Earth's tides than the Sun.
Reason (R) : The Sun is closer to the Earth than the Moon.
Code :
(A) Both (A) and (R) are true and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true, but (R) is not a correct explanation of (A).
(C) (A) is true, but (R) is false.
(D) (A) is false, but (R) is true.

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Answer with Reference

SL. NO. QUESTION NO. ANSWER REFERENCE NO.

1.	20	C	3.3.1

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Sub Unit - 4
June - 14

1. The vertical movement of cold water from deeper oceanic layers to replace warmer surface water is called as
(A) Turbidity
(B) Emergence
(C) Upwelling
(D) Halocline

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Answer with Reference

SL. NO. QUESTION NO. ANSWER REFERENCE NO.

1.	12	C	3.4.1.1

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December - 14

1. The average depth of 'equatorial-counter' current is
(A) 50 m

(B) 100 m
(C) 150 m
(D) 200 m

2. The Gulf Stream and the Kuroshio Current move forcefully northward as a result of
(A) Western intensification
(B) Eastern intensification
(C) Northern intensification
(D) Southern intensification

3. Which of the following is a cold current ?
(A) Brazil current
(B) Gulf stream
(C) Benguela current
(D) Agualhas current

4. Given below are two statements, one labelled as **Assertion (A)** and the other labelled as **Reason (R)**. Select your answer from the codes given below :
Assertion (A) :The Sahara desert enjoys a dry climate.
Reason (R) : The eastern side of ocean in sub-tropics along with cold oceanic current.
Codes :
(A) Both (A) and (R) are true, and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true, but (R) is not correct explanation of (A).
(C) (A) is true, but (R) is false.
(D) (A) is false, but (R) is true.

Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	14	B	3.4.1.1
2.	15	C	3.4.2.2
3.	16	C	3.4.2.2,3.4.2.3,3.4.2.4
4.	18	A	3.4.2.4

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June - 15

1. Surface circulation of ocean water is driven by :
(A) Resisting force
(B) Tidal force
(C) Gravitational force
(D) Blowing wind

2. The speed of a ocean current is about :
(A) 2% of the speed of prevailing wind
(B) 4% of the speed of prevailing wind
(C) 6% of the speed of prevailing wind
(D) 8% of the speed of prevailing wind

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	11	D	3.4.1.1
2.	17	A	3.4.1.1

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December - 15

1. Identify the correct sequence from land to sea.
(A) Swash, Breaker, Transition, Surf
(B) Swash, Transition, Breaker, Surf
(C) Swash, Transition, Surf, Breaker
(D) Breaker, Swash, Surf, Transition

2. Match **List - I**with**List - II** and select the correct answer from the codes given below :

List - I (Oceans)	**List - II (Currents)**
(a) Indian	(i) El - Nino
(b) North Pacific	(ii) Kuroskio
(c) South Pacific	(iii) Monsoon Drift
(d) Atlantic	(iv) Gulf Stream

Codes :

(a)	**(b)**	**(c)**	**(d)**
(A)	iv	iii	ii i
(B)	iii	ii	iiv
(C)	i	iv	iii ii
(D)	ii	iiv	iii

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	11	C	3.3.2.2
2.	20	B	3.4.2.2,3.4.2.3,3.4.2.4

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July - 16

1. The tidal-generating force of the Sun is
(A) Only about half that of the Moon
(B) Only about one-third that of the Moon
(C) Only about three-fourth that of the Moon
(D) Only about one-fifth that of the Moon

2. The term 'microtidal' has been adopted to refer to spring tidal range
(A) > 6 m
(B) 4-6 m
(C) 2-4 m
(D) < 2 m

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	22	A	3.3.1
2.	22	D	3.3.1

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January - 17

1. 'Negative Southern Oscillation Index' refers to which of the following ?
(A) Favourable condition for El Nino
(B) Favourable condition for La Nina
(C) Favourable conditions both for El Nino and La Nina
(D) Unfavourable conditions both for El Nino and La Nina

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	7	A	3.4.2.3,3.4.4

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November - 17

1. Which one of the following is responsible for the greatest movements of all the tides ?
(A) Size of the Ocean
(B) Shape of the continents
(C) Gravitational attraction
(D) Salinity of the Ocean

2. Which one of the following percentages of distance from earth surface is correct for 'perigee'of Moon than 'apogee' ?
(A) 2%
(B) 5%
(C) 8%
(D) 12%

3. Given below are two statements, one labelled as **Assertion (A)** and the other labelled as **Reason (R).** Select your answer from the code given below :
Assertion (A) : The western sides of oceans are always warmer than the eastern margins.
Reason (R) : The movement of major ocean currents is in the western sides.
Code :
(A) Both (A) and (R) are true and (R) is the correct explanation of (A)
(B) Both (A) and (R) are true, but (R) is not a correct explanation of (A)
(C) (A) is true, but (R) is false
(D) (A) is false, but (R) is true

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Answer with Reference Table

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	12	C	3.3.1
2.	13	D	3.3.1
3.	14	A	3.4.1

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Sub Unit - 5
June - 14

1. Which one of the following types of sea floor sediments includes calcareous and siliceous oozes ?
(A) Fluvial
(B) Terrigenous
(C) Biogenous
(D) Hydrogenous

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	13	B	3.5.2

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December - 14

1. The Challenger Expedition of 1874 was headed by the country :
(A) United States of America
(B) United Kingdom
(C) U.S.S.R.
(D) India

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	19	B	3.1.1

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December - 15

1. Which of the following show correct sequence of coral development ?

(i) Volcanic-coral Island(ii)Fringe Reef

(iii) Barrier Reef (iv) Atolls

Codes :

(A)	(i)	(ii)	(iii)	(iv)
(B)	(ii)	(iii)	(iv)	(i)
(C)	(iv)	(ii)	(iii)	(i)
(D)	(iii)	(iv)	(i)	(ii)

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	12	A	3.5.1

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July - 16

1. The coral reefs that are generally found attached to the shore with an intervening shallow channel or a lagoon is called
(A) Barrier reef
(B) Patch reef
(C) Ribbon reef
(D) Fringing reef

2. Which one of the following is not the form of Coral Reefs ?
(A) Fringing Reefs
(B) Lagoon
(C) Barrier Reefs
(D) Atolls

3. Which one of the following temperatures of sea water is favourable for the formation of coral reefs ?
(A) Atleast 20 °C
(B) Atleast 15 °C
(C) Atleast 10 °C
(D) Atleast 5 °C

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	12	D	3.5.1
2.	15	B	3.5.1
3.	20	A	3.5.1

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January - 17

1. Match **List-I**with**List-II** and select the correct answer from the codes given below :

List-I **(Sea configuration)**	**List-II** **(Deposits)**
I. Sea bottom	A. Hadalpelagic
II. Surface layer of sea water	B. Pelagic province
III. Deep-sea trenches	C. Benthic province
IV. Sea water column	D. Epipelagic zone

Codes :

(a)	**(b)**	**(c)**	**(d)**
(A)	iiiiv	ii	i
(B)	iiiiv	i	ii
(C)	iv	iii	ii i
(D)	Iiv	ii	iii

2. Given below are two statements, one labelled as **Assertion (A)** and the other labelled as **Reason (R)**. Select your answer from the codes given below :

Assertion (A) : Coral reefs tend to be most extensively developed along the eastern edges of continents.

Reason (R) : Sea water is warmer than 20 ºC.

Codes :

(A) Both (A) and (R) are true and (R) is the correct explanation of (A).

(B) Both (A) and (R) are 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. Which one of the following is the main chemical composition of coral reefs ?

(A) $MgCO_3$ (Magnesium Carbonate)

(B) KCO_3 (Potassium Carbonate)

(C) NaCl (Sodium Chloride)

(D) $CaCO_3$ (Calcium Carbonate)

Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	19	B	3.5.2
2.	21	A	3.5.1
3.	22	D	3.5.1

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November - 17

1. Who among the following scholars has given the Subsidence Theory relating to coral-reefs ?
(A) Dally
(B) Davis
(C) Dutton
(D) Darwin

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	5	D	3.5.1.1

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July - 18

1. The subsidence theory related to the coral reef was propounded by :
(A) Davis
(B) Darwin
(C) Dally
(D) Dana

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	4	B	3.5.1.1

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Extra
June - 15

1. Match **List - I**with**List - II** and select the correct answer from the codes given below :

List - I List - II

(River) (Sediment transported to ocean in 104 tons/y)

(a) Ganga (i) 726

(b) Mekong (ii) 500

(c) Brahmputra(iii) 1600

(d) Yangtze (iv) 1000

Codes :

(a)(b) (c) (d)

(A) iii ii iv i

(B) ii i iii iv

(C) iii iv iii

(D) iv iii iii

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	20	C	River related question

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July - 16

1. The sea attained its present level during the geological period
(A) Holocene
(B) Miocene
(C) Cambrian
(D) Jurassic

2. Which one of the following countries has the world's longest coastline ?
(A) Australia
(B) Brazil
(C) Japan
(D) Canada

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	17	A	Geologicai time scale
2.	21	D	See atlas

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January - 17

1. Match **List-I**with**List-II** and select the correct answer from the codes given below :

List-I	**List-II**
(Elements)	**(Density in gm/cm3)**
I. Sea water	A. 2.4
II. Oceanic crust	B. 1.03
III. Continental crust	C. 2.8
IV. Continental margin	D. 2.9

Codes :

(a)	**(b)**	**(c)**	**(d)**
(A) iv	ii	iiii	
(B) ii	iv	iiii	
(C) ii	iv	iii	i
(D) iii	iv	ii	i

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Answer with Reference

SL. NO.	QUESTION NO.	ANSWER	REFERENCE NO.
1.	18	C	3.2.1 and 3.1.2.2

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