EXPLORERS EDUCATION PROGRAMME™

EXPLORERS PLANNING GUIDE FOR PRIMARY SCHOOL TEACHERS

OCEAN LITERACY AND ENGAGEMENT

OCEANS FACTS, EVALUATION TOOLS
& IDEAS FOR THE CLASSROOM

WWW.EXPLORERS.IE

EXPLORERS Education Programme™

EXPLORERS EDUCATION PROGRAMME™ MISSION STATEMENT AND GOALS

OUR MISSION STATEMENT

The Explorers Education Programme™ aims to build on Ireland's marine and maritime heritage by increasing awareness of the value, opportunities and social benefits of our ocean wealth and identity.

OUR GOALS

1. **Educate** school children, teachers and educators in Ireland, enabling them to understand the ocean's influence on us and our influence on the ocean, through outreach activities in Ireland.
2. **Coordinate** professional development training and workshops for teachers and trainee teachers, to develop their marine literacy skills and promote the use of marine content in line with the national curriculum.
3. **Develop** education materials and resources based on the Irish school curriculum to support teachers teaching marine subjects in schools.
4. **Promote** ocean literacy and marine outreach activities with local communities, educators and influencers so as to create dialogue and engagement about our ocean.

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OCEAN LITERACY PRINCIPLES AND FUNDAMENTAL CONCEPTS

OCEAN LITERACY

Ocean Literacy means 'understanding the ocean's influence on you and your influence on the ocean'.
An ocean literate person:

- understands essential principles and fundamental concepts about the ocean;
- can communicate about the ocean in a meaningful way; and
- is able to make informed and responsible decisions regarding the ocean and its resources.

OCEAN LITERACY PRINCIPLES

The following seven ocean literacy principles have been developed by scientists and educators to help us learn more about the ocean.*

The ocean principles can be easily incorporated into subjects across the curriculum where different principles and concepts can be used.

This booklet also provides some interesting facts and multiple-choice questions about the ocean that are colour-coded based on the ocean literacy principle.

1. The Earth has one big ocean with many features

2. The ocean and life in the ocean shape the features of the Earth

3. The ocean is a major influence on weather and climate

4. The ocean makes Earth habitable

5. The ocean supports a great diversity of life and ecosystems

6. The ocean and humans are inextricably interconnected

7. The ocean is largely unexplored

**The ocean literacy principles were first developed as an ocean literacy framework in the USA and are now being adopted in the EU. For further information see: Ocean Literacy: The Essential Principles and Fundamental Concepts of Ocean Sciences for Learners of All Ages, Version 2: March 2013. Retrieved from: http://www.coexploration.org/oceanliteracy/documents/ OceanLitChart.pdf*

IDEAS TO DEVELOP OCEAN LITERACY IN YOUR CLASSROOM AND SCHOOL

Ocean literacy and engagement can be easily adopted using the national curriculum subject and strands units in your class and school.

Some sample projects and work completed by schools can be seen below and may provide you with new inspirational ideas.

Also see **www.explorers.ie** and **www.facebook.com/ExplorersMarineEducation/** for teaching resources, lesson plans and updates to help introduce marine themes into your class.

GEOGRAPHY

- ✔ Create maps, plans, diagrams or use models and globes to learn about the different ocean names and continents around the world. Don't forget to learn about the Real Map of Ireland.
- ✔ Create a wall hanging from the ceiling to the floor comparing the depths of the ocean to the heights of famous landmarks and mountains above the sea - use photos and pictures to show what the children would find at the different depths of the ocean.
- ✔ Create a marine environmental awareness and care poster / postcard campaign to encourage the class, school or local community to Save the Seas; 'Reduce, Recycle & Reuse'; or learn about sustainable fishing.
- ✔ Organise a day at the beach and complete a seashore safari and beach clean.
- ✔ Complete a project learning about the fishing industry or aquaculture industry in Ireland and compare to another country in the world such as China, Norway or Canada.

SCIENCE

- ✔ Invite a marine scientist to the classroom.
- ✔ Build a virtual aquarium in the classroom learning about the ocean animals and habitats.
- ✔ Develop an experiment about materials, energy and forces or environmental awareness and care using a marine theme.
- ✔ Enter a science competition.

MATHS

- ✔ Develop a technology or engineering project using Lego or recycled items to build a boat or submarine that may work in water.
- ✔ Create wall hangings of life-size marine animals such as sharks, whales or dolphins to represent mathematical measurements as a pictorial or diagrammatic.
- ✔ Have a mathathon using marine themes for the range of maths applications and problem solving questions, as well as testing maths terminology, facts and definitions.

HISTORY

- ✔ Create a historical time-line or projects about famous Irish and international people who have influenced our marine heritage such as John Phillip Holland who built the first modern submarine; Francis Beaufort who invented the scale to measure the wind and Ellen Hutchins who classified seaweeds to name a few. Maybe include a few from this century such as Andy Wheeler who led the discovery of Moytirra Hydrothermal vents in the Atlantic.
- ✔ Create a project about boats and ships made through out time such as the Vikings longboats, Irish currach, Irish hookers. Get your class to build a series of models of some of the famous ships and boats.
- ✔ Look at the history of research vessels that have been used to explore the ocean, and what life was like for the people who were onboard. Famous vessels might include: HMS Endeavour (1760 - 1770's) HMS Challenger (1858 - 1878); Calypso (1950) to name a few. Compare to the research vessels that are used today such as the RV Celtic Explorer.
- ✔ Learn about the race to the poles over time. Go back in time and imagine being part of the expedition team. Write home explaining what it is like seeing the icy waters and the marine animals for the first time.
- ✔ Create a project about the history of light houses locating them all around Ireland. Get your class to build their own lighthouse using a miniature light, copper wire and battery circuit.
- ✔ Learn about seaweeds that have been used over time in Ireland for food and medicines. Compare to other parts of the world or to other resources from the ocean have been used.

ART

- ✔ Create a marine art exhibition using a marine theme.
- ✔ Build a marine sculpture.
- ✔ Produce a film or animation about the ocean or a famous marine personality.

ENGLISH / IRISH

- ✔ Create a language mobile of marine words in English, Gaeilge and other languages e.g. 'ocean': ocean, aigéan, farraige mhór, oceano, oleah, hav, ozean, haiyáng...
- ✔ Create a book about the ocean such as a Seashore Guide, a book of Ocean Poetry or My Favorite Marine Folklore and Fables adapted by the class.
- ✔ Enter a story writing competition using a marine theme.
- ✔ Write an article for a newspaper or create a newsletter about the ocean.

DRAMA / MUSIC

- ✔ Create a play telling a story about the animals in the ocean.
- ✔ Write a film script and storyboard creating a mythical tale about the sea.
- ✔ Form a choir singing songs with marine themes... and even write your own.
- ✔ Create costumes of famous marine people and play dress-ups of the characters telling their stories: what is their name, what are they famous for, what was it like in the time they were alive (what did they have / didn't have compared to today), what did they do, where did they go, who did they meet, what did they see...

HOW OCEAN LITERATE IS YOUR SCHOOL?

School Self-Evaluation Questionnaire
Ocean Literacy and Engagement in your School

Date: _____

Please insert an X in the correct box:

Junior Infants		**1st**		**3rd**		**5th**	
Senior Infants		**2nd**		**4th**		**6th**	

	Strongly disagree	Disagree	Don't Know	Agree	Strongly Agree
My pupils like talking about the ocean					
My pupils understand how important the ocean is to humans					
My pupils can talk about how humans affect the ocean					
My pupils can discuss how the ocean affects our weather					
My pupils know about Ireland's marine species					
My pupils can classify different marine species					
My pupils enjoy learning about the ocean					
My pupils like to write stories about the ocean					
My pupils can write scientific reports about marine species					

OCEAN LITERACY AND ENGAGEMENT TEACHING RESOURCES

The Explorers Education Programme™ provides a number of resources that can be used to help develop your class. These can be downloaded from **www.explorers.ie**

- **Ocean Fun Facts and Illustrations** are based on the seven ocean literacy principles and concepts. Samples of the fun facts are in this booklet and may be introduced in the class to help raise awareness about the ocean through research, discussion and sharing of ideas.
- **The Explorers Education Programme™ Teachers Resources and Guidelines** are full of ideas for class modules, projects and activities relating to the marine. The teachers guides include content that covers cross curricular teaching using marine themes in the class such as marine environmental awareness and care, living things using saltwater aquariums in the class, tips on organising a seashore safari, as well as learning about hydrothermal vents.
- **Over one hundred marine themed primary school Explorer Lesson Plans** have been developed by teachers and marine experts that can be used in cross curricular teaching. These include the following subjects: Science, Geography, History, Mathematics, English, Gaeilge, Physical Education, Visual Arts, Drama and Music.
- **The Explorers Ocean Literacy PowerPoint** contains images and facts about the ocean highlighting the ocean literacy concepts.
- **The Real Map of Ireland** poster shows Ireland's marine resource that is ten times the size of its land area.
- **Your Ocean – Your Future** posters highlight the ocean principles and concepts as well as the Blue Society's vision, where people benefit from the ocean while preserving its environment (www.bluesociety.org). These can be downloaded for printing and / or to use within PowerPoint presentations.
- **Our Ocean Depth** poster shows the depths of the ocean from the sunlight zone to the trenches. It highlights some interesting facts about the ocean from animals that live at the different levels to some of the discoveries that have been made in the deepest parts of the ocean.
- **Ocean Literacy: The Essential Principles and Fundamental Concepts of Ocean Sciences for Learners of All Ages, Version 2: March 2013** provides an excellent guide on the seven ocean literacy principles and concepts. The guide can be downloaded from: http://www.coexploration.org/oceanliteracy/documents/OceanLitChart.pdf

FUN FACTS ABOUT THE OCEAN

Facts about the marine are endless and cover a multitude of subjects. Facts may include information about the marine sciences, technology and engineering to influences in marine heritage, culture and the arts.

The fun marine facts and multiple choice questions contained in this document have come from a range of sources including our ocean friends from around the world, our Explorers outreach team, as well as contributions from a range of marine scientists and specialists. The facts and questions may be used as a source of inspiration to develop ocean literacy and engagement. We therefore hope you find them useful in starting class discussions and conducting your own research and exploration about the marine in range of subjects.

The facts and questions are categorised based on seven ocean literacy principles. Have fun testing yourself, the students in your class, or even your fellow colleagues about the ocean. Maybe even try introducing a marine fact a day into the class - particularly during Science Week, Maths Week, Engineering Week, Seachtain na Gaeilge and Heritage Week. Best of Luck!!!

OCEAN PRINCIPLE 1:

THE EARTH HAS ONE BIG OCEAN WITH MANY FEATURES

SIZE/ AREA

- The ocean covers 70% of the planet's surface.
- 97% of the earth's water is found in the ocean.
- There is one global ocean. It is geographically divided into five distinct regions which are known as the: Atlantic Ocean, Pacific Ocean, Indian Ocean, Arctic Ocean and the Southern (Antarctic) Ocean.
- The Atlantic Ocean is the world's second largest ocean and covers up to 25% of the Earth's surface, after the Pacific Ocean.
- The Atlantic Ocean is getting bigger by approximately 5cm each year as new sea floor is created by volcanic activity along its Mid-Oceanic Ridge.
- Europe and Africa are only separated by 14.3 km of ocean.
- The most remote point in the ocean is called Point Nemo, in the Pacific Ocean. It is known as 'The Pole of Inaccessibility' and is 2,688 kilometers from the nearest land.
- Ireland has a marine seabed that is ten times the size of the island of Ireland, (880,000km^2) and is considered one of the largest maritime States of the European Union (see the Real Map of Ireland Ireland at the end of this booklet).

UNDERWATER FEATURES

- The longest mountain range in the world is the Mid-Oceanic Ridge. It is a chain of mountains that runs along the centre of the ocean basins under water, stretching over 56,000km. The Mid-Atlantic Ridge is part of this formation.

- The vertical zonation along the seashore contributes to the distribution of animals and algae. This is influenced by the tides where the seashore is divided into zones.
  - » **The splash zone** is above the high tide mark. Salt water only splashes into it at very high tides and storms.
  - » **The intertidal zone** is made up of the upper, middle and lower shore which is home to many species that have to survive out of the water during the changing tides.
  - » **The subtidal zone** is uncovered by water during extremely low tides.

LAYERS AND OCEAN DEPTHS

- The ocean depths are divided into five main layers. These layers, known as "zones" extend from the surface to the most extreme depths where light can no longer penetrate.
  - » **Epipelagic Zone / Sunlight zone** (0-200m). A wide range of temperatures can occur in this zone around the world.
  - » **Mesopelagic Zone / Twilight zone** (200m - 1,000m). The light that penetrates to this depth is extremely faint.
  - » **Bathypelagic Zone / Midnight zone** (1,000m - 4,000m). There is no light in this zone and the water pressure at this depth is immense, reaching 5,850 pounds per square inch.
  - » **Abyssopelagic Zone / Abyssal zone** (4,000m - 6,000m) comes from a Greek word meaning "no bottom". The water temperature is near freezing, and there is no light at all.
  - » **Hadalpelagic Zone / The trenches** (6,000m – 11,000m). The temperature of the water is just above freezing, and the pressure is an incredible eight tons per square inch.
- The deepest part of the ocean is known as the Mariana Trench. It is off the coast of Japan in the Pacific Ocean and measures a depth of nearly 11km (10,911 meters).
- The average depth of the ocean is 4km.
- At the ocean's deepest point, the water pressure is the equivalent or trying to hold up 48 Boeing 747 jumbo jets piled on top of you.

OCEAN PRINCIPLE 2:

THE OCEAN AND LIFE IN THE OCEAN SHAPE THE FEATURES OF THE EARTH

WATER FEATURES

- There are 2.74 septillion drops of water in the ocean.
- The ocean drives the water cycle and is a major influence on our weather and climate.
- Water takes around 1000 years to travel all the way around the whole globe and is known as the global ocean conveyor belt or thermohaline current (thermo = temperature, haline = salinity).
- The crashing waves of the ocean help shape the features of the coastline as well as creating sand by breaking up rocks and shells. This is why sand comes in lots of different colours.
- The changing levels of the ocean including sea level rises is a process over time that has expanded and contracted the continental shelves, created and destroyed inland seas and shaped the surface of the land.
- The ocean's waves and currents are constantly moving and redistributing the sand on the shoreline and under the ocean on the seafloor.

TECTONIC AND LAND FEATURES UNDER THE SEA

- 75% of the world's active and dormant volcanoes are in the Ring of Fire, an area around the edge of the Pacific Ocean.
- There are over 500,000 earthquakes detected each year with more occurring under the ocean than on land.
- The landscape of the Burren in County Clare has been shaped by geological forces for hundreds of millions of years. The different rock types were formed under different conditions; the limestones, which contain fossil corals, crinoids and brachiopods were formed in a warm tropical sea near the equator, very much like the Bahamas today. The limestones were deposited slowly over a very long period of time, around 20 million years and much of the rock is actually made up of little bits of broken fossils.

LIVING FEATURES

- The ocean is home to the world's largest living structure - the Great Barrier Reef located off the coast of Australia. It is made up of corals forming reefs and islands stretching over 2,300 kilometers, which is nearly 10 times the width of Ireland at its widest point.
- In Ireland cold water corals survive at depths of 3000 metres along the continental shelf, including the Porcupine bank.

OCEAN PRINCIPLE 3:

THE OCEAN HAS A MAJOR INFLUENCE ON WEATHER AND CLIMATE

THE OCEAN – CARBON DIOXIDE RELATIONSHIP

- The ocean absorbs 30% of the carbon dioxide added to the atmosphere by human activity.
- The ocean has a significant influence on climate change by absorbing, storing, and moving heat, carbon and water.
- Ocean acidity (pH) has increased by 26% since the industrial revolution due to uptake of CO^2 from the atmosphere, a rate that is 10 times faster than any natural acidification for over 55 million years.
- The increase in ocean acidity can have a negative effect on animals with calcium in the shells and bodies, such as coral reefs, sea shells, crabs and lobsters.

THE OCEAN – GLOBAL TEMPERATURE RELATIONSHIP

- Seawater freezes at a lower temperature than freshwater.
- At least 15 percent of the ocean is covered by sea ice for some part of the year. Much of the Arctic Ocean is covered by sea ice that varies in extent and thickness seasonally.
- Due to global warming or climate change the polar ice is decreasing and the sea levels are increasing.
- Ocean circulation is the large scale movement of water in the ocean. This effect is known as the Coriolis force.
- Thermohaline circulation is also known as the ocean's conveyor belt (which refers to deep ocean density which drives ocean basin currents). These currents, called submarine rivers, flow under the surface of the ocean and are hidden from immediate detection.
- 29,000 rubber ducks were lost at sea in the Pacific Ocean in 1992, and are still being found today. It has taken 15 years for ducks to travel from the Pacific to land on British beaches. Have you seen any of these ducks in Ireland?
- In Newfoundland, Canada, (which is located directly across the Atlantic Ocean from Ireland) people play hockey on the ocean when it freezes near the land in wintertime. This temperature difference (between the coast of Ireland and Canada) is due to an ocean current called the Gulf Stream.
- The Gulf Stream is a current of warm water that moves across the Atlantic Ocean from the Gulf of Mexico. It brings warm moist air past Ireland and affects the moderate temperature and the amount of rainfall we receive.

WATER FEATURES

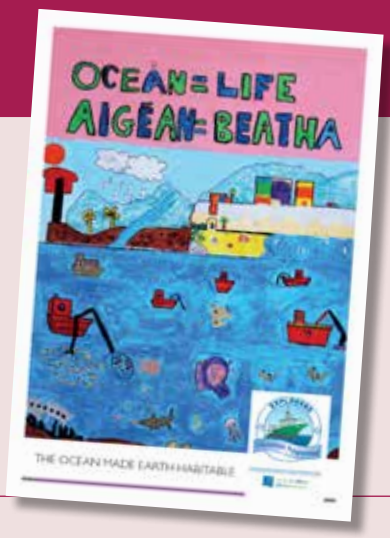
- Ocean currents transport enormous amounts of heat around the world, which is known as thermohaline circulation. This is also known as the Great Ocean Conveyor Belt.
- Hurricanes can form where warm water (from oceans) and air interact. They gain or lose strength (wind speed) based on the temperature of the ocean below. Warmer oceans may result in more frequent hurricanes with stronger wind speeds.

LAYERS AND OCEAN DEPTHS

- There are lots of difference types of seashore, including sandy, rocky and shingle shores and muddy estuaries.
- The seashore is broken up into a number of different zones. The splash zone is the area above the high tide mark, which is rarely covered by saltwater. The area of the shore between the high and low tide marks (intertidal) is broken up into the upper, middle and lower shore. The sub tidal zone is the area below the low tide mark, which is rarely exposed to the air.
- Tides are caused by the gravitational force of the moon and the sun on earth's ocean. When the moon and sun are 'in a straight line', the force is greatest and spring tides occur (tides with the highest high tide and lowest low tide). When the sun and moon are at right angle, the force is at its weakest and neap tide occur (lowest high tide and highest high tide).

OCEAN PRINCIPLE 4:

THE OCEAN MAKES EARTH HABITABLE



OCEAN – LIFE RELATIONSHIP

- Over 50% of the oxygen we breathe comes from phytoplankton (tiny microscopic plants) in the ocean.
- The oceans are part of the water cycle, which form the basis of the rain that falls. This includes the process of precipitation and evaporation.
- Life began in our oceans around 3.5 million years ago.

OCEAN CHEMISTRY AND LIFE RELATIONSHIP

- The density of ocean water is determined by its salinity (or salt content) and temperature. Salt water is most dense at its freezing point, unlike fresh water, which is most dense at about 3.9°C. When seawater freezes, however, the ice contains very little salt because only the water part freezes. It can be melted down to use as drinking water.
- The ocean has a significant influence on climate change by absorbing, storing and moving carbon and heat. This process is changing the ocean chemistry, sea levels and the surface temperatures of the sea surface. For example, if the ocean absorbs too much carbon dioxide it will become too acidic.
- The ocean receives nutrients, salts, sediments as well as pollutants from rivers, lakes and streams that flow into it.
- Chemosynthesis is the process where food is made by bacteria using chemicals as the energy source, rather than sunlight. This process typically occurs around hydrothermal vents at the bottom of the ocean floor.

OCEAN PRINCIPLE 5:

THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS

OCEAN LIFE - BIODIVERSITY

- Our oceans teem with life ranging from the biggest animal on Earth, the blue whale — to tiny microscopic plants and animals called phytoplankton and zooplankton.
- The blue whale is the largest animal to ever live on the Earth, measuring approximately 30m in length. It's maximum weight is 180 metric tons (200 tons) which is equivalent to 2667 humans (each weighing approximately 70kg).
- The word plankton comes from the Greek word planktos, which means "wanderer" or "drifter." Plankton is the general term for the diverse collection of organisms that live in the ocean and drift with the currents as they are unable to swim. These organisms include zooplankton, phytoplankton, bacteria and algae. They provide a crucial source of food to many large animals such as fish and whales.
- Atlantic mackerel can live for up to 17 years and attain a length of 60 cm and a weight of 3.4 kg.
- Mackerel swim in schools that can measure up to 32 kilometers in length.
- There are at least 30 different types of sharks and rays living in Irish waters including dogfish, spur dogs, smooth hounds, tope, blue sharks, thresher sharks, basking sharks and many more.
- There are over 600 different species of seaweeds found in Irish and British waters, including brown, green and red seaweeds.
- The orange roughy fish found in the deepest parts of the ocean, can live to over 150 years of age.
- Approximately 24 species of whale and dolphin have been sighted in Irish waters.
- Lots of marine animals have an exoskeleton, which means their skeleton is on the outside of their body.
- There are three types of fish that have stings around Ireland- The Stingray, the Lesser Weaver fish and the Greater Weaver fish.
- There are approximately 2000 types of starfish in the world.
- There are many types of seabird around Ireland including Herring Gulls, Cormorants, Curlews, and Oyster catchers, Gannets, Plovers, Herons, Sandpipers and Terns. Some are divers, and hunt for food by diving under the water, while others wade across the shore in search of prey.
- Shellfish are an important part of the Irish Seashore. They can be found clinging onto rocks, crawling on seaweed and buried in the sand. Some species have one part to their shell while others have two. Mussels are a species with a shell made up of two parts. They cling to the rock with byssal threads which are thin but strong. They feed by drawing water into their shell and filtering plankton (tiny microscopic plants and animals) out as it passes through.

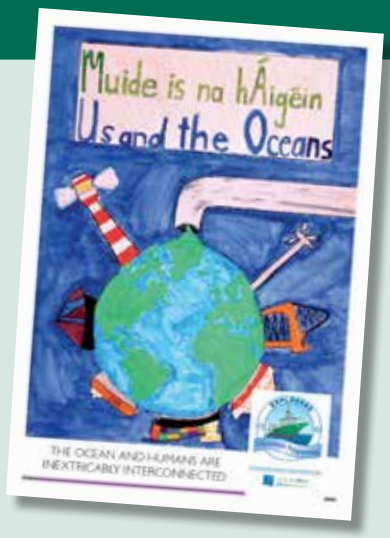
- Crustaceans are animals which usually have an exoskeleton. They have jointed limbs and some, such as crabs, shrimps and prawns have five pairs (ten legs in total). Some can survive out of water for certain periods of time (crabs and sand hoppers) while others such as prawns and shrimps are found mainly in water.
- Hermit Crabs, unlike most crab species have a hard shell which only covers a section of their body. They wear the empty shell of other shellfish, such periwinkles and dogwhelks to protect the lower part of its body (abdomen). As they grow, and as these shells become too small in size they search for larger shells to move into and call home.
- Squid, octopus and cuttlefish are all part of the Cephalopod family. They move using jet propulsion, by drawing water in and funnelling it out through their siphon. They can all camouflage by changing their colour, while octopuses can also change their shape. They shoot out ink when trying to escape from a predator as a line of defence.
- Salmon have a number of different life stages, including Eggs, Alevins, Fry, Parr, Smolt and Adult. They begin life in freshwater and remain here until age 1-3, when as Smolts they leave rivers and head to sea. They remain at sea until they are mature and ready to have their own young, then they return to the river where they were born to begin the cycle once again.
- Many fish reproduce by spawning. Eggs and Milt are released into the water, where they mix to create baby fish. For many there is a very high mortality rate in the first few days and to combat this some fish release a large number of eggs. Female cod can release up to 500,000 eggs per kg of her weight. A large 5kg cod could release up to 2.5 million eggs per year.

OCEAN HABITATS

- The Ocean abounds with life, offering millions of animals a place to live. Scientists say that more plant and animal life is found in the ocean than on land. It is estimated that for every species of marine life we know of, at least another three are yet to be discovered.
- Estuaries provide an important habitat for productive nursery areas for many marine species including mammals, fish and bird life including otters, mullet and oyster catchers.
- Ocean plant and animal life can live in the most extreme environments; surviving near hydrothermal vents with temperatures that can melt lead, to areas of seawater that freeze into ice, and even where there is no light or oxygen. In the dark zone, most of the animals that live at these depths are black or red in colour due to the lack of light.
- Chemosynthesis is the process where food is made by bacteria using chemicals as the energy source, rather than sunlight. This happens in the deepest parts of the ocean where sunlight does not reach.

OCEAN PRINCIPLE 6:

THE OCEAN AND HUMANS ARE INEXTRICABLY INTERCONNECTED



OCEAN PRODUCE AND FOOD

- Humans rely on the ocean for food. Globally, fish and shellfish provide 1 person out of every 7 with their main source of protein.
- The ocean provides a wealth of resources used in medicines, food products, cosmetics, animal feed and lots more. For example a natural thickening agent found in seaweeds, called agar is used in ice cream, beer, shampoo, soap and skin creams.
- Many seaweeds, corals and ocean species have chemicals and enzymes that are used to make different medicines that help improve our quality of life.
- A wealth of minerals can be found in the ocean including zinc, copper and salt to name a few. In addition, the ocean waters contain nearly 20 million tons of gold.
- Iodine was discovered by the French chemist Barnard Courtois in 1811 when he was extracting sodium and potassium compounds from seaweed ash.
- Aquaculture is the fastest growing food production sector in the world. It includes the farming of fish such as Salmon and Trout, shellfish such as mussel and oysters, and seaweed. Abalone and Urchin farming is relatively new in Ireland.
- Commercial fish are fish which are caught to sell. In Ireland our top 20 economically valuable species include Mackerel, Nephrops (i.e. Prawn Species such as Dublin Bay Prawn), Monkfish, Edible Crab and Haddock.
- The sustainable management of commercial fish and marine species involves many steps. These include monitoring of the stock, research surveys, sampling landings, studying discards, looking at the biology and age structure of the population.
- Age structure of a population is determined by sampling a selection of individuals and identifying their age. By doing this we can see how many 2,3,4,5 year old, and so on, fish there are in the sample. We can also study how many are male or female. The age of bony fish (whose skeleton is made of bone) is identified by looking at the fish's ear stone or otolith. This small structure has growth patterns which are similar to the rings on a tree.
- Fisheries are worth over 200 Billion Dollars to the Global economy. When you include tourism and shipping the ocean is estimated to be worth over 24 trillion dollars, making it the world's 7th largest economy.
- Scientists study the marine environment. They look at water quality, temperature, pH and wave heights. In Ireland the Digital Ocean provides information from the Galway Bay underwater observatory, water buoys, tidal gauges plus lighthouses. This information provides vital information for marine industries.

OCEAN LEISURE

- Ireland's Wild Atlantic Way is 2600km in length and is one of the longest defined coastal routes in the world.
- The seashore is considered to be the most popular tourist destination.
- Famous inventors have made the ocean more accessible for thousands of years. - A German inventor and gifted engineer named Siebe invented the 'first closed diving helmet' in 1839.
- Jacques-Yves Cousteau is famous for co-inventing Scuba devices such as the Aqua-Lung, that revolutionised diving and exploring under the sea.

OCEAN ENERGY

- If we used ocean energy technology to capture just 0.1% of the total of the ocean's kinetic energy caused by tides and waves, we could satisfy the current global energy demand five times over.
- Research into renewable ocean energy is being carried out throughout the world including Ireland.

TRADE AND CONNECTIONS

- More than 90% of global trade is carried by sea.
- Shanghai in China was recorded as the world's largest port in 2014, when it handled 35 million twenty foot containers in one year.
- A transatlantic telecommunications cable is a submarine communications cable connecting one side of the Atlantic Ocean to the other.
  - » In the 19th and early 20th centuries each cable was a single wire. After mid-century coaxial cable came into use, with amplifiers. Late in the century, all used optical fiber, and most now use optical amplifiers.
  - » Valentia was the eastern point of the first commercially viable transatlantic telegraph cable. Cables were first landed at Knightstown in 1858 and Foilhommerum Bay in 1865 and finally resulted in commercially viable transatlantic telegraph communications from Foilhommerum Bay to Heart's Content, Newfoundland in 1866. Transatlantic telegraph cables operated from Valentia Island for one hundred years, ending with Western Union International terminating its cable operations in 1966.

POPULATION DISTRIBUTION

- Over half of the world's population lives within 60km of the sea.
- In Ireland, 40 percent of the population (1.9 million) live 5km from the coast.
- Three quarters of the world's largest cities are located by the sea.

OCEAN HERITAGE AND CULTURE

- At the end of the eighth century the first Viking raiders appeared in Irish waters. They used longships when they were exploring and raiding other countries.
- Ireland has a rich maritime history and includes many famous people who have been influenced by the ocean including
  - » Grace O'Malley (Granuaile) was a famous pirate, seafarer, trader and chieftain in the 1500's in Ireland.
  - » John Phillip Holland who was from County Clare, designed the first 'modern submarine' in 1897
  - » Sir Francis Beaufort created the Beaufort scale, which was used for judging the strength of wind at sea in 1805, which the scale is still used today.
- The oldest lighthouse in Ireland is called Hook Lighthouse and it dates back to the 12th century. It is located at the tip of Hook Peninsula in County Wexford. The oldest lighthouse in the world is the Tower of Hercules which was constructed in the second century. It is located in the northwest of Spain.
- The deep sea is often described as a mega museum, containing more artifacts and remnants of history than in all of the world's museums combined! In Irish waters there are over 15,000 shipwrecks including famous *RMS Lusitania*. There are possibly 3 million shipwrecks dotted around the world ocean.
- The *RMS Titanic* was a passenger liner that became infamous for its collision with an iceberg and dramatic sinking in 1912.
  - » The wreck of the *RMS Titanic* lies at the depth of 3,800m and was found in two pieces, the bow and the stern, by marine explorers Robert Ballard and Jean-Louis Michel in 1985. The coordinates of the wreck are: latitude 41° 43' 57" North, longitude 49° 56' 49" West.
- Yawls, Currachs and Galway Hookers are traditional boats built in Ireland.
- The ocean has inspired artists, musicians, photographers, writers and film makers for thousands of years where stories have been captured in time. Jules Verne published "Twenty Thousand Leagues Under the Sea" in 1870 and it still remains a story of influence and inspiration for artists, explorers and marine scientists today.
- Mythological stories about the ocean form part of many countries culture and heritage. For example, creatures called Selkies which are famous in Irish, Scottish, Faroese, and Icelandic folklore are said to live as a seal in the sea but shed their skin to become human on land.
- Ireland's heritage has close links to the ocean. There is a long history or fishing, boat building, and seaweed harvesting around our shores. Seaweeds such as Irish moss, Egg wrack and Dulse have been collected for centuries as a source of food, medicine and fertilizer.
- The Ocean has also provided inspiration for musical compositions. 'Port na Bpucai' is an old traditional Irish song from the Blasket Islands, which some say was inspired by the song of the Humpback Whale.

OCEAN DESTRUCTION

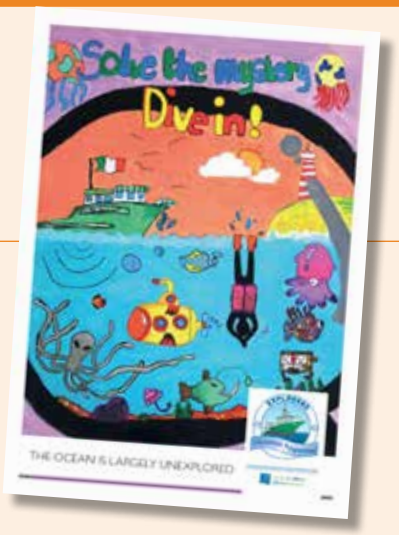
- Sadly approximately 14 billion pounds (6 Billion Kg.) of rubbish ends up in the ocean every year. Most of it is plastic.

OCEAN PRINCIPLE 7:

THE OCEAN IS LARGELY UNEXPLORED

OCEAN EXPLORATION

- Marie Tharp in partnership with Bruce Heezen created the first scientific map of the entire ocean floor in 1977 confirming the concept of tectonic plates and the continental shift.



OCEAN DISCOVERIES

- The elephant, with its long nose used for going under the water and extending it above the surface to breathe, inspired Alexandra the Great and his army who created the first recorded submersible - the Glass Diving Bell.
- Before compasses, Vikings navigated the ocean using the stars, birds, whales, celestial bodies, chants and rhymes.
- Hydrothermal vents were discovered 10 years after humans landed on the moon. They occur in areas of volcanic activity on the ocean floor and can grow to 60 meters in height.
- In 2011, Irish scientists discovered Hydrothermal vents along the Mid-Atlantic Ridge using the remotely operated vechicle ROV *Holland 1*.
- A Canadian man named Harold Hackett has put over 4800 messages in bottles into the ocean and has gotten over 3000 responses back.
- Some people say that we know more about the surface of the moon than we do about the depths of the ocean. This may well be true but it is also true to say that marine scientists across the world are working hard to rectify this gap in our knowledge. Every day more and more new sea creatures and new sources of food, medicine and energy are being discovered in our seas.
- Organisations like the Marine Institute in Ireland are working to increase our understanding of the ocean realm. From mapping and describing the physical, biological, geological, chemical, and archaeological aspects of the ocean to understanding ocean dynamics, and developing new technologies, every day we learn a little more about our ocean.

NEW TECHNOLOGY AND ADVANCEMENTS

- New technologies and equipment such as sonar, satellites, buoys, sensors and unmanned submersibles are expanding our ability to explore the ocean.
- Ireland, was the first country in the world to carry out extensive mapping of its marine territory, which is 880,000 Km^2 in size.
- Multibeam sonar on board the national research vessel, the RV *Celtic Explorer* was used on the first transatlantic mapping expedition between Ireland and Canada.
- At the underwater Ocean Observatory in Galway Bay, scientists are testing new environmental monitoring equipment and sensors. These may be useful in the development of renewable ocean energy around our shores.

101 OCEAN LITERACY MULTIPLE CHOICE QUESTIONS AND ANSWERS

The 101 ocean literacy questions and answers are based on the seven ocean literacy principles and concepts. The questions can be used as a pre and post evaluation test to assess your classes understanding of the ocean. This may include selecting questions from one or all of the ocean literacy principles themes. They may also be adapted to suit your classes age group.

	Ocean Literacy Questionnaire – Explorers Education Programme™	**Correct Answer**
	THE EARTH HAS ONE BIG OCEAN WITH MANY FEATURES	
1.	**Approximately how much of the Earth is covered by the ocean?** **a)** 31% **b)** 51% **c)** 71% **d)** 91%	C
2.	**What is the name of second largest ocean on Earth?** **a)** The Arctic Ocean **b)** The Atlantic Ocean **c)** The Pacific Ocean **d)** The Indian Ocean **e)** Southern Ocean	B
3.	**The Atlantic Ocean separates which continents?** **a)** Australia and Asia **b)** North America and Europe **c)** Antarctica and Africa	B
4.	**Which of the following is not an underwater feature?** **a)** Deep sea canyon **b)** Abyssal Plain **c)** Glacier	C
5.	**What is the name given to the area where a river meets the Sea?** **a)** Estuary **b)** Turlough **c)** Floodplain	A
6.	**Approximately what percentage of the total water on earth is in the ocean, i.e. saltwater?** **a)** 34% **b)** 52% **c)** 72% **d)** 97%	D
7.	**The remotest point in the ocean is in the Pacific Ocean which is 2,688 kilometres from land. It is called:** **a)** Point Nemo **b)** Point Dory **c)** Point Verne	A
8.	**What causes the tides?** **a)** Moon **b)** Sun **c)** Moon and Sun	C
9.	**How long does it take for the water at the seashore to go from a high tide to a low tide?** **a)** 24 hours and 50 minutes **b)** 12 hours and 25 minutes **c)** 6 hours and 12 minutes	C
10.	**When do spring tides occur?** **a)** Spring tides occur during the spring time **b)** Spring tides occur during the full moon and the new moon **c)** Spring tides occur during quarter moons	B

11.	**In the western Pacific Ocean, the Mariana Trench is the deepest known area of Earth's ocean. The deepest point is approximately:** **a)** 9,000 metres **b)** 11,000 metres **c)** 5,000 metres	B
12.	**The seashore is divided into zones. Which of the following statements is correct:** **a)** The seashores splash zone is at the subtidal zone, underwater at all times, even during low tide. **b)** The seashore's splash zone is on the middle shore and home to seaweeds, sea anemones and seashore fish **c)** The seashore's splash zone is above the high tide mark. Saltwater splashes into it at very high tides and storms.	C
13.	**As far as I know the longest mountain range in the world is called:** **a)** The Rocky mountains **b)** The Andes **c)** The Mid-Oceanic ridge	C
14.	**Waves are created by energy passing through water, causing it to move in a circular motion. Surface waves in the ocean are mostly caused by:** **a)** Wind moving across the surface of the water **b)** The gravity of the moon and sun **c)** Underwater volcanoes	A

THE OCEAN AND LIFE IN THE OCEAN SHAPE THE FEATURES OF THE EARTH

15.	**Which statement is the most accurate description about how sand is produced?** **a)** Most of the sand in the ocean is produced by the breaking down of plastic **b)** Most of the sand in the ocean is produced by the erosion and breaking down of rocks **c)** Most of the sand in the ocean is produced by the breaking down of shells	B
16.	**Activity under the ocean has shaped features such as continental shelfs, plateau's, banks, ridges, seamounts, troughs, valley's as well as islands above sea level. These features have been formed through:** **a)** Movement of the tectonic plates and volcanic activity **b)** Erosions and landslides **c)** Changing Sea levels **d)** All of the above	D
17.	**The coastal environment is constantly changing, as sand and rocks are moved around the ocean floor and broken up. Which are the following are important for this process?** **a)** Wind **b)** Waves **c)** Tides **d)** All of these	D

18.	**Scientists have discovered cold water corals at depths of 1000 to 3000 metres in Irish waters known as the designated Irish Continental Shelf. In which area of Irish waters have cold water corals been discovered?** **a)** Rockall Trough **b)** Porcupine Abyssal Plain **c)** Porcupine Bank	C
19.	**Underwater volcanoes or submarine volcanoes accounts for 75% of the volcanic activity in the world. This activity is located near tectonic plate movement, known as mid-ocean ridges. This chain of activity has formed a feature known as the Ring of Fire. Which Ocean is this feature** **a)** In the Atlantic Ocean **b)** In the Pacific Ocean **c)** In the Arctic Ocean	B
20.	**Many features are formed where the ocean meets land. Which of the following is NOT a coastal feature?** **a)** Sandy Shore **b)** Wave cut platform **c)** U-shaped valley	C
21.	**Hydrothermal vents are like geysers that form thousands of metres under the ocean. They are like chimneys and are known as 'smokers'. They were first discovered in the late 1970's in which ocean?** **a)** The Atlantic Ocean **b)** The Indian Ocean **c)** The Pacific Ocean	C

THE OCEAN HAS A MAJOR INFLUENCE ON WEATHER AND CLIMATE

22.	**Hurricanes can form where water (from the ocean) and air interact. Hurricanes gain or lose strength (wind speed) based on the temperature of the ocean below. As ocean temperatures increase which of the following statements do you think is true?** **a)** Warmer Oceans will have no effect on the frequency or strength of hurricanes **b)** Warmer Oceans may result in less hurricanes, with lower wind speeds **c)** Warmer Oceans may result in more frequent hurricanes with stronger wind speeds	C
23.	**The Gulf Stream is a current of warm water that moves across the Atlantic Ocean and affects the weather in Europe. In what way does it affect the Irish Climate?** **a)** It brings warm, moist air past the Irish west coast causing mild and moist weather during winter **b)** It brings warm, moist air past our west coast causing long hot summers with little rain **c)** It brings warm, moist air past our west coast causing long cold winters with lots of snow and ice	A
24.	**The Arctic Ocean is covered by sea ice that varies in its area and thickness seasonally. In what way is climate change impacting the Arctic?** **a)** Arctic fish populations are increasing **b)** Polar ice is decreasing **c)** Mountain glaciers are growing larger	B

25.	**Ocean currents transport enormous amounts of heat around the world, which is known as thermohaline circulation. This is also known as the:** **a)** The Biggest Heat Wave **b)** The Longest Salty River **c)** The Great Ocean Conveyor Belt	**C**

THE OCEAN MAKES EARTH HABITABLE		
26.	**The water cycle involves a number of processes of which precipitation is one. Which statement best describes this process?** **a)** Precipitation is when water changes from a gaseous state back into water vapour **b)** Precipitation is when atmospheric water vapour falls back down to earth as rain, drizzle, snow, sleet or hail **c)** Precipitation is when water is vaporised from its liquid state in a gaseous state and rises upwards	**B**
27.	**Over 50 percent of the oxygen that we breathe has been produced by:** **a)** Microscopic plants in the ocean called phytoplankton **b)** Rain forests including all of the trees and plants **c)** Seaweeds including kelp, Irish moss and gutweed on the seashore	**A**
28.	**The ocean provides us with freshwater through the process called:** **a)** Diffusion **b)** Ice melting **c)** The Watershed **d)** The Water Cycle	**D**
29.	**The ocean is responsible for absorbing carbon dioxide from the atmosphere. What happens if the ocean absorbs too much carbon dioxide?** **a)** The ocean temperature stays the same **b)** There is more alkaline in the water **c)** The ocean becomes too acidic	**C**
30.	**The density of ocean water is determined by the:** **a)** The number of animals swimming in the ocean **b)** The pollution in the water **c)** Its salt content and temperature	**C**
31.	**Scientists believe that the first life on Earth evolved in:** **a)** Rainforests **b)** The Ocean **c)** The Desert	**B**
32.	**Scientists believe that most of the marine life in the ocean occurs at 0-200m in the warmer surface waters. This zone is also known as the:** **a)** Sunlight Zone **b)** Twilight Zone **c)** The Trenches	**A**

33.	**What causes different types of marine animals and seaweeds to live in different zones of the seashore?** **a)** Availability of water at low tide (Desiccation) **b)** Wave action, Light, Temperature, Substrate **c)** Pollution and Freshwater from land (Salinity changes) **d)** All of the above	D
34.	**Chemosynthesis is the process where food is made by bacteria using chemicals as the energy source, rather than sunlight. This process typically occurs around which feature in the ocean?** **a)** Near seamounts **b)** Around hydrothermal vents at the bottom of the ocean **c)** In sea caves	B

THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS		
35.	**The organisms with the highest population numbers in the ocean are called:** **a)** Fish **b)** Plankton **c)** Crustaceans **d)** Cnidarians	B
36.	**A typical seaweed attaches onto rocks using its:** **a)** Fronds **b)** Roots **c)** Holdfast	C
37.	**A sponge grows in one spot. What type of living thing is a sponge?** **a)** Animal **b)** Algae/Plant **c)** Fungus	A
38.	**Sea anemones belong to a family called cnidarians (pronounced nid-ar-ians). What other animals are they related to?** **a)** Sea slugs **b)** Jellyfish **c)** Sea squirt	B
39.	**What animal would you typically find swimming in the water of a rock pool on the seashore?** **a)** Blenny **b)** Giant Squid **c)** Seagull	A
40.	**Shellfish come in different shapes and sizes. Some have a shell which comes in one single piece while others have two halves that fit together. Based on this, which of these is the ODD one out?** **a)** Mussel **b)** Periwinkle **c)** Cockle	B
41.	**What is the largest animal in the world, which lives in the ocean and can grow to approximately 30 metres in length?** **a)** A Bowhead Whale **b)** A Blue Whale **c)** A Sperm Whale	B
42.	**What is the world's biggest fish?** a) Whale Shark **b)** Basking Shark **c)** Mantra Ray	A
43.	**Creatures that live in the deepest part of the ocean create their own light to attract prey, a mate, or to confuse predators. What is this called?** **a)** Bioluminescence **b)** Cimmerian **c)** Twilight	A

44.	**The ocean supports a large number of aquatic ecosystems. Which of the following is NOT an example of an aquatic ecosystem?** **a)** Salt Marsh **b)** Sea Floor **c)** Savannah	**C**
45.	**Orange roughy fish are found in the deepest parts of the ocean. They have been known to live as old as:** **a)** 50 years **b)** 80 years **c)** 150 years of age	**C**
46.	**Which of these birds is NOT a seabird (lives in a marine environment)?** **a)** Albatross **b)** Kiwi **c)** Oystercatcher	**B**
47.	**What is Ireland's most common species of Shark (cartilaginous fish)?** **a)** Basking Shark **b)** Lesser Spotted Dogfish **c)** Angel Shark	**B**
48.	**When marine animals die, millions of tiny particles often drift to the bottom of the ocean. This is an important food source for deep sea creatures. What is it known as?** **a)** Marine snow **b)** Marine pellets **c)** Ocean flakes	**A**
49.	**Coral reefs are among the oldest ecosystems in the world. The largest coral reef in the world is known as:** **a)** The Great Barrier Reef in the Pacific near Australia **b)** Red Sea Coral Reef in the Red Sea near Israel, Egypt, and Djibouti **c)** Florida Reef in the Atlantic Ocean and Gulf of Mexico near Florida	**A**
50.	**An octopus can change the colour of its entire body in just three-tenths of a second, to blend in with marine plants, rocks and sand. When animals do this it is called:** **a)** Huggermugger **b)** Camouflaging **c)** Cloak and dagger	**B**
51.	**Which statement is true about starfish:** **a)** Starfish are very gentle creatures and feed on marine plants **b)** Starfish are ocean stars mimicking the stars above and are known to bring you luck if taken home **c)** Starfish are carnivores that feed on shellfish and dead animal material	**C**
52.	**Leatherback sea turtles nest in warm waters such as those in the Caribbean. They migrate into colder waters such as waters around Ireland in search of their favourite food, which is:** **a)** Jellyfish **b)** Irish Moss **c)** Salmon	**A**
53.	**There are approximately 24 different species of dolphins and whales that have been recorded in Irish waters, including common dolphins, harbour porpoises, fin whales, humpback whales and sometimes even orcas (killer whales)! The scientific name for whales and dolphins is:** **a)** Crustaceans **b)** Cetaceans **c)** Cnidarians	**B**

54.	**Seahorses carry eggs in a pouch until they hatch fully formed as miniature seahorses into the water? Which of the following statements is true?** **a)** The female seahorses gives birth to miniature seahorses **b)** Male seahorses carryout the eggs in their pouches and gives birth to miniature seahorses **c)** Both female and male seahorses gives birth to miniature seahorses	**B**
55.	**Basking sharks diet consists mainly of:** **a)** Sea lions and Seals **b)** Shellfish including cockles and mussels **c)** Plankton (tiny plants and animals that live near the surface of water), fish eggs, barnacles and shrimp	**C**
56.	**Colossal squid have the largest eyes in the animal kingdom in relation to their body size. Approximately what size are their eyes?** **a)** Approximately 27cm which is about the size of an adult soccer ball **b)** Approximately 7cm which is about the size of a tennis ball **c)** Approximately 12cm which is the size of a standard cereal bowl	**A**
57.	**Mangroves grow in salty water in the inter-tidal zones of tropical and subtropical parts of the world. What are they?** **a)** Mangroves are a type of fish **b)** Mangroves are a type of tree **c)** Mangroves are a type of seaweed	**B**
58.	**Around half the global population or colonies of grey seals are found in what part of the world?** **a)** Around Asian coastlines **b)** Around American coastlines **c)** Around British coastlines	**C**
59.	**Which of the following statements is correct about Polar bears and Penguins?** **a)** Polar bears live in the Arctic while the penguins live in the Antarctica **b)** Polar bears and penguins live in the same area in the Artic **c)** Polar bears live in the Antarctic for some of the year	**A**
60.	**The fins on a fish help it swim and are used for balance and turning in the water. What is the tail of a fish called?** **a)** Dorsal fin **b)** Caudal fin **c)** Pectoral fin	**B**

THE OCEAN AND HUMANS ARE INEXTRICABLY INTERCONNECTED		
61.	**On average the majority of the world's population live near the ocean. In the Republic of Ireland, what distance does 40 percent of the population (1.9 million) live from the coast?** **a)** 60km **b)** 20km **c)** 5km	**C**
62.	**The ocean provides an essential source of food for humans. What species of cod are caught by fishermen in Ireland that are sold commercially?** **a)** Atlantic cod **b)** Pacific cod **c)** Greenland cod	**B**
63.	**Nephrops norvegicus are members of the crustacean family, which grows up to 25 cm and are one of the most commercially important groups of animals harvested and farmed throughout the world. They are given different names in different parts of the world. What are they commonly known as in Ireland?** **a)** Norway lobster **b)** Dublin Bay prawn **c)** Langoustine **d)** Scampi	**B**
64.	**Aquaculture is the fastest growing food sector in the world, which includes fish, shellfish, and seaweed. Which type of aquaculture is relatively new in Ireland?** **a)** Mussel and Oyster farming **b)** Salmon and Trout farming **c)** Abalone and Urchin farming	**C**
65.	**Marine scientists study marine animals, sponges, seaweeds and corals to help discover new medicines to help cure diseases. In Ireland, what type of seaweed has been used for centuries as a remedy for sore throats, coughs and colds, as well as a thickening agent in cooking?** **a)** Carrageen Moss or Irish Moss **b)** Bladderwrack **c)** Gutweed	**A**
66.	**Marine scientists monitor and test the marine environment for natural and human pollutants in the ocean. Phytoplankton blooms, micro-algal blooms, toxic algae, red tides, or harmful algae are all terms for naturally occurring phenomena in the ocean. What term is used by marine scientists to describe these events?** **a)** Harmful Algal Blooms **b)** Sinister Ocean Blooms **c)** Toxic Pollutions	**A**
67.	**Which human activity increases the acidity (pH level) of the ocean water the most?** **a)** Burning fossil fuels adds carbon dioxide to the atmosphere, which is then absorbed by the ocean **b)** The breaking down of human waste, such as plastic in the ocean, is releasing toxins into the water. **c)** Using alternative energy resources such as solar, sun and wave energy	**A**

68.	**What is the biggest cause of marine pollution around the world - approximately 80%?** **a)** Fishing vessels (e.g. Abandoned fishing gear etc.) **b)** Cruise and cargo ships (e.g. Greenhouse gas emissions, acoustic, and oil pollution) **c)** Nonpoint source pollution (e.g. Drains and sewers, open dump sites, humans leaving items on the beach, agriculture runoff washed into the sea)	**C**
69.	**Approximately how much global trade, such as things that we buy – food, clothing, cars, building materials etc. is carried by sea in cargo ships each year?** **a)** 60% **b)** 75% **c)** 90%	**C**
70.	**Which one of the below is NOT a maritime career?** **a)** Marine Insurance Consultant **b)** Stevedore **c)** Airline Pilot	**C**
71.	**Ocean energy is a form of renewable energy that constitutes a clean and inexhaustible energy source that can be used to power homes, transport and industries around the world. What elements of the ocean may be used to generate electricity?** **a)** The ocean's tides and waves **b)** Winds and currents **c)** Thermal elements **d)** All of the above	**D**
72.	**The majority of international data is transmitted by wires at the bottom of the ocean, which are called submarine communications cables. Between which countries on either side of the Atlantic Ocean was the first transatlantic cable laid in 1858?** **a)** Newfoundland and Ireland **b)** USA and the England **c)** Spain and South America	**A**
73.	**What is the name of the oldest lighthouse in Ireland?** **a)** Loophead Lighthouse **b)** Bull Rock Lighthouse **c)** Hook Lighthouse	**C**
74.	**The most popular holiday destinations in the world are:** **a)** Mountain resorts **b)** Seaside locations **c)** City breaks	**B**
75.	**Research shows that spending time by the ocean has many positive effects on health and well-being. Doctors were prescribing trips to the shore or visits to "bathing hospitals" — special clinics that offered seawater bath treatments — as early as what century?** **a)** the 18th century **b)** the 19th century **c)** the 20th century **c)** the 21st century	**A**
76.	**Garrett McNamara is a professional big wave surfer and famous for breaking the world record for largest wave (23.8m) ever surfed in 2011. What was the location of the wave he surfed?** **a)** Eileen at Cliffs of Moher, Ireland **b)** Nazaré, Portugal **c)** Jaws at Pe'ahi , Hawaii	**B**

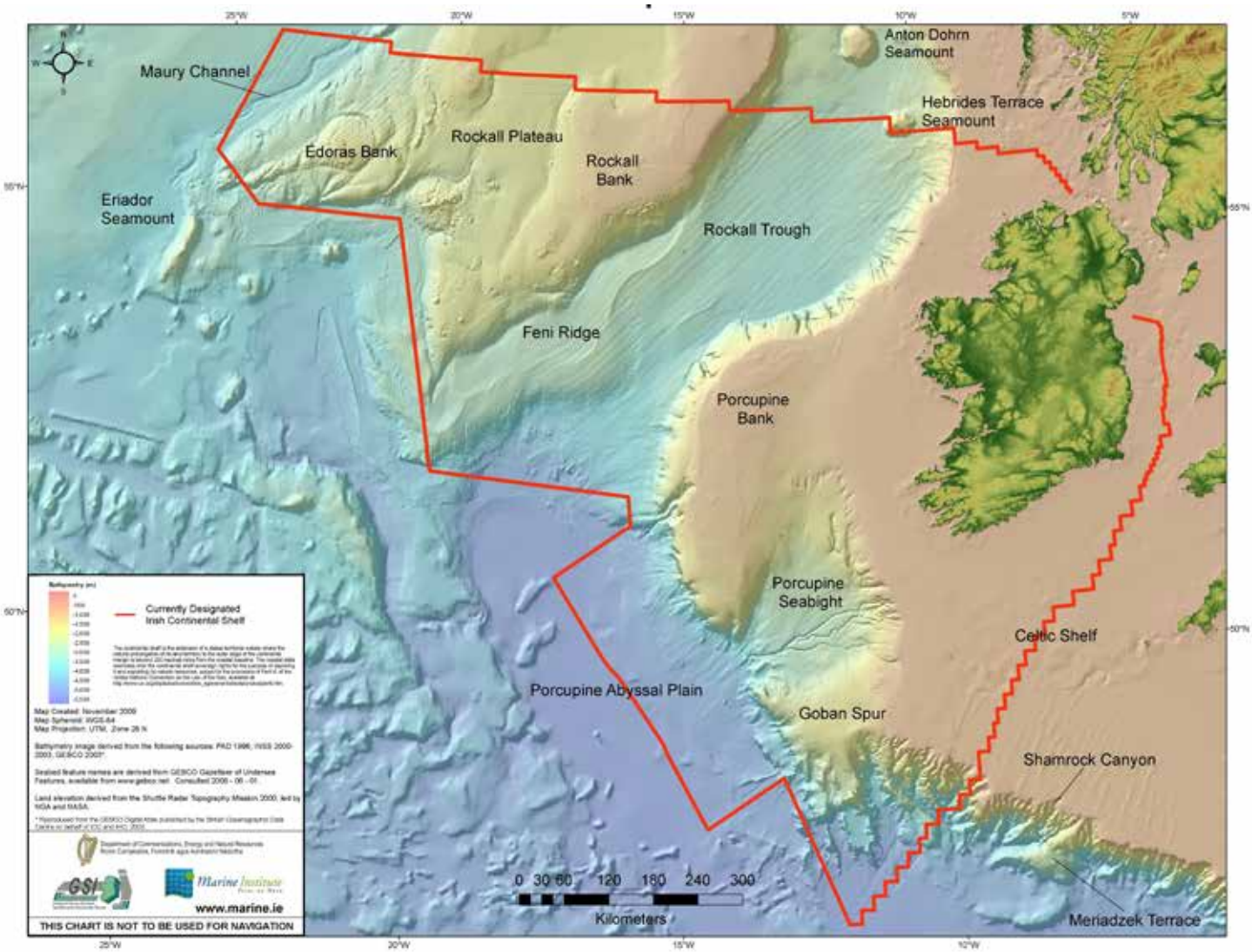
77.	**Francis Beaufort, born in Meath in 1774 is famous for inventing a scale that measured the wind conditions varying from calm to hurricane. What was the scale called?** **a)** Winfield scale **b)** Beaufort Scale **c)** Candlestick Scale	**B**
78.	**Ellen Hutchins, born in 1785 was Ireland's first female botanist. Her focus was on plants that do not produce seeds, such as mosses, liverworts, lichen, and seaweeds. What county in Ireland was she from?** **a)** Galway **b)** Cork **c)** Louth	**B**
79.	**John Phillip Holland, who was born in Ireland in 1858, was responsible for developing the first:** **a)** Rudder system for a boat **b)** The deep diving suit **c)** Modern submarine	**C**
80.	**A wetsuit is used by scuba divers, snorkelers, windsurfers, and surfers to keep them warm when they are in cold ocean water. A wet suit is made of:** **a)** Plastic or rubber materials such as neoprene **b)** Wool or flannel **c)** Leather and metal	**A**
81.	**What did Jacques-Yves Cousteau and Émile Gagnan co-invent that revolutionised diving and exploring under the sea in 1947?** **a)** Snorkel and mask **b)** Slip on rubber shoes called flippers **c)** Scuba (Self-Contained Underwater Breathing Apparatus) devices such as the Aqua-Lung	**C**
82.	**Grace O'Malley (Granuaile) was a famous pirate, seafarer, trader and chieftain in the 1500's in what country?** **a)** France **b)** Britain **c)** Ireland	**C**
83.	**Who wrote the famous book called "Twenty Thousand Leagues Under the Sea"?** **a)** Jules Verne **b)** Herman Melville **c)** Dr Seuss	**A**
84.	**What is the name of a children's movie in which the leading character is a clown fish?** **a)** Free Willy **b)** Finding Nemo **c)** Shark Tale	**B**
85.	**Mythological creatures called Selkies found in Irish, Scottish, Faroese, and Icelandic folklore are said to live as an animal in the sea but shed their skin to become human on land. What type of animal are they?** **a)** Turtle **b)** Seal **c)** Otter	**B**
86.	**A fish known as Bradán feasa is featured in Irish mythology where the fish gains the world's knowledge after eating nine hazelnuts that fell into the Well of Wisdom. The first person to eat the fish would in turn gain the knowledge of the fish. What type of fish is this story based on?** **a)** Shark **c)** Mackerel **c)** Salmon	**C**

87.	**What famous shipwreck is found in the Irish ocean and sea?** **a)** *RMS Lusitania* **b)** *RMS Titanic* **c)** *The Mary Rose*	**A**
88.	**The tall pole on a sail boat, to which the sail is attached is called a:** **a)** Rudder **b)** Hull **c)** Mast	**C**
89.	**Starboard and port are nautical terms which describe the right (starboard) and left (port) sides when facing the front (bow) of a ship or boat. What is the rear part of a ship or boat called?** **a)** The posterior **b)** The stern **c)** The tailpiece	**B**
90.	**At the end of the eighth century the first Viking raiders appeared in Irish waters. What type of ships did the Vikings use when they were exploring and raiding other countries?** **a)** Canoes **b)** Galleys **c)** Longships	**C**
91.	**What are Yawls, Currachs and Galway Hookers?** **a)** Traditional boats built in Ireland **b)** Traditional boats built in Africa **c)** Traditional boats built in America	**A**
92.	**What shipwreck is located using the following latitude 41° 43' 57" North, longitude 49° 56' 49" West?** **a)** Bismarck **b)** Titanic **c)** Carpathia	**B**
93.	**The largest patch of plastic waste in the world can be found in the North Pacific Ocean. In comparison to land area, it is the same size as:** **a)** Ireland **b)** Texas **c)** Canada	**B**

THE OCEAN IS LARGELY UNEXPLORED		
94.	**The diving bell is one of the earliest types of equipment for underwater work and exploration. Which sovereign in Europe was responsible for exploring the Mediterranean sea using a barrel of clear glass in 332 B.C.?** **a)** King Arthur **b)** Henry VIII **c)** Alexander the Great	**C**
95.	**What was the name of the ship that was used in 1872–1876 for a marine science expedition around the world that laid the foundation of oceanography?** **a)** *HMS Challenger* **b)** *HMS Endeavour* **c)** *Calypso*	**A**
96.	**A person who studies the diverse topics relating to the ocean such as marine life and habitats; plate tectonics and the geology of the seafloor; as well as the chemical; and physical properties of the ocean is called an:** **a)** Astronomer **b)** Oceanographer **c)** Volcanologist	**B**
97.	**What was the woman's name who created the first scientific map of the entire ocean floor confirming the concept of tectonic plates and the continental shift in 1957, while working with Bruce Charles Heezen?** **a)** Marie Tharp **b)** Syliva Earle **c)** Katherine Megan McArthur	**A**
98.	**Satellites were first used to map the seafloor in what year?** **a)** 1960's **b)** 1970's **c)** 2000's	**A**
99.	**Ireland has one of the largest ocean territories in the EU, ten times the size of its land area. Ireland is one of the first countries to map its deepest parts of its seabed using advanced multi-beam technology. Approximately what size is Ireland's seabed territory?** **a)** 10,000km^2 **b)** 880,000km^2 **c)** 1000,000km^2	**B**
100.	**What is the name of Ireland's largest research vessel responsible for deep sea research?** **a)** *RV Celtic Explorer* **b)** *RV Celtic Voyager* **c)** *Celtic Mist*	**A**
101.	**Only three people have ever reached the deepest part of the ocean at the bottom of the Mariana Trench in the Pacific. This included Jacques Picard and Don Walsh in 1960. What was the name of the movie director who dived to the bottom of the ocean in 2012?** **a)** James Cameron **b)** Steven Spielberg **c)** Steven Soderberg	**A**

For more interesting facts and information about the ocean check out **www.explorers.ie**

THE REAL MAP OF IRELAND



The Real Map of Ireland has a seabed territory ten times the size of its land area.

Notes

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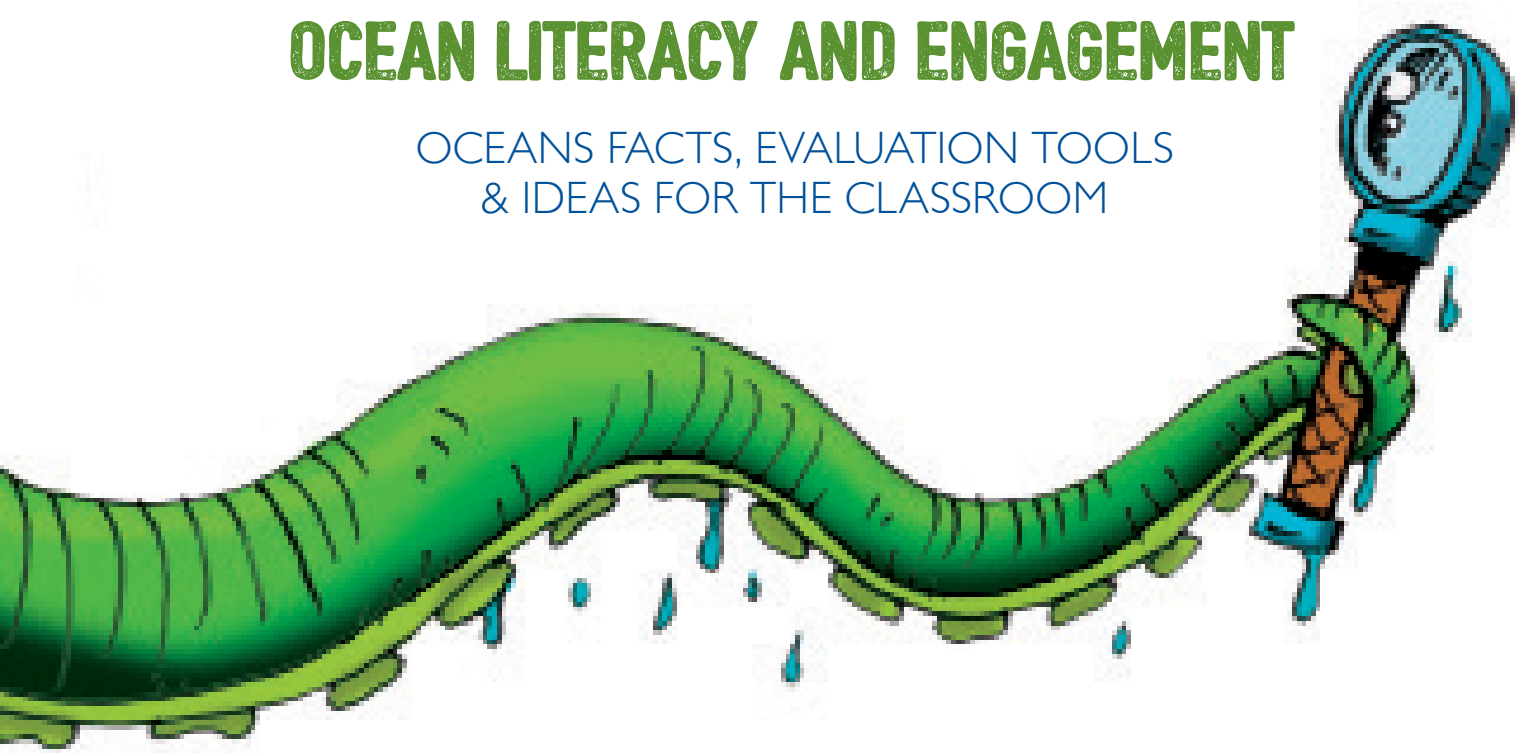

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