Aakash

Medical | IIT-JEE | Foundations

(Divisions of Aakash Educational Services Limited)

KNOWLEDGE BYTES

OCTOBER 2020

CLASS 9

Aakash

Medical | IIT-JEE | Foundations

(Divisions of Aakash Educational Services Limited)

Edition: 2020-21

PREFACE

What is Knowledge Bytes ?

Knowledge Bytes is a collection of riddles, interesting facts, mnemonics, and puzzles that will make your learning fun and engaging.
We want you to be delighted about studying. Knowledge Bytes helps you to know more about the subject in a fun, motivating and educational way and helps to implement what you learn in a creative way.

Benefits


Saves Time


Develops Learning Skills


Stimulates Interest


Leads to Increased Comprehension

EXPLORE

Triangles

Triangles in day to day Life

1. Bridges

Supporting structures for bridges are constructed in triangular shapes as they evenly distribute the weight without changing the proportions. Earlier bridges were used to be very weak and could not hold much weight before triangular shapes were incorporated in their structure.

2. Sailing ships

Triangular sail design helps to travel against the wind using a technique known as tacking. Tacking allows the ship to travel forward with the wind at right angles to the boat.

3. Roofs of houses

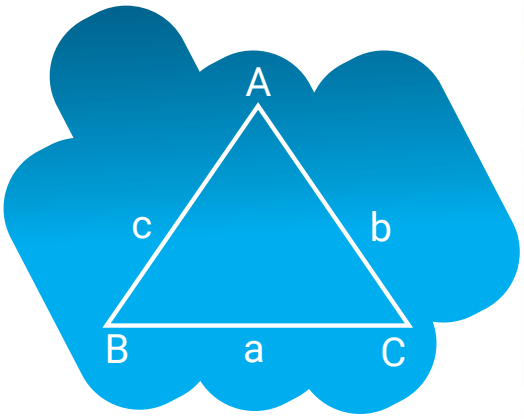
The roof of house is an obtuse-angled triangle. The roof truss is constructed because it doesn't let water or snow to stand on the roof for a longer time.

4. Finding heights of buildings

The concept of right angle comes in usage whenever we have to find the angle of elevation or the height of a tower or a mountain. Moreover, we can also calculate the distance of the ship from the particular tower.

Area of Triangle using Trigonometry

When two sides of the triangle and included angle between them is given Let's find the area of a triangle.



If Δ be the area of a triangle ABC, Prove that:

(i) Δ = ½ ab sin C

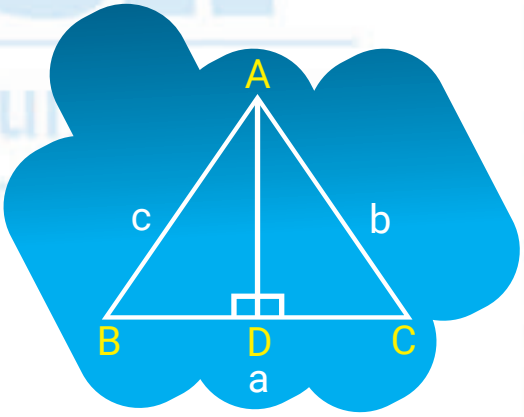
(ii) Δ = ½ ca sin B

(iii) Δ = ½ bc sin A

PROOF(i)

Let ABC is an acute angled triangle. Lengths of sides are given as AB = c, AC = b, BC = a

Construction: Draw perpendicular AD as height of triangle ABC



In Δ ADC:

$$\sin C = \frac{AD}{AC} \quad \left[\sin\theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}}\right]$$

$$\Rightarrow \sin C = \frac{AD}{b}$$

$$\Rightarrow AD = b \sin C$$

$$\Delta = \text{area of triangle ABC}$$

$$= \frac{1}{2} \text{ base} \times \text{altitude}$$

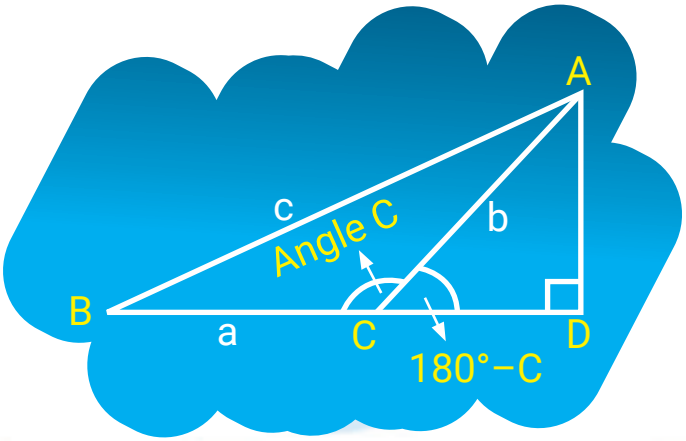
$$= \frac{1}{2} \cdot BC \cdot AD$$

$$\therefore \quad \Delta = \frac{1}{2} ab \sin C$$

Other Case

Triangle ABC is an obtuse angled triangle. Produce BC and draw perpendicular AD.

In Δ ADC:



$$\sin(180° - C) = \frac{AD}{AC}$$

$$\Rightarrow \sin C = \frac{AD}{AC}, \text{ [Since, } \sin(180° - \theta) = \sin\theta]$$

$$\Rightarrow \sin C = \frac{AD}{b},$$

$$\Rightarrow AD = b \sin C$$

$$\Delta = \text{area of triangle ABC}$$

$$= \frac{1}{2} \text{ base} \times \text{altitude}$$

$$= \frac{1}{2} \cdot BC \cdot AD$$

$$\therefore \quad \boldsymbol{\Delta = \frac{1}{2} ab \sin C}$$

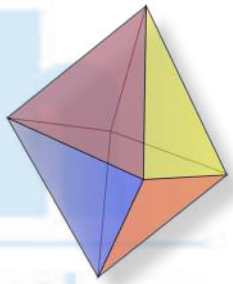
2D to 3D

Many 2D triangles can combine to form 3D platonic solids.

? How tetrahedron is made?

1. Octahedron

A platonic solid composed of 8 equilateral triangles (12 edges and 6 vertices).



Volume and Surface Area

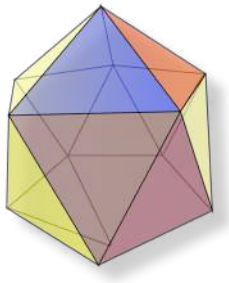
Volume = $(\sqrt{2})/3 \times (\text{Edge Length})^3$

Surface Area = $2 \times (\sqrt{3}) \times (\text{Edge Length})^2$

- It has 8 faces
- It has 12 edges
- and at each vertex 4 edges meet
- Each face is an equilateral triangle
- It has 6 vertices (corner points)
- It is one of the platonic solids

2. Icosahedron

A platonic solid whose faces are 20 equilateral triangles.



Volume and Surface Area

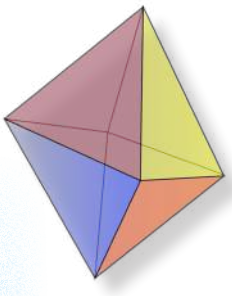
Volume = $5 \times (3 + \sqrt{5})/12 \times (\text{Edge Length})^3$

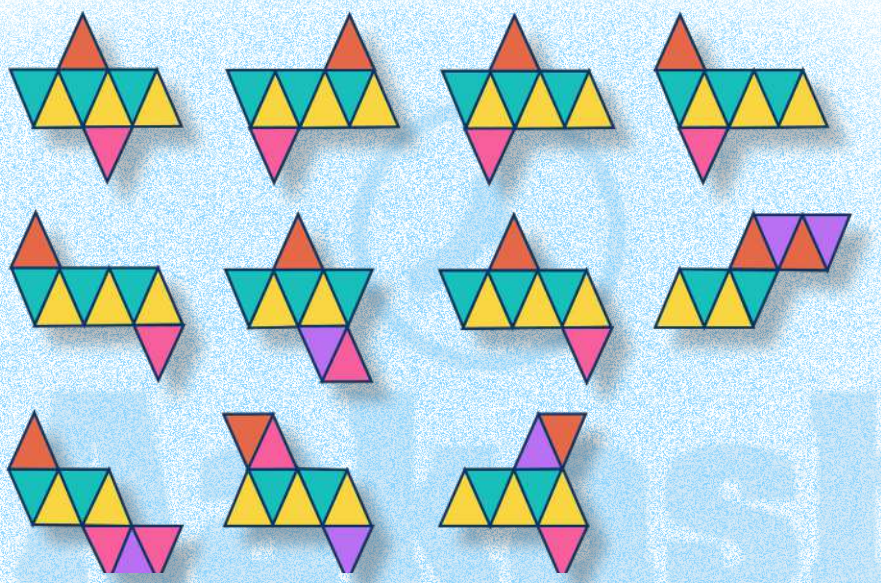
Surface Area = $5 \times (\sqrt{3}) \times (\text{Edge Length})^2$

- It has 20 faces
- It has 30 edges
- and at each vertex 5 edges meet
- Each face is an equilateral triangle
- It has 12 vertices (corner points)
- It is one of the platonic solids

Origami (Net)

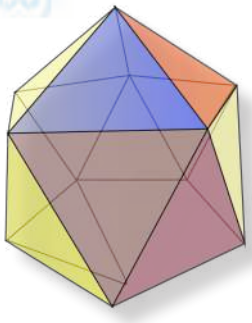
1. Octahedron

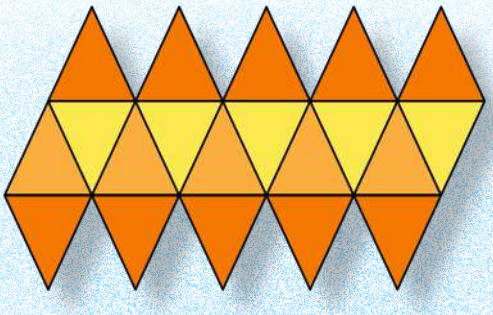




Join the nets to form 3D shapes.

2. Icosahedron





Join the nets to form 3D shapes.

Some More Interesting Facts

20-Sided Dice?

Yes ! An icosahedron that has 20 equal faces has an equal chance of landing on any face.

In fact, you can make fair dice out of all of the platonic solids.

Soccer Ball

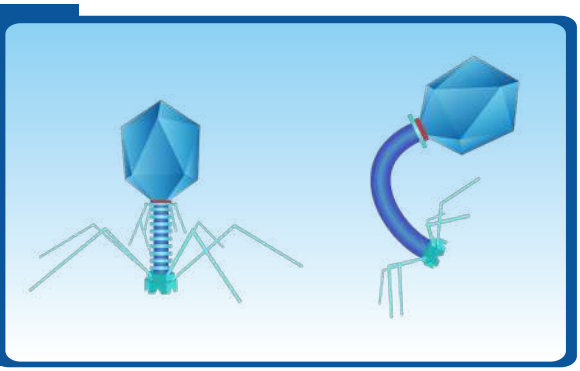
A soccer ball is related to an icosahedron :

It is a truncated icosahedron (truncated means it has bits chopped off it)

It has 12 pentagons and 20 hexagons

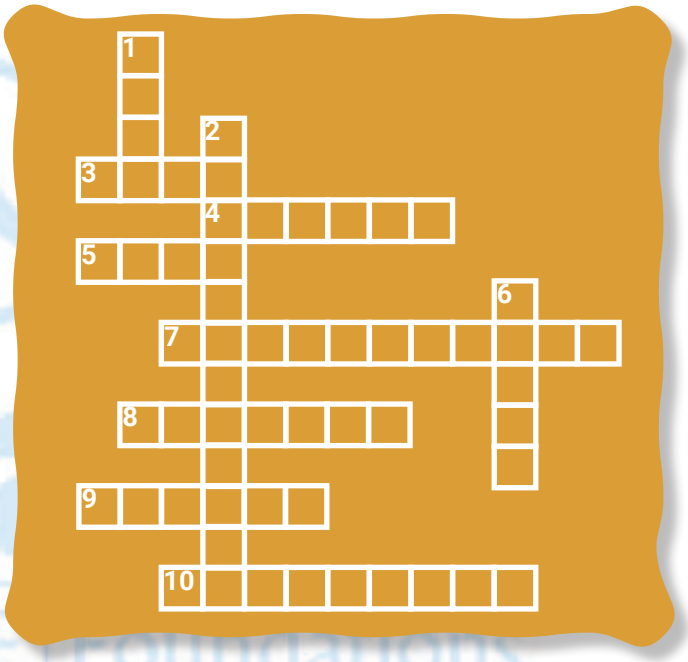
Bacteriophage

The head of a bacteriophage (a virus that targets bacteria) is an icosahedron



Gravitation

Crossword



Across

3. Value of acceleration due to gravity at the centre of the earth.
4. Scientist who gave laws of gravitation.
5. Gravitational force depends upon.
7. Force by which all the bodies having mass attract each other.
8. Force of attraction by Earth on other object.
9. Gravitational force does not depend upon.
10. Value of g _____ with increase in depth below the earth surface.

Down

1. At surface of the earth the value of acceleration due to gravity is maximum at.
2. Gravitation is a _____ force.
6. Gravitational force is also known as _____ force.

Acceleration on Freely Falling Body

Mr. Scientist

Mr. Computer, why are we falling downwards?

Sir, earth's gravitational field is pulling you downward, it always attracts any body having mass, this is also known as universal law of gravitation.
Any Body having mass will attract any other body having mass . Given as

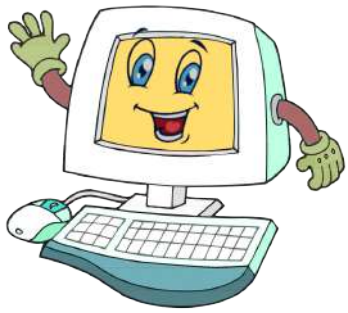
$$F = \frac{Gm_1m_2}{d^2}$$

Mr. Computer

Mr. Scientist

Ohhh really...!!! That sounds interesting but why my speed is increasing during my fall?

Sir, as gravitational force is acting on you, which produces an acceleration on freely falling body, known as acceleration due to gravity (g), given by $g = \frac{GM}{R^2}$ (value of which is taken as $9.8 m/sec^2$) at the surface of earth.



Mr. Computer

Mr. Scientist

Thanks Mr. computer for the information, but right now just switch on the parachute and save me.

Acceleration Due to Gravity (g)

Mr. Scientist

Hey Mr. Physicist, can I discuss something about 'g'?

Mr. Physicist

Do not disturb me, otherwise I will really get too angry

Mr. Scientist

But please help

Mr. Physicist

Okay, 'g' is not constant it may change with...

- Shape of the earth- 'g' at poles is more as compared to 'g' on equator.
  $g_p > g_e$ (as earth is not a perfect sphere, radius of equator is larger than radius of pole)
- Height from the surface of earth- 'g' dereases with height, given as -

$$g_h = g\left(\frac{R_e}{R_e + h}\right)^2$$

And for small height < 500 km – 600 Km.
Below formula can be used

$$g' = g\left[1 - \frac{2h}{R_e}\right]$$

- Depth from the surface of the earth- 'g' dereases with depth, given as -

$$g_d = g\left[1 - \frac{d}{R_e}\right]$$

And at the centre of the earth acceleration becomes "Zero"

Ohhh... With these formulae I got this acceleration variation graph on the screen

Facts

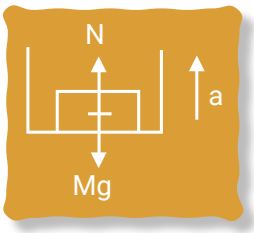
Fact-1

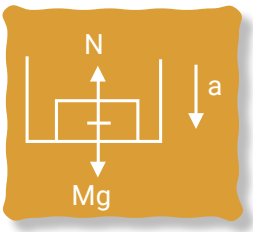
With movement of lift, value of Normal reaction on body changes, hence weight of an object changes in accelerating lift.

Case 1 : Lift moves up with an acceleration 'a'

$N - Mg = Ma$

$N = M(g + a)$ (Body appears heavier)





Case 2 : Lift moves down with an acceleration 'a'

$Mg - N = Ma$

$N = M(g - a)$ (Body appears lighter)

Fact-2

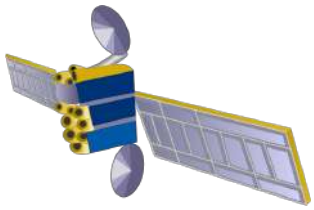
In order to move out of the earth's gravity any space craft will require an Escape velocity of 11.2 km/sec. Similarly, other planets will also have their own escape velocities.

Fact-3

Satellites launched in the different orbits have different orbital velocities with which they are projected.

Geostationary satellites are launched in the orbit at a height of 36000 km from the surface of earth having time period of 24 hrs.

Polar satellites are in the orbit at a height of 500 km – 600 km having time period of 100 minutes.



DID YOU KNOW?

During free fall, you are in the condition of weightlessness as there in no normal force acting on the body.

Weight of the sky divers is considered to be as zero during their free fall motion.

DID YOU KNOW?

(1) The law of Orbit : Every planet moves around the sun in an elliptical orbit with sun at one of the foci.

(2) The law of Area : The line joining the sun to the planet sweeps out equal areas in equal intervals of time. i.e. areal velocity is constant. According to this law, planet will move slowly when it is farthest from the sun and move rapidly when it is nearest to sun. It is similar to law of conservation of angular momentum.

(3) The law of period : The square of the time period of revolution of any planet around sun is directly proportional to the cube of the semi-major axis of the orbit.

$$T^2 \propto a^3$$

Time period of revolution of earth is 365 days.

If its radius of orbit is reduced to half then time period of revolution becomes approx 129 days.

Answer (Crossword)

P												
	O											
	L		C									
Z	E	R	O									
			N	E	W	T	O	N				
M	A	S	S									
			E							F		
		G	R	A	V	I	T	A	T	I	O	N
			V							E		
		G	R	A	V	I	T	Y		L		
			T							D		
M	E	D	I	U	M							
			V									
		D	E	C	R	E	A	S	E	S		

Is Matter Around Us Pure ?

Pun Time

Want to hear a joke about sodium, bromine and oxygen ?

NaBrO.

Sure enough, the chemical symbols of sodium (Na), bromine (Br) and oxygen (O) combine to form a casual way to tell someone you're not interested in hearing a joke.

Two chemists walk into a cafe.

One says, "I'll have an H_2O." The other says, "I'll have an H_2O, too." The second chemist dies.

H_2O_2 is the chemical formula for hydrogen peroxide, which you can't drink at a bar without grievous consequence.

If H_2O is water and H_2O_2 is hydrogen peroxide, what is H_2O4 ?

Drinking, bathing and lots of other daily activities.

Get it? What it is 4?

Riddles

Who I am?? What I am, mixture or a pure substance?

1. I am invisible and present everywhere. You breathe one of my component.

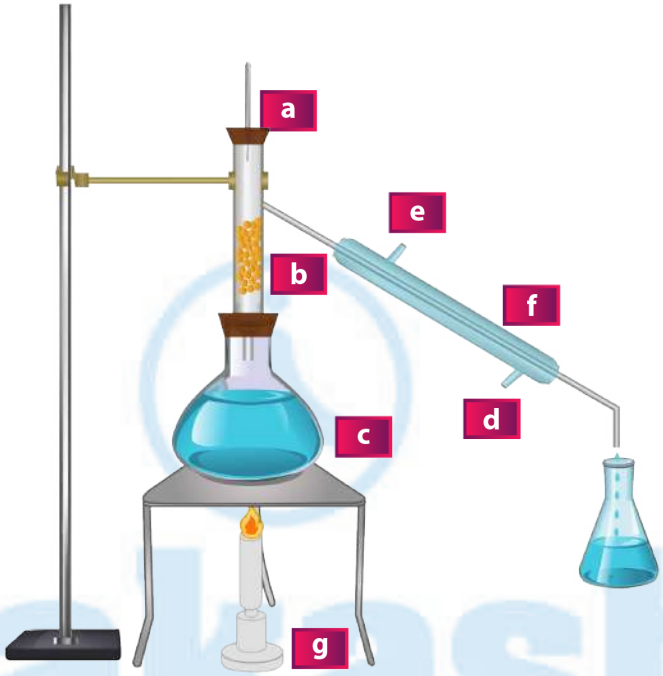
2. I am tasteless and odourless yet very important for you. You drink me everyday.

3. I am very costly, not everyone could afford me. Golden yellow is my colour and you wear my ornaments.

4. Trees have their roots in me. I provide them base, nutrients and my colour is brown.

5. I am white and very healthy. You may or may not like me but your mom will always like me. You drink me.

What's My Name? My Name is_____



Answers (Riddles)

1. Air, mixture
2. Water, pure substance
3. Gold, pure substance
4. Soil, mixture
5. Milk, mixture

Answers (What's My Name? My Name is_____)

a. Thermometer
b. Fractionating Column
c. Round Bottom Flask
d. Water Inlet
e. Water Outlet
f. Water condenser
g. Burner

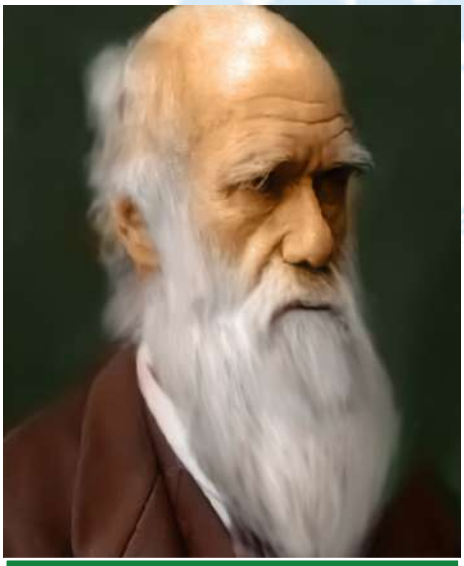
Diversity in Living Organisms

Interesting Facts

Aristotle : Father of Biology, "In the 4th century BC the Greek philosopher **Aristotle** travelled to Lesvos, an island in the Aegean sea then as now, with wildlife. His fascination with what he found there, and his painstaking study of it, led to the birth of a new science-biology.

Aristotle also taught **Alexander** and his friends about medicine, philosophy, morals, religion, logic, and art.

Aristotle



Charles Darwin

Darwin married his cousin, Emma

Charles Darwin was Backgammon fan.

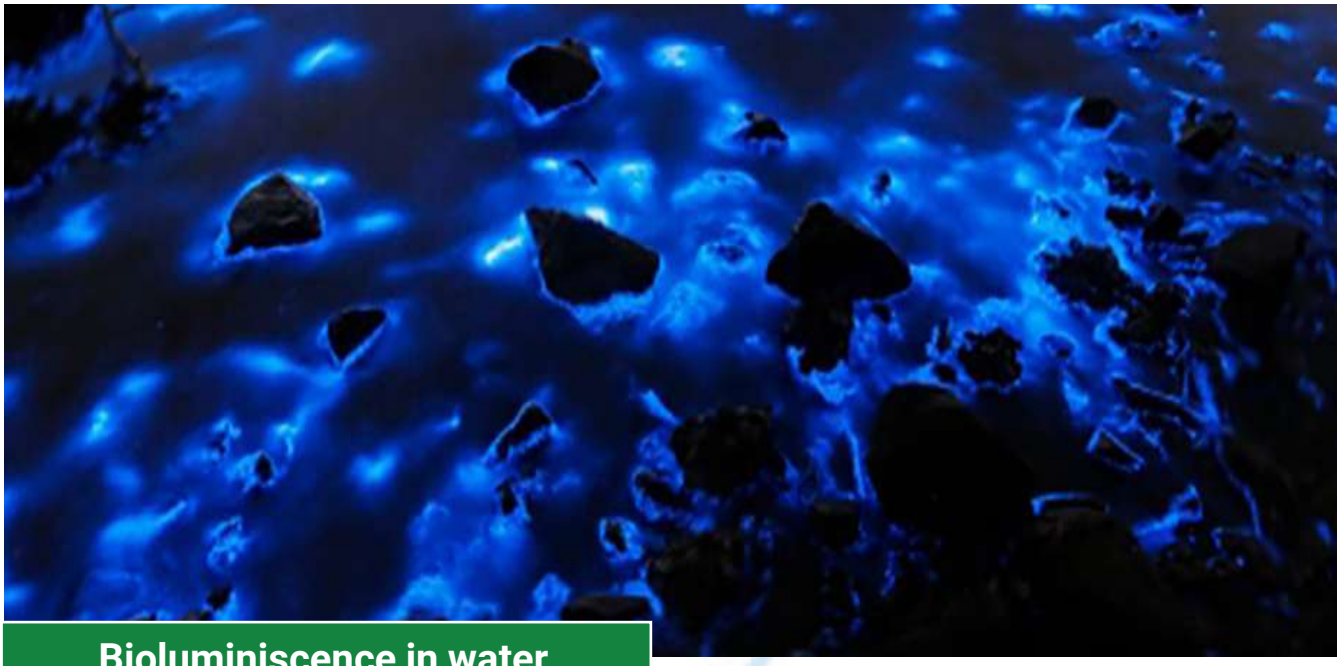
After 126 years that Darwin died, the church apologized to him.

For Darwin's 25th birthday, the captain of the Beagle, named a mountain in Tierra del Fuego in his honor.

Darwin almost didn't get picked to go on the voyage, because the captain didn't like his nose.

Darwin wanted to be a doctor, but he could not stand the sight of blood.

A less well-known fact about the 19th-century scientific explorer is that he had an equally adventurous palate. He eagerly ate many of his specimens—including iguanas, armadillos, and rheas.



Bioluminiscence in water

One type of bioluminescent algae is a dinoflagellate called *Noctiluca*, or sea sparkle. *Noctiluca* are so small that thousands of them can fit in a single drop of water.

Dead Ant

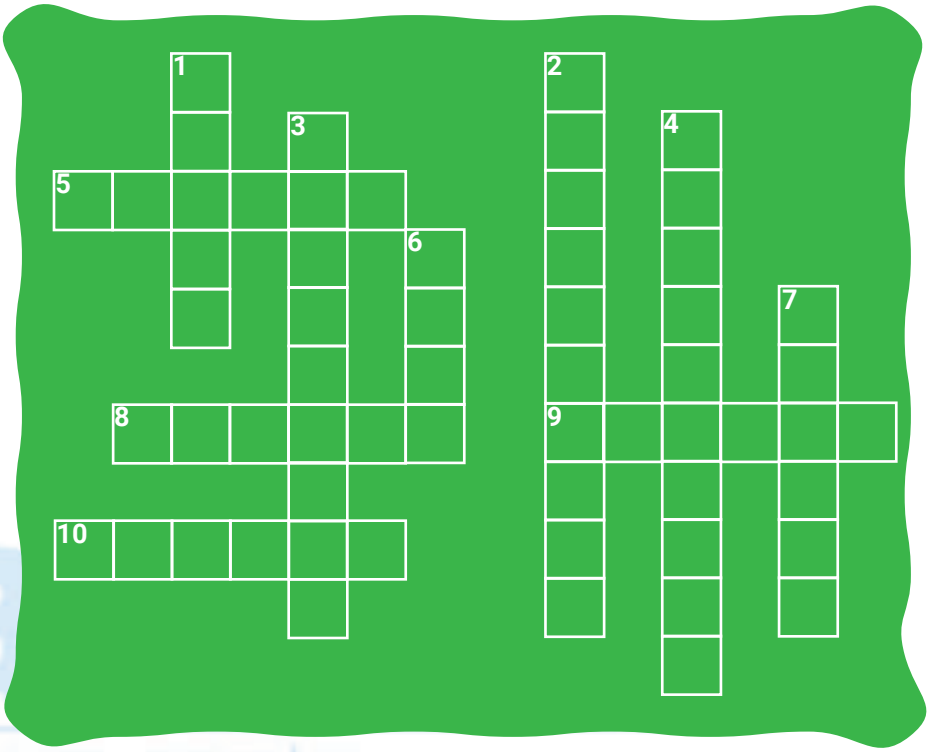
Dead ants emit a chemical that tells other ants to move the body to a sort of burial ground. If this chemical is sprayed on a live ant, other will treat it as a dead ant, regardless of what the live/dead ant does.

A study found that each year arthropods (like millipedes, spiders and ants) eat over 2,100 pounds of junk food discarded in New York City's Broadway/ West St. corridor in Manhattan. That's the equivalent of 60,000 hot dogs.

Crossword

Across

5. Prokaryotes belongs to this group.
8. Common name for *Paphiopedilum*.
9. Genus of sparrow.
10. Fruit trees, roses, and daisies.



Down

1. Group of organisms with a cell wall and heterotrophic nutrition.
2. Plant with flowers such as sunflower.
3. Amphibians of plant kingdom.
4. Plants which has naked seeds.
6. A group of fungi that grows on bread.
7. Body cavity in most of the animals.

Word My Name

1.
I can fly.
I am not a bird.
I sleep during the day.
I am black.

2.
I have four legs.
I live on the farm.
I bleat.
I give milk.

3.
I live in china.
I am a kind of bar.
I am black and white.
I eat bamboo.

4.
I have four legs.
I live in field.
I am curring or sly
I love chickens.

5.
I can swim.
I have eight arms.
I have a soft body.
I can change colur.

6.
I have two legs.
I lay eggs.
I live on the farm
I cluck.

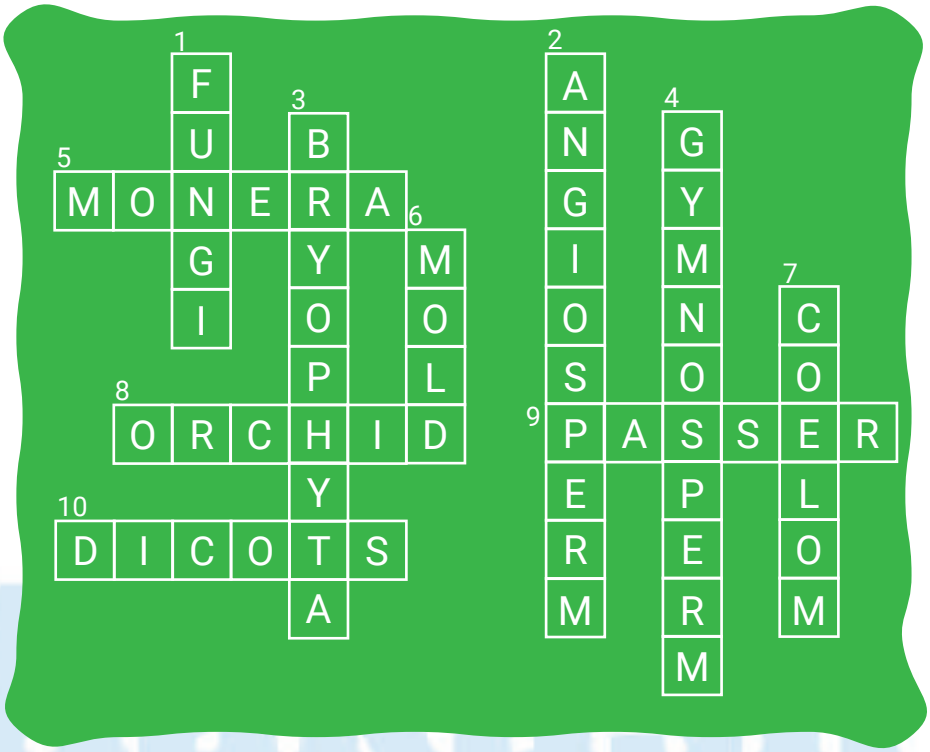
7.
I can swim.
I have a hard shell.
I move sideways.
I have eight legs.

8.
I eat grass.
I live in Africa.
I am black and white.
I look like a horse.

9.
I live in forest.
I eat grass.
People hunt me.
I have antlers.

10.
I have no legs.
I can swim very well.
I look like a snake
I am slippery.

Answers (Crossword)



Answers (What My Name)

1. Bat	**2.** Goat	**3.** Panda	**4.** Fox
5. Octopus	**6.** Chicken/Hen	**7.** Crab	**8.** Zebra
9. Deer	**10.** Eel		

Islands and its Types

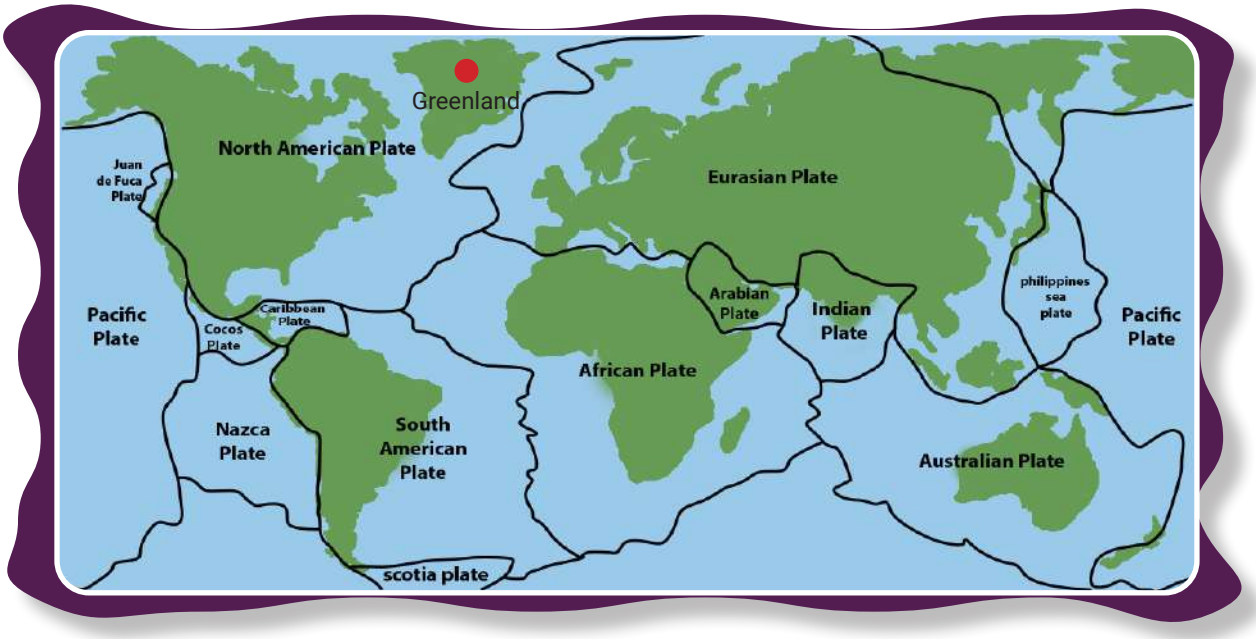
Introduction

Islands are the uplifted landmass surrounded by water. It has been a home to variety of flora, fauna as well as certain civilizations.

Types of Island

1. Continental Island

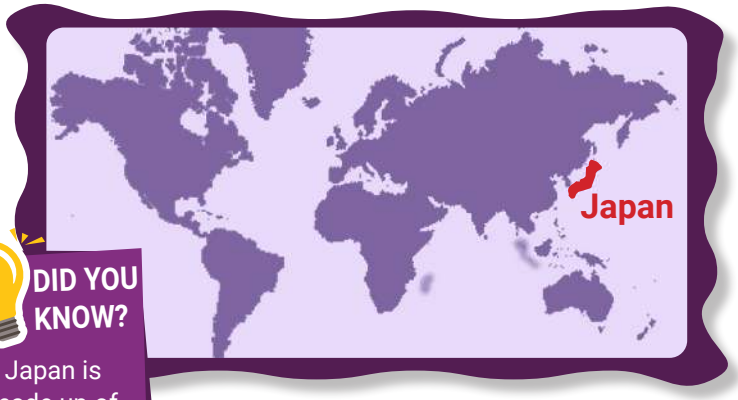
The Island formed when there is a subsidence of some part of land or submergence of lower areas into ocean of the mainland. The resulted landmass looks detached from the mainland, hence, forming an island.
eg. Greenland; it is a part of North American Plate and a part of the continent.



2. Oceanic Island

These are the small islands located in the middle of the ocean.

eg. Japan



DID YOU KNOW?

Japan is made up of 6,852 islands

3. Coral Island

These islands are formed by small microscopic organism known as corals.

These islands are the popular tourist destination of the world.

eg. Maldives, Lakshadweep, Andaman Islands etc...

DID YOU KNOW?

Coral reefs are also knows as the rainforest of the ocean

4. Artificial Islands

These are the man made islands.

eg. Dubai Palm Island

Major Factors Leading to Shortages in Supply of Fresh Water

- Increasing population
- Rising demands for food and cash crops
- Increasing urbanisation
- Rising standards of living

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Starting Early is the Secret of Getting Ahead

Honest Efforts ! Incredible Results !

Our Top Performers within 100 AIR from Classroom in JEE (Main) 2020

CHIRAG FALOR

ANTHE QUALIFIER

Four Year Classroom Student of Aakash 2016 - 20 | Class IX – XII

JEE Main 2020 100 Percentile	NTS Scholar 2018
KVPY (SA) 2018 KVPY (SX) 2019 Fellowship Award	International Olympiad on Astronomy and Astrophysics – 2 Gold Medals
During 2017 to 2019 in different years PRMO/ RMO/ INMO Qualifer	Selected for OCSC 2020 route to International Physics Olympiad
Selected for OCSC 2017 route to International Junior Science Olympiad	X Board 94.8% XII Board 98.4%

Many other Olympiad & Scholarship Winner / Qualifier

SOORAJ SRINIVASAN

ANTHE QUALIFIER

Three Year Classroom Student of Aakash 2017 - 20 | Class X – XII

NTS Scholar 2018	KVPY (SA) 2018 KVPY (SX) 2019 Fellowship Award
NSEA in 2018-19 NSEP in 2019 Qualified	During 2017 to 2019 in different years PRMO/ RMO/ INMO Qualifer
Selected for OCSC 2020 route to International Physics/ Biology Olympiad	X Board 93.2% XII Board 97.8%

Many other Olympiad & Scholarship Winner / Qualifier

AVVAL AMIL

ANTHE QUALIFIER

Three Year Classroom Student of Aakash 2017 - 20 | Class X – XII

NTS Scholar 2018	KVPY (SA) 2018 Fellowship Award
NSEA in 2018-19 and NSEA in 2019-20 Qualified	During 2017 to 2019 in different years PRMO Qualifer
Selected for OCSC 2020 route to International Astronomy Olympiad	X Board xx% XII Board xx%

Many other Olympiad & Scholarship Winner / Qualifier

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Starting Early is the Secret of Getting Ahead

Honest Efforts ! Incredible Results !

Our Top Performers within 100 AIR from Classroom in

JEE (Main) 2020

PRERIT PALIWAL

ANTHE QUALIFIER

Four Year Classroom Student of Aakash 2016 - 20 | Class IX – XII

KVPY (SA) 2018 KVPY (SX) 2019 Fellowship Award	NSEA 2019-20 Qualifier
PRMO 2018 PRMO 2019 Qualifer	RMO 2019 Qualifer
X Board 94.8% XII Board 94.2%	Many other Olympiad & Scholarship Winner / Qualifier

ERA SARDA

ANTHE QUALIFIER

Four Year Classroom Student of Aakash 2016 - 20 | Class IX – XII

NTS Scholar 2018	KVPY (SA) 2018, KVPY (SX) 2019 Fellowship Award
NSEJS 2017-18 Qualifier	NSEP 2019-20 Qualifier
PRMO 2017 PRMO 2018 PRMO 2019 Qualifer	RMO 2017 RMO 2018 RMO 2019 Qualifer

Many other Olympiad & Scholarship Winner / Qualifier

SHIKHAR AGRAWAL

ANTHE QUALIFIER

Three Year Classroom Student of Aakash 2017 - 20 | Class X – XII

NSEA 2019-20 Qualifier	KVPY (SA) 2018, KVPY (SX) 2019 Fellowship Award
PRMO 2017 PRMO 2018 Qualifer	RMO 2018 Qualifer
X Board 91.4% XII Board 94.4%	Many other Olympiad & Scholarship Winner / Qualifier

Aakash

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Our Result in Medical & Engineering Entrance Exams-2019

80081 in NEET	688 in AIIMS	7879 in JEE (Main)	1633 in JEE (Adv.)
69826 Classroom + 10255 Distance & Digital	576 Classroom + 112 Distance & Digital	7250 Classroom + 629 Distance & Digital	1441 Classroom + 192 Distance & Digital
AIR - 1, 2, 3	AIR - 1, 2, 3	AIR - 1*, 4*, 11*,16, 26, 35*, 39	AIR - 7*, 17*, 36*, 45*, 46*, 53*, 58*

*Rank from Distance Learning Program

Our Achievements in Olympiads & Scholarship Exams 2019-2020

949	366	1598	115
832 Classroom +117 Distance & Digital	317 Classroom + 49 Distance & Digital	1556 Classroom + 42 Distance & Digital	111 Classroom + 4 Distance & Digital
NTSE (Stage-I) 2019-2020	NTSE (Stage-II) 2019	PRMO 2019	RMO 2019

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