Aakash

Medical | IIT-JEE | Foundations

KNOWLEDGE BYTES

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CLASS 10

Aakash

Medical | IIT-JEE | Foundations

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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

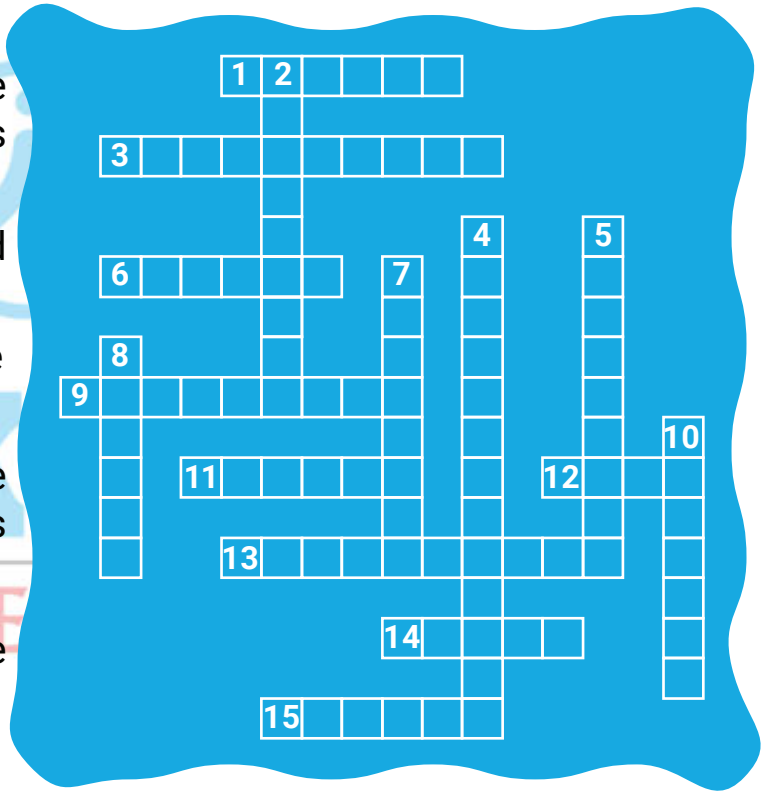
EXPLORE

Introduction to Trigonometry

Crossword

Across

1. The SI unit of measurement used to define a particular angle of a circle.
3. A circle with a unit radius.
6. In a right triangle : hypotenuse divided by adjacent side is _____ of angle.
9. Mnemonics for sine, cosine and tangent.
11. A unit of measurement of angle in sexagesimal system.
12. Side opposite to given angle divided by hypotenuse gives _____ of angle.
13. The side of a right triangle opposite the right angle.
14. A unit of measurement of angle in centesimal system.
15. $\pi/2$ radians in degrees.

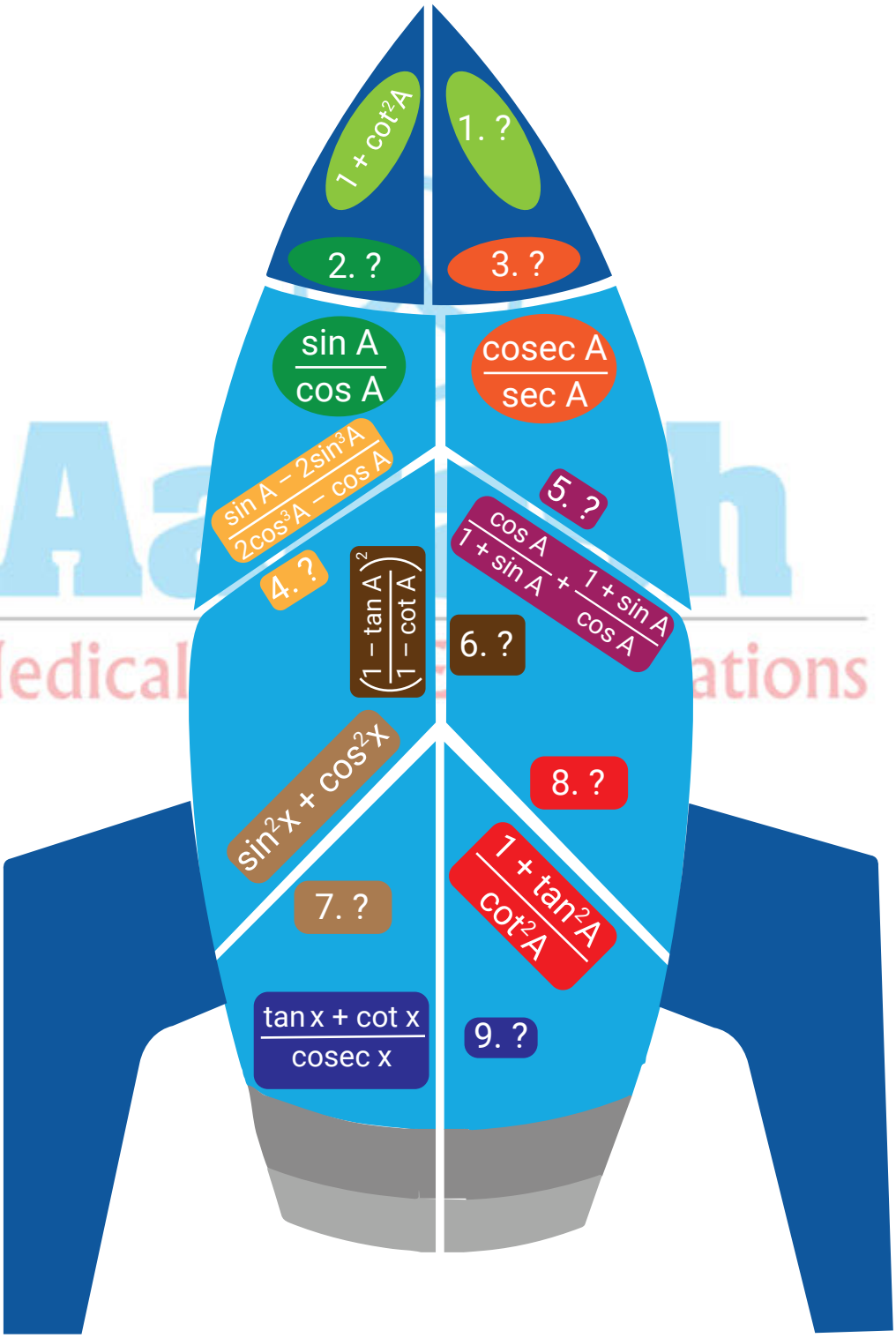


Down

2. Distance between an arc's end points along the path of the circle.
4. Two angles whose sum is 90 degrees.
5. Move _____ from the positive x-axis to measure a negative angle.
7. Side next to an angle but not the hypotenuse in a right triangle.
8. Adjacent side to the angle divided by the hypotenuse results _____ of given angle.
10. There are 360 _____ in one rotation of the unit circle.

Trigo Rocket

Find the corresponding values such that the rocket parts can be connected together to complete it.



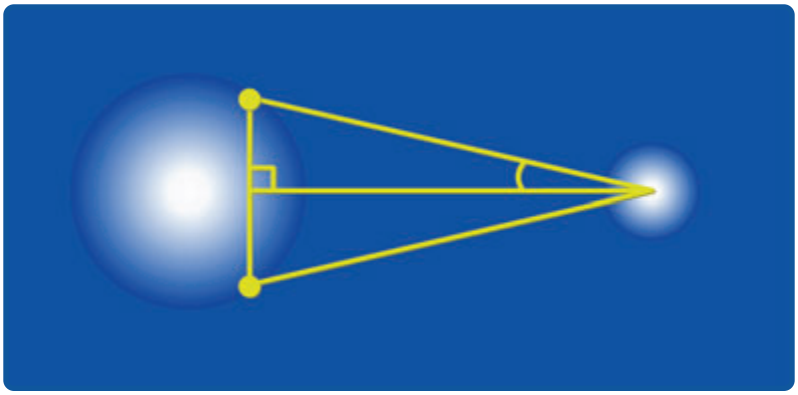
Applications of Trigonometry

Historically trigonometry was developed for work in astronomy and geography. Today it is used extensively in mathematics and many other areas of the sciences.

Practical Usage

- ✓ Find height and distances.
- ✓ In the architecture of the buildings.
- ✓ In astronomy.
- ✓ In geology.
- ✓ For navigation purposes.
- ✓ In oceanography.

Astronomy



Navigation and Oceanography

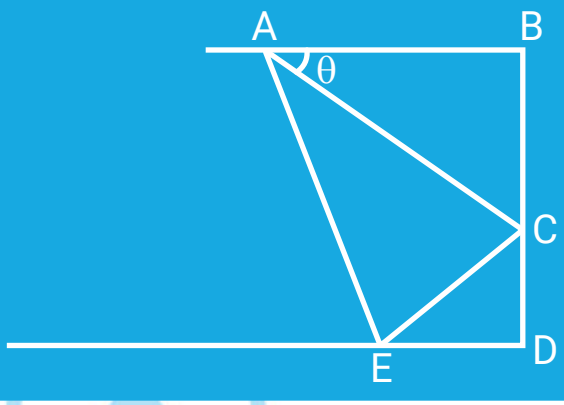
It is used in navigation to find the distance of the shore from a point in the sea.

Architecture

Geology

Grand Canyon Skywalk

In the given figure, width of sheet is 'x' units. It is folded along AC in way that E coincides with B. Find the length of AC, if $\angle B$ is right angle.



Sol :- As, E overlaps B

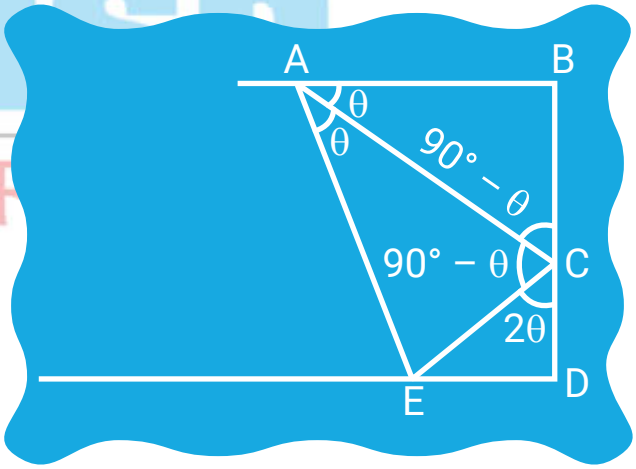
$\Rightarrow \Delta AEC \cong \Delta ABC$

$\therefore \angle CAB = \angle CAE = \theta$

$\angle ACB = \angle ACE = 90° - \theta$

$\Rightarrow \angle ECD = 180° - (90° - \theta + 90° - \theta)$

$= 180° - 180° + 2\theta = 2\theta$



In ΔCED

$$\cos 2\theta = \frac{CD}{CE} \Rightarrow CD = CE \cos 2\theta$$

In ΔABC

$$\sin \theta = \frac{BC}{AC} \Rightarrow BC = AC \sin \theta$$

As, BC = EC

$\therefore EC = AC \sin \theta$

Also, $x = CD + CB$

$= CE \cos 2\theta + AC \sin \theta$

$x = AC \sin \theta \cos 2\theta + AC \sin \theta$

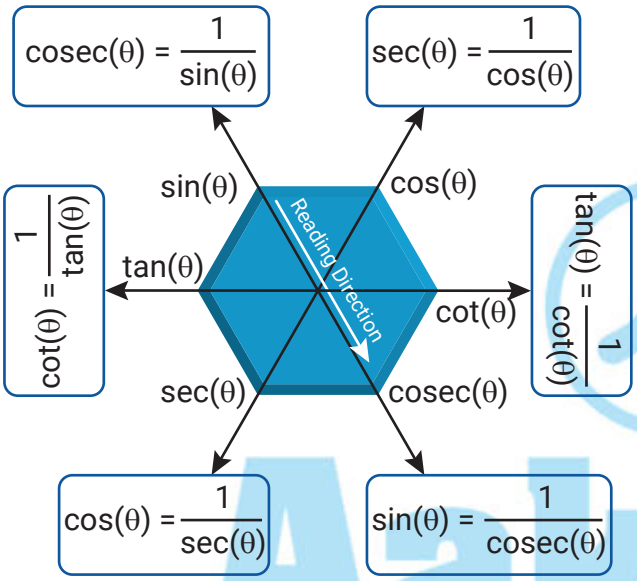
$x = AC \sin \theta (1 + \cos 2\theta)$

$$\frac{x}{\sin \theta (1 + \cos 2\theta)} = AC$$

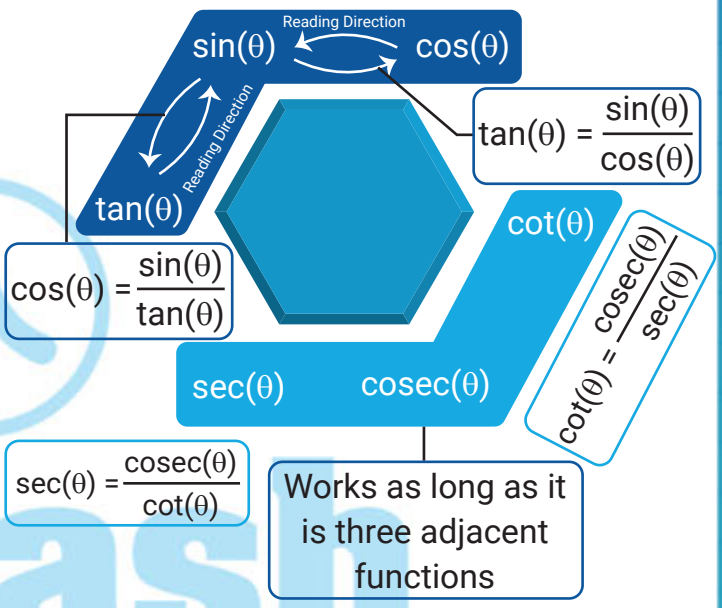
or $$AC = \frac{x}{\sin 2\theta \cos \theta}$$

Hexagon Mnemonic

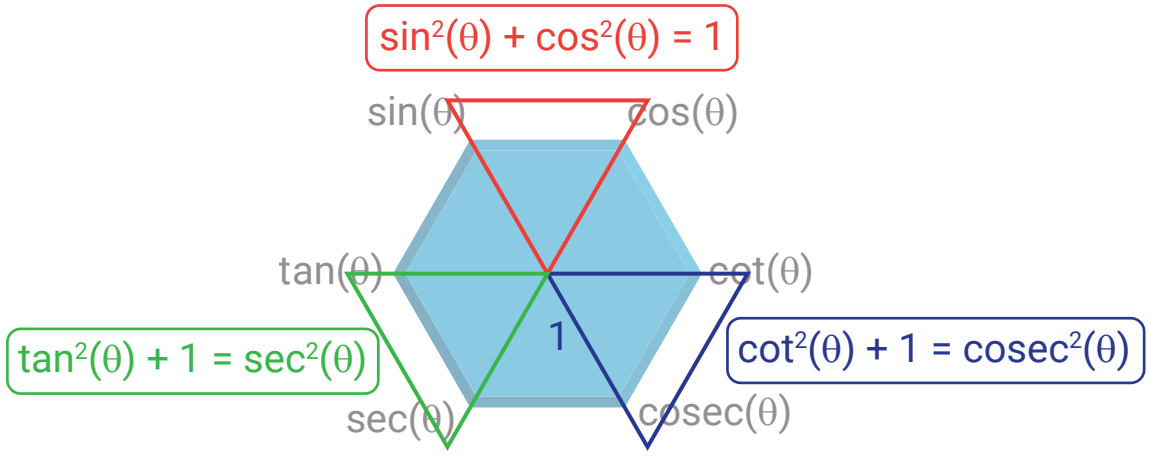
Reciprocal Identity

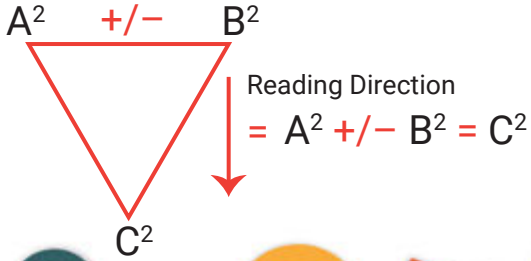


Quotient Identity

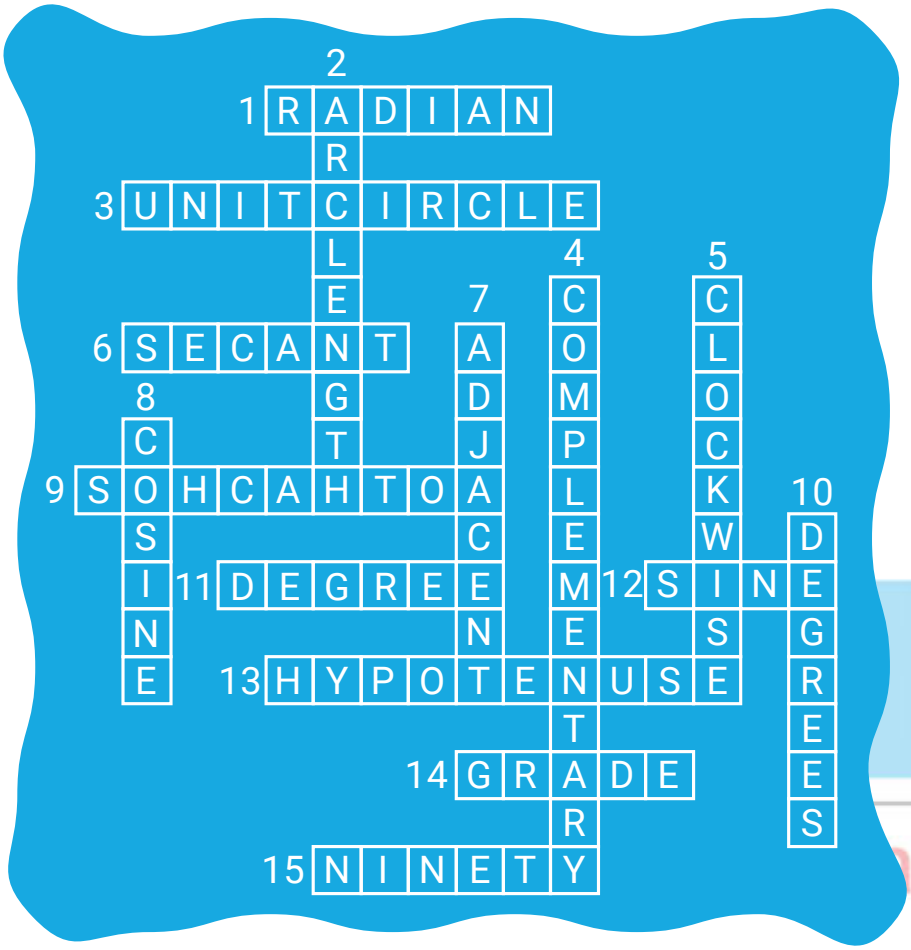


Pythagorean Identity





Answer (Crossword)

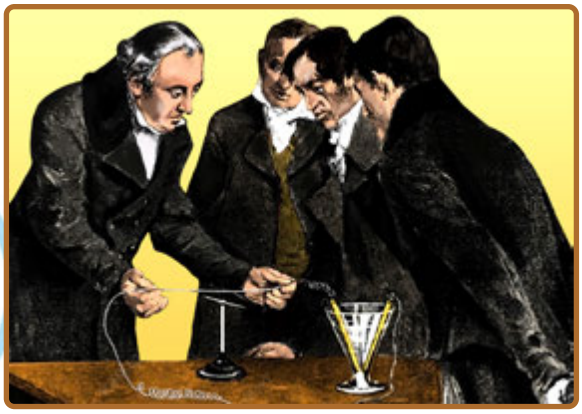


Answer (Trigo Rocket)

Across	Down
1. $\text{cosec}^2 A$	2. tanA
6. $\tan^2 A$	3. cotA
9. sec x	4. tanA
	5. 2 secA
	7. 1
	8. $\tan^2 A \sec^2 A$

Accidents are Good

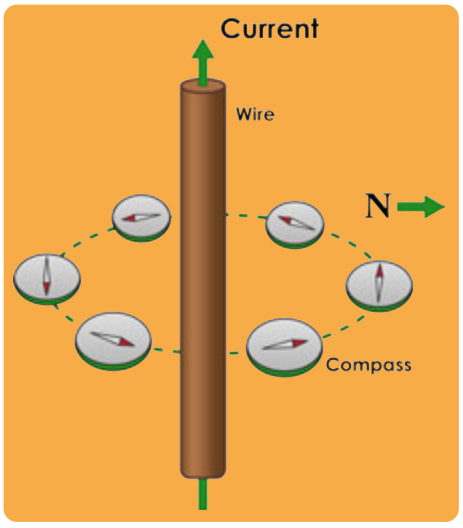
In 1820, A Danish scientist named Hans Christian Oersted, changed the idea of electricity and magnetism and found the relation between them.



But like many other marvellous and significant discoveries in science, his discovery was just a luck and this might encourage you to think and act more in science practical and theory.

HOW IT HAPPEN?

- One day Oersted was trying to point out his students that electricity and magnetism aren't related.
- He placed a current carrying wire next to a compass, the needle of the compass didn't move, as he expected.
- After the demonstration, a mischievous student playing with same wire and held it near to compass again, but in a different direction.
- Oersted was seeing the student and he was surprised, because the needle of the compass swung toward the wire. Oersted was intrigued and did more experiments.
- Thus Oersted had discovered that an electrical current creates a magnetic field.



That's how this accident changed the world. With the help of this magnetic effect, the electric motor, electric generator, fan, toys, electric crane and many more appliances are working.

Guess the Name of Appliances Based on Magnetic Effect of Current

1. A device which converts electrical energy into mechanical energy is _l_c_r_c_m_t_r

2. A device which used to make us cool in summer. It may have three or four hands is F_n

3. A machine which is used for lift big cars and trucks is El_ctrom_gne_ Cr_n_

4. A device which is used as an alarming system is, El_c_r_c B_ _ l.

5. A device which gives us amplified voice is, M_g_P_o_e

6. The fast train also works on magnetic effect of current. The name of train is Ma_n_tic L_v_t_t_o_ Trains.

DIY Activity

Make an electromagnet by yourself

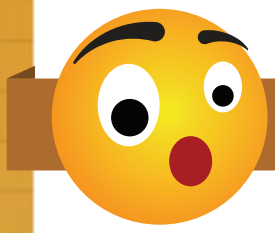
Prerequisite- Thick paper like drawing sheet, insulated copper wire, 9V battery or eliminator through which current may flow, switch and iron scale

Follow the given steps

1. Make a cylindrical tube by rolling the thick paper sheet.
2. Make around 200 to 300 coils of insulated copper wire around this tube.
3. Connect the end of the wires with the help of a switch to the ends of the battery.
4. Take an iron scale near the tube before the switch is on.
5. You will see that no force may be felt over the iron scale.
6. Now the switch is on and allow the current to flow.
7. As current flows the iron scale is pulled towards the tube. This shows that the cylindrical tube works as a magnet. This magnetic property occurs due to solenoid.
8. Now fill iron inside the paper tube (core). You will observe that there is a greater force pulling at the scale. This shows that the electromagnet has become stronger. This happened because the iron core attracts the magnetic field and their atoms inside the core line up and increase magnetic field.
9. As the current flow is stopped, the magnetic effect of the tube is also lost.

PRECAUTION

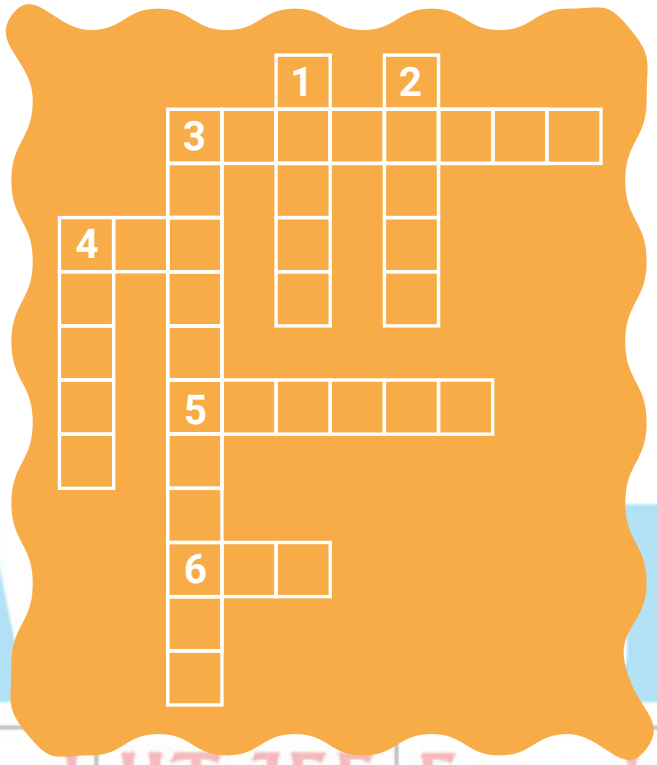
- ✓ Wear the rubber gloves and shoes.
- ✓ Don't touch the wire when current is flowing in it.



Interesting Facts

- First known magnets were the pieces of lodestone, an ore of iron oxide found in large quantites in magnesia, Asia minor.
- Magnets are blackstone found in earth which has property to attract iron, nickel and cobalt.
- Magnets have two poles, North (N) and South (S).
- An isolated pole of a magnet does not exist.
- Moving charge also produces magnetic field around it.
- Magnetic field flow from North pole to South pole.
- The SI unit of magnetic field intensity is tesla (T).
- The CGS unit is gauss (G).
  [1 T = 10^4 gauss]
- When a charge is thrown perpendicular to the magnetic field it exhibits circular motion.
- Oersted proved that current carrying wire produces magnetic field and Faraday proved that varying magnetic field produces induced current.
- Debit cards and Credit cards work on the principle of electromagnetic induction.
- A fuse acts as a safety device which is made up of tin-lead alloy having high resistance and low melting point.
- Magnetism has been used to study bee communication patterns, migratory cycles and several other animals behaviour.

Crossword



Across

3. All electrical appliances are connected in this combination in household circuit.

4. Material used to make fuse wire is an alloy of lead and_____.

5. The material can't be used to make fuse.

6. Colour of live wire.

Down

1. Colour of earth wire.

2. Colour of Neutral wire.

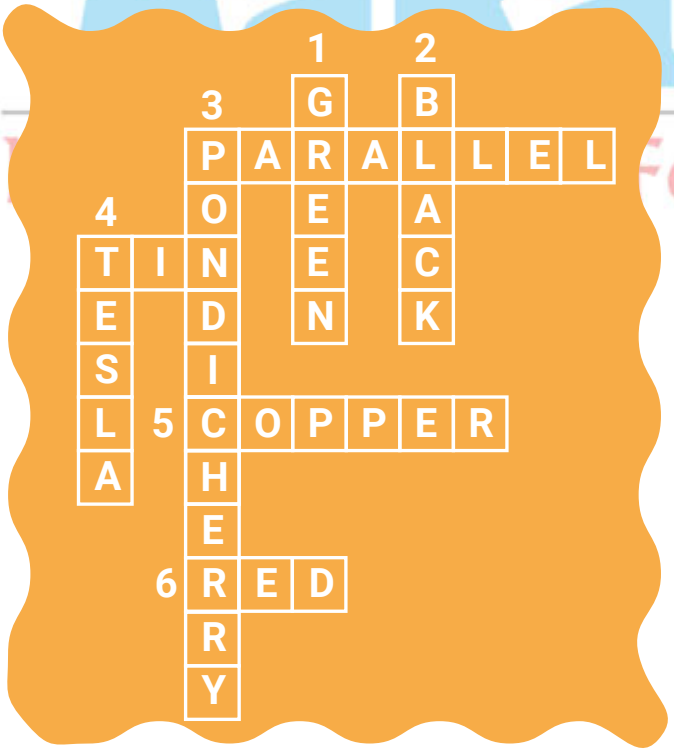
3. Place in India where angle of declination is zero.

4. SI unit of magnetic field.

Answer (Guess the name of appliances based on magnetic effect of current)

1. Electric Motor
2. Fan
3. Electromagnet Crane
4. Electric Bell
5. Mega Phone
6. Magnetic Levitation

Answer (Crossword)

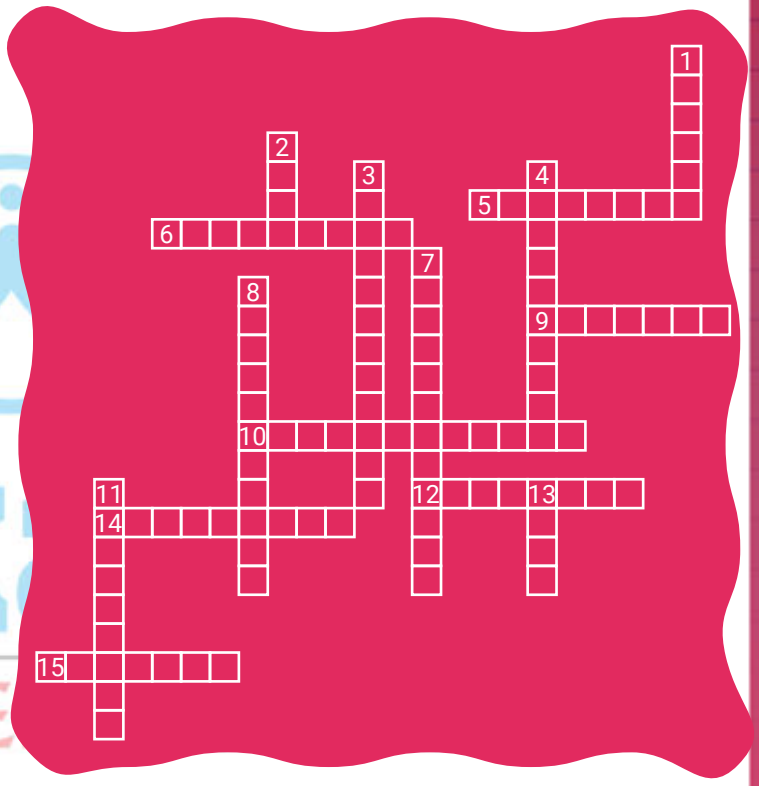


Carbon and Its Compounds

Crossword

Across

5. Allotrope of carbon having hexagonal rings [8]
6. Allotrope of carbon also known as bucky ball [9]
9. Common name of saturated hydrocarbons [7]
10. Organic compounds of hydrogen and carbon only. [12]
12. Amorphous form of carbon [8]
14. Different physical forms of same element [9]
15. Hardest crystalline form of carbon [7]



Down

1. Unsaturated hydrocarbon containing atleast one double bond between carbon atoms [6]
2. Almost pure form (95%) of carbon [4]
3. Type of charcoal used to decolourise cane sugar [4, 8]
4. Property of self linking of carbon atoms [10]
7. Type of charcoal which is a better fuel than wood [4, 8]
8. Shape of methane [11]
11. Black pigment made from burning kerosene oil used in shoe polishes [4, 5]
13. Greyish black hard solid used for steel manufacturing [4]

Hydrocarbon as a Fuel

Although hydrocarbons have lot of important uses, they are most importantly used as fuels. This is because their covalent bonds store a large amount of energy, which is released when the molecules are burned.

METHANE

Methane is the main constituent of natural gas. Natural gas is stored under high pressure as compressed natural gas (CNG). It is now being used as a fuel for transport vehicles because it is less polluting. It is a cleaner fuel.

PROPANE AND BUTANE

Liquefied Petroleum Gas or LPG consists mainly of butane and propane. LPG is commonly used as a fuel for cooking and in portable heaters.

ETHYNE

Ethyne (also known as Acetylene) is used for cutting and welding. The welding process that uses oxygen and fuel gas like acetylene is known as oxy-fuel cutting or gas cutting.

BUTANE

Butane is a highly flammable gas which can be easily liquefied. It is typically used as a fuel for cigarette lighters and portable stoves.

Quiz

Q. 1 Which of the following represents the correct number of covalent bonds of a single carbon atom in its allotropes?

(1) Diamond - 3, Graphite - 3

(2) Diamond - 4, Graphite - 3

(3) Diamond - 3, Graphite - 4

(4) Diamond - 4, Graphite - 4

Q. 2 Which of the following is used for making glass cutters ?

(1) Graphite (2) Diamond

(3) Steel (4) Bronze

Q. 3 Which one of the following statements is incorrect ?

(1) An unsaturated hydrocarbon containing a triple bond is called alkyne.

(2) An unsaturated hydrocarbon containing a single bond is called alkane.

(3) An unsaturated hydrocarbon containing a double bond is called alkene.

(4) All of the above

Q. 4 The property of carbon which enables it to form a large number of carbon compounds is called

(1) Acidity
(2) Catenation
(3) Electropositivity
(4) All the above

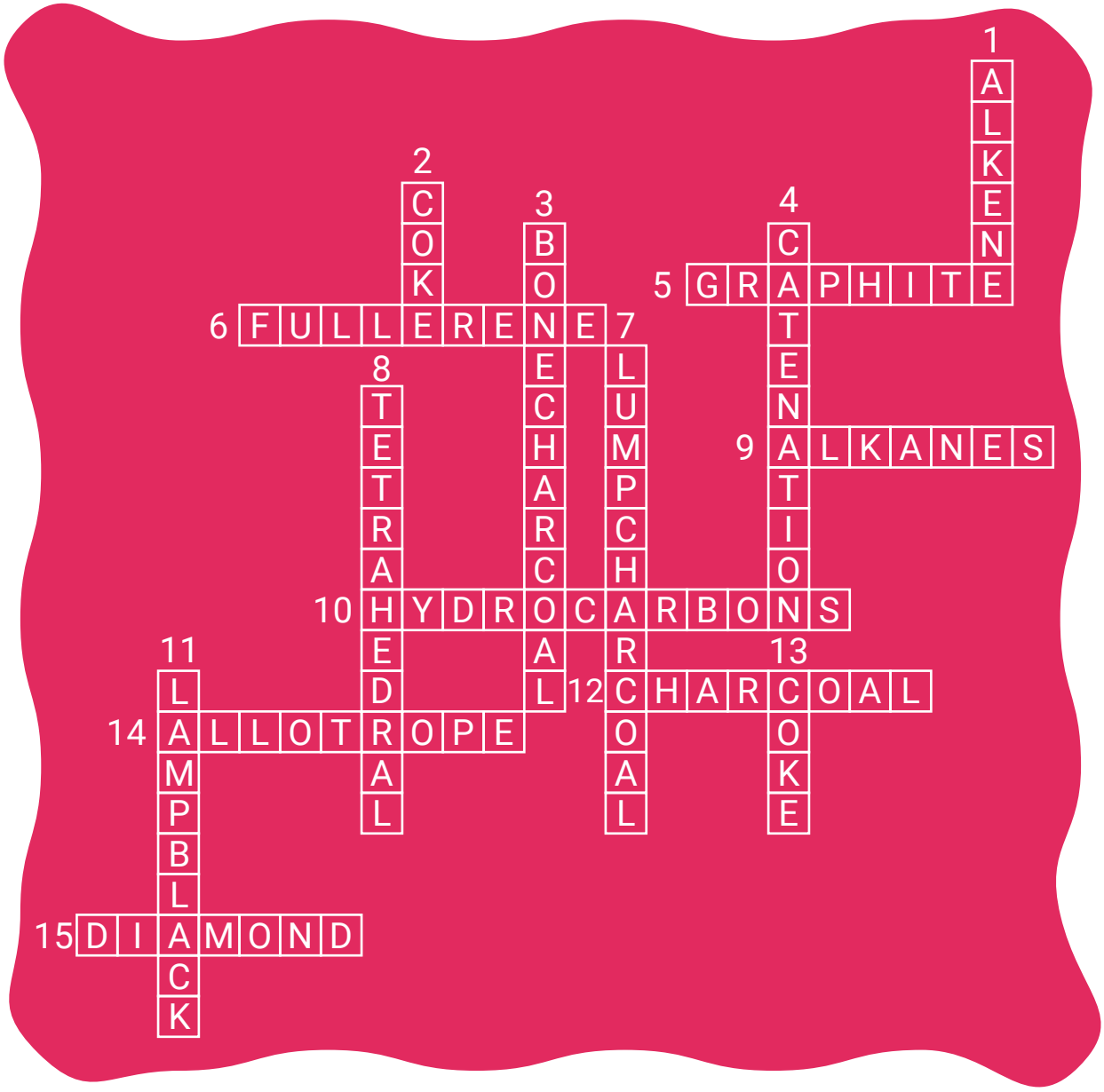
Q. 5 Which of the following has a free delocalized electron between layers that gives rise to electrical conductivity ?

(1) Graphite
(2) Diamond
(3) Fullerenes
(4) None of these

Answer

(1) (2) **(2)** (2) **(3)** (2)
(4) (2) **(5)** (1)

Answer (Crossword)



Heredity and Evolution

1. Mendel's Marvels

Mendel studied the seven characters in the pea plant. He died of a kidney disease before he could be rewarded with any fame. We call him the father of genetics today but when three scientists Carl Correns, Hugo de Vries, and Erich von Tschermak rediscovered his work, they had to learn the 7 characters he chose. Let us see how many of these do you know ?

(i) Dominant flower colour

(ii) Recessive pod shape

(iii) Dominant pod colour

(iv) Recessive seed shape

(v) Dominant plant height

(vi) Recessive flower position

(vii) Dominant seed colour

C	O	N	S	T	R	I	C	T	E	D
Y	D	F	T	E	G	I	J	L	D	G
E	Z	A	Y	R	P	R	L	L	W	F
L	L	B	P	M	O	Q	E	M	R	V
L	K	J	C	I	F	G	H	E	I	S
O	M	K	L	N	B	M	C	O	N	E
W	R	I	T	A	T	G	L	A	K	R
S	D	O	E	L	R	E	D	F	L	T
T	P	O	L	E	T	D	A	L	E	L
P	N	X	A	K	H	B	Z	H	D	Q
W	R	O	L	K	T	V	C	X	Z	W

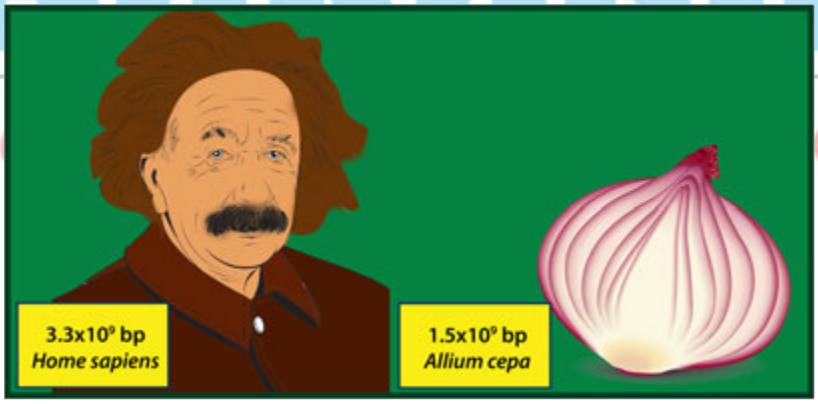
2. Stupefying Stats of the Ginormous Genome

a. The Human Genome Project: 13years, $100 million!

In 2003, the first human genome was revealed. This human genome sequencing took 13 years (1990 - 2003) and US $100 million. Whereas today some companies offer to do it for you in two days with a price of US $1000.

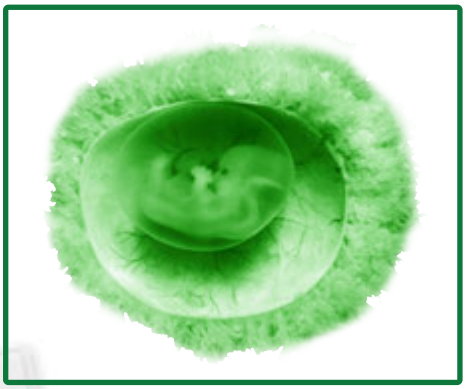
b. Onion genome 5 times bigger than ours

Onion (*Allium cepa*) has a genome size of 15.9 GB, which is ~5 times as much DNA as a human genome (3.3 GB).



c. We have 8% viral DNA in our genome

The human genome contains around 22,000 genes, but not all of it is our perse. Eight percent of our DNA consists of remnants of ancient viruses that had infected us years ago and inserted their DNA during an infection.



d. You share 99.9% of your genome with the person sitting next to you!

Yes! Your genes are 99% same as a chimp, 97.5% as a mouse, 50% that of a banana! These stats are proof that all living organisms on Earth share the same basic genetics. Our DNA is made up of same four base pairs Adenine, Thymine, Guanine and Cytosine, found wherever life exists, even in viruses!

Punnett Square Made Easy

Gametes	(RY)	(Ry)	(rY)	(ry)
(RY)	RRYY	RRYy	RrYY	RrYy
(Ry)	RRYy	RRyy	RrYy	Rryy
(rY)	RrYY	RrYy	rrYY	rrYy
(ry)	RrYy	Rryy	rrYy	rryy

a. Phenotypic ratio- 9 : 3 : 3 : 1

9 Round Yellow (Red -Biggest triangle)

3 Round Green (Yellow -Corners of smaller triangle)

3 Wrinkled Yellow (Pink -Smallest triangle)

1 Wrinkled Green (Green- Corner most)

b. **All Heterozygous combinations-** In Red diagonal line

c. **All Homozygous combinations-** In other diagonal line (Red, Yellow, Pink, Green)

Answer (Mendel's Marvels)

(i) Violet

(ii) Constricted

(iii) Green

(iv) Wrinkled

(v) Tall

(vi) Terminal

(vii) Yellow

C	O	N	S	T	R	I	C	T	E	D
Y	D	F	T	E	G	I	J	L	D	G
E	Z	A	Y	R	P	R	L	L	W	F
L	L	B	P	M	O	Q	E	M	R	V
L	K	J	C	I	F	G	H	E	I	S
O	M	K	L	N	B	M	C	O	N	E
W	R	I	T	A	T	G	L	A	K	R
S	D	O	E	L	R	E	D	F	L	T
T	P	O	L	E	T	D	A	L	E	L
P	N	X	A	K	H	B	Z	H	D	Q
W	R	O	L	K	T	V	C	X	Z	W

Famous Battles of History

If we look back in history we find there were the rules of different kingdoms/ dynasties in the world and their rule was not easy rather it was established through wars.

A war is an intense conflict fought between two groups in order to establish the social, economic, political, cultural, philosophical supremacy.

In this section we will discuss about some of the important wars of the history whose impact was not only localized to a particular region for a particular period of time rather has a long term impact.

1. The Battle of the Hydaspes

Historical Facts

- The war has been fought in 326 BCE between Alexander the Great and King Porus of the Paurava kingdom on the banks of the Jhelum River.
- This result into the loss of the King Porus and a victory of Alexander the Great.

Significance of the War

This war led to the introduction of Alexander the Great in the Indian Subcontinent.

Interesting Facts

- The river Jhelum was known to Greeks as Hydaspes that is why the battle was named as such.
- Apart from the political effect on the Indian Subcontinent there were also the cultural influences. E.g.: Greco-Buddhist Art.

2. Conquest of Nanda Empire

Historical Facts

- This war of conquest was fought in 321-320 BC between the King of Nanda Empire Dhana Nanda and Chandragupta Maurya.
- Chandragupta Maurya fought this war with the help of his guru Kautilya.

Significance of the War

This war led to the establishment of the Mauryan dynasty in the Indian Subcontinent.

Interesting Facts

- Ashoka the Great, the third ruler of the Mauryan Dynasty ruled over almost all the parts of Indian Subcontinent.
- Arthashastra, a book written by Kautilya is still considered a great treatise on economic, political and military administration of the state.

3. First Battle of Panipat

Historical Facts

- It was fought in 1526 CE between the forces of Babur and Ibrahim Lodi of Lodi dynasty.
- This led to the defeat of Ibrahim Lodi and victory of the invading forces of Babur.

Significance of the War

This war marked the beginning of the Mughal Empire in India and the end of the Delhi Sultanate.

Interesting Facts

- This was one of the earliest battle which involved the use of gunpowder and firearms.
- Field artillery in the Indian subcontinent was introduced by the Mughals in this battle.

4. Second Battle of Panipat

Historical Facts

- This battle was fought in 1556 CE between the forces of Akbar and Hemu.
- Akbar was victorious in this battle.

Significance of the War

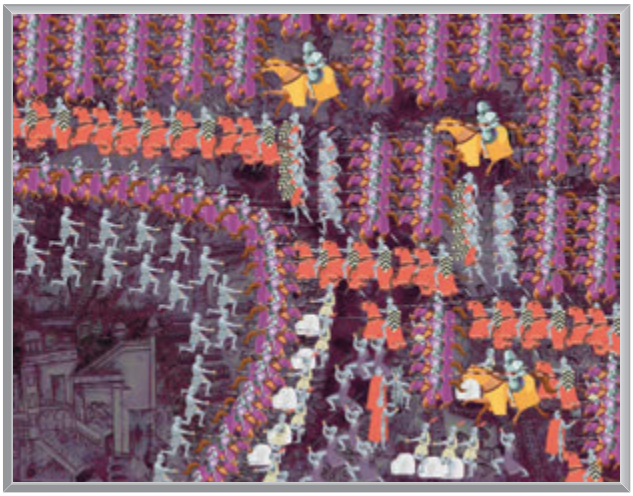
It consolidated the position of Mughal Empire in India by defeating the Afghans.

Interesting Facts

- At the time of this war, Akbar was just 13 years old and the war was fought under the leadership of Bairam Khan, guardian of Akbar.
- After the defeat of Hemu, Akbar refused to behead him as he has already lost the war. It was Bairam Khan who beheaded Hemu.

5. Third Battle of Panipat

Historical Facts



- This battle was fought in 1761 between the King of Afghanistan, Ahmed Shah Abdali (also known as Ahmed Shah Durrani) and the Maratha Empire.
- The battle is considered one of the largest and most eventful fought in the 18th century, and it has perhaps the largest number of fatalities in a single day between two armies.
- It led to the victory of Ahmed Shah Abdali and the defeat of the Maratha Empire.

Significance of the War

- The Maratha dream for the foundation of their territory over whole nation was broken.
- In the absence of a strong authority, it cleared the way for the British rule in India.

Interesting Facts

- Most inspiring thing is that the Maratha army of 40,000 in strength travelled on foot to North for 1000 KM.
- The war was fought with such intensity that although Abdali won the war but he never tried to return to Hindustan.

6. Battle of Plassey

Historical Facts

- This battle was fought in 1757 between the British East India Company and the Nawab of Bengal.
- From British East India Company's side Robert Clive led the forces and Siraj ud-Daulah led the forces from Bengal's side.

- It led to the victory of British East Indian Company.

Significance of the War

- This battle gave the political control of Bengal in the hands of the British East India Company.
- After this war the British became the political master in India for the first time.

Interesting Facts

- Robert Clive was the clerk in the East India Company.
- He implemented the concept of the "king maker" in Bengal by promising the commander in chief of the Nawab of Bengal, Mir Jafar the post of Nawab.

Determiners

QUIZ ?

1. _____ Indians are appreciated for their welcoming nature.

(a) The (b) An

(c) A (d) No article

2. _____ the books - 'A Christmas Carol' and 'Oliver Twist' are written by Charles Dickens.

(a) Each (b) Every

(c) Both (d) All

3. The judge let only ____ criminals go by without getting a sentence.

(a) a few (b) the few

(c) little (d) few

4. _____ of my classmates are working at reputed firms.

(a) Many (b) Most

(c) Every (d) Another

5. _____ is used to determine one of the two things, people or situations.

(a) Either (b) Neither

(c) Both (d) Most

6. I have never seen such _____ beautiful scenery.

(a) the (b) an

(c) a (d) No article

7. Look here, _____ is the place where they shot the movie Jodhaa Akbar.

(a) that (b) these

(c) this (d) those

8. Do you have _____ book I need?

(a) a (b) an

(c) the (d) No article

9. The dog growled and showed _____ teeth.

(a) its (b) it's

(c) his (d) this

10. _____ student of the class was given a role in the play.

(a) None (b) Each

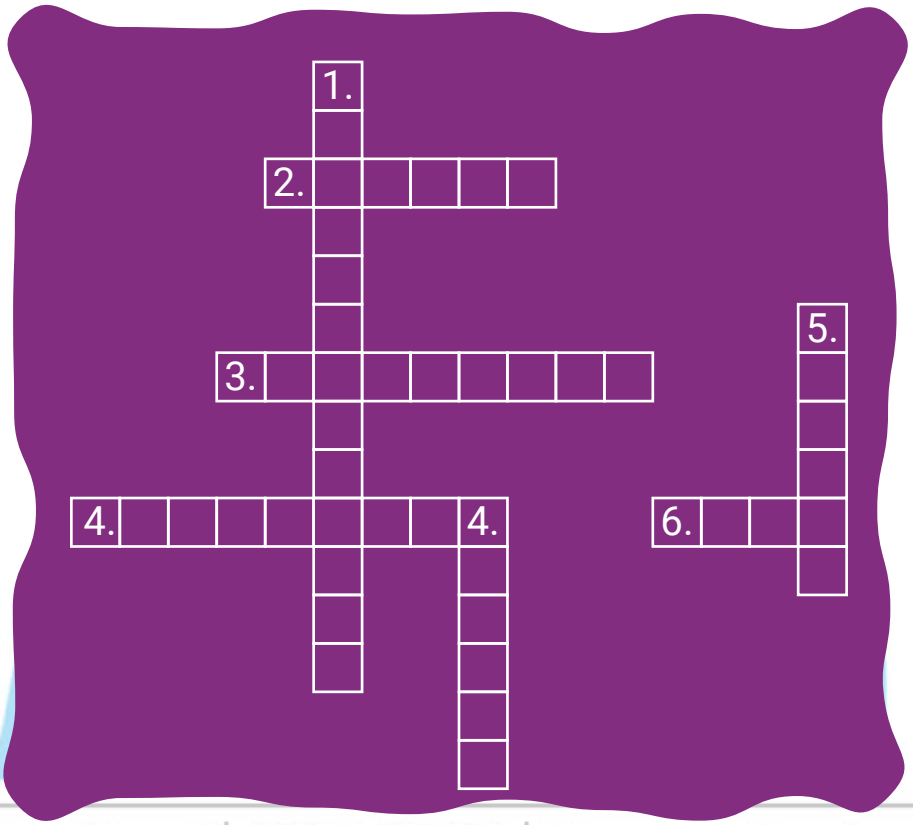
(c) Most (d) Few

1.	(a)	**2.**	(c)	**3.**	(d)	**4.**	(b)	**5.**	(a)
6.	(c)	**7.**	(c)	**8.**	(c)	**9.**	(a)	**10.**	(b)

Clock and Calendar

Image Based Puzzle

Crossword



Across

2. Day on 15th August, 1947.

3. Day on 19th October, 1977.

4. The minute hand gain _____ over hour hand per hour.

6. Year 2020 and year 2048 have the _____ calendar.

Down

1. The hands of the clock are _____ to each other when they are 15 minute spaces apart.

4. According to codes given to the days, which day will be there for code 0 or 7.

5. The _____ angle formed by hour and minute hands of a clock at 05 : 30 is 345°.

Historical Facts

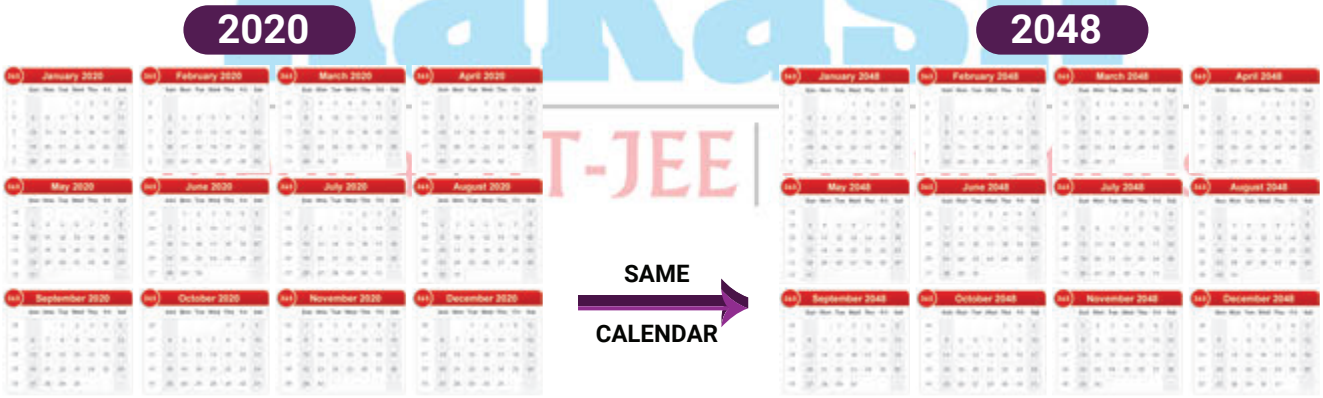
Calendar

The word calendar comes from the latin word, 'Kalendae' which means the first day of the month.

Clock

The word 'clock' comes from the french word 'Cloche' meaning bell, which enters the language around the 14th century, around the time when clocks started hitting the mainstream.

Calendar Repeatation



Odd no. of days

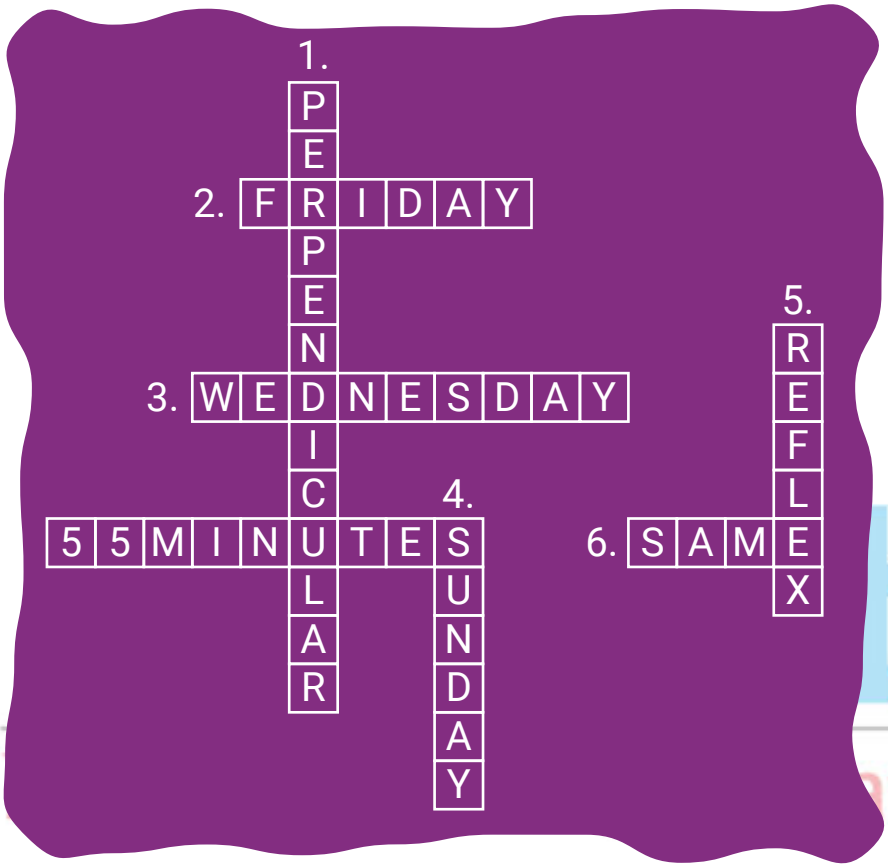
2020	2	2036	2
2021	1	2037	1
2022	1	2038	1
2023	1	2039	1
2024	2	2040	2
2025	1	2041	1
2026	1	2042	1
2027	1	2043	1
2028	2	2044	2
2029	1	2045	1
2030	1	2046	1
2031	1	2047	1
2032	2		
2033	1		
2034	1		
2035	1		

35 → Multiple of 7.

So, the same calendar we get in 2048.

Solution (Image Based Puzzle)

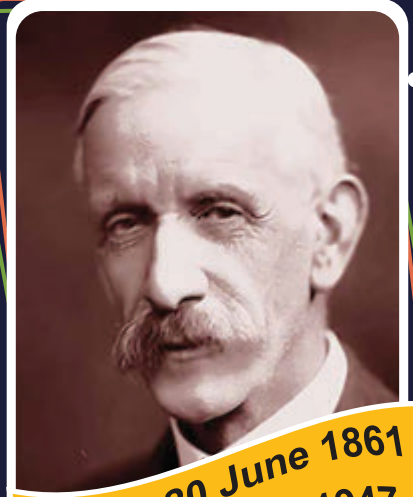
Solution (Crossword)



Nobel Prize Winner in physiology

Happy Birthday

Frederick Gowland Hopkins



Born - 20 June 1861
Died - 16 May 1947

Sir Frederick Gowland Hopkins, (born June 20, 1861, in Eastbourne, East Sussex, Eng. - died May 16, 1947, in Cambridge), was a British biochemist, who received the 1929 Nobel Prize for Physiology or Medicine (with Christiaan Eijkman) for discovery of essential nutrient factors-now known as vitamins-needed in animal diet to maintain health.

OUR RESULTS 2024

NEET (UG) 2024

AIR 1

JEE (Advanced) 2024

1430 Students Scored Above MAS

344 Classroom Students Qualified in NSEs* 2023-24

- (Group A & B) 34+30 NSEA*
- 156 NSEB*
- 72 NSEC*
- 23 NSEP*
- 29 NSEJS*

Aakashians Qualified for INO-2024

Diptanshu Sharma	Priyanshu Sarkar	Mridul Garg	Zaman Hussain	Shubhradeep Paul	Samvit Shandilya
NSEB | NSEC | NSEP	NSEB | NSEC | NSEP	NSEB | NSEC | NSEP	NSEA | NSEC | NSEP	NSEA | NSEC | NSEP	NSEA | NSEC | NSEP

and many more...

*NSEA-National Standard Examination in Astronomy | NSEB-National Standard Examination in Biology | NSEC-National Standard Examination in Chemistry
NSEP-National Standard Examination in Physics | NSEJS-National Standard Examination in Junior Science | INO-Indian National Olympiad

Aakashians Qualified for OCSC/IMOTC-2024

32 Classroom Students Qualified in INOs 2024

Aneesh Shastri	Sanvi Jain	Mridul M Anand	Zaman Hussain	Sushant Agarwal	Archit Kumar
Qualified INAO	Qualified INChO	Qualified INBO	Qualified INMO	Qualified INJSO	Qualified INAO Jr

OCSCs - Orientation cum Selection Camps | **IMOTC** - International Mathematical Olympiad Training Camp

and many more...

Aakashians Qualified for RMO from Classroom Programs

869 Classroom Students Qualified in IOQM 2024

Class VIII Joish Achyuta	Class VIII Pranava NS	Class VIII Bruteshwar Rajguru	Class VIII Hardik Mishra	Class VIII Hardik Dhariwal	Class IX Dhanush Damu
2 Year Classroom	3 Year Classroom	3 Year Classroom	2 Year Classroom	2 Year Classroom	4 Year Classroom

IOQM - Indian Olympiad Qualifier in Mathematics

and many more...

Board Exam Results 2024

Top Performers from Class X

Devidyuti K Pisharody	P Harini	Jiya Dugar V
Marks 500/500	Marks 499/500	Marks 498/500
CBSE	CBSE	CBSE

and many more...

Top Performers from Class XII

Ananthan R	Ansh Agrawal	Himanshu Agarwal
Marks 496/500	Marks 495/500	Marks 495/500
CBSE	CBSE	CBSE

and many more...

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