



Aakash

Medical | IIT-JEE | Foundations

KNOWLEDGE BYTES

SEPTEMBER 2025

CLASS 9





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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

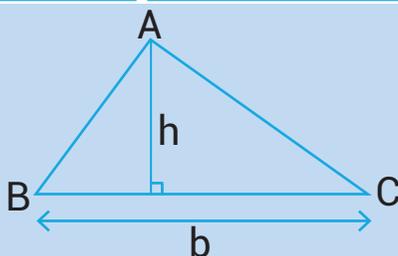
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Heron's Formula, Surface Areas and Volumes

/// Heron's Formula (Mensuration) ▀

Triangle with Base = b and Height = h

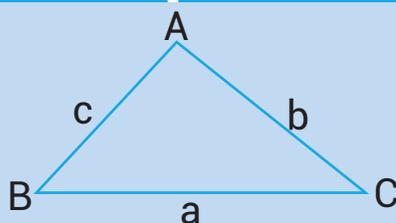
$$\text{Area} = \frac{1}{2} (\text{Base} \times \text{Height})$$



Triangle with sides a, b and c
s = Semi-perimeter of the Triangle

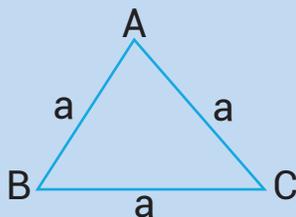
$$s = \frac{a + b + c}{2}$$

$$\text{Area} = \sqrt{s(s - a)(s - b)(s - c)}$$



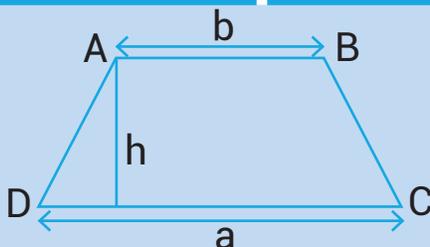
Equilateral Triangle with Side = a

$$\text{Area} = \frac{\sqrt{3}}{4} a^2 \text{ square units}$$



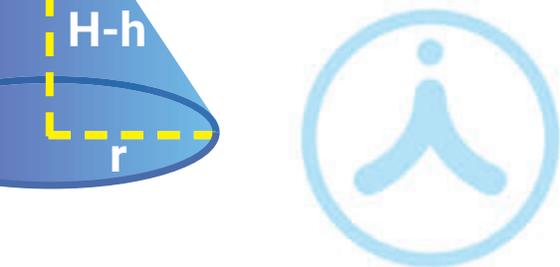
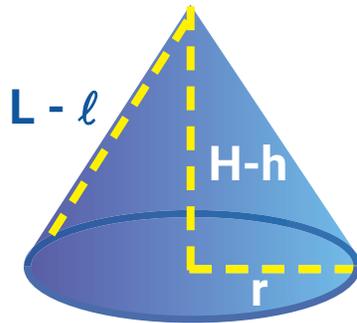
Trapezium with parallel sides a, b and distance between these parallel sides is h

$$\text{Area} = \frac{1}{2} (a + b)h \text{ square units}$$



/// Frustum (Volume and Surface Area) ▀

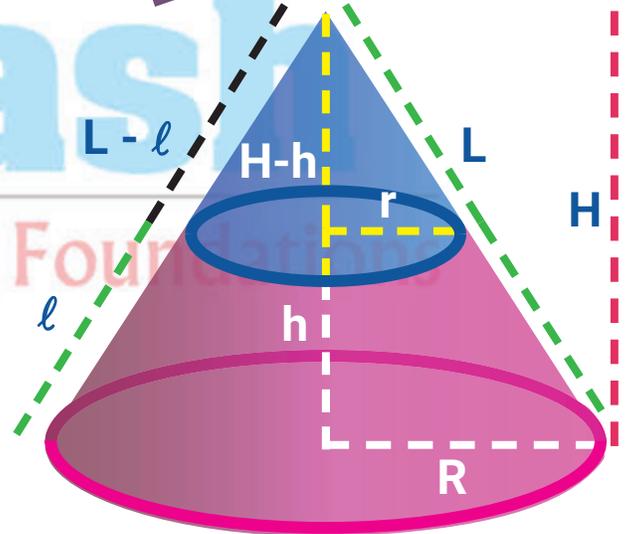
Small Cone



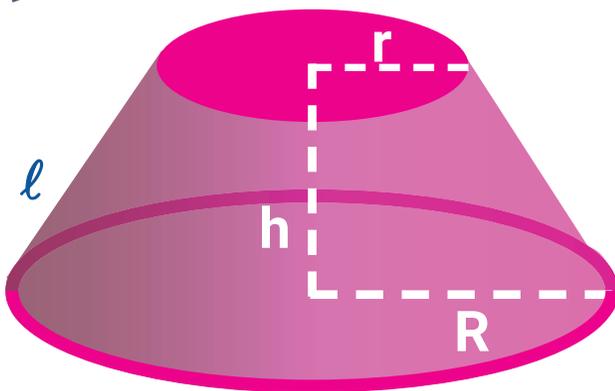
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Large Cone

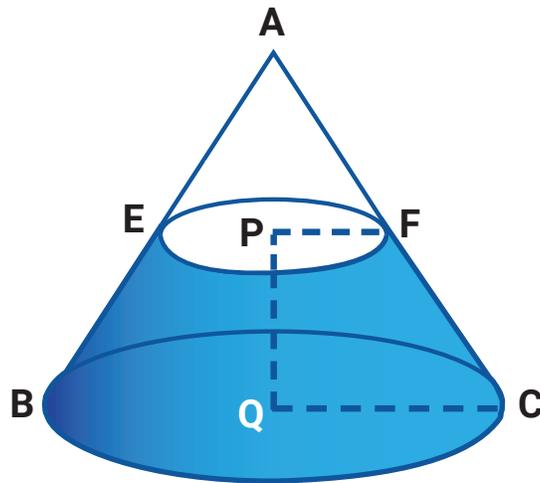


Frustum



/// Frustum

If a solid cone is cut by a plane parallel to the base BC, then the solid portion between the base and plane is called frustum of the cone.



Here, EBCF is frustum of the cone ABC.

PF = r = radius

QC = R = radius

PQ = h = height

FC = l = slant height

r = radius of smaller circle

R = radius of larger circle

l = slant height of frustum

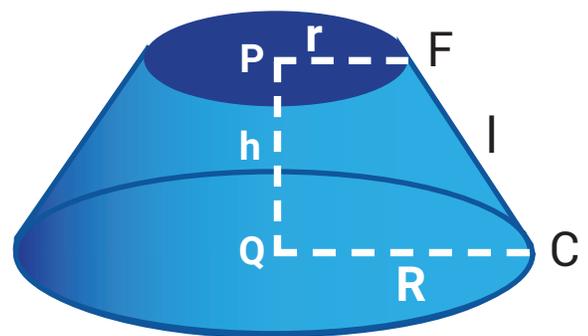
$$\text{Volume} = \frac{1}{3} \pi h(r^2 + rR + R^2)$$

$$\text{Lateral Surface Area} = \pi(r + R)l$$

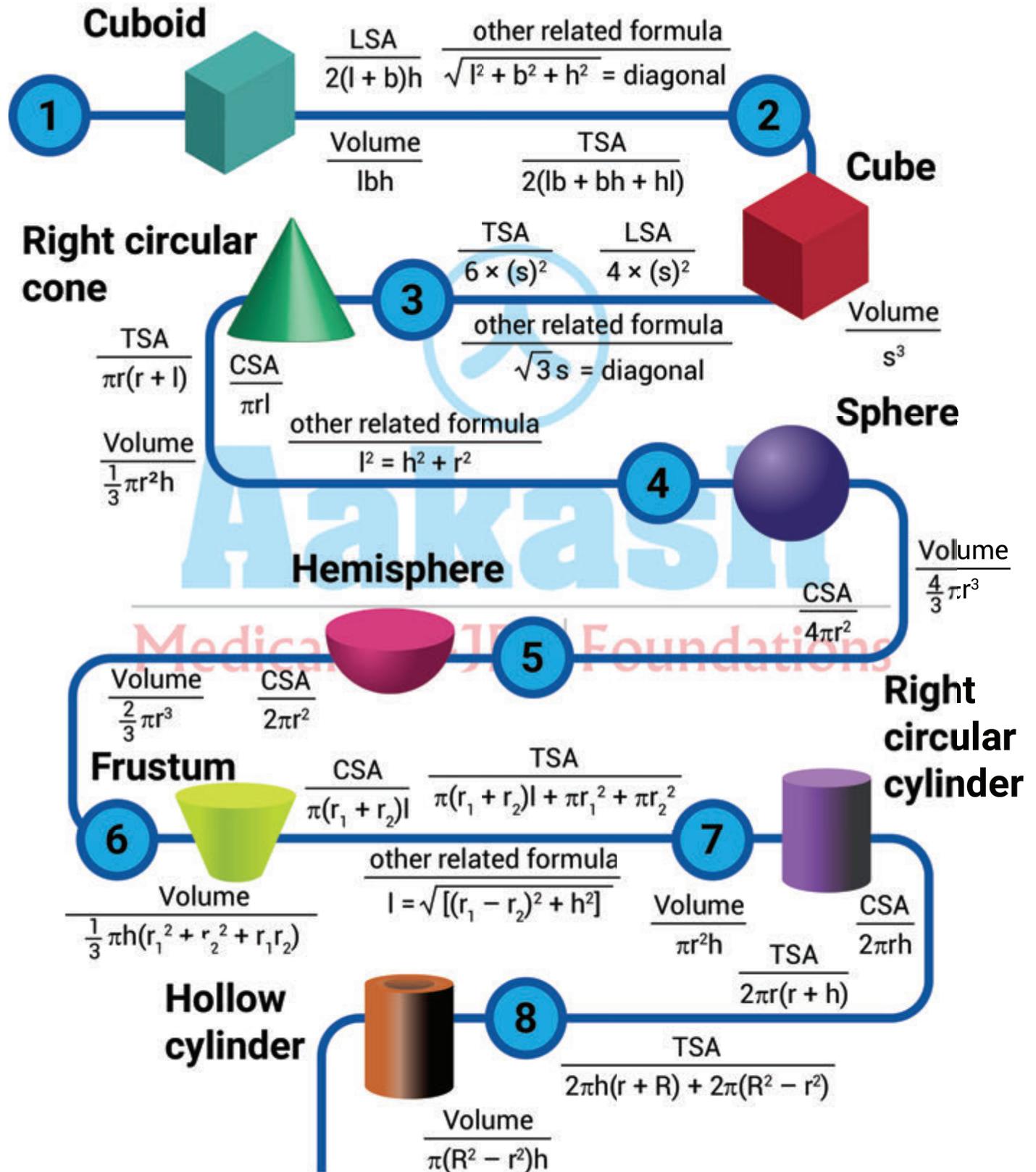
$$= \pi(r + R)\sqrt{(R - r)^2 + h^2}$$

$$\text{Total Surface Area} = \pi(r + R)l + \pi r^2 + \pi R^2$$

$$= \pi(r + R)\sqrt{(R - r)^2 + h^2} + \pi r^2 + \pi R^2$$



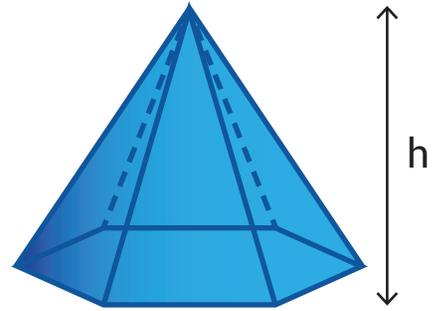
Formulas Involving Surface Areas and Volumes



/// Some More 3-D Geometrical Shapes

Pyramid

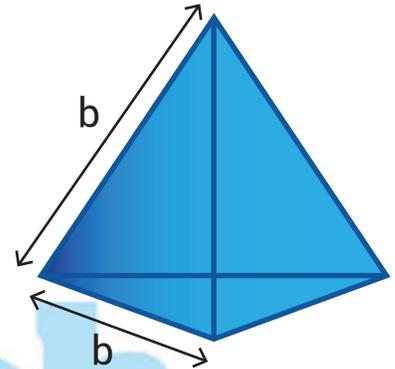
Volume of a general pyramid = $\frac{1}{3} Ah$
where A = base area and h = height



Regular Tetrahedron

$$\text{Volume} = \frac{b^3}{6\sqrt{2}}$$

$$\text{Surface area} = \sqrt{3} b^2$$



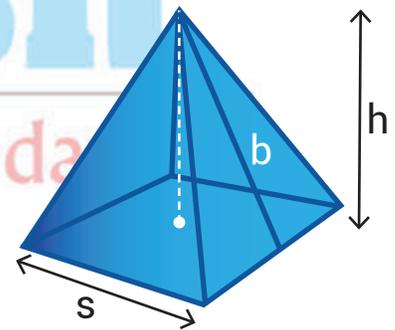
Square Pyramid

$$\text{Volume} = \frac{1}{3} s^2 h$$

(where h is perpendicular height of top)

$$\text{Surface area} = s^2 + 2sb$$

b = slant height measured along triangular face

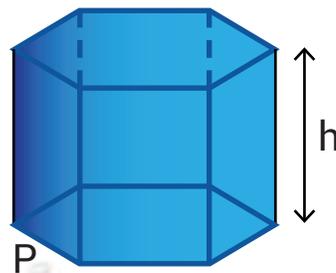
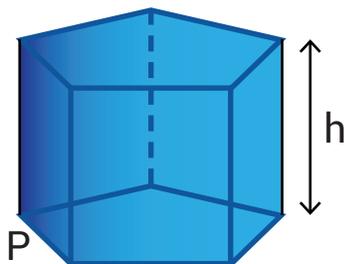


Prism

Volume of any prism = Ah

Surface area of a closed prism = $2A + (h \times p)$

where A = base area, h = height, p = base perimeter

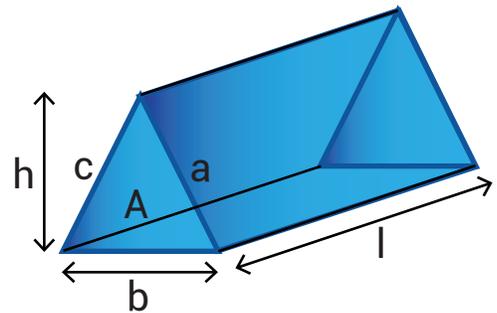


Triangular Prism

$$\text{Volume} = Al \text{ or } \frac{1}{2}bhl$$

(where h = perpendicular height of triangle)

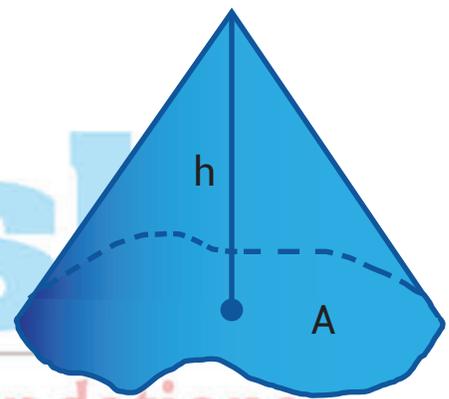
$$\text{Surface area} = bh + (a + b + c) \times l$$



General Cone OR Pyramid

A = area of base, h = perpendicular height

$$\text{Volume: } V = \frac{1}{3} Ah$$



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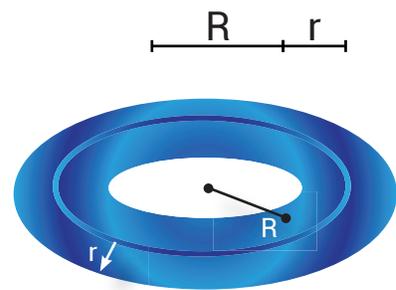
Torus

r = tube radius,

R = torus radius

$$\text{Volume : } V = 2\pi^2 r^2 R$$

$$\text{Surface area : } S = 4\pi^2 r R$$



/// Quiz

Q.1 The other name of the cuboid is

- | | |
|-----------------------|-------------------------|
| (a) Square prism | (b) Tetrahedron |
| (c) Rectangular prism | (d) Square base pyramid |

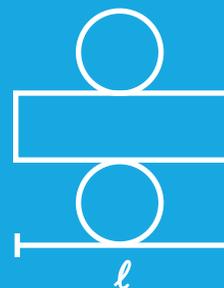
Q.2 Pentagonal prism has

- | | |
|------------------------|------------------------|
| (a) 5 Pentagonal faces | (b) 4 Pentagonal faces |
| (c) 3 Pentagonal faces | (d) 2 Pentagonal faces |

Q.3 Circumference of the base of 8 m high conical tent is $\left(\frac{264}{7}\right)$ m. The area of canvas required to make the tent is

- | | |
|--|--|
| (a) $\left(\frac{1320}{7}\right)$ m ² | (b) $\left(\frac{1360}{7}\right)$ m ² |
| (c) 286 m ² | (d) 98 m ² |

Q.4 On the basis of given figure, the length of a rectangle in the net of cylinder is equal to



- | | |
|-----------------------------|-------------------------------------|
| (a) Circumference of circle | (b) Height of cylinder |
| (c) Radius of circle | (d) Curved surface area of cylinder |

/// Answer (Quiz)

A.1 (c) Rectangular prism

A.2 (d) 2 Pentagonal faces

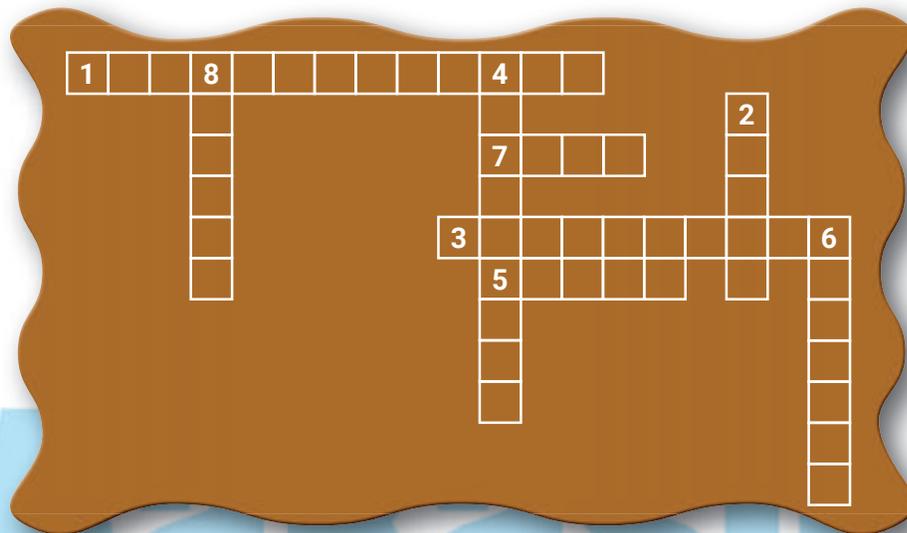
A.3 (a) $\left(\frac{1320}{7}\right)$ m²

A.4 (a) Circumference of circle



Sound

/// Crossword



ACROSS

1. Multiple echoes leading to persistence of sound in an auditorium are also called _____. [13]
3. Sound whose frequency is below 20 Hz is called _____. [10]
5. _____ is a form of energy which produces a sensation of hearing. [5]
7. A sound of single frequency is called _____. [4]

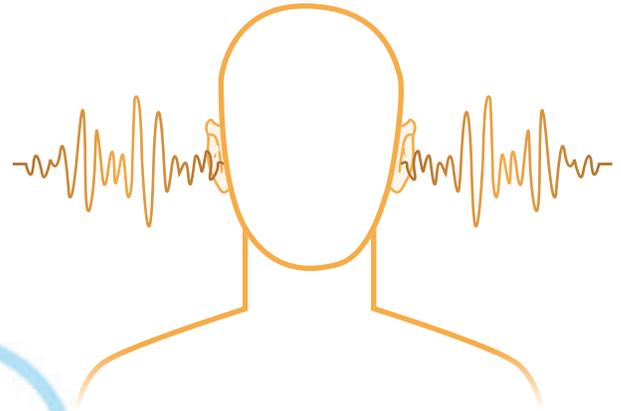
DOWN

2. _____ is a bone of the middle ear. [5]
4. Amount of sound energy passing a unit area in a unit time is called _____ [9]
6. The speed of sound increases with decrease in _____ of air. [7]
8. The propagation of longitudinal waves through a medium leads to transmission of _____ [6]



/// Facts About Sound

1. Flies cannot hear any kind of sound not even their own buzzing.
2. The majority of cows that listen to music end up producing more milk than those who do not.
3. Birds create sound maps to navigate their migration and travel through air. Scientist believe that low level sounds are responsible for disrupting a bird's natural compass.
4. If you clap in front of Chichen Itza's El Castillo pyramid the echo will sound like a chirping bird.
5. Horror films like to use infrasound, which is below the range of human hearing. It creates shivering, anxiety and even heart palpitations in humans when it is being played.
6. Sound comes from vibrations. These vibrations create sound waves which move through mediums such as air and water before reaching our ears.
7. Our ears vibrate in a similar way to the original source of the vibration, allowing us to hear many different sounds.
8. Dogs can hear sound at a higher frequency than human, allowing them to hear noises that we can't.
9. Sound is used by many animals to detect danger, warning of possible attacks before they happen.
10. Sound can't travel through vacuum (an area empty of matter).
11. In non-humid air at 20 degrees Celsius, the speed of sound is around 767 miles per hour.
12. The loud noise you create by cracking a whip occurs because the tip is moving so fast that it breaks the speed of sound.
13. When traveling through water, sound moves around four times faster than when it travels through air.
14. The scientific study of sound waves is known as acoustics.



Quiz

Q.1 Which part of human ear converts sound vibrations into electrical signals.

- (a) Hammer
- (b) Stirrup
- (c) Tympanic membrane
- (d) Cochlea

Q.2 What do dolphins, bats and porpoise use

- (a) Ultrasound
- (b) infrasound
- (c) Both (a) and (b)
- (d) None of them

Q.3 Children under the age of 5 can hear upto

- (a) 25 Hz
- (b) 25 kHz
- (c) 20 Hz
- (d) 30 kHz

Q.4 Reverberation of sound is used in

- (a) Stethoscope
- (b) Trumpets
- (c) Megaphone
- (d) All of these

Q.5 To hear a distinct echo each time interval between the original sound and the reflected sound must be :

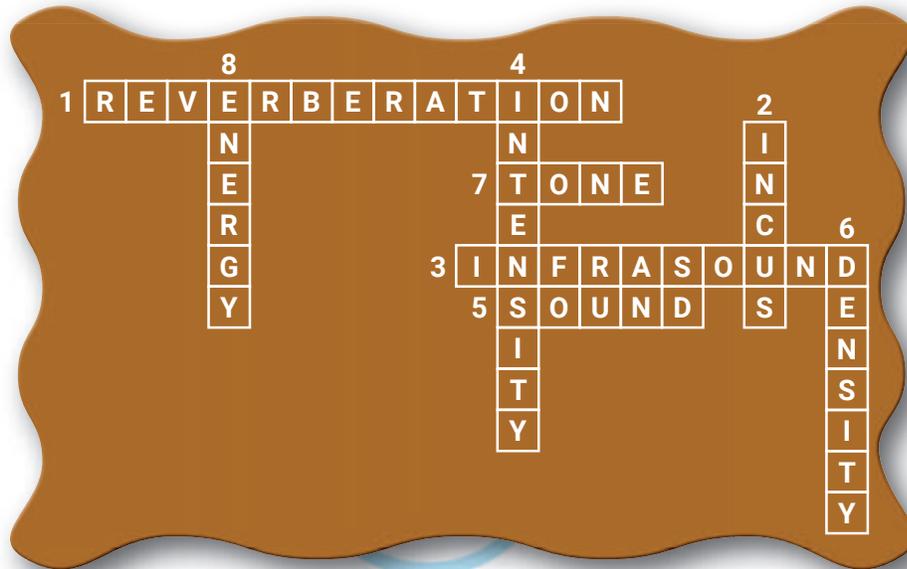
- (a) 0.2 s
- (b) 1 s
- (c) 2 s
- (d) 0.1 s

Q.6 Speed of sound depends upon

- (a) Temperature of the medium
- (b) Pressure of the medium
- (c) Temperature of source producing sound
- (d) Temperature and pressure of medium



/// Answer (Crossword) ■



/// Answer (Quiz) ■

A.1 (d) Cochlea

A.2 (a) Ultrasound

A.3 (b) 25 kHz

A.4 (d) All of these

A.5 (d) 0.1 s

A.6 (a) Temperature of the medium

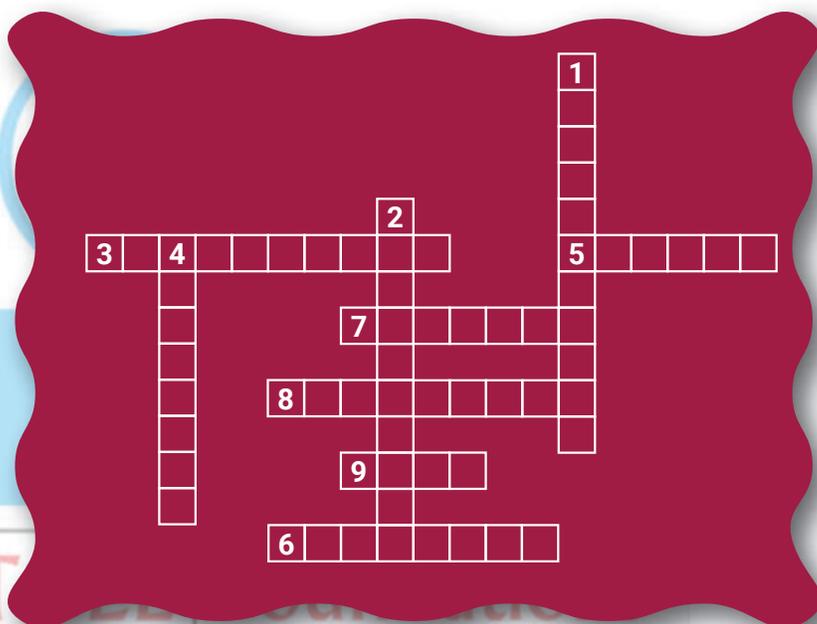


Structure of the Atom

/// Crossword

ACROSS

3. Greek philosopher who discovered atoms. [10]
5. English chemist who developed first atomic theory. [6]
6. Discovered the neutron. [8]
7. Discovered the electron. [7]
8. Discovered that particles behave like waves. [9]
9. Model showing electrons move with constant speed. [4]



DOWN

1. Developed quantum mechanical model. [11]
2. Discovered the nucleus. [10]
4. Determined the elementary charge of an electron using the oil-drop experiment. [8]



/// Quiz

1 Which pair of substances given below are isotopes?

- (a) $^{12}_6\text{C}$ and $^{14}_6\text{C}$
- (b) Carbon dioxide and carbon monoxide
- (c) Diamond and graphite
- (d) C_2H_4 and C_3H_6

2 Both an atom and an ion of the isotope of sodium ($^{22}_{11}\text{Na}$) contain

- (a) 11 Protons
- (b) 12 Neutrons
- (c) 23 Protons
- (d) 23 Neutrons

3 Which of the following atoms has the same number of valence electrons as a krypton atom with atomic number 36?

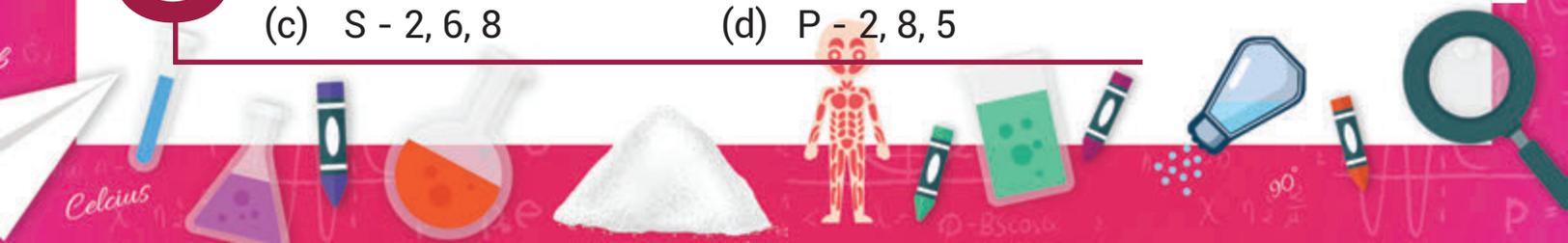
- (a) Chlorine
- (b) Sodium
- (c) Rubidium
- (d) Xenon

4 The Bohr's atomic theory explains

- (a) About quantum numbers
- (b) About the shape of sub-shells
- (c) About nucleus
- (d) About stationary states

5 Which of the following electronic configurations is incorrect?

- (a) Be - 2, 2
- (b) O - 2, 6
- (c) S - 2, 6, 8
- (d) P - 2, 8, 5



/// Interesting Facts

SEVEN THINGS TO KNOW ABOUT RADIOISOTOPES

✦ What are radioisotopes?

Radioisotopes are atomic elements that do not have the appropriate proton to neutron ratio to remain stable. With an unbalanced number of protons and neutrons, energy is given off by the atom in an attempt to become stable.

✦ How do we use radioisotopes in medicine?

Some radioisotopes give off alpha or beta radiation, and these are used for treating diseases such as cancer.

✦ Are radioisotopes dangerous to patients?

The radioisotopes given to patients undergoing diagnosis or treatment, decay and quickly become stable (non-radioactive) elements within minutes or hours depending on their half-lives or they are rapidly eliminated from the body.

✦ Where do radioisotopes come from? How are they made?

There are both naturally occurring and man-made radioisotopes. But for medical purposes, we only use the ones made by nuclear reactors and cyclotrons, because they are easy to produce, and have the characteristics needed for imaging.

✦ Why do we use radioisotopes in medicine? What's so special about them?

Radioisotopes are special because certain organs in the body respond in unique ways to different substances. For example, the thyroid gland absorbs iodine, so the radioisotope iodine-131 is widely used to treat thyroid cancer and in imaging the thyroid. Similarly, specific radioactive chemicals are picked up and metabolized by other organs like liver, kidney and brain.



/// Interesting Facts

✱ **If medical staff are cautioned to keep a distance, then why are these treatments allowed for patients?**

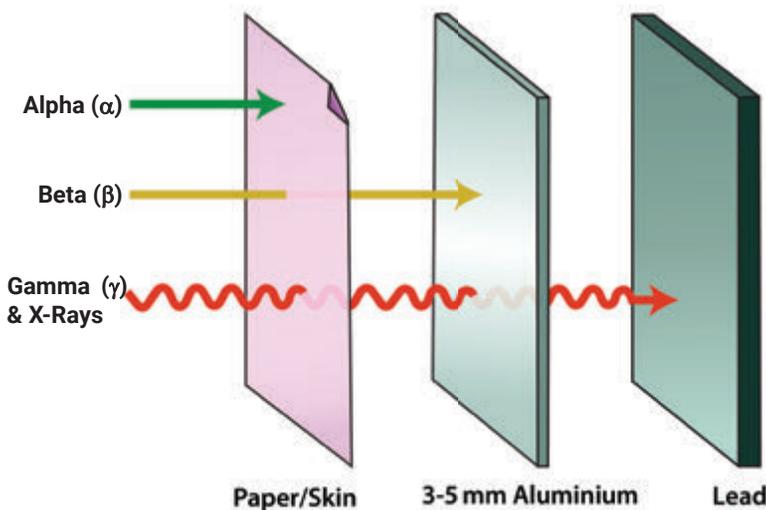
It all relates to 'justification', a key concept in nuclear medicine. Justification means that the benefit derived from the use of radiation must outweigh the potential harm to the patient.

Patients benefit from the properties of radiation in the treatment of cancer. And for someone who has cancer, the use of a short lived radioisotope during treatment could cure them from the cancer or extend their lives.

Health care workers are trained on clinical practices to appropriately manage exposure as they provide support for patients undergoing radiation therapy.

✱ **Are radioisotopes inside a patient dangerous to the public?**

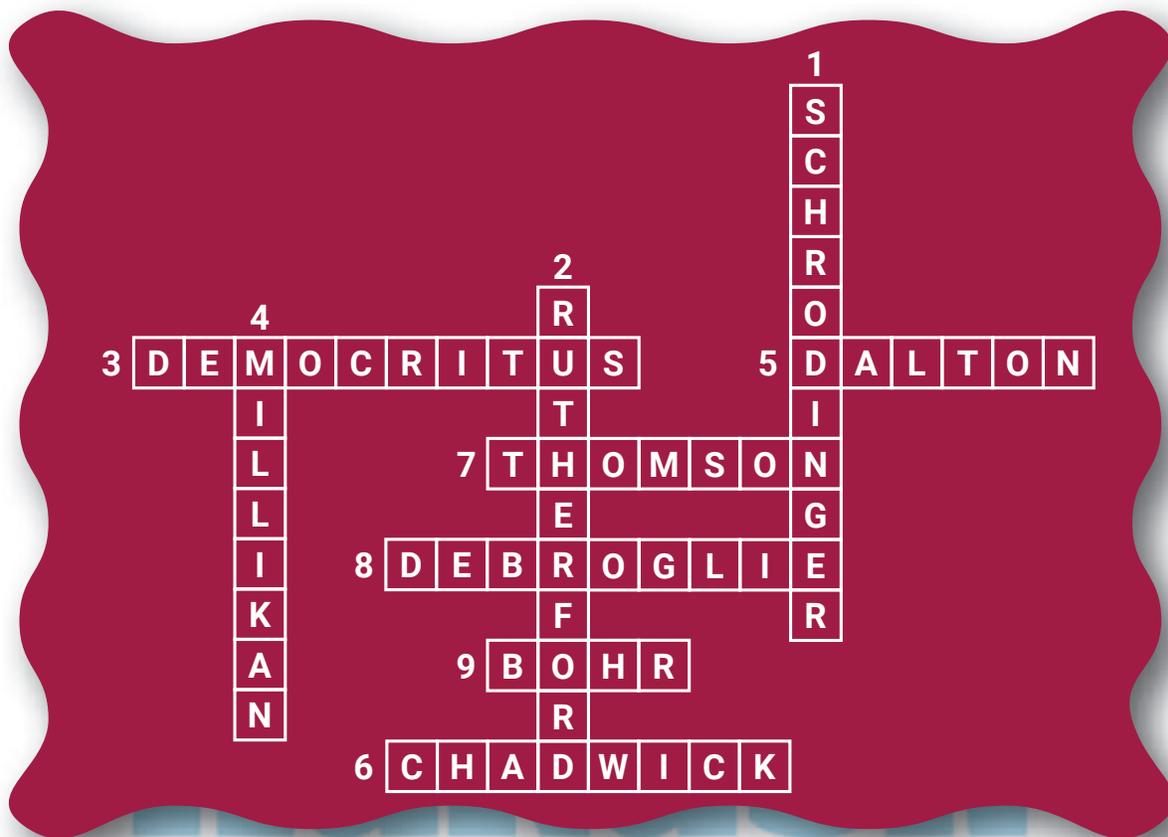
Medical staff follow strict rules and are trained to ensure that those patients who are given therapeutic doses of radioisotopes are kept isolated in their hospital rooms until the patient's exposure to the worker and public is reduced to a safe level.



Therefore these treatments are often justified in the eyes of both the patient and their physician.



/// Answer (Crossword)



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/// Answer (Quiz)

1 (a) $^{12}_6\text{C}$ and $^{14}_6\text{C}$

2 (a) 11 Protons

3 (d) Xenon

4 (d) About stationary states

5 (c) S - 2, 6, 8



Natural Resources

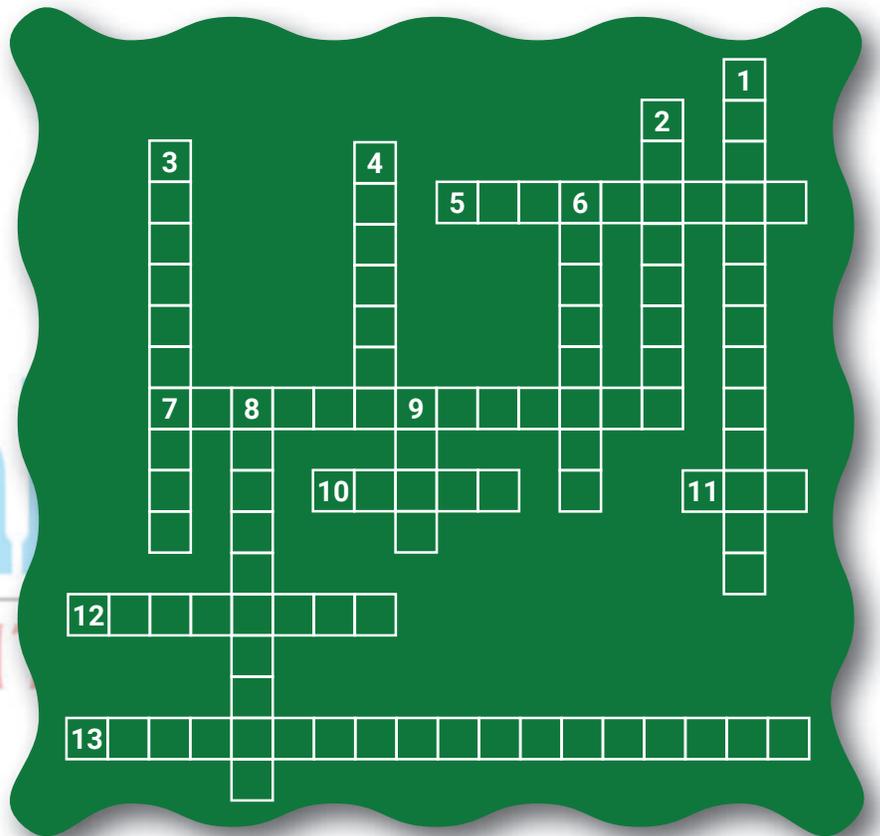
/// Crossword

ACROSS

5. Contamination of the environment. [9]
7. Plantation of trees. [13]
10. Protective shield in the stratosphere. [5]
11. Mixture of gases. [3]
12. This famous historical monument was affected by acid rain. [3, 5]
13. Combination of carbon monoxide (CO) and haemoglobin. [18]

DOWN

1. Cutting of trees or destruction of forests. [13]
2. Gas that forms 78% of the Earth's atmosphere. [8]
3. Substances which contaminate air and water. [10]
4. Purified water, suitable for drinking. [7]
6. Seepage of field water into the ground. [8]
8. Most popular physical method for removing impurities from water. [10]
9. Combination of smoke and fog. [4]



/// Interesting Facts

1

Indication of Pollution Level

S. No	Pollution Level	BOD (mg/L)
(1)	Low	< 1500
(2)	Medium	1500–4000
(3)	High	> 4000

2

Usually there are no clouds in stratosphere because of negligible concentration of water vapours in this layer. However, during South polar winter, air of stratosphere above Antarctica drops down below -80°C that leads to the formation of thin clouds.



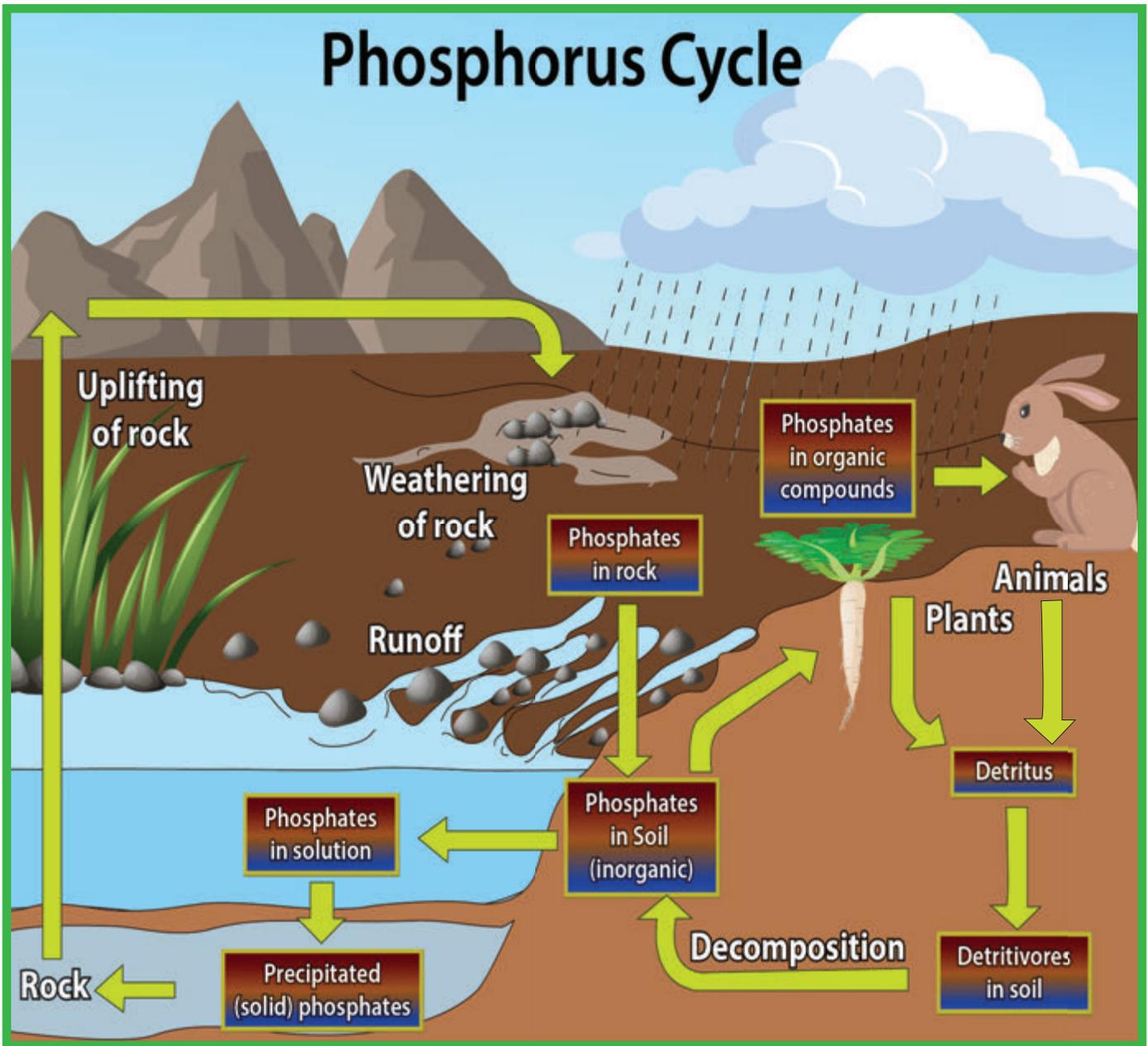
The cloud in stratosphere is known as 'mother of pearl' or Nacreous.



3

Sedimentary cycles

These are another type of biogeochemical cycles whose reserves are generally found in the lithosphere. Here is a diagrammatic explanation of one such cycle i.e. Phosphorus cycle. Other examples are calcium cycle, iron cycle and sulphur cycle.



/// Using the words from the word box

_____ is a poisonous gas which is produced on incomplete burning of fossil fuels.

1.

Carbon is returned to the atmosphere by _____.

2.

The process of conversion of nitrates into gaseous nitrogen which escapes into the atmosphere is called _____.

3.

Oxygen is returned to the atmosphere by _____.

4.

Bad ozone is formed in the _____ and harms plants and animals.

5.

CFCs are most damaging and efforts are being made to replace CFCs by _____.

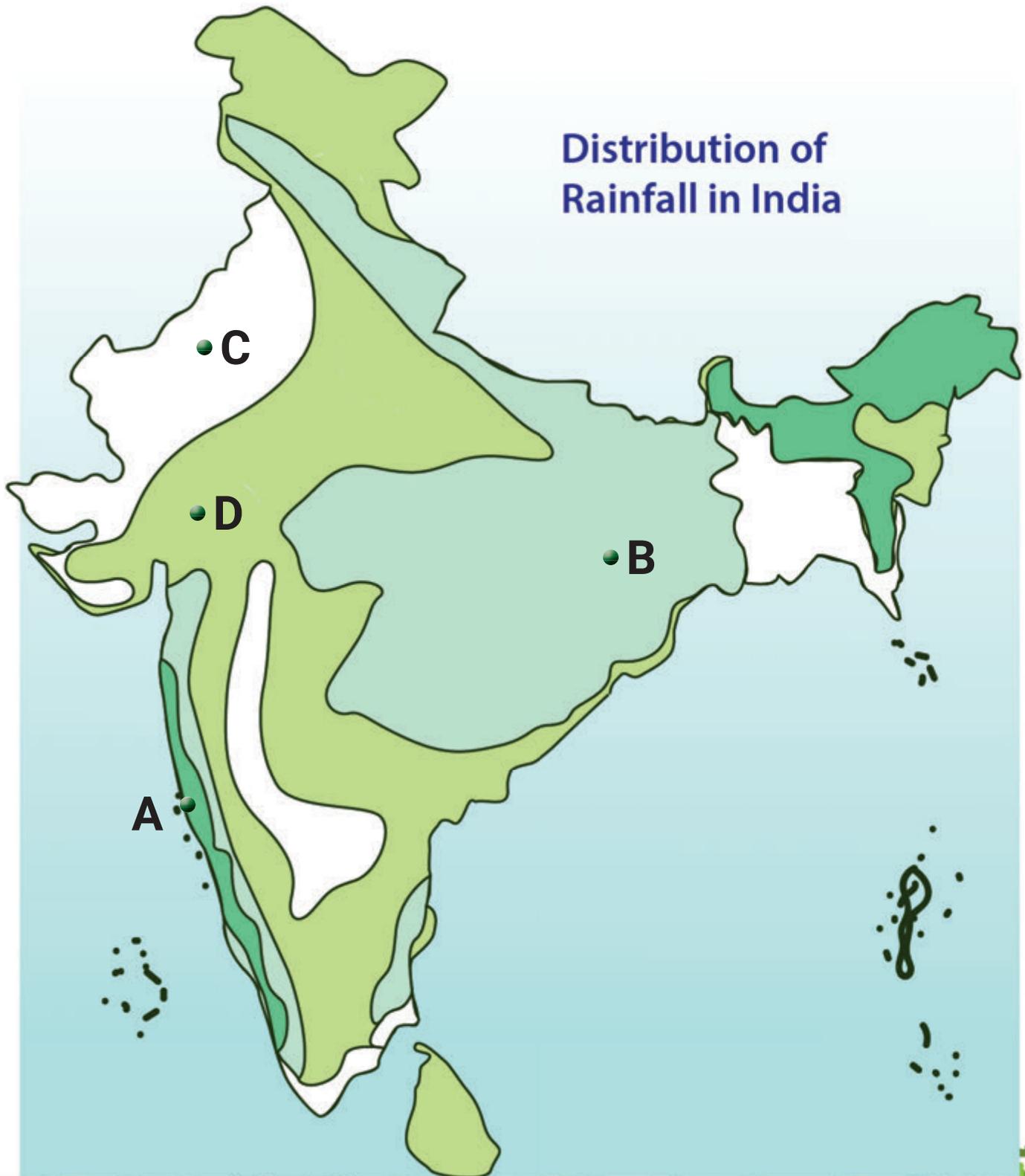
6.

WORD BOX

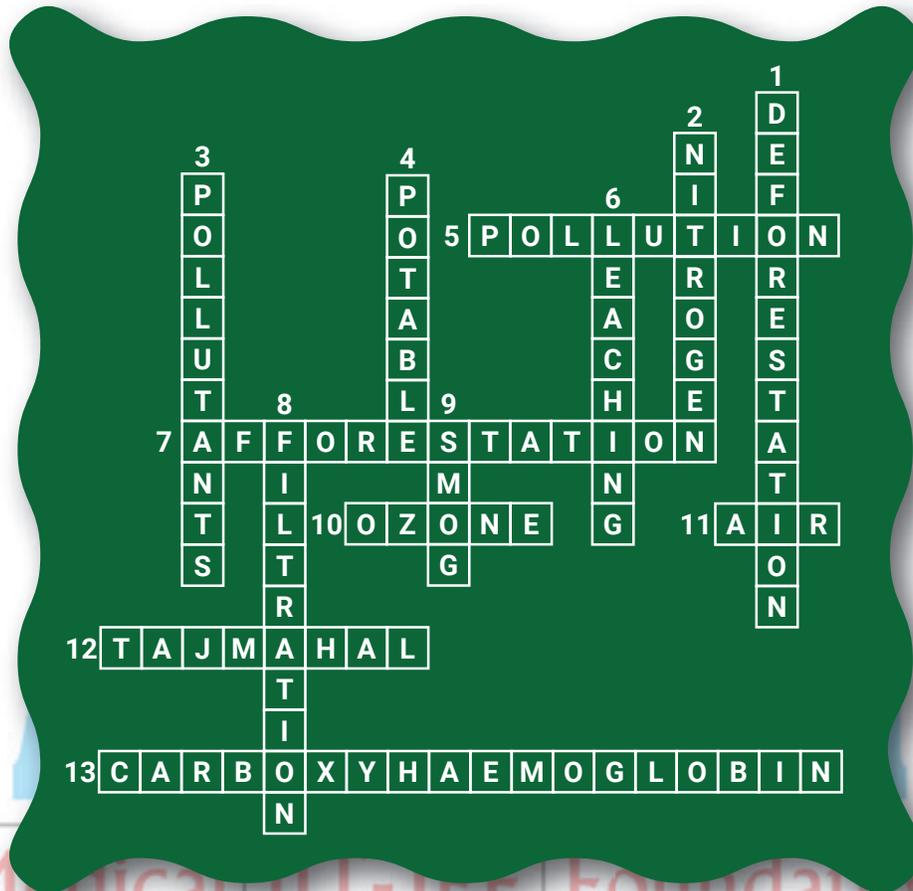
- Denitrification
- Hydrofluorocarbons
- Respiration
- Troposphere
- Carbon monoxide
- Photosynthesis

/// Find the Zones █

Mention the approximate intensity of rainfall in below labelled areas.



/// Answer (Crossword)



/// Answer (Fill in the blanks)

Carbon monoxide **1.**

Respiration **2.**

Denitrification **3.**

Photosynthesis **4.**

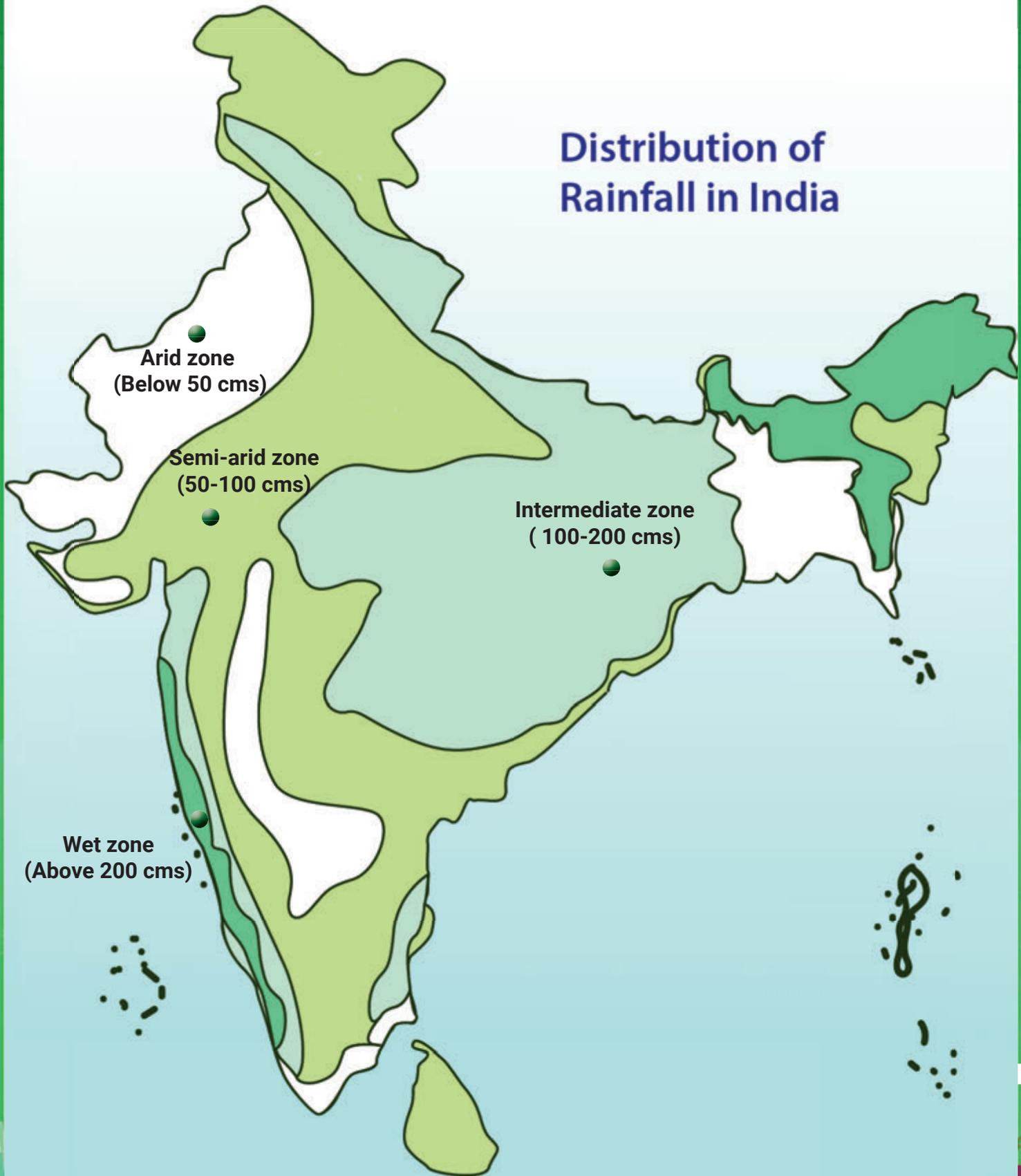
Troposphere **5.**

Hydrofluorocarbons **6.**



/// Answer (Find the Zones) ■

Distribution of Rainfall in India



Electoral Politics

/// Challenges to Free and Fair Election in India



Omission

/// A Missing Part of Speech

Identify the missing link and provide it as the answer to make the sentence grammatically correct.

Q.1

- (a) An English passenger, talking kindly me, drew
(b) me conversation. He was older than I.
(c) He asked me what I ate, who I, where I was going,
(d) why I was shy, and so on. He also advised me to come his table.

	Before	Missing	After
(a)	_____	_____	_____
(b)	_____	_____	_____
(c)	_____	_____	_____
(d)	_____	_____	_____

Q.2

- (a) After Sri Ramakrishna's passing 1886, Vivekananda
(b) renounced the world and crisscrossed India a
(c) wandering monk. His mounting compassion India's
(d) people drove to seek material help from the West.

	Before	Missing	After
(a)	_____	_____	_____
(b)	_____	_____	_____
(c)	_____	_____	_____
(d)	_____	_____	_____



Q.3

- (a) About 260 million years the earliest ancestor of turtles and
- (b) tortoises, bulbous reptile known as *Eunotosaurus africanus*,
- (c) emerged from egg in South Africa's Karoo Basin. Its
- (d) evolutionary descendants spread the globe, giving rise to the turtles and tortoises living today.

	Before	Missing	After
(a)	_____	_____	_____
(b)	_____	_____	_____
(c)	_____	_____	_____
(d)	_____	_____	_____

Q.4

- (a) Earth is an oblate spheroid. This means is spherical in shape,
- (b) but not perfectly round. It has a slightly greater radius the
- (c) Equator, the imaginary line running horizontally around middle
- (d) of the planet. In addition bulging in the middle, Earth's poles are slightly flattened.

	Before	Missing	After
(a)	_____	_____	_____
(b)	_____	_____	_____
(c)	_____	_____	_____
(d)	_____	_____	_____



/// Answer (A Missing Part of Speech)

A.1

Before	Missing	After
(a) kindly	to	me
(b) me	into	conversation
(c) who	I	was
(d) come	to	his

A.2

Before	Missing	After
(a) passing	in	1886
(b) India	as	a
(c) compassion	for	India's
(d) drove	him	to

A.3

Before	Missing	After
(a) years	ago	the
(b) tortoises	a	bulbous
(c) from	an	egg
(d) spread	around	the

A.4

Before	Missing	After
(a) means	it	is
(b) radius	at	the
(c) around	the	middle
(d) addition	to	bulging



Non-Verbal Reasoning

/// Quiz

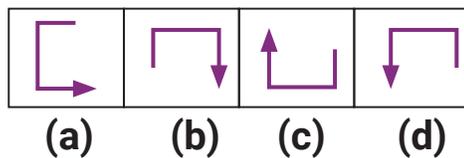
Directions (Q.1 to Q.3) : Complete the given series as per the appropriate pattern.

Q.1

Question figure

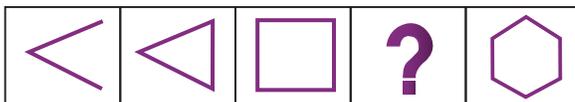


Answer figure

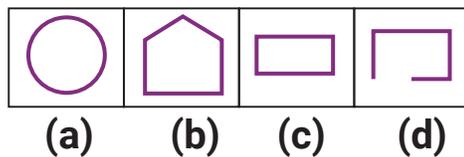


Q.2

Question figure

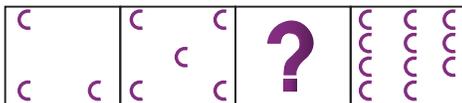


Answer figure

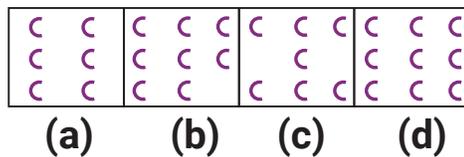


Q.3

Question figure

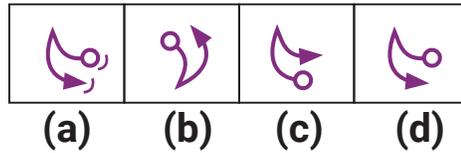
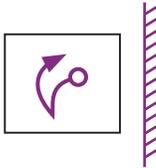


Answer figure

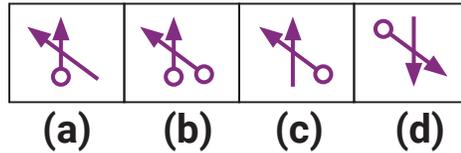
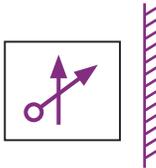


Directions (Q.4 to Q.5) : In each of the following questions you are given a figure followed by four alternatives (a), (b), (c) and (d). Choose the alternatives which is closely resembles to the mirror image of the given figure.

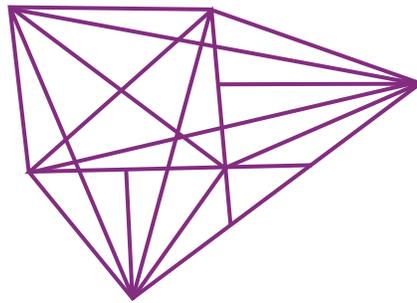
Q.4



Q.5

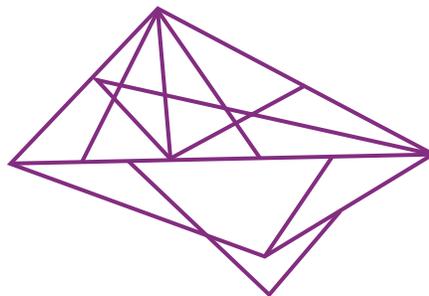


Q.6 What is the number of straight lines in the following figure ?



- (a) 17 (b) 16 (c) 19 (d) 18

Q.7 How many triangles are there in the given figure?



- (a) More than 10 but less than 20 (b) More than 19 but less than 25
 (c) More than 24 but less than 30 (d) More than 29



Q.8 How many quadrilaterals are there in the given figure ?

(a) 32 (b) 19 (c) 16 (d) 43

Q.9 Choose the correct alternative which complete the figure.

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

Q.10 If a paper (Transparent Paper) is folded in a manner and design cut or pattern punched is made. When unfolded this paper appears as given below in the answer figure. Choose the correct answer figure given below.

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



/// Answer (Quiz)

A.1 (c) 

A.2 (b) 

A.3 (c) 

A.4 (b) 

A.5 (c) 

A.6 (a) 17

A.7 (d) More than 29

A.8 (a) 32

A.9 (b) 

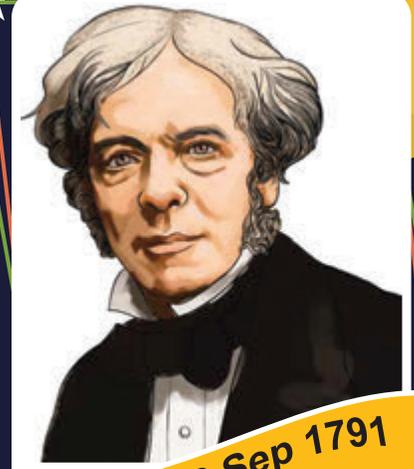
A.10 (b) 



Happy Birthday

Michael Faraday

“Nothing is too wonderful to be true if it is consistent with the laws of nature.”



Born - 22 Sep 1791
Died - 25 Aug 1867

Born on September 22, 1791, this famous English physicist and chemist is best remembered for his understanding of electromagnetism. Once Faraday discovered that electricity could be made by moving a magnet inside a wire coil, he was able to build the first electric motor. He later built the first generator and transformer. He introduced several words that we still use today to discuss electricity : ion, electrode, cathode and anode.

NEET 2025 Wasn't Easy. Our Results Say Otherwise.

5 AAKASHIANS IN TOP 10 AIR NEET(UG) 2025



OUR NATIONAL TOPPERS IN NEET (UG) 2025



Our Problem *Solvers* shine bright in **JEE (Advanced) 2025**

Our Top 100 AIR



Aakashians Create History in International Olympiads

(Classroom Program Students)



Dhruv Advani

IBO 2023



Gold Medalists

34th International Biology Olympiad



Rohit Panda



Chirag Falor



International Olympiad on Astronomy & Astrophysics



Dhiren Bhardwaj



32nd International Biology Olympiad



Anshul



32nd International Biology Olympiad



Amritansh Nigam



33rd International Biology Olympiad



Prachi Jindal



33rd International Biology Olympiad



Tanishka Kabra



54th International Chemistry Olympiad

1484 Students Scored Above MAS

420

Classroom Students
Qualified in
NSEs* 2024-25

(Group A & B)

49
NSEA*

(Group A & B)

229
NSEB*

(Group A & B)

70
NSEC*

(Group A & B)

38
NSEP*

34
NSEJS*

Aakashians Qualified for INO-2025



Krishna Agrawal
NSEA | NSEP | NSEC



Mohit Shekher Shukla
NSEA | NSEP | NSEC



Utkarsh Awadhya
NSEB | NSEP | NSEC



Rupayan Pal
NSEC | NSEP | NSEP



Devansh Garg
NSEJS



Aaron Thakkar
NSEJS

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 RMO 2024

899

Classroom Students

Qualified
in IOQM
2024



Joish Achyuta
Class - VIII



Dhanush Damu
Class - IX



Arnav Singh
Class - X



Pranit Goel
Class - XI



Aayush Agarwal
Class - XII

and many more...

Aakashians Qualified for INMO 2025

161

Classroom Students

Qualified
in RMO 2024-25



Kotha D Reddy
Reg. No. 00006657265



Abhipraya Verma
Reg. No. 00010407513



Aditya Singh
Reg. No. 00012631688



Rujul Garg
Reg. No. 00005153903



Mohit Shekher Shukla
Reg. No. 00006093814

and many more...

Aakashians Qualified for OCSC/IMOTC-2025

25

Classroom Students

Qualified
in INOs 2025



Pranit Goel
Qualified INMO



Harshit Singh
Qualified INJSO



Subhrojit Paul
Qualified INBO



Mohit Shekher Shukla
Qualified INChO



Rujul Garg
Qualified INPhO



Aditya Singh
Qualified INAO Jr

and many more...

Aakashians Qualified for Merit Certificate

1019

Classroom Students

Qualified
in IMO (Level-I)
2023-24



Intl.
Rank
1

Prisha Miglani
Class - IX



Intl.
Rank
2

Sushant Agarwal
Class - X



Intl.
Rank
4

Ekaashar Gupta
Class - IX



Intl.
Rank
7

Harshit Singh
Class - VIII

438

Classroom Students

Qualified
in IMO (Level-II)
2024

and many more...

Aakashians Qualified for Merit Certificate

4902

Classroom Students

Qualified
in NSO (Level-I)
2024-25



Intl.
Rank
2

Meghav Ladani
Class - X



Intl.
Rank
2

Anubhab Manna
Class - VIII



Intl.
Rank
3

Arnav Gupta
Class - IX



Intl.
Rank
7

Parshti Bajpai
Class - IX



Intl.
Rank
10

Shreya
Class - VIII

and many more...