

My Favorite Guide On

SCIENCE & TECHNOLOGY-I

विज्ञान व तंत्रज्ञान भाग-1

Std 10th - Semi English



Strictly As Per BOARDS New Syllabus



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महाराष्ट्रात
प्रथमच...

11th आणि 12th (Science) ची पुस्तके
English व Scientific मराठी मधून...

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PUNE | LATUR PATTERN

TOPIC – 01 GRAVITATION

1.1 Introduction:

We have seen in the previous standard that the gravitational force is a universal force and it acts not only between two objects on the earth but also between any two objects in the universe.

Q.1 Can you recall?

1) What are the effects of a force acting on an object?

Ans: Effects of force acting on an object:

- i) A force can set a body in motion. For example, if a ball at rest on the floor is pushed, it rolls on the floor.
- ii) A force can stop a moving body. For example, a moving bicycle can be brought to rest by application of brakes.
- iii) A force acting on a body can change speed of the body. For example, when brakes are applied to a moving a bicycle its speed decreases due to the friction between the brake shoes and the rim of the type.
- iv) A force can change the direction of motion of the body, for example in uniform circular motion of a body. The direction of motion of the body keeps on changing due to the applied force.

2) What types of forces of a familiar with?

Ans: Types of forces:

- i) The gravitational force between the earth and the moon.
- ii) Electromagnetic force between two charged particles in motion.
- iii) The nuclear force between a proton and a neutron in the nucleus of an atom.

3) What do you know about the gravitational force?

Ans: Gravitational force: The gravitational force is a universal force, i.e., it acts between any two objects in the universe.

१.१ Gravitation (गुरुत्वाकर्षण) -

Introduction (प्रस्तावना) -

मागील इयत्तेमध्ये आपण gravitational force हा universal force (वैश्विक) असून तो पृथ्वीवरीलच नाही तर या universe मधील कोणत्याही दोन object मध्ये कार्यरत असतो, हे शिकलो आहे.

Q.१ - Can you recall (थोडे आठवा) -

१) एखाद्या object वरती force act झाल्यावर काय effect होतो?

- Ans:** i) force apply केल्यामुळे moving body, rest position ला आणता येते तसेच ती motion मध्ये आणता येते.
 ii) Force act केल्यामुळे body च्या speed मध्ये बदल करता येतो.
 iii) Force act केल्यामुळे एखाद्या moving body ची direction बदलता येते.

२) Types of forces -

Ans: earth आणि moon मधील gravitational force, गतिमान (motion) प्रभारीत charged particles मधील electromagnetic force, Atom च्या nucleus मधील proton आणि neutron मधील nuclear force.

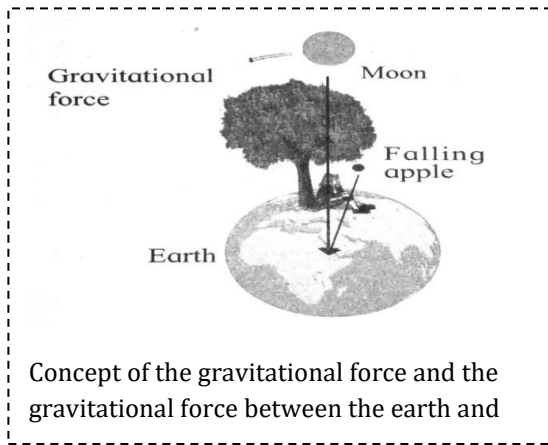
३) Gravitational force बदल तुम्हांला काय माहित आहे?

Ans: i) Gravitational force हा universal force आहे. तसेच ते universe मधील कोणत्याही दोन वस्तुमध्ये कार्यरत असते.

1.2 Gravitation:

Gravitation:

- i) The phenomenon of gravitation was discovered by Sir Isaac Newton.
- ii) As the story goes, he discovered the force by seeing an apple fall from a tree on the ground.
- iii) He wondered why all apples fall vertically downward and not at an angle to the vertical.
- iv) After much thought, he came to the conclusion that the earth must be attracting the apple towards itself and this attractive force must be directed towards the center of the earth.
- v) The direction from the apple on the tree to the center of the earth is the vertical direction at the position of the apple and thus, the apple falls vertically downwards.
- vi) Newton thought that if the force of gravitation acts on apples on the tree at different height from the surface of the earth, it can also act on objects at even greater heights, much farther away from the earth.



१.२ Gravitation (गुरुत्वाकर्षण):

- Gravitation चा शोध सर आयझॅक न्युटन यांनी लावला.
- As a story, न्युटन यांनी सफरचंदाच्या झाडाकडे पाहत असताना निरीक्षण करून त्यांचा शोध लावला.
- त्यांना असा प्रश्न पडला की सर्व apple हे vertical direction (सरळ रेषेत) खालीच का पडतात, ते सरळ रेषेशी कोणताही कोन न करता खाली पडतात.
- बऱ्याच विचारांती, त्यांनी असे conclusion काढले की earth attracts apple towards itself आणि this attraction force must be directed towards the centre of earth.
- Apple खाली पडण्याची जी direction हा centre of earth ला vertical आहे म्हणून apple हा vertically downward direction नी खाली पडतो.
- न्युटनने असा विचार केला की, force of gravitation हा झाडावरील apple च्या उंचीनुसार कार्यरत असतो आणि तो gravitational force हा earth वरील उंचीवरील वस्तुवर सुद्धा कार्यरत असेल का?

1.3 Force and Motion:

i) Force and motion: A force is necessary to change the speed as well as the direction of the motion of an object.

Q.2 Can you recall?

1) What are the Newton's laws of motion?

Ans: Newton's laws of motion:

i) Newton's first law of motion: An object continues to remain at rest in a state of uniform motion along a straight line unless an external unbalance force acts on it.

ii) Newton's second law of motion: The rate of change of momentum is proportional to the applied force and the change of momentum occurs in the direction of the force.

iii) Newton's third law of motion: Every action force has an equal and opposite reaction force which acts simultaneously.

(Note: Equal in magnitude and opposite in direction)

१.३ Force And motion:

आपणाला माहित आहे की, एखाद्या object च्या magnitude आणि direction मध्ये बदल घडवून आणण्यासाठी त्या object वर force apply (प्रयुक्त) करावा लागतो.

Q.२ Can you tell (थोडे आठवा)

Newton's laws of motion (न्युटनचे गतिविषयक) नियम कोणते?

Ans: i) Newton's first law of motion - (न्युटनचा गतिविषयक पहिला नियम) - प्रत्येक object हा कोणतेही external force apply होत नाही तोपर्यंत ती वस्तु तिच्या rest position ला किंवा motion मध्ये असेल सरळ रेषेत गतिमान राहते.

ii) Newton's second law of motion - (न्युटनचा गतिविषयक दुसरा नियम) - एखाद्या object हा accelerated (त्वरणीय) गतीमध्ये असेल तर हे $accl^n$ त्या object वर प्रयुक्त होणाऱ्या net force शी समानुपाती आणि त्या object च्या mass शी व्यस्तानुपाती असते.

iii) Newton's third law of motion - (न्युटनचा गतिविषयक तिसरा नियम) - निसर्गातील प्रत्येक action force ला त्याच परिमाणाचे समान आणि विरुद्ध दिशेने opposite force कार्यरत असतो.

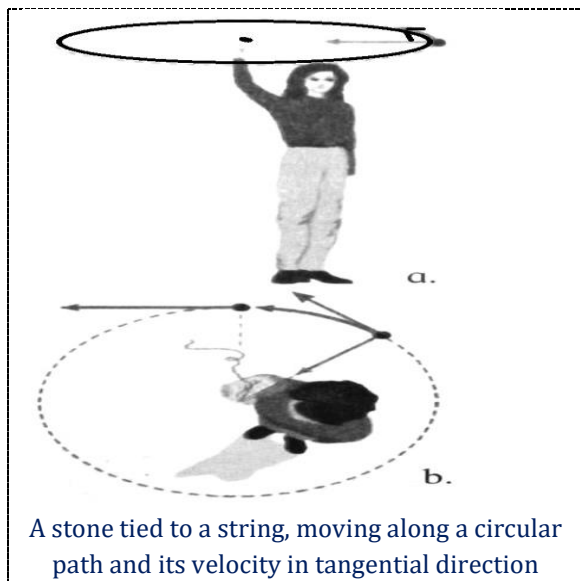
1.4 Circular motion and Centripetal force:

Q.3 Define Circular motion with an example.

Ans: Circular motion: i) Definition: Circular motion is a movement of an object along the circumference of a circle or rotation along a circular path.

ii) It can be uniform, with constant angular rate of rotation and constant speed, or non-uniform with a changing rate of rotation.

iii) **Examples:** An artificial satellite orbiting the earth at constant height, a stone which is tied to a rope and is being swung in circles.



Q.4 Define Centripetal force with an example.

Ans: Centripetal force:

- i) **Definition:** A force acts on any object moving along a circle and it is directed towards the Centre of the circle. This is called the centripetal force.
- ii) 'Centripetal' means Centre seeking, i.e. the object tries to go towards the Centre of the circle because of this force.
- iii) **Examples:** The force of gravity acting on a satellite in orbit, the friction of the tires of a car making a turn.

१.४ Circular motion (वर्तुळाकार गती) आणि Centripetal force (अभिकेंद्री बल):

- Q.३** i) Circular motion ही object ची circle च्या circumference वरील movement आहे किंवा circular path वरील rotation आहे.
- ii) ती constant angular rate of rotation आणि constant speed सह uniform असु शकते, किंवा changing rate of rotation सह non-uniform असु शकते.

Q.४ Centripetal force (अभिकेंद्रके बल) - circle च्या along move होणा-या object वर act होणारा force कि जो circle च्या center च्या दिशेने असतो, त्याला centripetal force म्हणतात.

ii) Centripetal म्हणजे centre seeking (केंद्राच्या दिशेने)

1.5 Kepler's Laws:

Kepler's Laws:

- i) Planetary motion had been observed by astronomer since ancient times. Before Galileo, all observations of the planet's positions were made with naked eyes.
- ii) By the 16th century a lot of data were available about planetary positions and motion.
- iii) Johannes Kepler, studied these data. He noticed that the motion of planets follows certain laws.
- iv) He stated three laws describing planetary motion. These are known as Kepler's laws which are given below.

Q.5 State and explain the Kepler's law of planetary motion.

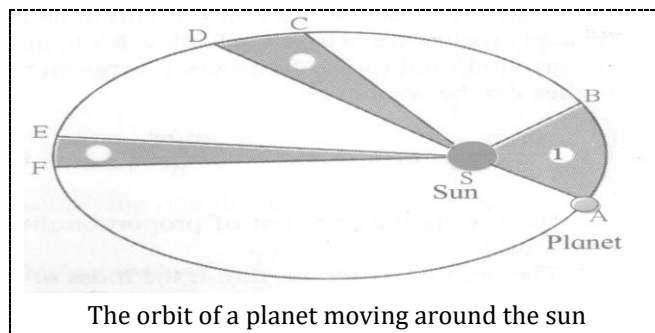
OR

Q.5 Write the three laws of planetary motion given by Kepler.

OR

Q.5 Explain with diagram: Kepler's three laws. Hence, show that gravitational force, $F = \frac{1}{r^2}$. (In the usual notation)

Ans: Kepler's laws of planetary motion:



The orbit of a planet moving around the sun

Kepler's first law:

- i) **Statement:** The orbit of a planet is an ellipse with the Sun at one of the foci.
- ii) Figure shows the elliptical orbit of a planet revolving around the sun. The position of the Sun is indicated by S.

Kepler's second law:

- i) **Statement:** The line joining the planet and the Sun sweeps equal areas in equal intervals of time.

ii) AB and CD are distance covered by the planet in equal time i.e. after equal intervals of time, the positions

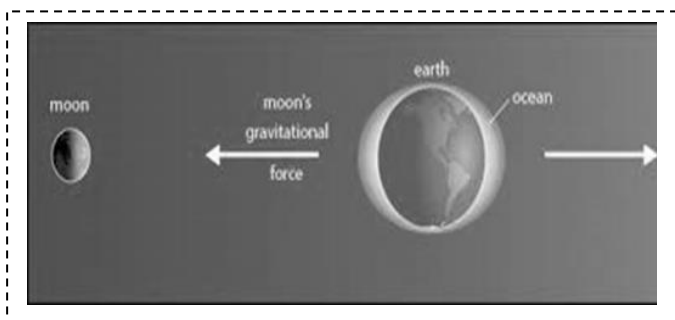
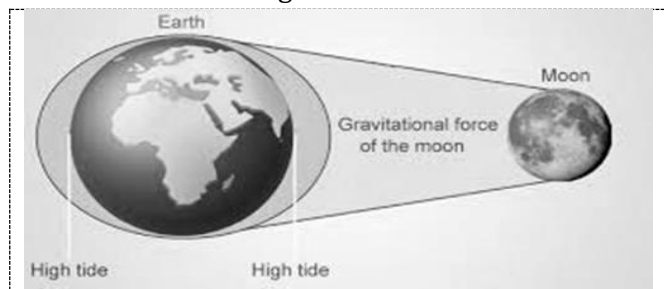
Q.8 Do you know? Low and high tides.

OR

Q.8 Give scientific reason: Low and high tides are regular phenomena.

Ans: Low and high tides:

- You must know about the high and low tides that occur regularly in the sea.
- The level of sea water at any given location along sea shore increases and decreases twice a day at regular intervals.
- High and low tides occur at different times at different places. The level of water in the sea changes because of the gravitational force exerted by the moon.
- Water directly under the moon gets pulled towards the moon and the level of water there goes up causing high tide at that place.
- At two places on the earth at 90° from the place of high tide, the level of water is minimum and low tides occur there as shown figure.



Q.9 Acceleration due to gravity (गुरुत्वीय त्वरण) किंवा acceleration due to gravity (गुरुत्वीय त्वरण) व्याख्या लिहा.

Ans: Earth (पृथ्वीच्या) gravitation force मुळे body मध्ये produce (निर्माण) होणाऱ्या acceleration (त्वरण) ला acceleration due to gravity (गुरुत्वीय त्वरण) म्हणतात.

Q.10 Law and high tides (भरती आणि ओहोटी) -

Ans: i) आपणाला माहित आहे की, Law and high tides (भरती आणि ओहोटी) या regularly (नियमितपणे) sea (समुद्र) मध्ये घडून येतात.

ii) Sea water (समुद्र पाण्याचा) च्या level sea shore (समुद्र किनारी) दिवसातून दोन वेळा increase (वाढणे) आणि decrease (कमी होणे) होते.

iii) High tides आणि low tides या different time (वेगवेगळ्या वेळी) ला different place ला घडून येतात. Sea water level हा moon (चंद्र) कडून exert (प्रयुक्त) केल्या जाणाऱ्या gravitation force मुळे बदलत असते.

iv) Moon (चंद्राच्या) च्या directly खाली असणारे water moon चंद्राकडे pulled toward (खेचले जाते) आणि त्या ठिकाणी असणारी water level मुळे high tides त्या ठिकाणी घडून येतात.

v) High tide च्या ठिकाणी earth (पृथ्वी) वरती दोन ठिकाणी 90° ला water level minimum असते आणि त्या ठिकाणी low tide घडून येते.

1.7 Earth's gravitational force:

Q.9 Write short note on: Earth's gravitational force.

Ans: Earth's gravitational force:

- The earth attracts every object near it towards itself because of the gravitational force.
- The center of mass of the earth is situated at its center, so the gravitational force on any object due to the earth is always directed toward center of the earth.
- Because of this force, an object falls vertically downwards on the earth.
- Similarly, when we throw a stone vertically upwards, this force tries to pull it down and reduces its velocity.
- Due to this constant downward pull, the velocity becomes zero after a while.
- The pull continues to be exerted and the stone start moving vertically downward towards the center of the earth under its influence.
- The gravitational force due to the earth also acts on the moon because of which it revolves around the earth. Similar situation exists for the artificial satellites orbiting the earth.

viii) The moon and the artificial satellites orbit the earth. The earth attracts them towards itself but unlike

Q.२५ सांगा पाहु?

i) Modern periodic table चे निरीक्षण करा आणि group १ मधील element ची नावे एका खाली एक लिहा.

Ans: i) Group १ मधील element: Hydrogen (H), Lithium (Li), Sodium (Na) आणि Potassium (K).

ii) मुलद्रव्यांचे electronic configuration (संरूपण) वरील तक्त्यामध्ये दिले आहे.

iii) या element च्या configuration मध्ये कोणते साम्य (similarity) दिसून येते?

Ans: या सर्व element ची valence electron (संयुजा इलेक्ट्रॉन) हा १ आहे.

iv) या element चे valence electron संख्या किती आहे?

Ans: या सर्व element ची valence electron (संयुजा इलेक्ट्रॉन) हा १ आहे.

Q.26 Can you tell?

i) On going through the modern periodic table, it is seen that the elements Li, Be, B, C, N, O, F and Ne belong to the period 2 write down electronic configuration all of them.

Ans:

Sr. No.	Elements	Electronic configuration
I	Li	2, 1
ii	Be	2, 2
iii	B	2, 3
iv	C	2, 4
v	N	2, 5
vi	O	2, 6
vii	F	2, 7
viii	Ne	2, 8

ii) Is the number of valence electrons same for all these elements?

Ans: The number of valence electrons is different for this entire element.

iii) Is the number of shells same the same in these?

Ans: The number of shells same is the same.

Q.२६ सादणीचे निरीक्षण करून विचारलेल्या प्रश्नांचे उत्तर लिहणे अपेक्षित आहे.

तिसऱ्या period मधील element ची metal, nonmetals आणि metalloid मध्ये वर्गीकरण करा तसेच त्यांचे periodic table मधील स्थान लिहा. यासाठी periodic table चे निरीक्षण करून उत्तरे लिहा.

Q.27 Use your brain power!

i) Look at the elements of third period classify them into metals and nonmetals.

Ans: Third row: Na, Mg, Al, Si, P, S, Cl, Ar

Metals: Na, Mg, Al

Nonmetals: P, S, Cl, Ar

ii) On which side of the period are metals left or right?

Ans: left side of the period are the metals.

ii) On which side of the period did you find the nonmetals?

Ans: Right sides of the period are the nonmetals.

Q.28 Use your brain power!

i) What is the Cause of nonmetallic character of elements?

Ans: The tendency of an element to form anion or electronegativity is the nonmetallic character.

ii) What is the expected trend in the variation of nonmetallic character of elements from left to right in period?

Ans: In a period as the atomic number increases from left to right electronegativity increases non-metallic character decreases this is due to decrease in the atomic size.

iii) What would be the expected trend in the variation of nonmetallic character of elements down a group?

Ans: In a group as the atomic number increases electropositivity increases while electronegativity decreases, nonmetallic character decreases.

Q.२८ जरा डोके चालवा.

i) मुलद्रव्यांचा non-metallic character (अधातु गुणधर्म) कशामुळे असतो?

Ans: Element ची anion (ऋण आयन) किंवा electronegativity निर्माण करण्याची क्षमता (tendency) म्हणजे non-metallic character होय.

ii) Period (आवर्त) मध्ये डावीकडून उजवीकडे जाताना element चा non-metallic character बदलण्याचा कोणता trend (कल) अपेक्षित आहे?

Ans: Period (आवर्त) मध्ये atomic number डावीकडून उजवीकडे वाढत जातो. Electronegativity (ऋण आयन) increases, non-metallic character (अधातु गुणधर्म) कमी होत, या सर्वांचे कारण कमी होत जाणारी atomic size (अणु आकारमान) आहे.

iii) Group मध्ये वरून खाली जाताना element चा non-metallic character बदलण्याचा कोणता (trend) दिसून येण्यामागे काय अपेक्षित आहे?

Ans: Group मध्ये वरून खाली जाताना atomic number वाढत जातो. Electropositivity वाढते, परंतु electronegativity कमी होत जाते.

Q.29 Can you recall?

Shell	N	$2n^2$	Electron capacity
K	1	2×1^2	2
L	2	2×2^2	8
M	3	2×3^2	18
N	4	2×4^2	32

i) What are the values of n for the shells K, L and M?

Ans.: For the shell K, the value of n is 1.
For the shell L, the value of n is 2.
For the shell M, the value of n is 3.

ii) What is the maximum number of electrons that can be accommodated in a shell? Write the formula.

Ans: The maximum number of electrons that can be accommodated in a shell is 32 electrons. The formula is $2n^2$.

iii) Deduce the maximum electron capacity of the shells K, L and M.

Ans: For the shell K, the maximum electron capacity is 2 electrons.

For the shell L, the maximum electron capacity is 8 electrons.

For the shell M, the maximum electron capacity is 18 electrons.

Q.२९ वरील तक्त्याचे observation वरून विचारलेल्या प्रश्नाची उत्तरे लिहणे अपेक्षित आहे.

Q.30 Write down the electronic configuration of the following elements from the given atomic numbers. Answer the following question with explanation.

i) ${}_3\text{Li}$, ${}_{14}\text{Si}$, ${}_2\text{He}$, ${}_{11}\text{Na}$, ${}_{15}\text{P}$. Which of these elements belong to the period 3?

Ans.:

Sr. No.	Elements	Electronic configuration
i	${}_3\text{Li}$	2, 1
ii	${}_{14}\text{Si}$	2, 8, 4
iii	${}_2\text{He}$	2
iv	${}_{11}\text{Na}$	2, 8, 1
v	${}_{15}\text{P}$	2, 8, 5

Elements belong to the 3rd period: ${}_{14}\text{Si}$, ${}_{11}\text{Na}$, ${}_{15}\text{P}$

ii) ${}_1\text{H}$, ${}_7\text{N}$, ${}_{20}\text{Ca}$, ${}_{16}\text{S}$, ${}_4\text{Be}$, ${}_{18}\text{Ar}$. Which of these elements belong to the second group?

Ans:

Sr. No.	Elements	Electronic configuration
i	${}_1\text{H}$	1
ii	${}_7\text{N}$	2, 5
iii	${}_{20}\text{Ca}$	2, 8, 8, 2
iv	${}_{16}\text{S}$	2, 8, 6
v	${}_4\text{Be}$	2, 2
vi	${}_{18}\text{Ar}$	2, 8, 8

Elements belong to the second group: ${}_4\text{Be}$ and ${}_{20}\text{Ca}$

iii) ${}^7\text{N}$, ${}^6\text{C}$, ${}^8\text{O}$, ${}^5\text{B}$, ${}^{13}\text{Al}$. Which is the most electronegative element among these?

Ans:

Sr. No.	Elements	Electronic configuration
i	${}^7\text{N}$	2, 5
ii	${}^6\text{C}$	2, 4
iii	${}^8\text{O}$	2, 6
iv	${}^5\text{B}$	2, 3
v	${}^{13}\text{Al}$	2, 8, 3

Among these, ${}^8\text{O}$ is the most electronegative element.

iv) ${}^7\text{Be}$, ${}^6\text{C}$, ${}^8\text{O}$, ${}^5\text{B}$, ${}^{13}\text{Al}$. Which is the most electropositive element among these?

Ans:

Sr. No.	Elements	Electronic configuration
i	${}^4\text{Be}$	2, 2
ii	${}^6\text{C}$	2, 4
iii	${}^8\text{O}$	2, 6
iv	${}^5\text{B}$	2, 3
v	${}^{13}\text{Al}$	2, 8, 3

Among these, ${}^{13}\text{Al}$ is the most electropositive element.

v) ${}^{11}\text{Na}$, ${}^{15}\text{P}$, ${}^{17}\text{Cl}$, ${}^{14}\text{Si}$, ${}^{12}\text{Mg}$. Which of these has largest atoms?

Ans:

Sr. No.	Elements	Electronic configuration
i	${}^{11}\text{Na}$	2, 8, 1
ii	${}^{15}\text{P}$	2, 8, 5
iii	${}^{17}\text{Cl}$	2, 8, 7
iv	${}^{14}\text{Si}$	2, 8, 4
v	${}^{12}\text{Mg}$	2, 8, 2

${}^{11}\text{Na}$ has the largest atomic atom.

vi) ${}^{19}\text{K}$, ${}^3\text{Li}$, ${}^{11}\text{Na}$, ${}^4\text{Be}$. Which of these atoms has smallest atomic radius?

Ans:

Sr. No.	Elements	Electronic configuration
i	${}^{19}\text{K}$	2, 8, 8, 1
ii	${}^3\text{Li}$	2, 1
iii	${}^{11}\text{Na}$	2, 8, 1
iv	${}^4\text{Be}$	2, 2

${}^4\text{Be}$ has smallest atomic radius.

vii) ${}^{13}\text{Al}$, ${}^{14}\text{Si}$, ${}^{11}\text{Na}$, ${}^{12}\text{Mg}$, ${}^{16}\text{S}$. Which of the above elements has the highest metallic character?

Ans:

Sr. No.	Elements	Electronic configuration
i	${}^{13}\text{Al}$	2, 8, 3
ii	${}^{14}\text{Si}$	2, 8, 4
iii	${}^{11}\text{Na}$	2, 8, 1
iv	${}^{12}\text{Mg}$	2, 8, 2
v	${}^{16}\text{S}$	2, 8, 6

${}^{11}\text{Na}$ has the highest metallic character.

viii) ${}^6\text{C}$, ${}^3\text{Li}$, ${}^9\text{F}$, ${}^7\text{N}$, ${}^8\text{O}$. Which of the above elements has the highest nonmetallic character?

Ans:

Sr. No.	Elements	Electronic configuration
i	${}^6\text{C}$	2, 4
ii	${}^3\text{Li}$	2, 1
iii	${}^9\text{F}$	2, 7
iv	${}^7\text{N}$	2, 5
v	${}^8\text{O}$	2, 6

${}^9\text{F}$ has the highest nonmetallic character.

Q.३० दिलेल्या element च्या atomic number वरून त्यांचे electronic configuration (संरूपण) लिहा. विचारलेल्या प्रश्नांची उत्तरे स्पष्टीकरणासह लिहा.

Ans: प्रत्येक question चे answer लिहण्यासाठी element चे electronic configuration लिहा. त्यावरून विचारलेल्या प्रश्नांची उत्तरे लिहा यासाठी modern periodic table चा अभ्यास करावा. Element च्या metallic & non-metallic character वरून उत्तरे लिहा.

3.6 Types of chemical reactions:**Q.10 Explain the types of chemical reaction with example.**

Ans: Types of chemical reaction: Chemical reactions are classified into the following four types in accordance with the nature and the number of the reactants and the products.

3.6.1 Combination reaction:**Q.11 Define combination reaction with example.**

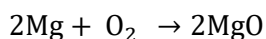
OR

Q.11 Explain the term combination reaction with example.

Ans: Combination reaction: When two or more reactants combine in a reaction to form a single product it is called a combination reaction.

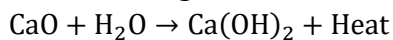
ii) Example:

a) Hold a magnesium (Mg) strip in a pair of tongs and ignite. On burning in air a white powder of magnesium oxide is formed. The reaction can be written in the form of equation as shown below.



In this reaction magnesium oxide is formed as the single product by combination of magnesium and oxygen.

b) Calcium hydroxide (Ca(OH)_2) is formed by combination of calcium oxide and water with generation of large amount of heat.



Calcium oxide

Calcium hydroxide

Combination reaction (संयोग अभिक्रिया) -**Types of Reaction (रासायनिक समीकरणाचे प्रकार):****Q-१० Chemical reaction चे प्रकार व example:**

Ans: i) Chemical reaction चे त्याच्या nature (स्वरूप) आणि product आणि reactant च्या संख्येवरून चार प्रकार पडतात.

Q-११ Combination reaction - जेव्हा reaction मध्ये two or more reactants (अभिक्रियाकारके) combine (संयोग) होवून एकच (single) product तयार होतो त्या reaction ला combination reaction म्हणतात.

ii) **Example-** a) Magnesium ची strip चिमट्यामध्ये धरून पेटवा. हवेमध्ये ती जाळली असता magnesium oxide तयार होते. ही reaction वरील प्रमाणे equation मध्ये लिहता येते. या reaction मध्ये magnesium oxide हा single product magnesium आणि oxygen यांच्या combination मधून तयार होतो.

iii) **Example -** Calcium oxide आणि water यांच्या combination मधून calcium hydroxide आणि प्रचंड प्रमाणात heat तयार होते. त्याचे equation वरीलप्रमाणे दिले आहे.

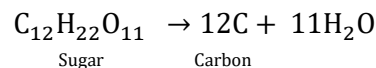
3.6.2 Decomposition reaction:**Q.12 Define decomposition reaction with example.**

OR

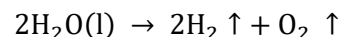
Q.12 Explain the term decomposition reaction with example.

Ans: Decomposition reaction: The chemical reaction in which two or more products are formed from a single reactant is called "Decomposition reaction".

ii) **Example:** A single reactant sugar is divided into two substances (C and H_2O)



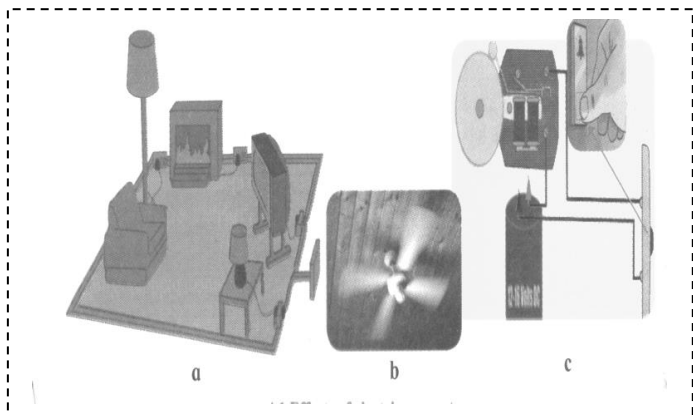
iii) Water decomposes into hydrogen and oxygen gases on passing electric current through acidulated water. This decomposition takes place by means of electrical energy. Therefore, it is called electrolysis.

**Q-१२ Decomposition reaction (अपघटन अभिक्रिया) व example**

Ans: ज्या chemical reaction मध्ये दोन किंवा दोनपेक्षा जास्त product (उत्पदिते) एकाच reactant पासून तयार होतात, त्या reaction decomposition reaction ला म्हणतात.

ii) **Example -** sugar (साखर) हा single reactant carbon आणि पाणी या दोन substances मध्ये divide होतो. Electric current pass (जाऊ दिला) केला असता water चे oxygen आणि hydrogen तयार होते. ही reaction electric energy मुळे घडून येते म्हणून याला electrolysis (विद्युत अपघटन) म्हणतात.

3.6.3. Displacement reaction:

Q.2 Observe and Discuss:**i) What do you observe in the following pictures?**

Ans: Lamps, TV, Computer, electric fan, electric bell.

ii) Which effects of electric current do you find?

Ans: Effects of electric current: Heating effect, magnetic effect, production of light, conversion of electric energy into mechanical energy and the conversion of that mechanical energy into sound.

Q.2 Observe and Discuss (निरीक्षण व चर्चा करा) -**i) वरील picture चे observation केले असता काय दिसून येते?**

Ans: Lamps (दिवा), TV (दूरदर्शन संच), computer (संगणक), electric fan (विद्युत पंखा) electric bell (विद्युत घंटी)

ii) Electric current चे कोणते effect तुम्हांला दिसून येतात?

Ans:- Heating effect (उष्णतेचा परिणाम)- Magnetic effect (चुंबकीय परिणाम), production of light (प्रकाशाची निर्मिती) electric energy (विद्युत उर्जा) चे mechanical energy (यांत्रिक उर्जा) चे होणारे conversion (रुपांतर) तसेच mechanical energy चे sound (ध्वनी) मध्ये होणारे conversion.

4.2 Energy transfer in an electric circuit:**Q.3 Explain the energy transfer in an electric circuit.**

Ans: Energy transfer in an electric circuit:

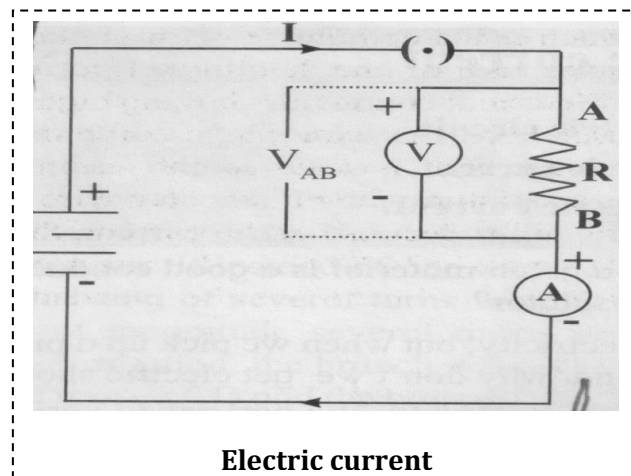
i) If a charge Q flows from A to B, work $V_{AB}Q$, has been done on Q while going from A to B.

ii) The source of energy is the cell.

iii) The cell gives this energy through the charge Q to the resistance where work $V_{AB} Q$ is performed.

iv) If the charge Q flows from A to B in time t , i.e. the work is performed in time t , then during that time the energy $V_{AB}Q$ is given to the resistor.

v) This energy is received by the resistor and is converted into heat energy, the temperature of the increased.



$$\text{vi) } P = \text{Electrical power} = \frac{\text{Energy}}{\text{Time required}} = \frac{V_{AB}Q}{t}$$

$$= V_{AB}I \quad \dots\dots (1) \quad \because \frac{Q}{t} = I,$$

vii) The source of energy, the cell, gives in time t , the energy $P \times t$ to the resistor. If I is the current flowing continuously through the circuit, the heat produced in the resistor in time t will be

$$H = P \times t = V_{AB} \times I \times t \quad \dots\dots\dots(2)$$

viii) According to Ohm's law,

$$V_{AB} = I \times R \quad \dots\dots\dots (3)$$

$$H = V_{AB}^2 \times \frac{t}{R} \quad \dots\dots\dots (4)$$

$$\text{ix) Similarly, } H = I \times I \times R \times t = I^2 \times Rt \quad \dots\dots\dots (5)$$

$H = I^2 \times R \times t$ is called Joules law of heating.

Unit of electrical power:

$$\text{x) } P = V_{AB} \times I = \text{Volt} \times \text{Amp} \quad \dots\dots\dots (6)$$

$$1 \text{ Volt} \times 1 \text{ Amp} = \frac{1\text{J}}{1\text{C}} \times \frac{1\text{C}}{1\text{s}} \quad \dots\dots\dots (7)$$

$$\frac{1\text{J}}{\text{s}} = \text{W (Watt)} \quad \dots\dots\dots (8)$$

Thus the unit of electrical power is 1W (watt).

Energy transfer in an electric circuit (विद्युत परिपथामध्ये ऊर्जेचे स्थानांतरण):

Q.३. Electric circuit मध्ये होणारे energy transefer:

Ans: i) जर Q इतका electric charge A पासून B कडे गेला तर या electric charge वर A पासून B पर्यंत flow होताना VABQ इतके work (कार्य) होते.

ii) हे work घडून येण्यासाठी cell (घट) हा energy चा source आहे.

iii) Charge Q मुळे energy ही cell मधून resistance ला मिळते आणि VABQ हे work घडून येते.

iv) जेव्हा charge Q हा A पासून B पर्यंत t यावेळेत flow होतो तेव्हा VABQ ही energy resistance ला t या वेळेत मिळते.

v) ही energy resistor कडून receive करतो आणि heat energy मध्ये convert करतो त्यामुळे temperature increase होते.

vi) Energy source ने t यावेळेत $p \times t$ इतकी energy resistance ला दिली. जर circuit मधून I इतका electric current continuously (सतत) flow होत असेल तर t या time मध्ये resistor मध्ये निर्माण होणारी heat equation मध्ये दिल्याप्रमाणे असेल.

viii) Ohm च्या नियमानुसार equation-३ मिळते म्हणून equation-२ वरून equation-४ व equation-५ मध्ये Heat energy चा formula मिळतो. शेवटी $H = I^2RT$ याला joules law of heating (ज्युलचा उष्णता विषयक नियम) म्हणतात.

Electric power (विद्युतशक्ती) चे एकक equation-६, equation-७ आणि equation-८ वरून electric power चे एकक १W (वॅट) हे आहे.

Q.4 Define the following terms:

- 1) Electric power
- 2) The watt
- 3) Commercial unit of electric energy
- 4) Electricity bill

Ans: 1) Electric power: Electric power is the electric work done per unit time or electric energy used per unit time. Its SI unit is the watt (W).

$$\text{Electric power (P)} = \frac{\text{electric work (W) or electric energy used}}{\text{time (t)}}$$

$$P = VI = I^2R = V^2 / R$$

2) The watt: If one joule of electric work is done per second, the electric power is 1 watt.

$$1 \text{ watt (W)} = \frac{1 \text{ joule (J)}}{1 \text{ second (s)}}$$

3) Commercial unit of electric energy: The commercial unit of electric energy is the kilowatt hour (kW.h)

$$1 \text{ kW.h} = 3.6 \times 10^6 \text{ J}$$

It is commonly known as the unit.

4) Electricity bill: Electricity bill shows the consumption of units (i.e., KW.h) and the cost of using electric energy.

Q.४ १) Electric power (विद्युतशक्ती)-

i) Electric power म्हणजे unit time (एकक कालावधी) मध्ये घडून आलेले electric work done होय. त्याचे SI unit हे watt (W) आहे.

ii) electric power चा formula वरीलप्रमाणे आहे.

२) Watt (वॅट):

i) जर एक joule इतके electric work एका सेकंदामध्ये होत असेल तर, त्यास १watt electric power म्हणतात.

३) Electric energy चे commercial (व्यावसायिक) unit:

Electrical energy चे commercial unit हे kilowatt hour आहे ते सामान्यपणे unit म्हणून संबोधले जाते.

४) Electric bill - Electric bill हे consume (वापरलेले) units आणि त्याची रक्कम दर्शवते.

Q.5 Think about it!

How can we write mechanical power in a manner similar to the electric power?

$$\text{Ans: Mechanical power (P)} = \frac{\text{mechanical work (W)}}{\text{time (t)}}$$

$$P = \frac{W}{t} = \frac{F s \cos \theta}{t}$$

Always remember:

- i) The unit of power 1 W is a very small unit, hence 1000 W or 1 kW is used as unit to measure electric power, in practice. If 1 kW power is used for 1 hour, it will mean 1 kW $\times$ 1 h of electric energy is used.
- ii) kW. h = 1 kilowatt.hour = 1000 W $\times$ 3600 s = 3.6×10^6 J.

4.3 Heating effect of electric current:

Q.6 What is heating effect of electric current?

Ans: Heating effect of electric current: When a resistor is connected in an electrical circuit, heat is produced in it due to the current. This is known as the heating effect of current.

४.३ विद्युतधारेचा औष्णिक परिणाम - जेव्हा electric circuit मध्ये resistor जोडला जातो तेव्हा electric current मूळे heat निर्माण होते. यालाच heating effect of electric current म्हणतात.

4.3.1 Joules law about heating effect of electric current:

Q.7 Explain the Joules law about heating effect of electric current.

Ans: Joules law about heating effect of electric current:

i) The quantity of heat produced in a conductor of resistances R, when a current I flows through it for a time T is directly proportional to (1) the square of the current (2) the resistance of the conductor (3) the time for which the current flows.

$H = I^2 R t = V I t = \frac{V^2}{R} t$, where v is the potential difference across the conductor.

ii) Here, H is expressed in joule, V in volt, I in ampere, R in ohm and t in seconds, we have:

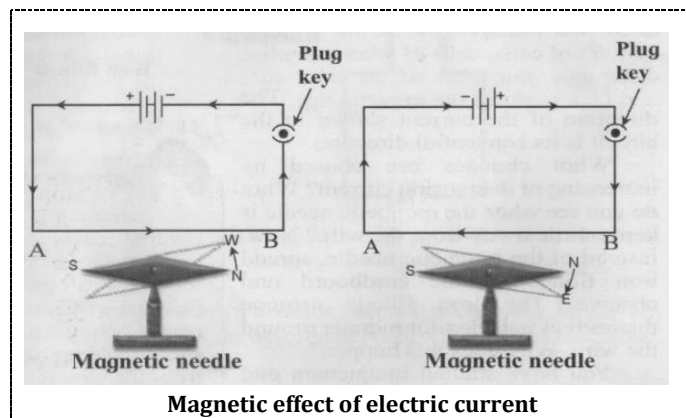
$$H = \frac{I^2 R t}{4.18} \text{ cal} = \frac{V I t}{4.18} \text{ cal} = \frac{V^2 t}{4.18 R} \text{ cal}$$

4.4 Magnetic effect of electric current:

Q.8 What is magnetic effect of electric current?

Ans: Magnetic effect of electric current:

i) When an electric current is passed through an electric resistor (electric conductor) heat is produced in it. Passage of electric current through a conductor also produces a magnetic field around it. This effect called magnetic effect of electric current was discovered by Hans Christian Oersted. The unit of intensity of magnetic field is Oersted.



Magnetic effect of electric current

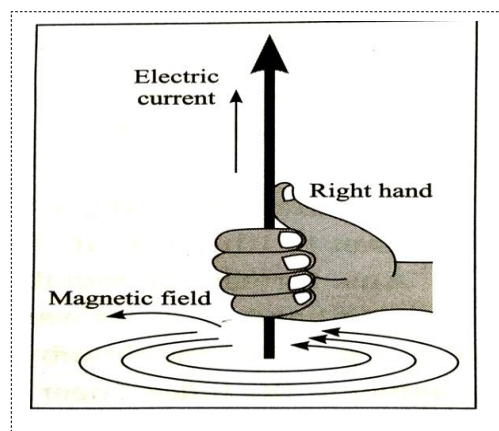
४.४ Magnetic effect of electric current (विद्युतधारेचा चुंबकीय परिणाम) -

i) जेव्हा electric current हा electric resistor मधुन pass होतो त्यावेळी त्याच्यामध्ये heat produce होते. Passage (मार्ग) of electric current हा conductor भोवती magnetic field produce करतो. यालाच magnetic effect of electrical current म्हणतात. हा effect Hans chritian Oersted यांनी शोधून काढला. Magnetic field च्या intensity (तीव्रता) चे unit oersted आहे.

4.5 Right hand thumb rule:

Q.9 State the Right hand thumb rule.

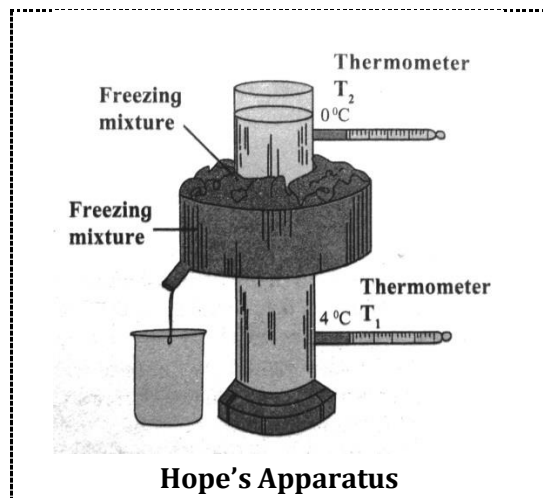
Ans: Right hand thumb rule: This is a convenient rule for finding out the direction of the magnetic field produced by a current flowing through an electrical conductor.



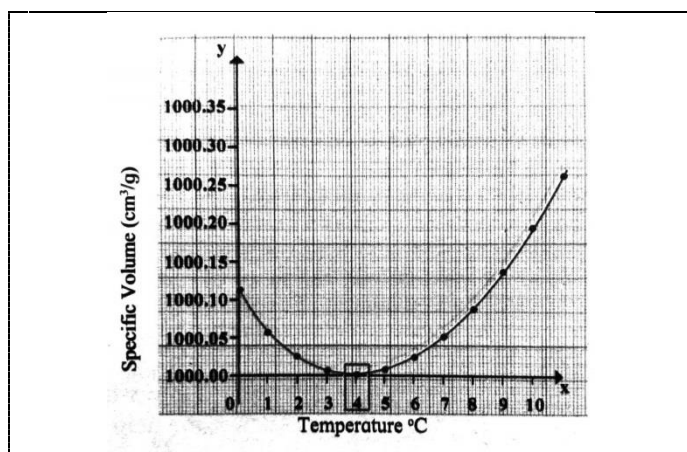
Statement: “Imagine that you have held the conductor in your right hand in such a way that your thumb points in the direction of the current. Then turn your fingers

Q.10 Draw the neat labelled diagram of Hope's apparatus. Explain how this apparatus can be used to demonstrate anomalous behaviour of water. Draw a graph of temperature of water against time.

Ans: Hope's apparatus to demonstrate anomalous behaviour of water:

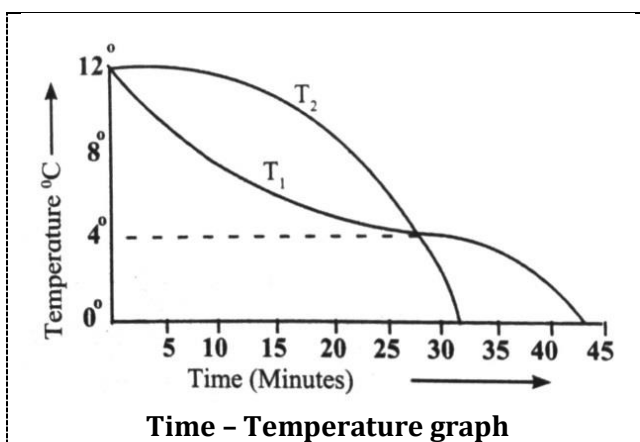


- i) Figure shows Hope's apparatus. Initially, the cylindrical container in Hope's apparatus is filled with water at about 12 °C and the flat bowl is filled with a freezing mixture of ice and salt.
- ii) The temperature of water in the upper part of the container (T_2) is recorded by thermometer T_2 and that water in the lower part of the container (T_1) is recorded by thermometer T_1 . Figure shows variation of temperature of water with time.
- iii) Initially, both the thermometers show the same temperature (say, 12°C).
- iv) In a short time, the temperature shown by the lower thermometer starts decreasing, while the temperature shown by the upper thermometer does not change very much.



Graph between Volume and Temperature of water

- v) This process continues till the temperature shown by the lower thermometer falls to 4°C and remains constant thereafter.
- vi) This shows that in the temperature range 12°C to 4°C, the density of the water in the central part of the container goes on increasing and hence the water sinks to the bottom.
- vii) It means that water contracts, i.e., its volume decreases as its temperature falls from 12°C to 4°C,
- viii) As the temperature of the water in the central part of the container becomes less than 4°C, the temperature shown by the upper thermometer begins to fall rapidly to 0°C.
- ix) But the temperature shown by the lower thermometer remains constant (4°C). Later, the reading shown by the lower thermometer decreases to 0°C.
- x) In the temperature range 4°C to 0°C, the water moves upward. This shows that the density of water goes on decreasing in this range.
- xi) It means that water expands, i.e. its volume increases as its temperature falls from 4°C to 0°C.
- xii) Thus, the volume of a given mass of water is minimum at 4°C i.e. the density of water is maximum at 4°C,
- xiii) In figure the point of intersection of the two curves shows the temperature at which the density of water is maximum. This temperature is 4°C.



Q-१० Hope या उपकरणाची (apparatus) चा उपयोग करून anomalous behaviour of water and Temperature of water - time graph:

Ans: i) वरील figure, Hopes apparatus दर्शवते. सुरुवातील (initially) hopes apparatus मध्ये cylindrical container (उभट नळकांडे) मध्ये 12°C temperature चे पाणी भरलेले असते आणि flat bowl (पसरट भांडे) मध्ये ice आणि salt (मीठ) यांचे freezing mixture (गोठण मिश्रण) भरलेले असते.

ii) Container (T_2) च्या upper part मध्ये असणाऱ्या पाण्याचे temperature thermometer T_2 ने record केले जाते आणि container (T_1) च्या lower part मध्ये असणाऱ्या पाण्याचे temperature thermometer (T_1) ने record केले जाते. वरील figure मध्ये पाण्याचे temperature चे time नुसार होणारे variation दर्शवण्यात आले आहे.

iii) सुरुवातीला दोन्ही thermometer हे same temperature (12°C) दर्शवतात.

iv) Short time मध्ये, container च्या lower part मधील पाण्याचे तापमान (T_1) decrease होत जाते तर upper part मधील पाण्याचे temperature (T_2) तुलनेने जास्त change होत नाही.

v) Container च्या lower part मधील thermometer चे temperature 4°C पर्यंत कमी होते आणि त्या ठिकाणी काही वेळ जवळ जवळ (thereafter) constant राहते.

vi) यावरून असे दिसून येते की, 12°C ते 4°C या temperature range मध्ये container च्या central part मधील पाण्याची density (घनता) वाढत गेलेली दिसून येते आणि पाणी bottom ला sink (तळाला जाणे) होते.

vii) याचा अर्थ, पाण्याचे contraction (आंकुचन) होते, म्हणजेच त्याचा volume (आकारमान) decrease होतो त्याप्रमाणे त्याचे temperature 12°C पासून 4°C पर्यंत कमी होते.

viii) Container च्या central part मधील पाण्याचे temperature 4°C पेक्षा कमी हाते, upper part मधील thermometer ने दर्शवलेले temperature 0°C पर्यंत वेगाने कमी होते.

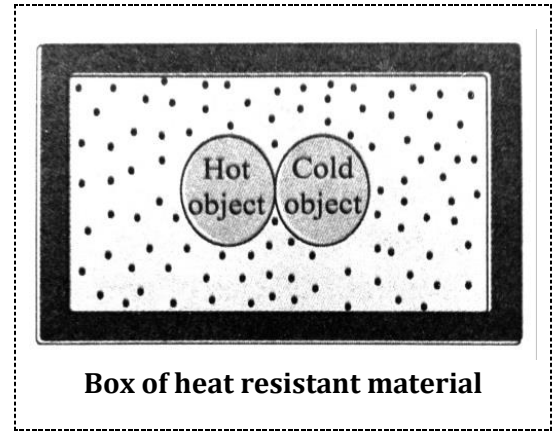
ix) परंतु lower thermometer चे temperature range मध्ये पाणी वरती (upward) जाते. यावरून असे दिसून येते की, या range मध्ये पाण्याची density कमी होत जाते.

x) म्हणजेच पाणी expand (प्रसरण) होते. Temperature 4°C ते 0°C पर्यंत कमी होताना त्याचा volume increase होतो.

xi) म्हणून, दिलेल्या mass of water चे volume 4°C ला minimum असतो. म्हणजेच पाण्याची density 4°C ला maximum असते.

xii) Figure मध्ये, दोन्ही curves चा point of intersection वरून असे दिसून येते की, जे temperature की ज्या ठिकाणी पाण्याची density maximum असते ते temperature 4°C आहे.

Heat Exchange:



i) If heat is exchanged between hot and cold objects, the temperature of the cold object goes on increasing, due to gain of energy and the temperature of hot object goes on decreasing due to loss of energy.

ii) The change in temperature continues till the temperatures of both the objects attain the same value. In this process, the cold object gains heat energy and the hot object loses heat energy.

iii) Heat energy lost by the hot object = Heat energy gained by the cold object. This is called as '**Principle of heat exchange**'.

Heat exchange (उष्णतेची देवाणघेवाण) -

i) जर hot आणि cold object मध्ये heat ची exchange (देवाणघेवाण) झाल्यास, hot object ची temperature कमी होत जाते आणि cold object चे temperature वाढत जाते.

ii) जोपर्यंत दोन्ही object चे temperature equal होत नाही तोपर्यंत temperature मधील हा change होत राहतो. या process मध्ये cold object हे heat energy gain करते आणि hot object हे heat energy loss करते.

iii) Object ने lost केलेली heat energy object ने gain केलेली heat energy ही equal असते, याला principle of heat exchange (उष्णता विनिमयाचे तत्व) म्हणतात.

Solved and Unsolved Numerical/ Problems:

1) Equal heat is given to two objects A and B of mass 1 g. Temperature of A increases by 3 °C and B by 5 °C. Which object has more specific heat? And by what factor?

Sol: Data: $m = 1 \text{ g}$, $\Delta T_1 = 3 \text{ }^\circ\text{C}$, $\Delta T_2 = 5 \text{ }^\circ\text{C}$ Q same
Here, $Q = mc_1\Delta T_1 = m c_2 \Delta T_2$

$$\therefore \frac{c_1}{c_2} = \frac{\Delta T_2}{\Delta T_1} = \frac{5^\circ\text{C}}{3^\circ\text{C}} = \frac{5}{3}$$

Thus, $c_1 > c_2$

The specific heat of A is more than that of B and

$$\frac{\text{specific heat of A}}{\text{specific heat of B}} = \frac{5}{3}$$

2) Liquid ammonia is used in ice factory for making ice from water. If water at 20 °C is to be converted into 2 kg ice at 0 °C, how many grams of ammonia are to be evaporated ?

(Given: the latent heat of vaporization of ammonia = 341 cal / g)

Sol: Data: $m_1 = 2 \text{ kg}$,

$$\Delta T_1 = 20 \text{ }^\circ\text{C} - 0 \text{ }^\circ\text{C} = 20^\circ\text{C},$$

$$c_1 = 1 \frac{\text{kcal}}{\text{kg}} \cdot ^\circ\text{C},$$

$$L_1 (\text{ice}) = 80 \frac{\text{kcal}}{\text{kg}},$$

$$L_2 (\text{vaporization of ammonia}) = 341 \frac{\text{cal}}{\text{g}},$$

$$= 341 \frac{\text{kcal}}{\text{kg}}$$

$$m_2 = ?$$

$$Q_1 (\text{heat lost by water}) = m_1 c_1 \Delta T_1 + m_1 L_1$$

$$= 2 \text{ kg} \times 1 \text{ kcal/kg} \cdot ^\circ\text{C} \times 20^\circ\text{C} + 2 \text{ kg} \times 80 \text{ kcal/kg}$$

$$= 40 \text{ kcal} + 160 \text{ kcal} = 200 \text{ kcal}$$

$$Q_2 (\text{heat absorbed by ammonia}) = m_2 \times L_2 \\ = m_2 \times 341 \text{ kcal/kg}$$

According to the principle of heat exchange, $Q_1 = Q_2$

$$\therefore 200 \text{ kcal} = m_2 \times 341 \text{ kcal/kg}$$

$$\therefore m_2 = \frac{200}{341} \text{ kg} = 0.5864 \text{ kg} = 586.4 \text{ g}$$

586.4 g of ammonia are to be evaporated.

3) A thermally insulated pot has 150 g ice at temperature 0°C. How much steam of 100 °C has to be mixed to it, so that water of temperature 50°C will be obtained?

(Given: Latent heat of melting of ice = 80 cal / g, Latent heat of vaporization of water = 540 cal / g, Specific heat of water = 1 cal / g · °C)

Sol: Data: $m_1 = 150 \text{ g}$,

$$\Delta T_1 = 50 \text{ }^\circ\text{C} - 0 \text{ }^\circ\text{C} = 50^\circ\text{C},$$

$$c_w = \frac{1 \text{ cal}}{\text{g}} \cdot ^\circ\text{C},$$

$$L_1 = 80 \text{ cal/g},$$

$$L_2 = 540 \text{ cal/g},$$

$$\Delta T_2 = 100 \text{ }^\circ\text{C} - 50 \text{ }^\circ\text{C} = 50 \text{ }^\circ\text{C}$$

$$m_2 = ? \quad Q_1 (\text{heat lost by ice}) = m_1 L \\ = 150 \text{ g} \times 80 \text{ cal/g} \\ = 1200 \text{ cal}$$

$$Q_2 (\text{heat absorbed by water formed on melting of ice}) \\ = m_1 c_w \Delta T_1 \\ = 150 \text{ g} \times 1 \frac{\text{cal}}{\text{g}} \cdot ^\circ\text{C} \times 50^\circ\text{C} = 7500 \text{ cal}$$

$$Q_3 (\text{heat given out by steam}) = m_2 L_2 \\ = m_2 \times 540 \text{ cal/g}$$

$$Q_4 (\text{heat given out by water formed on condensation of steam}) = m_2 c_w \Delta T_2 \\ = m_2 \times 1 \text{ cal/g} \cdot ^\circ\text{C} \times 50^\circ\text{C}$$

According to the principle of heat exchange, $Q_1 +$

$$Q_2 = Q_3 + Q_4$$

$$\therefore 1200 \text{ cal} + 7500 \text{ cal} = \\ = m_2 \times 540 \text{ cal/g} + m_2 \times 50 \text{ cal/g}$$

$$\therefore 19500 \text{ cal} = m_2 (540 + 50) \text{ cal/g}$$

$$\therefore m_2 = \frac{19500}{590} \text{ g} = 33.05 \text{ g}$$

$\therefore 33.05 \text{ g of steam is to be mixed.}$

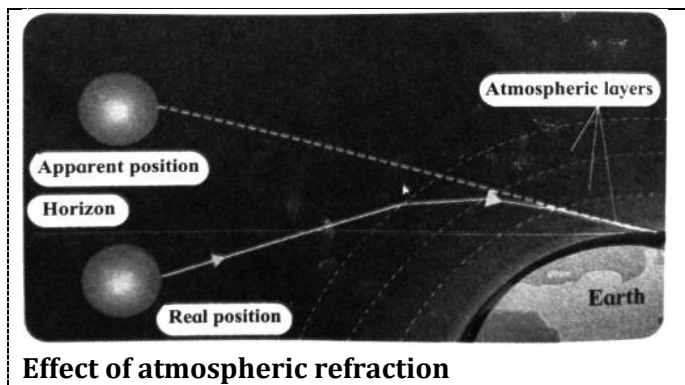
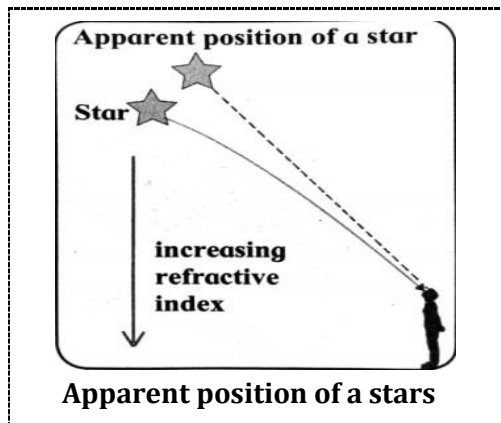
Q.17 Can you tell? /Twinkling of stars.

1) What is the correct reason for blinking / flickering of stars? Explain it.

- a) The blasts in the stars.
- b) Absorption of star light by the atmosphere.
- c) Motion of the stars.
- d) Changing refractive index of gases in the atmosphere.

Ans: Blinking / flickering of stars:

The correct reason is d) Changing refractive index of gases in the atmosphere.

**Explanation:**

i) As a star is far away from the earth, it appears as a point source of light. The density of air decreases with height above the earth's surface. Hence, the refractive index of air also decreases with height. When starlight enters the earth's atmosphere, it undergoes refraction continuously in the medium with gradually changing refractive index. The bending of starlight occurs towards the normal as it passes from the optically rarer part of the medium to the optically denser part.

ii) Hence, when a star is observed near the horizon, its apparent position is slightly higher than the actual position.

iii) Further, the apparent position varies with time as the medium is not stationary due to mobility of air and change in temperature. When more light is refracted towards the observer the star appears bright. When less light is refracted towards the observer, the star appears dim.

iv) Thus there is fluctuation in the brightness of a star when observed from the earth. This is called twinkling of a star.

v) Compared to stars, planets are relatively closer to the earth. Hence, a planet appears as a collection of a large number of point sources. Due to the changes in the refractive index of air, there is a change in the position and brightness of these point sources. There is an increase in intensity of light coming from some point source while there is a decrease in intensity of light coming from equal number of other point sources, on an average. The average brightness of a planet remains the same. Also, there is no change in the average position of a star. Hence, a planet does not twinkle.

vi) Therefore, Changing refractive index of the gases in the atmosphere results in blinking/flicking of stars.

Q-१७ Stars (तारे) चे Blinking / flickering (चमचमणे / लुकलुकणे) याचे योग्य (correct) reason:

Ans: i) Atmosphere मधील gases चा refractive index change (बदलत) होत राहतो. ज्याप्रमाणे star (तारे) हे earth पासून खूप दूर (far away) असल्याने ते light च्या point source सारखे दिसतात. Air ची density ही earth surface वर height नुसार decrease होत जाते. म्हणून refractive index सुद्धा height नुसार change होतो.

जेव्हा star light ही earth च्या atmosphere मध्ये enter करते तेव्हा medium मध्ये तिचे continuously refraction होते, त्यावेळी refractive index हळूहळू change होतो. Light ही optically rarer medium मधून optically denser medium मध्ये जात असताना ती normal कडे bend होते.

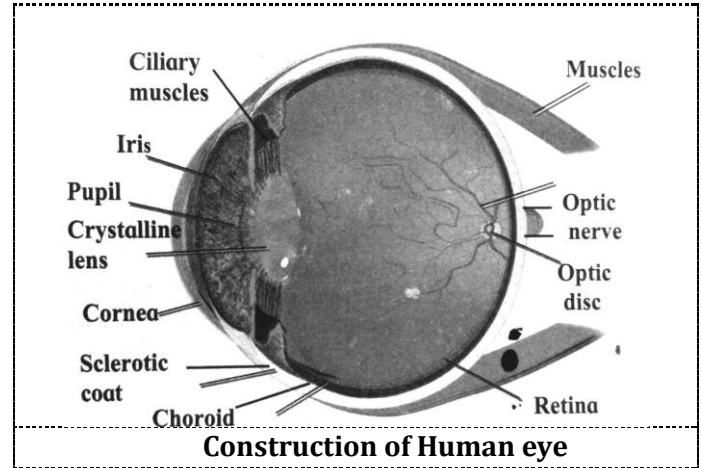
ii) म्हणून जेव्हा star चे horizon (क्षितीज) जवळ observation केले असता, तेव्हा star ची apparent (उलट प्रत्यक्ष दिसणारी) position ही actual (वास्तविक) position पेक्षा slightly (किंचित/थोड्या प्रमाणात) higher असते.

iii) याशिवाय (further) mobility of air (हवेची हालचाल) आणि temperature मधील change यामुळे medium हे stationary (स्थिर) राहत नाही. म्हणून apparent position ही time नुसार varies होते. जेव्हा जास्त light ही observer कडे refract झाली असता stars हे bright (स्पष्ट) दिसून येतात. जेव्हा कमी light ही observer कडे refract झाली असता stars हे dim (अस्पष्ट) दिसून येतात.

iv) म्हणून जेव्हा earth वरून आपण star चे observation करतो, त्यावेळी star च्या brightness (प्रखरता) मध्ये fluctuation (चढ उतार) दिसून येतो.

v) Star शी comparison करता, planets हे star पेक्षा earth च्या जवळ आहेत. म्हणून planet हे जास्त संख्येच्या point sources चे collection असलेले दिसून येतात. हवेच्या बदलत्या (change) refractive index मुळे point source कडून येणाऱ्या light ची intensity मध्ये वाढ होते तर काही point source कडून येणाऱ्या light ची intensity कमी होत राहते. Planet ची सरासरी brightness काही सारखीच राहते. त्याचप्रमाणे star च्या सरासरी position मध्ये बदल होत नाही. म्हणून planets हे चमकत नाहीत.

vi) अशा प्रकारे atmosphere मधील gases च्या बदलत्या refractive index (अपवर्तनांक) चा परिणाम म्हणजे blinking (चमचमणे) किंवा flickering of stars होय.



2) Working:

i) **Power of accommodation of the eye:** The ability of the eye lens to adjust its focal length is called the power of accommodation of the eye.

ii) **The minimum distance of distinct vision and the near point:** The minimum distance from the normal eye at which an object is clearly visible without stress on the eye is called the minimum distance of distinct vision. It is 25 cm for the normal human eye.

iii) The position of the object at the minimum distance of distinct vision is called the near point of the eye. For a normal human eye, the near point is at 25 cm from the eye.

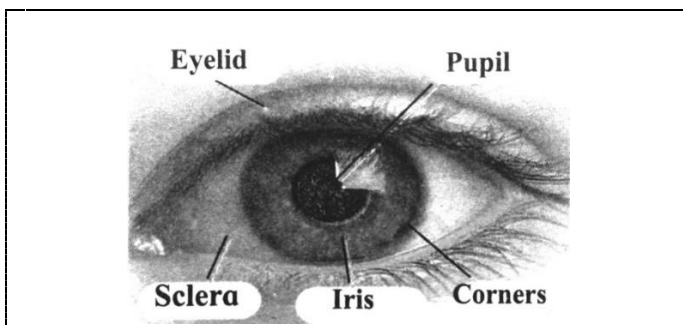
7.11 Human eye and working of its lens:

Note: Prepare Q.11 and Q.12 for this point.

Q.11 Explain the structure and working of Human eye.

Ans: Structure and working of Human eye:

1) Diagram:

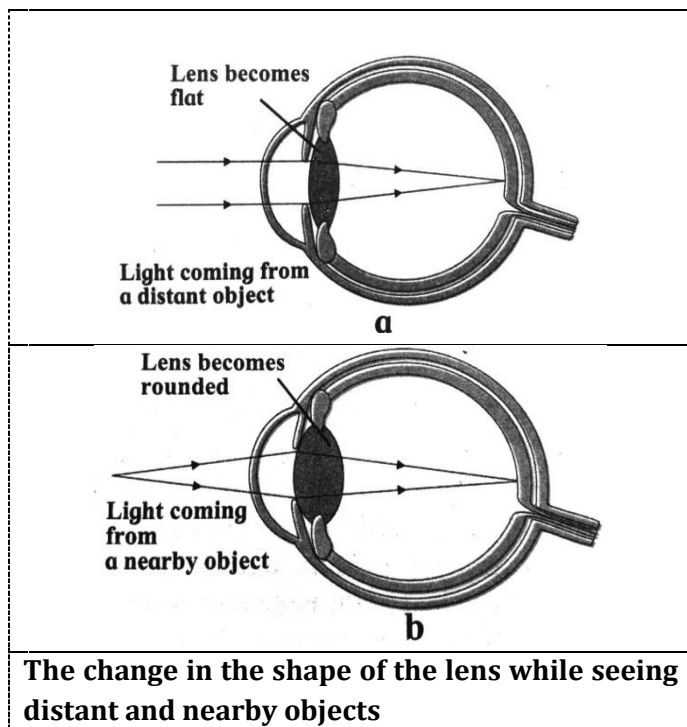


Q. 11 Structure and working of human eye (मानवी डोळा आणि त्याचे कार्य):

२) **Working (कार्य):** i) डोळ्याच्या accommodation (समायोजन / जुळवाजुळव)- ची power (शक्ती)- focal length मध्ये आवश्यकतेनुसार change करण्याच्या lens च्या ability ला डोळ्याची power of accommodation (समयोजन शक्ती) म्हणतात.

ii) **सुस्पष्ट दृष्टीचे (distinct vision) minimum distance (लघुत्तम अंतर) आणि निकटबिंदु (near point) - normal eye** पासून ज्या minimum distance वर object असताना ती clear आणि डोळ्यावर कोणताही stress पडून न देता, ती दिसू शकते, त्या distance ला minimum distance of distinct vision म्हणतात. Normal eye साठी हे distance २५ cm आहे.

iii) Object च्या minimum distance of distinct vision च्या position ला (near point) निकटबिंदु म्हणतात, आणि तो normal eye साठी २५ cm वर असतो.

Always Remember:

- i) The minimum distance of an object from a normal eye, at which it is clearly visible without stress on the eye, is called as minimum distance of distinct vision.
- ii) The position of the object at this distance is called the near point of the eye, for a normal human eye, the near point is at 25 cm.
- iii) The farthest distance of an object from a human eye, at which it is clearly visible without stress on the eye is called farthest distance of distinct vision.
- iv) The position of the object at this distance is called the far point of the eye. For a normal human eye, the far point is at infinity.

Always remember:

Q-११ चे explanation वाचावे आणि त्यानुसार study करावा.

Q.37 Fill in the blanks:

i) The process of extraction of a metal from its ore is called -----.

Ans: metallurgy.

ii) ----- process is used for the purification of bauxite.

Ans: Bayer's

iii) The reaction of iron oxide with aluminium is known as ----- reaction.

Ans: thermit

iv) ----- is used to obtain pure metals from impure metals.

Ans: Electrolysis method

v) Corrosion can be prevented by putting a layer of ----- metal on corrosionable metal.

Ans: noncorrosionable

विद्यार्थी मित्रांनो, Q-३७. ते Q-४१ साठी याआधीच्या theory चा काळजीपूर्वक अभ्यास करावा. आवश्यक त्या ठिकाणी आधीचा theory चा संदर्भ घ्यावा व त्यानुसार या question ची answer लिहण्याचा प्रयत्न करावा.

Q.38 Rewrite the following the statement by selecting the correct options:

i) What would be the correct order if Zn, Fe, Al, and Cu are arranged in increasing order of reactivity?

- a) Cu, Fe, Zn, Al.
- b) Al, Cu, Fe, Zn.
- c) Zn, Al, Cu, Fe.
- d) Fe, Zn, Al, Cu.

Ans: a) Cu, Fe, Zn, Al

ii) During the extraction aluminium -----

- a) Ingredients and gangue in bauxite.
- b) Use of leaching during the concentration of ore.
- c) Chemical reaction of transformation of bauxite into alumina by Hall's Process.
- d) Heating the aluminium ore with concentrated caustic soda.

Ans: c) Chemical reaction of transformation of bauxite into alumina by Hall's Process.

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