KEY CONCEPT

HEREDITY
Transmission of characters/traits from one generation to another

Variation
Difference in the character/trait shown by individuals of a species during reproduction

Traits
Trait and characteristics that are reliably inherited to next generation

Environmental Varition
Variation due to education, diet, chemicals , environment etc

Genetic variation
In population give rise to mutation (sudden inheritable change in gene), meiosis (reduction at division which required for gameteformation) and sexual reproduction (fusion of gametes leading to variation in offspring

Acquired Traits (character)
Characteristics of an organisms that are not inheritable ex-language, art etc. they are not genetically controlled

Inherited Traits
Characteristic of the organisms that are inherited (caused due to change in DNA)

Rules for Inheritance of traits (Mendelism)
studied by G J mendel on pea plant factors (genes) are the carriers of trait
1. Law of dominance
2. Law of Segregation
3. Law of Independence

Sex Determination
A mechanism by which sex of new born is determined

Natural Sex Determination
Sex of the child is determined naturely XY determination eg humans/drosophila
XO determination eg. insects

Artificial sex Determination
Modification of species by the process of selective breeding in order to produce a new strain of organism

Gene → Pair → Allele, Allele
Character / Trait

TT Tall, Tt Tall, tt Short → Genotype → Phenotype

Alleles → TT Homozygous, Tt Heterozygous, tt Homozygous

7 Contrasting characters

	Dominant	Recessive
1. Plant height	Tall TT, Tt	Short tt
2. Seed colour	Yellow YY, Yy	Green yy
3. Seed shape	Round RR, Rr	Wrinkled rr
4. Pod colour	Green GG, Gg	Yellow gg
5. Pod shape	Inflated II, Ii	Constricted ii
6. Flower colour	Purple PP, Pp	White pp
7. Flower position	Axial AA, Aa	Terminal aa

Pure bred parents → Homozygous condition

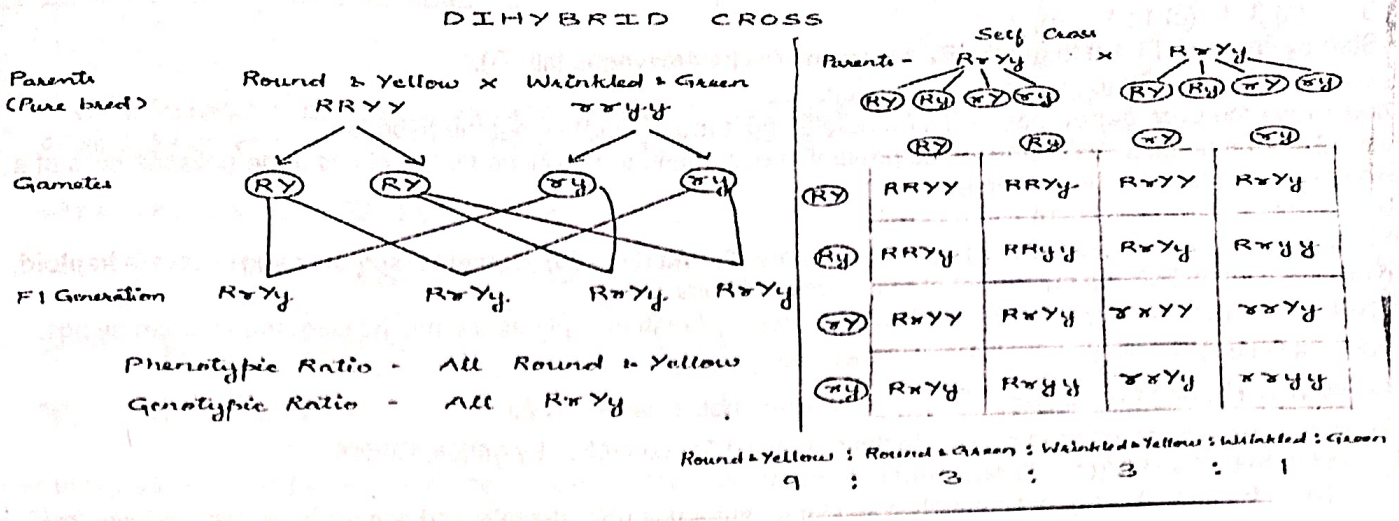
MONOHYBRID CROSS

Pure bred TT × tt
Gametes: T, T, t, t
Offspring (F1 Generation): Tt Tall, Tt Tall, Tt Tall, Tt Tall
Phenotypic Ratio – All Tall 100%
Genotypic Ratio – All Tt 100%

Self Cross
Parent Tt × Tt
Gametes: T, t, T, t
Offspring (F2 Generation): TT Tall, Tt Tall, Tt Tall, tt short
Phenotypic Ratio – Tall : Short → 3 : 1 → 75% : 25%
Genotypic Ratio – TT : Tt : tt → 1 : 2 : 1 → 25% 50% 25%

Back Cross → Test cross
Parent Tt × TT
Gametes: T, t, T, T
Offspring (F2 Generation): Tt Tall, TT Tall, Tt Tall, Tt Tall
Phenotypic Ratio – All Tall 100%
Genotypic Ratio – TT : Tt → 1 : 1 → 50% 50%

Parent Tt × tt
Gametes: T, t, t, t
Offspring (F2 Generation): Tt Tall, Tt Tall, tt short, tt short
Phenotypic Ratio – Tall : Short → 1 : 1 → 50% : 50%
Genotypic Ratio – Tt : tt → 1 : 1 → 50% 50%



How do traits get expressed

Cellular DNA (Information source) → For synthesis of Proteins → Works efficiently More Hormone Produced → tallness of plants

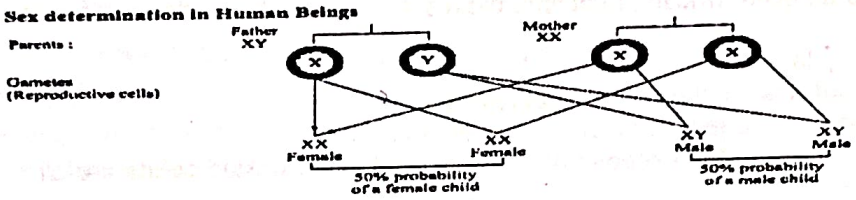
Therefore, genes control characteristics or trait

SEX DETERMINATION

Determination of sex of an offspring.

FACTORS Responsible for Sex Determination

Sex Chromosomes : In human beings, there are 23 pairs of chromosome. Out of these 22 chromosomes pairs are called autosomes and the last pair of chromosome that help in deciding gender of that individual is called sex chromosome.



This shows that half the children will be male and half will be female. All children will inherit an X chromosome from their mother regardless whether they are boys or girls. Thus, sex of children will be determined by what they inherit from their father, and not from their mother.

CHAPTER WISE QUESTION BANK

Multiple Answer Type Question (1 Mark Each)

1. The process where characteristics are transmitted from parent to offspring is called

(a) Variation (b) Heredity (c) Gene (d) Allele

(Hint: Think about the biological term that explains how traits pass from one generation to the next.)

2. Exchange of genetic material takes place in

(a) Vegetative reproduction (b)Asexual reproduction

(c)Sexual reproduction (d)budding

(Hint: Think about which type of reproduction involves the combination of genetic material from two parents, resulting in genetic variation)

3. The following results were obtained by a scientist who crossed the F1 generation of pure-breeding parents for round and wrinkled seeds

Dominants trait	Recessive trait	No. of F2 offspring
Round seeds	Wrinkled seeds	7524

From these results, it can be concluded that the actual number of round seeds he obtained was:

(a) 1881 (b) 22572 (c) 2508 (d) 5643

(Hint: In a monohybrid cross ($F_1 \times F_1$), the typical phenotypic ratio for dominant to recessive traits in F_2 generation is **3:1.**

Use this ratio to find how many out of 7524 offspring are **round** (dominant trait).)

4. In peas, a pure tall plant (TT) is crossed with a pure short plant (tt). The ratio of pure tall plants to pure short plants in F2 generation will be:
(a) 1 : 3 (b) 3 :1 (c) 1 : 1 (d) 2 : 1
(Hint: Start by crossing TT × tt to get the F_1 generation (all heterozygous tall, Tt).
Then, cross the F_1 (Tt × Tt) to get the F_2 generation.
Now count only the **pure genotypes** — TT (pure tall) and tt (pure short) — not the hybrids.)
5. What will be the number of chromosomes present in each gamete produced by the plants if the palisade cells of a species of plant contain 28 chromosomes in all?
(a) 56 (b) 28 (c) 14 (d) 4
(Hint: Palisade cells are **somatic (body) cells**, so they are **diploid** (2n = 28). Gametes (sperm or egg cells) are **haploid**, meaning they contain **half** the number of chromosomes of body cells)
6. Choose the correct statement from the following codes: I. Variation in plants are much lesser than human beings.
II. Each trait in child is influenced by only paternal DNA.
III. An individual having two different alleles for the same trait is called hybrid.
IV. Traits that are passed on from parents to their offspring are controlled by genes. Codes
(a) I, II and III(b) I, III and IV(c) II, III and IV(d) I, II and IV
(Hint: I: Think about genetic variation — plants reproduce both sexually and asexually; is their variation really less than in humans?
II: Are traits influenced by **only the father's DNA** or by both parents?
III: Is someone with alleles like Tt or Bb (one dominant, one recessive) called a hybrid?
IV: What actually controls inherited traits?)

Assertion-Reasoning

Each of these questions contains two statements, Assertion (A) and Reason (R). Each of these questions also has four alternative choices, any one of which is the correct answer.
You have to select one of the codes (a), (b), (c) and (d) given below. (a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true, but R is not the correct explanation of A
(c) A is true, but R is false
(d) A is false, but R is true
1. Assertion: Dominant allele is an allele whose phenotype expresses even in the presence of another allele of that gene.
Reason: It is represented by a capital letter, e.g. T.
(Hint: b) Both A and R are true, but R is not the correct explanation of A)
2. Assertion: Mendel self-crossed F1 progeny to obtain F2-generation.
Reason: F1 progeny of a tall plant with round seeds and a dwarf plant with wrinkled seeds are all dwarf plants having wrinkled seeds.
(Hint: c) A is true, but R is false)
2. Assertion: All the human female gemetes will have only X-chromosome.
Reason: Females are homogametic with two X-chromosomes.
(Hint: a) Both A and R are true and R is the correct explanation of A)
3. Assertion: The sex of a child will be determined by chromosome received from the father.
Reason: A human male has one X and one Y-chromosome.
(Hint: (a) Both A and R are true and R is the correct explanation of A)

Very short answer question (2marks)

1.If a pure tall plant is crossed with a pure dwarf plant, what will be the height of F1 and F2 generations?
(Hint: In F1 generation, all plants will be tall (heterozygous). In F2 generation, the ratio will be 3 tall:1 dwarf.
2.A hemophilic man marries a normal woman. Will their daughters be carriers or affected? Explain.
(Hint:The daughters will be carriers (XHXh) as they inherit the defective X from their father and a normal X from their mother.
3.A pure-breeding red flowered plant is crossed with a pure-breeding white flowered plant. The F1 generation has all red flowers. In F2 generation, some plants show white flowers.
Explain the pattern of inheritance.
(Hint:This shows dominance of the red flower trait over white. The F1 are heterozygous (Rr), and in F2, the ratio of red to white is 3:1.
4.A child has attached earlobes (recessive trait) even though both parents have free earlobes (dominant trait). Explain how this is possible.
(Hint:Both parents are heterozygous (Ee) for the earlobe trait. The child inherited recessive alleles (ee) from both, resulting in attached earlobes.
5.Explain how traits get expressed. Use the example of a tall plant.
(Hint:Traits are expressed through genes on DNA.
Each gene has two alleles.
In a tall plant (Tt or TT), the gene for tallness (T) produces more growth hormone.

1.

Mother's Genotype: XNXc (Carrier)
Father's Genotype: XNY (Normal)

Punnett Square:

	XN	Xc
XN	XNXN	XNXc
Y	XNY	XcY

Refer to the above cross between a carrier mother (XNXc) and a normal father (XNY):
(a) What are the chances of their sons being colorblind?
(b). What are the chances of their daughters being carriers?
(c.) Explain why colorblindness is more common in males.
(Hint: a)
b). There is a 50% chance that daughters will be carriers (XNXc).
c.) Males have only one X chromosome; the presence of a single recessive allele (Xc) results in the expression of colorblindness. Females have two X chromosomes, so a single recessive allele does not result in the condition.)

Diagram:
(Cross between RrYy x RrYy)

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

2.
Question (a) How many phenotypes are observed in the F2 generation?
(b) Write the phenotypic ratio.
(c) Explain what this cross demonstrates about inheritance.
a) Four phenotypes: round yellow, round green, wrinkled yellow, wrinkled green. b) Phenotypic ratio: 9:3:3:1.
c) This demonstrates independent assortment of genes.
3.State one difference between dominant and recessive traits with an example. (Hint:
Dominant trait: Expressed even if one allele is present (e.g., round seeds in pea). Recessive trait: Expressed only when both alleles are recessive (e.g., wrinkled seeds in pea).

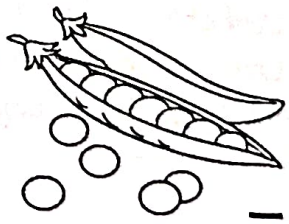
Look at the family tree below, showing an inherited trait:

The shaded circles and squares represent individuals with the trait.

a) If this trait is recessive, what can you say about the parents in generation II?
4. b) Explain why some children have the trait while parents do not.
(Hint:a) Parents in generation II are carriers (heterozygous).
b) Because they each carry one recessive allele, the children can inherit two recessive alleles and express the trait.

Long answer type question (5 marks)

1.Mendel conducted a dihybrid cross with pea plants (seed shape and seed color).
(a) Draw the Punnett square for the cross of round yellow (RRYY) × wrinkled green (rryy).
(b) State the phenotypic ratio of F2 generation.
(c) Name the law Mendel concluded from this cross.
(Hint :Hint:Think of the combinations of RY, Ry, rY, and ry gametes. Recall the 9:3:3:1 ratio and the Law of Independent Assortment.



2.Explain how the principles of heredity can help predict outcomes in genetic crosses.
(a) State Mendel's laws of heredity.

(b) Give an example of a genetic cross and predict the outcome.

(c) How can Punnett squares help in this process?

(Hint:Think of Law of Segregation and Law of Independent Assortment. Use a simple example like Tt x Tt.

Case study question (4marks)

1. *A human family's pedigree chart shows the inheritance of a recessive genetic disorder (shaded shapes indicate affected individuals). The father is normal, and the mother is a carrier for the disorder.*

A) What will be the genotype of the heterozygous parents?

(a) BB (b) Bb (c) bb (d) BBbb

(Hint: Recall that heterozygous means having two different alleles for a trait — one dominant and one recessive.)

B).What is the expected phenotypic ratio of brown to blue-eyed flies in the next generation?

(a) 1:1 (b) 3:1 (c) 1:2:1 (d) 9:3:3:1

(Hint: Consider a simple Mendelian inheritance where brown eye color is dominant over blue eye color. Think about the cross between two heterozygous parents) C)What is the probability of getting a blue-eyed fly if 100 offspring are produced?

(a) 25% (b) 50% (c) 75% (d) 0%

(Hint: Blue eyes are recessive, so they appear only when the fly inherits two recessive alleles (bb). Think about the offspring ratio from parents who are both heterozygous (Bb).) D).Which Mendelian law explains the segregation of the two alleles (B and b)?

a) Law of Dominance b) Law of Segregation

c) Law of Independent Assortment d) Law of Variation(Hint: This law states that during the formation of gametes, the two alleles for a trait separate so that each gamete carries only one allele.)

2.*In a pea plant, the allele for green pods (G) is dominant over the allele for yellow pods (g). A heterozygous green pod plant is crossed with a yellow pod plant.*

A).What are the genotypes of the parents?

(a) GG ×gg (b) Gg ×gg (c) GG × GG (d) gg × gg

(Hint: Think about how dominant and recessive alleles combine in parents to produce different offspring genotypes.)

B).What is the expected phenotypic ratio of green to yellow pods in the offspring?

(a) 1:1 (b) 3:1 (c) 9:3:3:1 (d) 1:3

(Hint: Consider a monohybrid cross where green pod color (G) is dominant over yellow pod color (g). Think about the ratio when two heterozygous plants (Gg × Gg) are crossed.) C).What percentage of offspring will have green pods?

(a) 25% (b) 50% (c) 75% (d) 100%

(Hint: Green pods (G) are dominant over yellow pods (g). If two heterozygous plants (Gg × Gg) are crossed, think about how many offspring will show the dominant green pod trait.) D).What percentage of offspring will have yellow pods?

a) 0% b) 25% c) 50 d) 75%

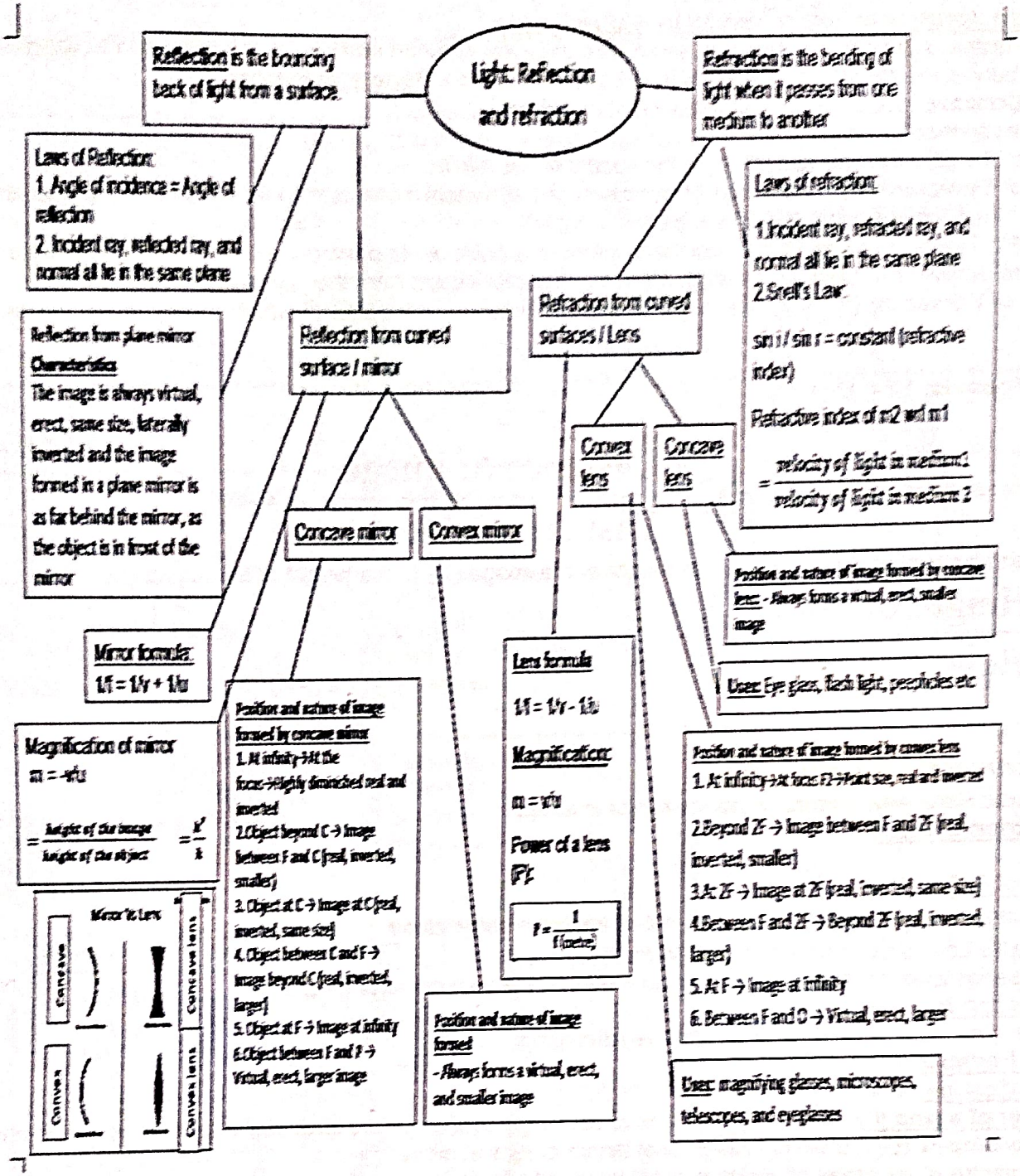
(Hint: Yellow pods are recessive (gg). Consider a cross between two heterozygous green pod plants (Gg × Gg) and how many offspring inherit the recessive trait.) E).Which law applies to the inheritance of pod color?

a) Law of Segregation b) Law of Dominance

c) Law of Independent Assortment d) Law of Variation

(Hint: This law explains how pairs of alleles separate during gamete formation so that each gamete carries only one allele.)

Chapter-9
Light Reflection and Refraction



Summary

- Light is a form of energy that enables us to see objects. It travels in a straight line. The chapter covers two main phenomena: Reflection and Refraction.
- **Reflection** is the bouncing back of light from a surface.
- **Refraction** is the bending of light when it passes from one medium to another due to a change in its speed.
- Reflection of Light
- **Laws of Reflection:**
  1. Angle of incidence = Angle of reflection

2. Incident ray, reflected ray, and normal all lie in the same plane Types:
- Regular Reflection: From smooth surfaces like mirrors
- Diffused Reflection: From rough surfaces

✞ **Characteristics of image formed by a plane mirror:**

The image is always virtual, erect, same size, laterally inverted and the image formed in a plane mirror is as far behind the mirror, as the object is in front of the mirror **Spherical Mirrors**

Types: Concave (converging) and **Convex** (diverging)

Important terms:

Pole (P): The pole of spherical mirror is the centre of the mirror.

Center of Curvature (C): The center of curvature of a spherical mirror is the centre of the hollow sphere of glass of which the spherical mirror is a part.

Focus (F): The principal focus of a concave mirror is a point on its principal axis to which all the light rays which are parallel and close to the axis, converge after reflection from the concave mirror

Radius of Curvature (R): It is the radius of the hollow sphere of glass of which the spherical mirror is a part.

Mirror Formula: $1/f = 1/v + 1/u$

Magnification (m): magnification = $\frac{-\text{Distance of image}}{\text{Distant of object}}$ $m = -v/u$

It can also be expressed as ratio of the height of the image (h') to the height of the object (h).

$m = \frac{\text{Height of image}}{\text{Height of object}} \frac{h'}{h}$

Uses:
- Concave: Reflectors, dentist mirrors
- Convex: Rear-view mirrors, vigilance mirror in shops

Refraction of Light

Laws of Refraction:

1. Incident ray, refracted ray, and normal all lie in the same plane
2. Snell's Law: sin i / sin r = constant (refractive index)

Light bends towards the normal in denser medium and away in rarer medium.

Refraction by Lenses

Types: Convex (converging) and Concave (diverging)

Lens Formula: $1/f = 1/v - 1/u$

Magnification: $m = v/u$

Power of a lens (P): The ability of a lens to converge or diverge is expressed in term of power of lens. Its **unit** is **Dioptre (D)** It is reciprocal of focal length of lens in metre

One dioptre is the power of a lens of focal length of one metre.

Power of combination of lens P =P1 +P2+P3+ ..... $P = \frac{1}{f\,(\text{metre})}$

Uses of lens: Spectacles, magnifying glass, cameras, microscopes.

Ray Diagrams Summary Concave mirror:

Sl.No .	Position of the object	Position of image	Size and Nature of image

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Uses of lens: Spectacles, magnifying glass, cameras, microscopes.

Ray Diagrams Summary Concave mirror:

Sl.No	Position of the object	Position of image	Size and Nature of image

(a)	At infinity	At the focus	Highly diminished (point size) real & inverted
(b)	Beyond C	Between F and C	Diminished, real and inverted
(c)	At C	At C	Same size, real and inverted
(d)	Object between C & F	Image beyond C	Enlarged, real and inverted
(e)	Object at F	Image at infinity	Highly enlarged, real and inverted
(f)	Object between F & P	Behind the mirror	Enlarged, Virtual and erect

Convex Mirror:

	Position of the object	Position of image	Size and nature of image
(a)	At infinity	At the focus F, behind the mirror	Highly diminished (pointsized), virtual and erect
(b)	Between infinity and the pole P of the mirror	Between P and F, behind the mirror	Diminished, virtual and erect

Image formed by concave mirror

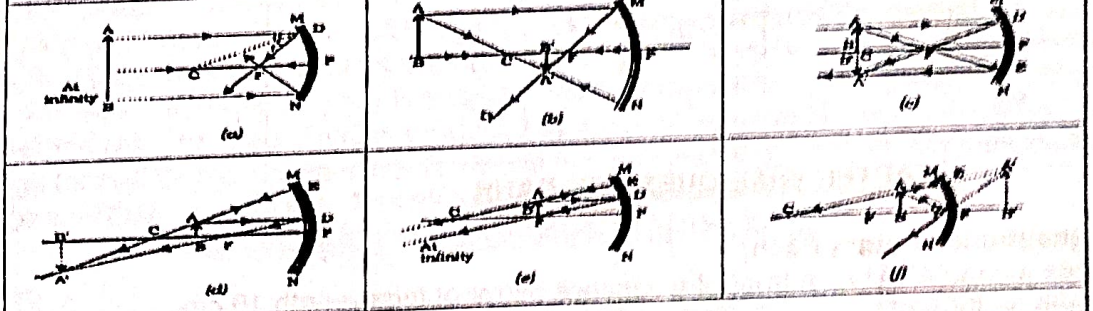
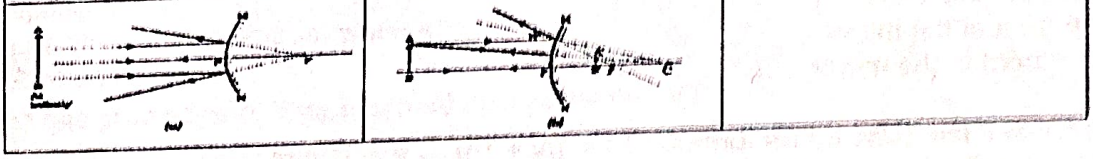


Image formed by Convex lens



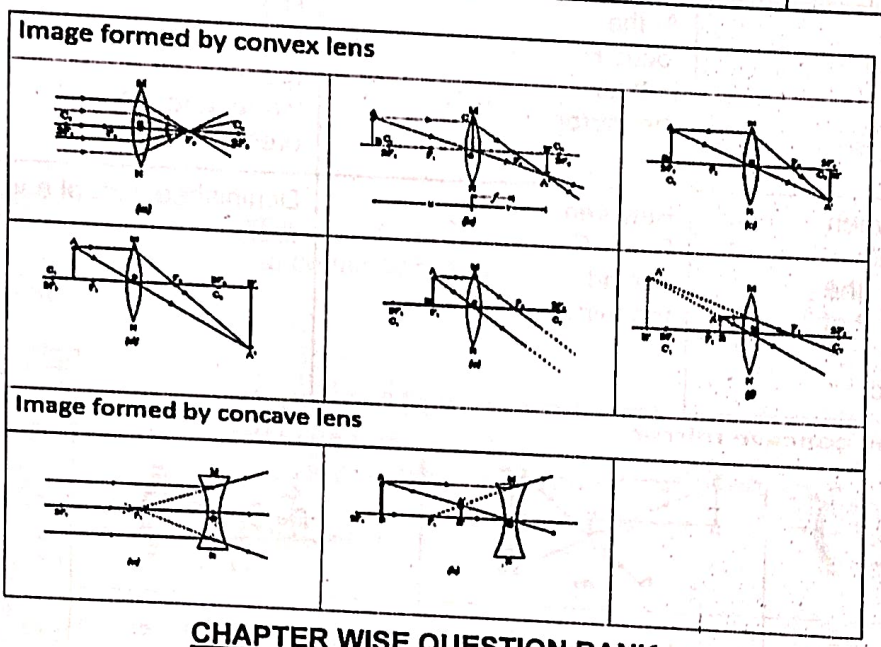
Convex Lens:

Sl. No.	Position of the object	Position of image	Size and nature of image

(a)	At infinity	At focus F2	Highly diminished (point-sized), Real and inverted
(b)	Beyond 2F1	Between F2 and 2F2	Diminished, Real and inverted
(c)	At 2F1	At 2F2	Same size, Real and inverted
(d)	Between F1 and 2F1	Beyond 2F2	Enlarged, Real and inverted
(e)	At focus F1	At infinity	Infinitely large, Real and inverted
(f)	Between focus F1 and optical centre O	On the same side of the lens	Enlarged, **virtual and erect**

Concave Lens:

	Position of the object	Position of image	Size and nature of image
A	At infinity	At focus F1	Highly diminished (pointsized), virtual and erect
b	Between infinity and the pole P of the mirror	Between focus F1 and optical centre O	Diminished, virtual and erect



CHAPTER WISE QUESTION BANK

Multiple choice questions (1 mark Each)

Q1.A student places a candle 15 cm in front of a concave mirror of focal length 10 cm. Where will the image be formed?

(a) 30 cm behind the mirror
(b) 15 cm in front of the mirror
(c) 30 cm in front of the mirror
(d) At the focus (Hint: (Use mirror formula: $1/f = 1/v + 1/u \rightarrow v = 30$ cm)

Q2. A driver notices that the image of a car behind appears smaller and upright in his mirror. What kind of mirror is being used?

(a). Concave
(b)Convex
(c). Plane
(d) Cylindrical

(Hint: It is a converging mirror)

Q3. A pencil partially dipped in water appears bent. Which of the following explains this phenomenon?

A. Reflection of light B. Absorption of light

C. Dispersion of light D. Refraction of light

(Hint: It is shown by glass slab)

Q4. An optician uses a lens that forms a virtual, erect, and magnified image of letters when reading. What kind of lens is it?

A. Concave lens B. Convex lens

C. Plane lens D. Diverging lens

(Hint: It is a converging lens)

Q5. A ray of light bends more when entering glass than when entering water. What does this tell you about the refractive index?

A. Water has higher refractive index

B. Both have equal refractive indices

C. Glass has higher refractive index

D. Light travels faster in glass than in water (Hint: . Glass has higher refractive index)

Q6. Raman uses a lens to focus sunlight onto a piece of paper and it starts to burn. What type of lens is he using?

A. Concave lens B. Cylindrical lens

C. Convex lens D. Plane glass

(Hint: It is a converging lens)

Assertion and Reason Questions:

Options:

A. Both A and R are true, and R is the correct explanation of A.

B. Both A and R are true, but R is not the correct explanation of A.

C. A is true, but R is false.

D. A is false, but R is true.

Q7.Assertion (A): A concave mirror can form both real and virtual images.
Reason (R): A concave mirror converges parallel rays to a single point. (Hint: A Both A and R are true, and R is the correct explanation of A.)

Q8.Assertion (A): The image formed by a convex mirror is always virtual and erect.
Reason (R): A convex mirror diverges rays and they appear to come from a point behind the mirror.

(Hint: A Both A and R are true, and R is the correct explanation of A.)

Q9.Assertion (A): When light enters from air to glass, it bends towards the normal.
Reason (R): Glass is a rarer medium than air.
(Hint: C (Reason is incorrect – glass is a denser medium than air)

Q10.Assertion (A): The magnification produced by a concave mirror is always negative. Reason (R): The image formed by a concave mirror is always real and inverted. (Hint: D (Magnification is positive when the image is virtual, so A is false, R is also false sometimes)

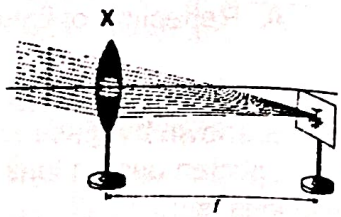
Very Short Answer Questions: (2 Marks Each)

11. Draw a ray diagram showing the path of rays of light when it enters with oblique incidence
(i)from air into water; (ii) from water into air.
(Hint: Refer contents)

12. Write two properties of image formed by a plane mirror?

(Hint: The image is always virtual, erect, same size, laterally inverted and the image formed in a plane mirror is as far behind the mirror, as the object is in front of the mirror)

13. A student determines the focal length of a device X, by focusing the image of a far off object on the screen positioned as shown in the figure below: a. Identify this device X. Explain the nature of the image obtained on the screen. (Hint:These lens are used in Hypermetropia)



14. Sarita finds out that the sharp image of the window pane of her science laboratory is formed at a distance of 15 cm from the lens.

She now tries to focus the building visible to her outside the window instead of the window pane without disturbing the lens.

a) In which direction will she move the screen to obtain a sharp image of the building?

b) What is the approximate focal length of this lens?

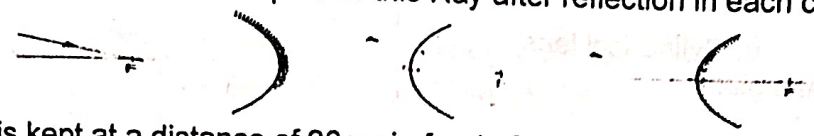
(Hint: Refer contents)

15. Find the focal length of a lens of power 2D also write the type of lens.

Hint: P=1/f (metre), +ve sign indicates convex lens and -ve sign indicates concave lens

Short Answer Questions: (3 Marks Each)

16. Complete the following diagram in which a Ray of light is incident on a concave and convex mirror on your answer sheet. Show the path of this Ray after reflection in each case.



17. A candle is kept at a distance of 20cm in front of a concave mirror of focal length 10cm.

(i) Find the position of the image

(ii) Find the magnification also

(Hint hint: Use mirror and magnification formula.

18. During a science exhibition a student wants to project the image of a candle flame on a screen 80 cm in front of a mirror by keeping the candle flame at a distance of 20 cm from its pole.

(i) Which type of mirror should the student use?

(ii) Find the distance between the object and its focus.

(iii) Find the magnification of the image produced.

19. A student of class X placed the object in front of a convex lens at different distance from it and recorded the image distance as per the given data in the following table.

Sl No.	Object distance 'u' in cm	Image distance 'v' in cm
1	-60	+12
2	-30	+15
3	-20	+20
4	-15	+30
5	-12	+60
6	-9	+90

Read the above paragraph and answer the following questions.

(a) Find the focal length of the convex lens.

(b) At which of the position of the object from the lens, image formed by the above convex lens will be real, inverted and magnified.

(c) Can a convex lens can be used a magnifying glass? State the reason.

Long Answer Questions: (5 marks)

20.(a) Draw a ray diagram to show the image formation by a concave mirror when the object is placed between the pole (P)and the focus (F). State the nature, size, and position of the image formed.
(b)An object is placed at a distance of 20 cm from a convex lens of focal length 10 cm. Find the position and nature of the image using the lens formula.
(Hint:
(a)Diagram: (Student should draw a concave mirror with object between P and F) Image Characteristics:
Nature: Virtual and erect, Size: Enlarged, Position: Behind the mirror (b)Given: $u = -20$ cm, $f = +10$ cm

Using lens formula : $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ $\frac{1}{10} = \frac{1}{v} - \frac{1}{20}$ $\frac{1}{v} = \frac{3}{20}$ $v = 20$ cm

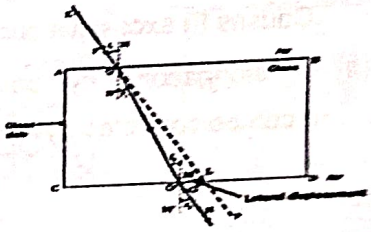
Image Position: 20 cm on the other side of the lens
Nature: Real, inverted, and same size
Q21.A person got his eyes tested by an optician. The prescription for the spectacle lenses to be made reads : Left eye : + 2.50 D Right eye : + 2.00 D

(a) State whether these lenses are thicker in the middle or at the edges.
(b) Find out the focal length of each lens.
(c) Which lens bends the light rays more strongly?
(d) State whether these spectacle lenses will converge light rays or diverge light rays.
Hint: take reference of lens, use formula for power of lens, meaning of power

Case-Based Question

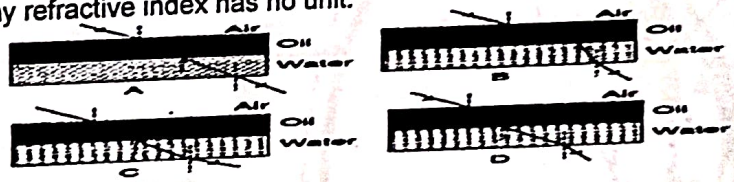
Q22: During an experiment, Meena passes a ray of light through a rectangular glass slab placed on a white sheet. She traces the path of the light ray and notices that the emergent ray is parallel to the incident ray but slightly shifted sideways. This sideways shift is called lateral displacement.

1. What happens to the light ray when it enters the glass slab from air?
2. Why does the emergent ray shift sideways even though it is parallel to the incident ray?
3. What is the name of the angle between the incident ray and the normal at the point of incidence? Hint :



1. The light ray bends towards the normal when it enters the glass slab from air due to refraction.
2. The emergent ray shifts sideways due to refraction at both air-glass and glass-air surfaces. This is called lateral displacement.
3. The angle is called the angle of incidence.

Q23: (a)Choose the correct path of a ray of light passing from air to kerosene oil and from kerosene oil to water is
(a)A (b). B (c). C (d). D (b) State Snell's Law.
(c)Give reason why refractive index has no unit.



Chapter- 10
The Human Eye and the Colourful World

Sl No	Parts of eye	Functions
1	Cornea	Refracts light rays

2	Pupil	regulates and controls the amount of light Figure 11.1 The human eye entering the eye
3	Iris	controls the size of the pupil
4	Ciliary muscle	Controls the thickness of lens hence help in accommodation
5	Crystalline lens	Fine adjustment of focal length
6	Retina	Sensory receptors for sight
7	Optic nerve	Transmits electrical impulse to the brain

Structure of human eye

The ability of the eye lens to adjust its focal length is called **power of accommodation. Far point and near point of eye:** The farthest point that a normal eye can see any object clearly is infinity and the nearest point is 25cm (Least Distance of Distinct Vision or LDDV)

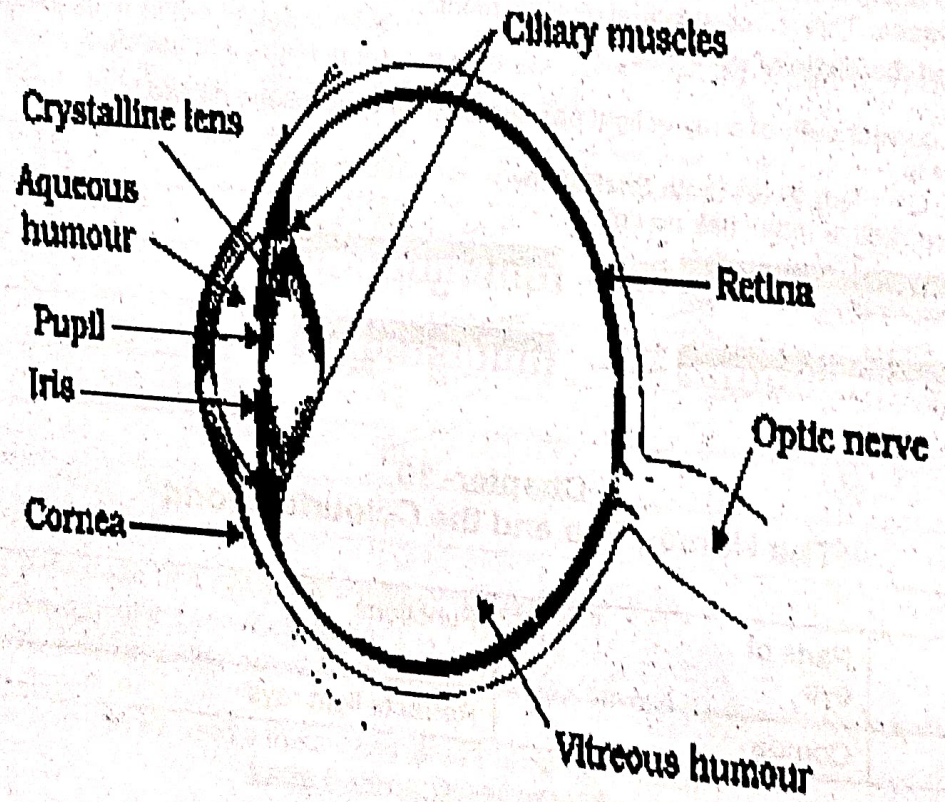
Defects of vision and their correction

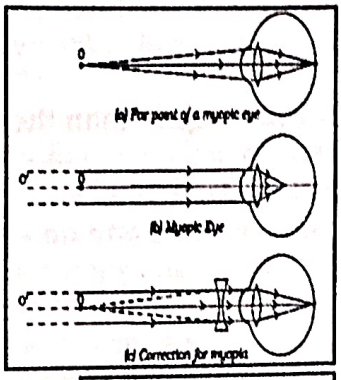
(i) **Myopia (short-sightedness)**: A person can see nearby object clearly but can't see distant object clearly.

Causes (i) excessive curvature of lens or decreased focal length.

(ii) elongation of eye ball The image is formed in front of retina.

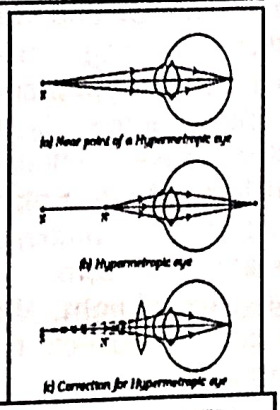
It can be corrected by using concave lens.

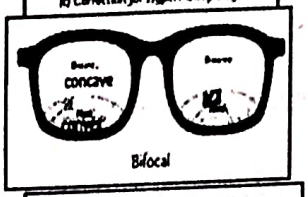




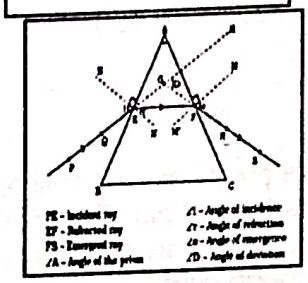
(ii) **Hypermetropia (far-sightedness)**: --A person can see distant object clearly but can't see nearby object clearly.
--Cause: (i) Shortening of eye ball.
(ii) increase in focal length of lens or decrease in power of lens.
--The image is formed behind the lens.
--This defect can be corrected by using convex lens.

(iii) **Presbyopia** : --This defect is caused during old age. -- In this defect the ciliary muscles weakens and decreases the power of accomodation and unable to see nearby objects clearly.
--Sometime old people unable to see narby as well as distant object clearly.
--The defect can be corrected by **bifocal lens.**

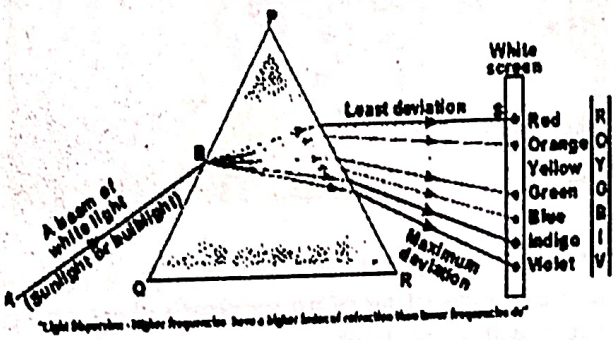




Refraction through Prism:
When a ray of white light passes through a glass prism then it refract twice and deviates from its normal path'
The angle to which it enters the prism is called angle of incidence ( ) The angle to whicl ∠i deviates from its normal path is called angle of deviation (D).

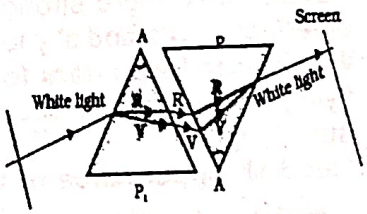


Dispersion of whilte light by a glass prism
When a beam of white light passes through a prism it get refracted twice and finally the white light split into a band of seven colour or visible spectrum. This splitting of light into seven colour is called dispersion of light.



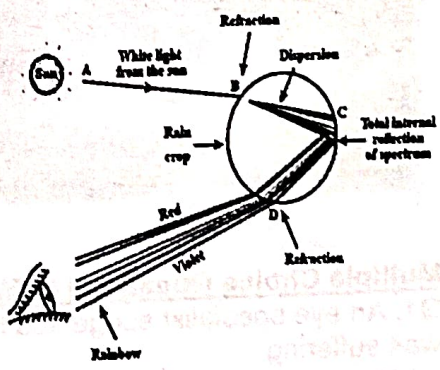
Different colours of light bend through different angles with respect to the incident ray, as they pass through a prism.
The red light bends the least while the violet the most.

Recombination of the spectrum of white light
Sir Issac Newton tried to find out that whether the spectrum obtained by prism are further split into more colour he kept one prism upright and other inverted and passed white light but he failed to split further instead he found that the seven colour unite to form white light again, which suggest that white light consist of seven colour.



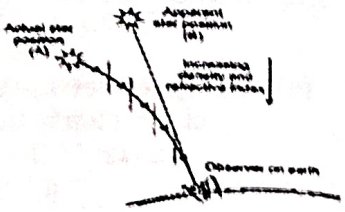
Formation of rainbow

- Rainbow is a band of seven colours or natural visible spectrum which is formed just after the rain shower.
- The suspended tiny water droplets in air act as prism, when light passes through these tiny droplets then it **refracted** and **dispersed** and finally suffers **total internal reflection** results in formation of band of seven colours called rainbow
- Essential condition for observing a rainbow is that observer must stand with his back towards the sun



Atmospheric refraction (stars seen higher than they are,

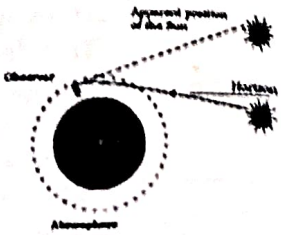
advance sunrise and delayed sunset, the sun appears flattened during sunrise and sunset, stars twinkle but planet do not.)



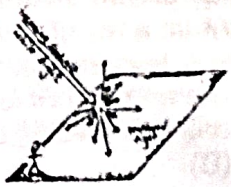
Stars seen higher than they are: Stars are very far away the light coming from space (vacuum, a rare medium) enters into the earth's atmosphere (denser medium) after several refraction the stars appear backward

Advance sunrise and delayed sunset

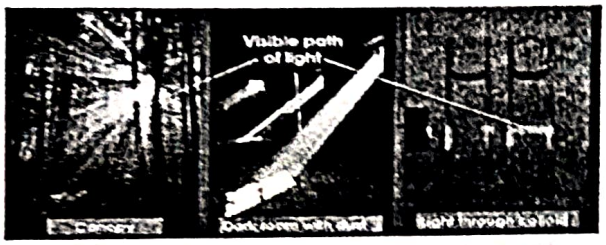
During sunrise and sunset sunlight coming from lower atmospheric density to higher density due to which refraction takes place and light appears to be coming from above the horizon level than the actual position of the sun. **Sun appears flattened during sunrise and sunset:** Due to unequally bending of light from lower and upper part of sun during sunrise or sunset, it appears oval.



Stars twinkle but planets do not: Stars are very far away from the earth and act as a point source of light. The light coming from the star reaching our eyes increases and decrease continuously due to earth's atmospheric refraction hence appears twinkling. Whereas planets are closer to the earth and act as large number of point sources. The total variation in the amount of light entering our eye from all the point sized source will average out to zero.



Scattering of light: When a beam of light encounter any suitable size of particle then the particle redirects the direction of light in different direction, which illuminates the surrounding.



The phenomenon of scattering of light by the colloidal particles like smoke, tiny water droplets, suspended particles of dust and molecules of air of atmosphere gives rise to **Tyndall effect.** Ex: Light passing through canopy, dark room with dust, light through colloid.

Why is the colour of the clear Sky Blue?: When sunlight passes through the atmosphere, the fine particles in air scatter the blue colour (shorter wavelengths) more strongly than red. The scattered blue light in atmosphere enters our eyes and sky looks blue.

Why space looks dark for astronauts: The sky appears dark to passengers flying at very high altitudes, due to absence of atmosphere, scattering is not prominent at such heights.

Reddish appearance of the Sun at the sunrise or sunset: Near the horizon light has to travel longer distance and most of the blue light and shorter wavelengths are scattered away by the particles. Therefore, the light that reaches our eyes is of red colour having longer wavelengths which do not scatter completely. This gives rise to the reddish appearance of the Sun during sunrise and sunset.

CHAPTER WISE QUESTION BANK

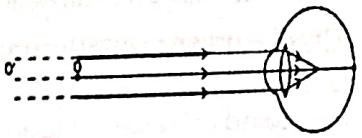
Multiple Choice Questions (1 Mark Each) Select and write one most appropriate option.

11. An eye specialist suggested his patient to wear a lens of power -0.5D. Which defect of eye the patient was suffering

a) Hypermetropia (b) Myopia (c) Presbyopia (d) Astigmatism

Hint:It is also known as shortedness)

Q2. What is the farthest point up to which the eye can see clearly?
(a) 25 cm (b)1m (c) Infinity (d) 25cm
(Hint:No limit)
Q3. Which colour of light deviates the least after passing through a prism
(a) Violet (b) Blue (c) Green (d) red
(Hint:Used for stopping vehicle at traffic)
Q4. Look at the ray diagram of a defective eye and name the defect of the eye



(a) Myopia (b) Hypermetropia
(c) Presbyopia (d) colour blindness
(Hint:It is also known as shortsightedness)
Q5. Which phenomenon of light gives rise to Tyndall effect
(a) Dispersion (b) Scattering (c) Reflection (d) Refraction
(Hint: It is done by particles of colloid solution)

Q6. Which of the following statement is not correct
(a) Tyndall effect is due to scattering of light
(b) Splitting of light when it passes through a prism is due to dispersion of light
(c) Twinkling of light is due to atmospheric refraction of light
(d) Formation of rainbow is due to reflection of light
(It is seen in the sky after rain)

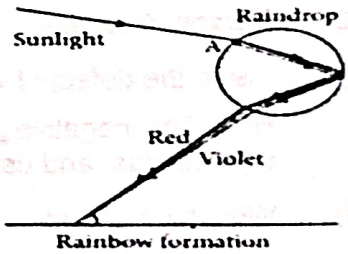
ASSERTION REASON QUESTIONS

Directions for the question 7 to 10: In each of the questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

Q7. Assertion: When a ray of white light passes through a prism, it split into its sevencolour components
Reason: Different colours of light bend through different angles with respect to the incident ray, as they pass through a prism.
Ans: (a) Both A and R are true and R is the correct explanation of A.
Q8. Assertion: Hypermetropia is due to increase in focal length of eye lens.
Reason: Due to increase in focal length the rays coming from the object meet before retina.
Ans hint: due to increase in focal length the rays meet or image is formed behind the retina.
Q9. Assertion: Planets twinkle but stars do not.
Reason: Twinkling of stars is due to atmospheric refraction Hint: Twinkling of stars is due to atmospheric refraction
Q10. Assertion: The colour of the sun looks reddish during sunrise and sunset
Reason: The red colour has longest wavelength and scatter less in the atmosphere and able to reach to the observer's eye
Hint: (a) Both A and R are true and R is the correct explanation of A

Very Short Answer Questions (2 Marks Each)



Q11. A rainbow is a natural spectrum caused by dispersion of sunlight by tiny water droplets, present in the atmosphere.
Name the phenomenon that takes place at Point A and point B.
Q12. Archana's grandfather is not able to see the distant objects as well as nearby objects clearly.
(i) From which defect of eye, he is suffering from.
Hint: Presbiopia
(ii) What is the cause of this defect and what type of spectacle can correct this defect.
Hint: Bifocal lens
Q13. Gautam's doctor advised him to wear spectacle of power 4D.
(i) Calculate the focal length of the lens of the spectacle. Hint: P=1/f

(ii) From which defect of eye he is suffering from.

Hint: +ve sign indicates convex lens and -ve sign indicates concave lens Q14. Why it takes some time to see objects clearly when we enter a dark room from bright sunny day outside?

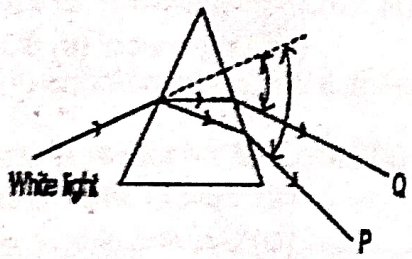
Hint: Accommodation of eye

Q15. Why stars appear twinkling but planets do not?

Hint: Atmospheric refraction

Short Answer questions: (3 Marks Each)

Q16. In the given diagram a beam of white light passed through a glass prism which split into band of seven colours with lower colour P and upper colour Q



(i) Name the phenomena.

Hint: Dispersion of light

(ii) State the colour P and Q.

Hint: Acronym VIBGYOR

(iii) Why do different colours bend at different angles when it passes through prism?

Hint: Refractive index of the prism material varies with the wavelength of light

Q17. Draw the path of light ray passing through a prism and label the angle of incident and angle of deviation

Hint: Refer to content

Q18. Name the phenomena involved in the formation of rainbow. What are the essential conditions for the formation of rainbow?

Hint: A natural spectrum, phenomena involved are refraction, dispersion and total internal reflection, Essential condition: observer must stand with his back towards the sun.

Q19. Write the expression for power of a lens. State its unit. What does its sign '+ve' and '– ve' indicate?

Hint: The ability of a lens to converge or diverge, $p=1/f$, unit- Dioptre (D), +ve sign indicates convex lens and -ve sign indicates concave lens.

Long Answer Questions: (5 marks Each)

Q20. (a) "A lens can form a magnified erect image as well as magnified inverted image of an object placed in front of it". State the nature of this lens and draw ray diagrams to justify the above statement. Mark the positions of O,F and 2F in the diagram

(b) With the help of labelled ray diagram show

(I) Myopic eye

(II) Correction to myopia using suitable lens

Hint: Refer to contents

Q21. A person uses spectacles of focal length of – 4m. (Answer any five question)

(i) Name the defect of vision he is suffering from

Hint: The negative sign in the focal length (-4m) indicates that the person has myopia (short-sightedness) and uses a concave lens to correct their vision.

(ii) What type of lens is required to correct this defect ?

(iii) Hint: The negative sign in the focal length (-4m) indicates that the person has myopia (short-sightedness) and uses a concave lens to correct their vision.

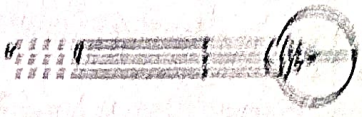
(iv) What are the causes of of development of this defect ?

Hint:decreased focal length /elongation of eye ball

(v) What will be the power of the lens?

Hint:P=1/f(metre)

(vi) Draw a ray diagram of this defective eye.



Case based question:

Q22. Mr. Backson, a 55-year-old man, experiences difficulty seeing clearly, especially for reading. He is fade up by blurry vision at close distances, while distant objects appear relatively better. After examination, his eye doctor diagnosed that his eye lens has become less flexible and opaque.

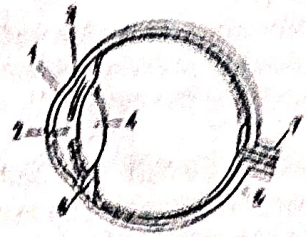
Questions:

22.1. Based on Mr. Backson's symptoms and the doctor's findings, what eye condition is he likely experiencing?

Hint: less flexibility and opaque lens is the symptom of cataract

22.2. According to the condition identified in question 1, Where does the light focus in the eye?

Hint: In hypermetropia the rays meet beyond retina



22.3. Describe the role of the lens in the process of vision.

Hint: refraction takes place through lens and converge light

22.4. What is the remedial option for Mr Backson condition?

Hint: removal of cause of opacity or replacement of lens

Q23. Observe the given diagram of structure of eye and answer the questions based on it.

1. Name the parts 1,2,3 and 4 of the eye structure given above

Hint: (1) maximum refraction takes place

(2) Allows amount of light to enter into eyes

(3) gives colour to eye

(4) fine adjustment of image

1. From which part of eye maximum refraction takes place name that part also. (Hint: It is outermost part of eye)
2. What is the nature of the image formed at retina of the eye?
   (Hint:Real, inverted and smaller than the object)
3. Define power of accommodation. Which part of eye is responsible for this function?
   (Hint: The ability of the eye to focus both near and distant objects, by adjusting its focal length.)

Electricity

Electricity is a form of energy used to run various electric appliances like fan, television, bulb, heater, motor etc.

Electric current: Electric current is the rate of flow of charge through any conductor $I = \frac{q}{t}$

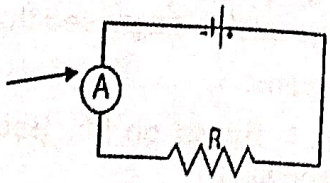
Unit of current is Ampere, Smaller unit of current $1mA = 10^{-3}A$ $1\mu A = 1.6 \times 10^{-6}A$

1 ampere is equivalent to flow of 1 coulomb charge in 1 second

One coulomb charge = 6×10^{18} electrons

An electron possesses –ve charge of = $1.6 \times 10^{-19}C$

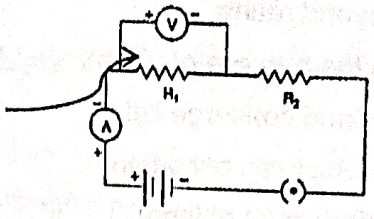
Ammeter A device used to measure current, it is always connected in series of the circuit



Electric potential: The electric potential at appoint in an electric field is defined as the work done in moving a unit positive charge from infinity to that point.

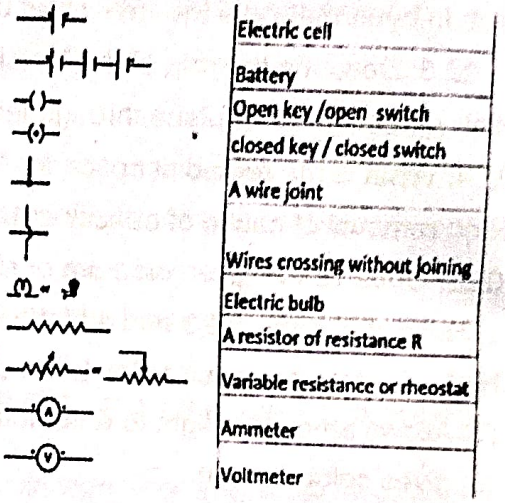
Potential difference: The difference in electric between two points is known as potential difference the two points. Its unit is Volt (V)

Voltmeter: A device used to measure voltage. It is always connected in parallel to the circuit



Electric circuit: The path of electric charges/ current. The symbolic representation of any electric circuit is called **circuit diagram.**

Symbols of some imp. Components of electric circuit **Ohm's law** states that electric current flowing through a metallic wire is directly proportional to the potential difference (V) across its ends provided its temperature remains the same



$V = IR$ (R is constant called Resistance)

Resistance: Resistance is a property of a conductor to resist flow of charge through it. Its SI unit is **Ohm (Ω)**

Rheostat: A variable resistors is a component which allows changing of resistance in a circuit keeping the voltage same.

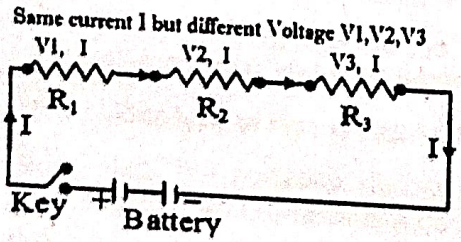
Factors effecting resistance: Length (l), Area of cross section (A), and Resistivity ρ (Rho)

$R \propto l$, $R \propto 1/A$ Combining the two we will get Therefore $R = \rho \frac{1}{A}$ ρ is the constant of proportionality and is called electrical resistivity.

Resistance of a system of resistors

Difference between resistance and resistivity

Resistance in series



$R = R_1 + R_2 + R_3 + \ldots \ldots$

Resistance	Resistivity
Resistance of a conductor is the obstruction offered by the conductor in the flow of current through it	Resistivity is the property of the material due to which it offers resistance
depends upon its material, temp, length and area of cross section.	depends only on its material, temp
variable quantity.	constant for any material
S.I. unit Ohm (Ω)	S.I. unit Ohm metre (Ωm)

Note: In series connection current remain same but voltage differs.

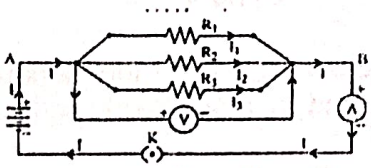
Advantage of series connection: Switches, fuse, cells of batteries are connected in series.

Disadvantage: Series Wiring is "ALL or NONE" type wiring.

High supply voltage are needed if we need to add more load in the series circuit

Resistance in parallel

$$\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$$



Note: In parallel connection Voltage (V)remain same but

Current (I) varies

Advantage of parallel connection:

Appliances are independent from others.

More loads can be added without voltage drop,

Disadvantages: more current needed if we add more appliances, parallel wiring need more cables, wiring is complex.

Heating effect of electric current: Heat is caused due to collision of electrons in any current carrying conductor, more current-more electron-more collision- more heat, more resistance -more collision-more heat, long time collision- more heat

Joules law of heating: This states that **heat produced** (H)in a circuit is directly proportional to the square of current flowing I^2, resistance (R) for current and time (t)for which current flows.

^{2}Rt |*Variants of formula* $H=\frac{v^2}{R}t$ $H=VQ$

Electric power: SI unit: Watt (W) other unit Volt Ampere (VA)

The rate of doing work is power. This is also the rate of consumption of energy.

Work done = $P=\frac{w}{t}=\frac{V\times I\times t}{t}$ Joules $(V=W/Q, W=VQ, Q=It)$

The power P is given by, P × V × I

or $P=I^2R=\frac{V^2}{R}$

One watt is the power consumed by a device that carries 1 A of current when operated at a potential difference of 1 V. Thus,

1 W = 1 volt × 1 ampere = 1 V A

CHAPTER WISE QUESTION BANK

Multiple Answer Type Question (1 Mark Each)

Q1. The equivalent resistance in series combination is:

(a) smaller than the largest resistance.

(b) larger than the largest resistance.

(c) smaller than the smallest resistance.

(d) larger than the smallest resistance.

Hint: R=R+R2+R3+ ....

Q2. If R1 and R2 are the resistances of filaments of a 400W and a 200W lamp, designed to operate on the same voltage, then :

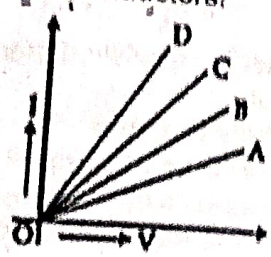
(a) R1 = R2 (b) R2= 2R1 (c) R2= 4R1 (d) R1= R2 Hint: Use ratio of $P=V^2/R$

Q3. What are the essential requirements of a heater filament?

(a) high resistivity, low melting point.

(b) low resistivity, low melting point.
(c) high resistivity, high melting point . (d) low resistivity , high melting point .
Hint: Resistance to current in a conductor provides heat, excess heat may melt the conductor
Q4. A bulb of resistance of 80 ohms draws a current of 0.5A. What is the voltage across it?
a) 40 V b) 60 V c) 70 V d) 75 V
Hint: V=IR
Q5. Study the V-I graph for four conductors A, B, C, and D having resistance R_A, R_B, R_C, and R_D respectively and which one of the following relations is true for these conductors.

a. $R_A > R_B > R_C > R_D$ b. $R_A < R_B < R_C < R_D$
c. $R_A = R_B = R_C = R_D$ d. $R_A = R_B < R_C < R_D$
Hint:IαV, I=1/R



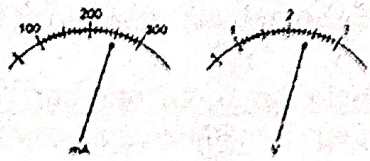
Q6.The resistance of a conductor in a circuit depends on
(a)Length b) Area of cross section c) Material d) All of the above
Hint: $R = R=\rho\frac{l}{A}$

Assertion Reason Question

Assertion & Reason Based Questions (1 Mark Each)
Following questions consist of two statements--Assertion(A) and Reason (R).Answer these questions selecting the appropriate option given below:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.
Q7. **Assertion (A):** A thick wire has less resistance than a thin wire of the same material and length.
Reason (R): Resistance is inversely proportional to the cross-sectional area.
Answer: A Hint: $R=\rho\frac{l}{A}$
Q8. **Assertion (A):** A fuse is always connected in parallel with the main circuit.
Reason (R): A fuse is used to prevent overloading in a circuit.
Answer: D
Hint:(A fuse is always connected in series.)
Q9. **Assertion (A):** Electric current is a scalar quantity.
Reason (R): It has magnitude but no direction.
Answer: C Hint: Current always flow from positive to negative terminal in a circuit irrespective of position of circuit
Q10. **Assertion (A):** Copper is a better conductor of electricity than nichrome.
Reason (R): Copper has lower resistivity than nichrome.
Answer: A
Hint: Copper has lower resistivity than nichrome
Short Answer Questions(2 marks each)
Q11. A wire having 4 ohm resistance and 10cm length is stretched to 20cm. What will be its new resistance.
Hint: Use $R=\rho\frac{l}{A}$ by doubling the length the cross section will become A/2
Q12. List the factors on which resistance of a wire depends.
Q13. State Ohm's law. An electric bulb draws 1.2A current at 6.0V. find the resistance of the bulb.
Hint: Ohm's law V=IR, Use formula V=IR Ans 5Ω
Q14. Give two point difference between Resistance and resistivity.
Hint: Refer to the content
Q15.Why Nichrome is used as a heating elements?
Hint: Nichrome has high resistivity and melting point, it does not react with O_2

Short Answer Questions (3 Marks each)

Q16. The current flowing through a resistor connected in a circuit and the potential difference developed across its ends are as shown in the diagram by milliammeter and voltmeter readings respectively



(a) What are the least counts of these meters?

(b) What is the resistance of the resistor

Hint Count the marking reading of Ammeter and voltmeter

Q17.(i)Calculate the percentage change in a resistive circuit, if the current is increased to two times.

(ii) A 5Ω resistor is connected across a battery of 6 volts. Calculate The current flowing through the resistors The energy that dissipates as heat in 10s.

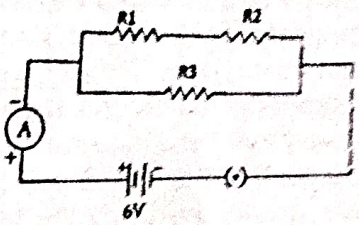
Hint: (i) H=I2Rt (ii) (a) I=V/R Ans: 1.2A (b) H=I2Rt Ans 72J

Q18. (i) What is power? What is its SI unit?

(ii) An electric motor takes 5 A from a 220 V line. Determine the power of the motor and the energy consumed in 2 h.

Hint: (i)Rate of doing work, unit: watt (W). (ii) P=VI, E=Pt

Q19.In the given circuit the value of R1= 10 Ω, R2= 50 Ω and R3 =30 Ω . Find the total resistance of the circuit and current flowing through the ammeter.



Hint: Use formula of resistance in series and parallel and V=IR for current

Long Answer Question (5 Marks Each)

Q20. (i) Draw a circuit diagram with a lamp of 20 Ω resistance and a conductor of 4 Ω resistance connected in series with a 6V battery source, an ammeter and a closed key (K) and then calculate

(ii) The current through the circuit

(iii) The potential difference across the bulb and conductor of 4 Ω resistance

(iv)Power of the bulb.

Q21. (a) State the commercial unit of electrical energy and find its SI unit.

b) The current through a resistor is made three times its initial value. Calculate how it will affect the heat produce in the resistor.

c) Find the increase in the amount of heat generated in conductor if another conductor of double resistance is connected in the circuit keeping all other factors unchanged.

Hint: Use: KWh 3.6×10^6J, Use formula $H=I^2Rt$

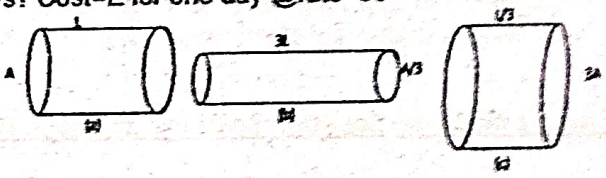
Case Based Questions (4 Marks Each)

Q22. Rita uses an electric iron rated 220 V, 1000 W to iron clothes every day for 1 hour. She wants to know how much energy the iron consumes and how much it costs her if the electricity rate is ₹6 per unit.

1. What is the current drawn by the iron? Hint: Use P=VI
2. How much energy does the iron consume in 1 hour? E=Pt
3. Calculate the cost of electricity for one day. Cost=E @rate
4. What will be the cost of electricity if Rita uses it for 30 days? Cost=E for one day @rate×30

Q23. The figure below shows three cylindrical copper conductors along with their face areas and lengths. Which has greater resistance?

(b) What will happen if we double the length of part (b) given in the picture without disturbing its other parameters



Chapter-12

Magnetic Effects Of Electric Current

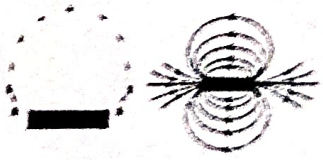
An electric current-carrying conductor behaves like a magnet. It is one of the effects of electricity. **Magnetic field and field lines:** A magnetic field is the region surrounding a magnet, in which the force of the magnet can be detected.

Magnetic field is a vector quantity as it has both direction and magnitude. The direction of the magnetic field is taken to be the direction in which a north pole of the compass needle moves inside it.

The unit of magnetic field strength is Oersted named to honor the scientist Hans Christian Oersted

Magnetic field lines: Magnetic field lines are path along which a hypothetical free north pole of a magnet tends to move toward south pole

It is taken by convention that the field lines emerge from north pole and merge at the south pole

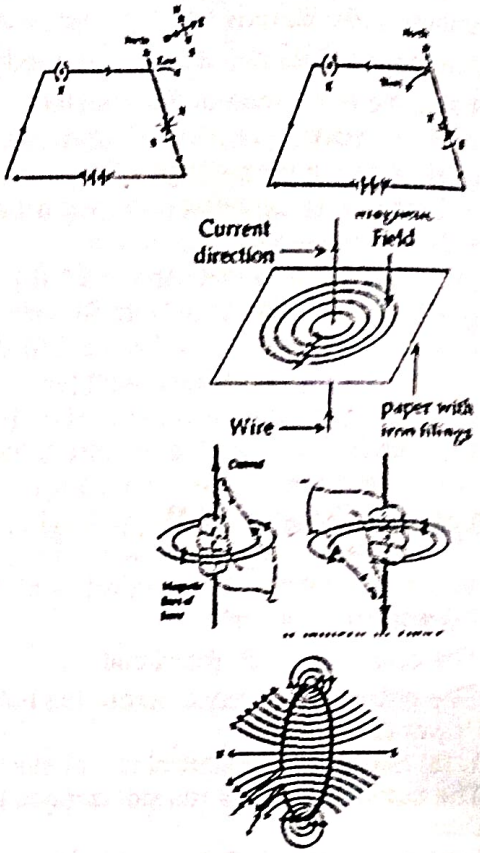


Properties of magnetic field lines

- Magnetic field lines are closed curves.
- They emerges from North and merge into South pole.
- Inside the magnet, the direction of the field lines are from south to north pole

- Magnetic field lines never intersect each other. If they did, it would mean that at the point of intersection, the compass needle would point towards two directions, which is not possible

Magnetic field due to current carrying conductor: *An electric current through a metallic conductor produces a magnetic field around it.*



If a magnetic compass is placed near a conductor carrying current (wire), the needle is deflected. This shows that a conductor carrying current has a magnetic field around it. # If the direction of the current is from north to south, the deflection of the magnetic needle is towards the east.

#If the direction of the current is from south to north, the deflection of the needle is towards the west.

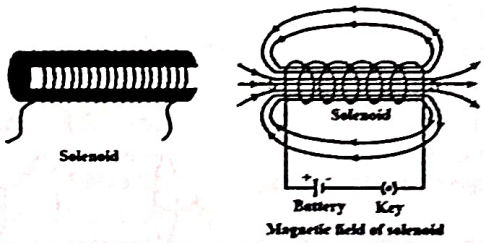
Magnetic Field due to a Current through a Straight Conductor: The magnetic field around a current carrying straight conductor is in concentric circles. The direction of the magnetic field around a conductor is given by the **Right Hand Thumb Rule.**

It states that ' If a current carrying conductor is held in the right hand such that the thumb points in the direction of current, then the fingers wrapped around the conductor shows the direction of the magnetic field '.

Magnetic field due to a current through a circular loop :- When current is passed through a circular conductor (loop) the magnetic field produced is in the form of concentric circles around the conductor. Towards the centre the arcs of the circles become larger and appears as straight line.

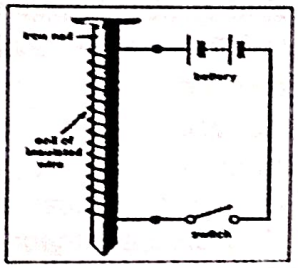
Solenoid: A solenoid is a circular coil of wire in the shape of a cylinder.

Magnetic field due to current in a solenoid: When current flows through a solenoid, it behaves like a bar magnet. The ends of the solenoid behaves like the North and South poles of a magnet.



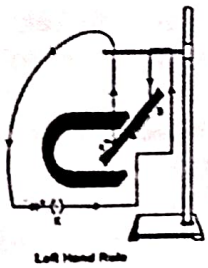
Factors on which the strength of the magnetic field of solenoid depends:

(i) Strength of the current.
(ii) The number of turns of the coil.
(iii) radius of coil
(iv) Material of core of the solenoid.



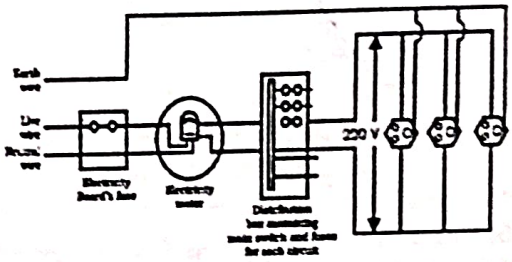
Electromagnet: A strong magnetic field inside a solenoid can be used to magnetise a piece of magnetic material like a soft iron when placed inside the coil. Such a magnet is called an electromagnet.

Force on a current carrying conductor in a magnetic field:
A.M.Ampere suggested that if a current carrying conductor produces a magnetic field and exerts a force on a magnet, then a magnet should also exerts a force on a current carrying conductor.
The direction of force can be found out by Fleming's left hand rule.



Fleming's Left Hand Rule.
It states that ' If we hold the thumb, fore finger and middle finger of the left hand perpendicular to each other such that the fore finger points in the direction of magnetic field, the middle finger points in the direction of current, then the thumb shows the direction of force (motion) of the conductor.

Domestic electric circuit: Electric power to homes is supplied through the mains. It has two wires. One is a live wire (positive wire) with red insulation and the other is a neutral wire (negative wire) with black insulation. The potential difference between the two wires is 220V. The earth wire with green insulation is connected to a metal plate kept in the ground.



Two separate circuits are used.
-One is of 15A for appliances with high power rating like geysers, air conditioners etc.
-The other is of 5A for fans, bulbs etc.
The different appliances are connected in parallel so that every appliance gets equal voltage and even if one is
switched off the others are not affected
The appliances having metallic body like electric iron, refrigerators etc., their metallic body is connected to the earth wire so that if there is leakage of current, it passes to the earth and prevents electric shock.

Electric fuse

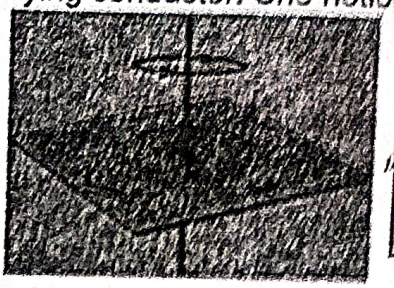
- It is safety device
- used in series
- It is a wire having high resistance and low melting point.
- If excess current flows through the circuit, the fuse wire melts and breaks the circuit.
- Fuse wire is made of Lead (Pb) and tin (Sn).

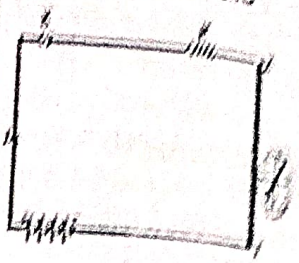
Overloading :-
Overloading is caused due to increase in voltage, or if the live wire and neutral wire comes in contact or if too many appliances are connected to a single socket. It results in overheating of the wires and can cause damage to the circuit and appliances.
Short circuit :- Short circuit is caused when the live wire and neutral wire comes in contact and the current suddenly increases in the circuit. It causes spark, fire and damage to the circuit and appliances.

CHAPTER WISE QUESTION BANK

Multiple Answer Type Question (1 Mark Each)

Q1. A student places a compass near a straight current-carrying conductor. She notices that the needle deflects. What can be concluded from this observation?





(a) The conductor becomes hot
(b) The conductor emits radiation
(c) The current produces a magnetic field
(d)The current produces an electric field
Hint:(Any current carrying conductor behaves as a magnet).

Q2. A magnetic field is produced around a current-carrying wire. The direction of the magnetic field can be determined using:

(a) Fleming's Left-hand Rule (b)Right-hand Thumb Rule
(c) Faraday's Law (d)Newton's Third Law
Hint: (b)

Q3. Two identical circular coils are placed near each other, carrying current in the same direction. What will be the net magnetic field at the center of the coils?

(a) Zero, because the fields cancel out
(b) Double, because the fields reinforce each other
(c) Infinite, due to mutual inductance
(d) Unchanged, as each field is independent
Hint: (magnetic field will add up)

Q4. In an experiment, iron filings are sprinkled around a current-carrying wire and form concentric circles. What does this pattern show?

(a) Electric field lines are circular
(b) Gravitational field around a conductor
(c) Magnetic field lines are circular around the wire
(d) There is no field around the wire
Hint:: (magnetic field lines always arrange in circular rings)

Q5. Which of the following appliances uses the magnetic effect of electric current?

(a) Electric heater (b) Table fan
c) Microwave oven d) Electric bell
Hint:: (electromagnetic effects)

Q6. If the direction of current in a solenoid is reversed, what happens to the polarity of its magnetic field?

(a) It remains the same
(b) The solenoid stops producing a magnetic field
(c) The polarity of the magnetic field is reversed
(d) The magnetic field becomes zero
Hint: (direction of magnetic field depends upon the direction of current)

Assertion Reason Questions

Choose the correct option:

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Q7. Assertion (A): Magnetic field lines do not intersect each other.
Reason (R) At the point of intersection, the compass needle would point in two directions, which is not possible
Hint:: (a) Both A and R are true, and R is the correct explanation of A.

Q8. Assertion (A): A fuse in a circuit prevents damage to the appliances and the circuits due to overloading
Reason (R): Overloading occurs when the live wires and the neutral wire come into direct contact.
Hint:: (b) Both A and R are true, but R is not the correct explanation of A

Q9. Assertion (A): When a current is switched on in a circuit with a wire, a magnetic compass placed near it gets deflected.
Reason (R): A current-carrying wire produces a magnetic field.
Hint:: (a) Both A and R are true, and R is the correct explanation of A.

Q10. Assertion (A): Strength of magnetic field increases with the number of turns in a solenoid.
Reason (R): Each turn of the solenoid adds to the magnetic field produced.

Hint:: (a) Both A and R are true, and R is the correct explanation of A.

Short Answer Question (2Marks)

Q11. Manish places a magnetic compass near a current-carrying straight conductor and observes deflection in the needle.

a) What does this observation indicate about the relationship between electricity and magnetism?

b) Name the scientist who discovered this phenomenon.

Hint: a) current-carrying conductor produces a magnetic field around it.

b) Hans Christian Oersted.

Q12. A student uses Fleming's Left-Hand Rule to determine the direction of force on a wire placed in a magnetic field.

a) Which physical quantities are represented by the three fingers of the left hand? b) What is the use of this rule?

Hint:a) Thumb – Force (motion), Forefinger – Magnetic field, Middle finger – Current.

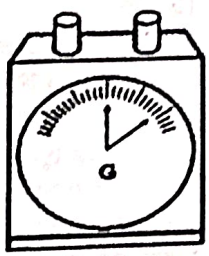
b) To determine the direction of force on a current-carrying conductor in a magnetic field.

Q13. When is the force experienced by a current carrying conductor placed in a uniform magnetic field?

(a) Maximum (b) Minimum

Hint: perpendicular and parallel respectively

Q14. Observe the following image and answer the following questions i. What is the name of the instrument ii. What is the use of this instrument?



Q15. Why two magnetic field lines do not intersect each other?

Hint: The needle of north pole of compass can not show two direction at a point at a time.

Short Answer Questions (3 marks)

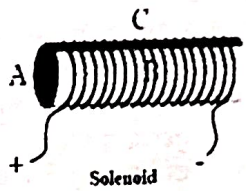
Q16 Metallic electrical appliances are connected to the mains through a three pin plug, whereas electrical bulb with two pin plug.

(a) Why do electrical appliances are connected to the mains through a three pin plug?

Hint: the third pin is earthing connected to the ground (b) What is the function of a fuse in domestic circuit.

Hint: It is a safety device

Q17. (a) An electrician wants to connect an immersion rod, a bulb and a fan simultaneously. How should these gadgets be connected with the main line. Justify your answer with two reasons. (c) Which gadgets he will connect with 15A and 5A wiring.



Q18. In the given current carrying solenoid

(i) Draw magnetic field lines. Hint: Refer content

(ii) Explain giving reason that at which point among A, B and C, the field strength is maximum and at which point it is minimum.

Hint: The density of field lines are minimum at C and maximum at B (B>A>C)

Q19. (i)Draw the pattern of magnetic field lines due to a magnetic field through and around a current carrying circular loop.

Hint: refer content, Topic magnetic field through circular loop

(ii) Name and state the rule to find out the direction of magnetic field inside and around the loop.

Hint: Refer content

Long Answer Questions (5 marks)

Q20.(i) Describe a solenoid?

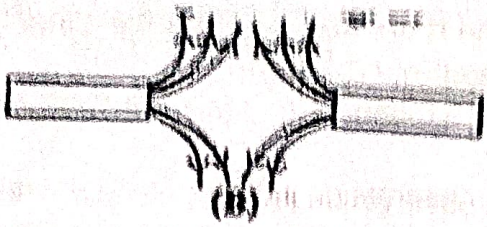
(ii) Draw magnetic field lines in (a) a current carrying solenoid and (b) a permanent magnet (iii) What are the difference between magnetic field lines between a current carrying solenid and a permanent magnet?

Q21.(a) Magnetic field lines are shown in Fig A and Fig B. Select the figure that represents the correct pattern of correct lines. Give reason for your answer.

(b) Name the poles of the magnets facing each other.

(c) Draw complete magnetic field lines around a bar magnet.

(A)



(B)

Case base Questions (4 Marks)

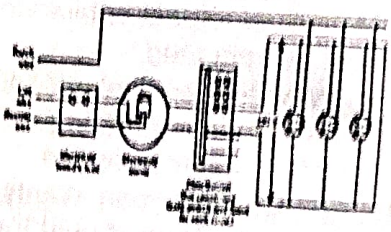
Q22. House fuses play a pivotal role in ensuring the safety and functionality of home electrical infrastructure and appliances. It acts as a protective device which is designed to interrupt the flow of electric currents which can restrict and prevent any overload when a short circuit happens in the house. This is the measure which prevents potential damage which can cause serious accidents or even death
So every house has a house fuse, and they are the very essential components of an electrical system. They have a metal wire that is in a protective case. The main function of this is to safeguard by breaking all the circuit if any fault happens in any appliance by the flow of too much current by overloading, and protecting the wire and appliances. This type of fuse is also very helpful in reducing the risk of fire damage and any dangerous incidents that can happen due to an electrical shock.

(a) What is a fuse? Why it is connected in series of positive line of circuit?
Hint: It is a safety device, in series, it becomes part of the circuit's path, when excessive current passes through, it becomes too high, the fuse melts stopping the flow of current.

(b) How it play its role in electrical circuit? Hint: Refer hint of above question

(c) What type of wire is used for fuse? What are the characteristics of fuse wire? Hint: An alloy

Q23. In our homes, we receive supply of electric power through a main supply (also called mains). This supply, usually with red insulation cover, is called live wire (or positive). Another wire, with black insulation, is called neutral wire (or negative). In our country, the potential difference between the two is 220 V. At the metre-board in the house, these wires pass into an electricity meter through a main fuse. Through the main switch they are connected to the line wires in the house. These wires supply electricity to separate circuits within the house. Often, two separate circuits are used, one of 15 A current rating and other of 5 A current rating.. The earth wire, which has insulation of green colour, is usually connected to a metal plate deep in the earth near the house.



(a) Why two separate circuits are there in house electrical wiring? Explain. Hint: to use different powered appliances

(b) What is the function of earth wire in electrical appliances?appliances Hint: Provide safety from getting shock form any leakge of current in (c) Can we use a 1500W heater in a domestic circuit of having 5A fuse.
Hint: Calculate current using I=V/R if it is less than 5A then yes if more than 5A then No

Chapter-13
Our Environment

Autotrophic and Heterotrophic are the two modes of nutrition in living organisms. Plants and some bacteria are autotrophic as they make their own food. Animals, fungi and some bacteria are heterotrophic as they derive their food from other organisms.

Saprophytes and decomposers Saprophytes feed on dead and decaying material, For example, fungi and microorganisms, bacteria, worms, slugs, and snails

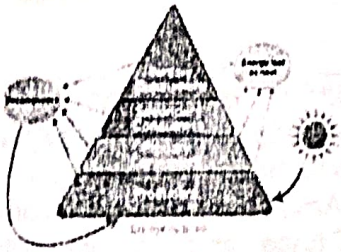
Functions of Saprophytes:They absorb nutrients from dead and decaying plants and animal parts.

Functions of Decomposers break down the organic matter or waste material and release nutrients into the soil. They break down the complex organic matter into simpler substances.

Abiotic components :Non-living chemical and physical components of the environment like the soil, air, water, temperature, etc.

Biotic components Living organisms of the environment like plants, animals, microbes and fungi.

Trophic levels :It refers to the various levels in a food web as per the flow of energy. The different trophic levels are –



PYRAMID OF TROPHIC LEVELS:

- Is a graphical representation.
- Can be the pyramid of numbers, the pyramid of biomass or the pyramid of energy.

➢ All the pyramids start with producers.

1st	Producers
2nd	Primary consumers (herbivores)
3rd	Secondary consumers (primary carnivores)
4th	Tertiary consumers(Sec carnivores)
5th	Quaternary consumers (Ter. Carnivores)
6th	Decomposers

a) **Pyramid of numbers**: gives the number of organisms present at each trophic level. It can be upright or inverted.

b) **Pyramid of biomass:** gives the biomass of each trophic level and could be upright or inverted.

c) **Pyramid of energy:** is always upright as it shows the flow of energy from one trophic level to the next trophic level.

Law of conservation of energy : Energy can neither be created nor destroyed; rather, it transforms from one form to another.

In biological systems, it gets passed from one organism to another across trophic levels. To know more about the Law of conservation of energy

Energy flow

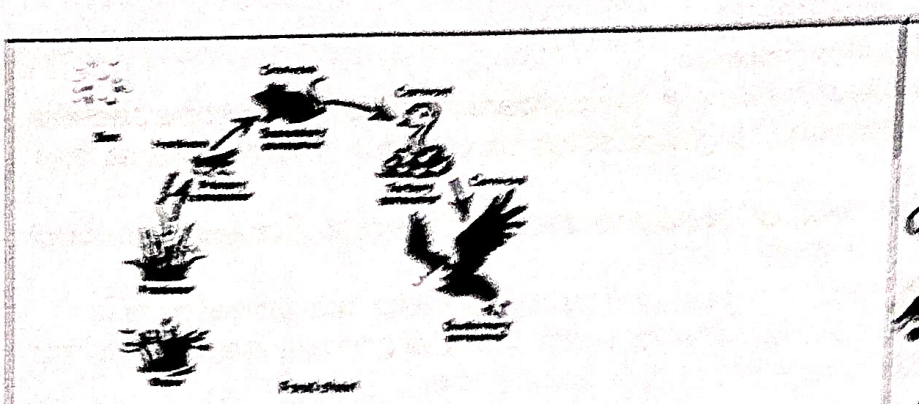
Transfer of energy from one trophic level to another depicting its direction and amount.

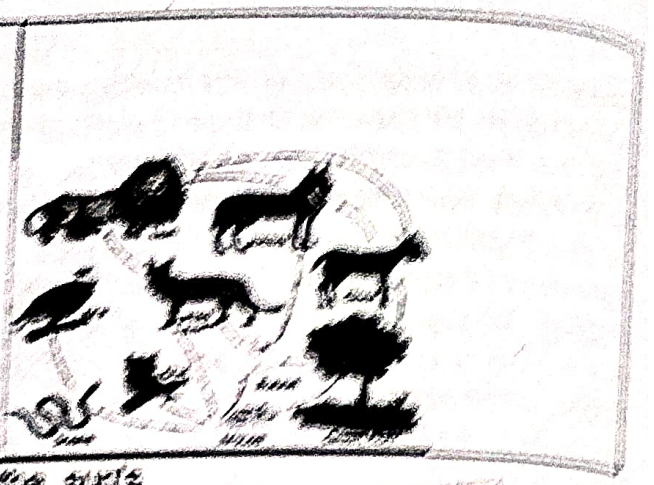
- Can be represented by the pyramid of energy.

In any food chain, only 10% of the energy is transferred from one trophic level to another.

To know more about Energy Flow in Ecosystem

FOOD CHAIN	FOOD WEB
A series of organisms each dependent on the next as a source of food.	Is formed by interconnections of different food chains. Is a graphical representation of 'Who eats Whom' in an ecosystem





Ozone layer: The ozone layer protects the earth from the sun's ultraviolet (UV) radiation. CFCs released into the atmosphere react chemically with ozone molecules and are depleting the layer.

Advantages of the Ozone Layer

Cancer and cataract protection

Environmental and ecosystem protection

Cause of Ozone layer depletion:

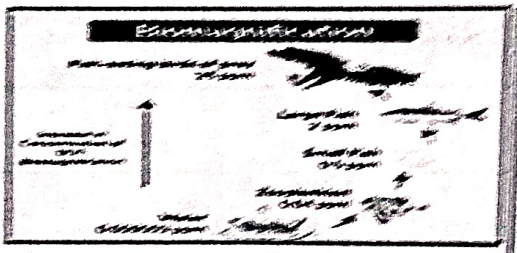
The primary cause of ozone layer depletion is the release of man-made chemicals, particularly those containing chlorine and bromine, into the atmosphere. These chemicals, such as chlorofluorocarbons (CFCs) and halons, break down ozone molecules in the stratosphere, reducing the layer's ability to block harmful ultraviolet radiation.

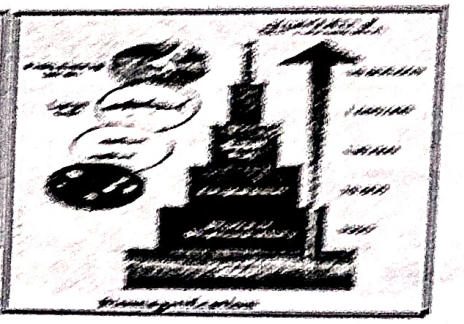
Garbage management: Involves all the activities and actions required to manage waste from its inception to its final disposal.

Ensures environmental best practices are followed along with proper monitoring and regulation. Steps involved:

1. Segregation of waste 2. Collection, 3. Transport, 4. Treatment, 5. Processing & Recycling

2. Disposal





Biomagnification: It is the increase in the concentration of contaminants as they move up each trophic level in a food chain.

CHAPTER WISE QUESTION BANK

Multiple Answer Type Question (1 Mark Each) 1.What is the role of decomposers in an ecosystem? (a) They do not break down the organic compounds.

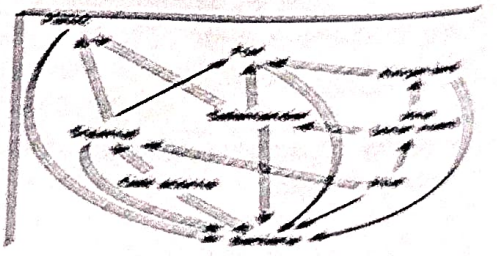
(b) They convert inorganic materials to an organic compound

(c) They convert organic material into inorganic forms

(d) They convert inorganic material into simpler forms

(Hint: It convert organic material into simple forms)

2) Which is correct as per above food web.



(a) Fox feeds on hawk obtain energy.

(b) Hawk feeds on oak acorn to obtain energy.

(c) Squirrel feeds on pine borer to obtain energy.

(d) Salamander feeds on pine borer to obtain energy.

Hint: Analyse the picture

3. Ozone is formed by a combination of free oxygen atoms along with oxygen molecules. How can free oxygen atoms be formed at higher levels of the atmosphere?

a. By splitting molecular oxygen into free oxygen atoms in the presence of high energy ultraviolet radiations.

b. By splitting the molecular oxygen into free oxygen atoms in the presence of low energy ultraviolet radiations.

c. By combining two free oxygen atoms in the presence of low energy ultraviolet radiations.

d. By combining two free oxygen atoms in the presence of high energy ultraviolet radiations.

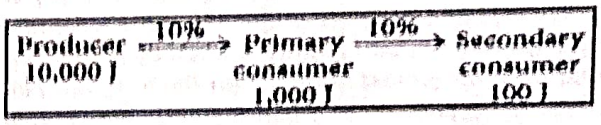
(Hint: It is process of splitting the molecular oxygen into free oxygen atoms)

4. From most to the least favoured, select the order of the waste management hierarchy:
(a) Prevention > Reuse > Disposal > Recycle (b) Prevention > Recycle > Reuse > Disposal
(c) Prevention > Disposal > Reuse > Recycle (d) Prevention > Reuse > Recycle > Disposal
(Hint: d)
5. Excessive exposure of humans to ultraviolet rays result in
(a) Damage to immune system and skin cancer
(b) diabetes
(c) Damage to lungs
(d) Peptic ulcers
(Hint: Causes skin cancer)
6. Which of the following is not an example of abiotic factors?
(a) Light (b) Plant (c) Heat (d) Temperature (Hint: It green in colour)

Assertion & Reason Based Questions (1 Mark Each)

Following questions consist of two statements–Assertion(A) and Reason(R).Answer these questions selecting the appropriate option given below:
a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true
7.Assertion : Greater number of individuals are present in lower trophic levels.
Reason : The flow of energy is unidirectional
(Hint :a) Both A and R are true and R is the correct explanation of A.
8. Assertion: Ozone layer is getting depleted at upper atmosphere and it is a serious cause of concern.
Reason: CFC reacts with ozone and breaks it.
(Hint :a) Both A and R are true and R is the correct explanation of A.
9.Assertion : Polythene bags and plastic containers are non-biodegradable substances. Reason : They can be broken down by microorganisms in natural simple harmless substances.
(Hint: d) A is false but R is true
10.Assertion: Accumulation of harmful chemicals is higher in case of organisms at higher trophic level.
Reason: Food chain normally limited to 3 or 4 trophic level.
(Hint: c) A is true but R is false.

Very Short answer Based Question (2 Marks Each)

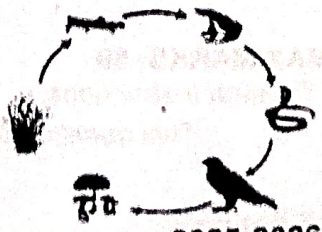


11.List two biotic components of a biosphere.
(Hint : Two biotic components of a biosphere are:
(i) Producers – Include organisms which can produce their food using simple inorganic compounds, e.g., all green plants, blue green algae (cyanobacteria).
(ii) Consumers – Include organisms which are unable to synthesise their food, therefore, utilise materials and energy stored by the producers or eat other organisms, e.g., all the animals.)
12.In a food chain, if 10,000 joules of energy is available to the producer, how much energy will be available to the secondary consumer to transfer it to the tertiary consumer? Hint :According to ten percent law, 10% of the energy of producer will be available to primary consumer, and 10% of this energy will be available to secondary consumer and so on.
13. Give an example to illustrate that indiscriminate use of pesticides may result in the degradation of the environment (Hint : Pesticides are the chemicals used to kill plant and animal pests. They are non-biodegradable and toxicants.) 14 Which organism of this food chain will have the highest concentration of non- biodegradable chemicals? (Hint :Hawk is the top consumer of the food chain, so, it will have high concentration of non- biodegradable chemicals)
15. Calculate the amount of energy available to the organisms at the fourth trophic level. If the energy available to the organisms at the second trophic level is 2000 J (Hint : See Flow chart----->

Producers →	Primary consumer →	Secondary consumer →	Tertiary consumer
T_1	T_2	T_3	T_4
20,000 J	2000 J	200 J	20 J

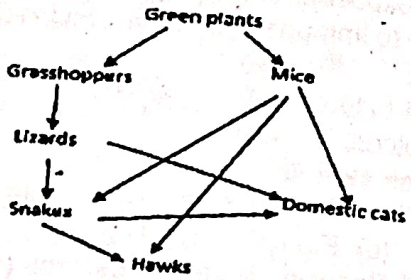
Short Answer Type Questions (3 Marks Each)

16.Draw a food chain with 4 tropic level having eagle at the top.
(Hint: See table of Food chain)
17..Why are bacteria and fungi called decomposers?
Hint: They Clean our surroundings
18..List any two advantages of decomposers to the environment? (Hint: Work as cleaning agents, Turn nitrates to Nitrites.) 19a) What is the relation shown in the figure called?
b) Assign the trophic level to the secondary consumer.
c) If the number of frogs shown in the food chain is suddenly reduced, then what can be different effects on the food chain?



(Long Answer Type Questions 5 Marks Each)

20. (a) Explain the role of UV radiation in formation of ozone layer.
(Hint . It initiates the chemical reactions that convert oxygen molecules into ozone (O3) in the stratosphere)
(b) Mention the reaction involved in the above question.
(Hint : Common types of chemical reactions include decomposition, combination, combustion, neutralization, single displacement, double displacement, precipitation, and redox reactions)



(b) Why is excessive use of CFCs a cause of concern for our environment? (Hint :They damage the ozone layer)

21.(a)Which organism has the largest variety of predators in the food web?
(b). Name secondary consumers in the food web
(c). Suggest three ways in which the ecosystem would be affected of there was a prolonged drought.

Case Based Questions (4 Marks Each)

22.*A lake is found fully covered with algae and scum. The water from this lake is used by people living nearby it for their household purposes. It is also found that many children are suffering from diarrhea and muscle cramps. As a precaution the doctor advises them not to drink water from the lake, and if at all they use it, it should be boiled and cooled.*
(a)What is the reason for the overgrowth of algae in the lake.
(Hint :Factors like too much sunlight and excess nutrients can lead to issues with floating algae growth.)
(b) What change will come to the quality of water when it is boiled and cooled?
(Hint ;Boiling and cooling water primarily kill the microorganisms)
(c). How can we remain free from diarrhoea?
(Hint: Diarrhea is characterized by loose, watery stools; taking healthy diet).

23. *Green plants capture about 1% of the solar energy incident on the earth to carry out the process of photosynthesis. A part of this trapped energy is used by plants in performing their metabolic activities and some energy is released as heat into the atmosphere. When these green plants are eaten up by herbivores, the chemical energy stored in the plants is transferred to these animals. These animals (herbivores) utilise some of this energy for metabolic activities and some energy is released as heat while the remaining energy is stored in their body. This process of energy transfer is repeated till top carnivores. In an ecosystem, transfer of energy follows 10 percent law, i.e,,* ***only 10 percent of the energy is transferred to each trophic level from the lower trophic level.***

(a) What percentage of energy is captured by the plants from the sun?
(Hint: 1%)

(b) Which component is present in the first level of food chain? Why?
(Hint: Green in colour)

(c) Explain by the help of a food web the process of biomagnification. (Hint: Accumulations of chemicals. Ref. Food web diagram.)

Solved Question Paper-I

MAX.MARKS: 80 **MAX. TIME: 3HRS**

General Instructions:

i. This question paper consists of 39 questions in 5 sections.