CBSE Sample Paper-03 (solved)
SUMMATIVE ASSESSMENT –II
SCIENCE (Theory)
Class – X

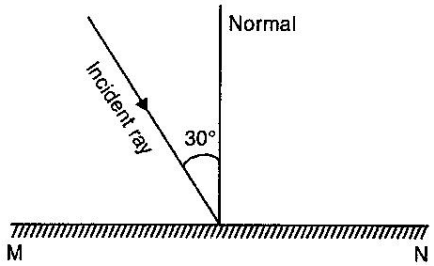
Time allowed: 3 hours Maximum Marks: 90

General Instructions:

a) All questions are compulsory.
b) The question paper comprises of two sections, A and B. You are to attempt both the sections.
c) Questions 1 to 3 in section A are one mark questions. These are to be answered in one word or in one sentence.
d) Questions 4 to 6 in section A are two marks questions. These are to be answered in about 30 words each.
e) Questions 7 to 18 in section A are three marks questions. These are to be answered in about 50 words each.
f) Questions 19 to 24 in section A are five marks questions. These are to be answered in about 70 words each.
g) Questions 25 to 27 in section B are 2 marks questions and Questions 28 to 36 are multiple choice questions based on practical skills. Each question of multiple choice questions is a one mark question. You are to select one most appropriate response out of the four provided to you.

Section A

1. Write the (i) name and (ii) formula of the functional group present in the compound CH_3COOH.
2. Figure below shows an incident ray and normal on a plane mirror MN. Draw the reflected ray and find the angle between the incident ray and reflected ray.



3. Name any two biodegradable substances.
4. Explain why atomic number is more important than atomic weight in determining chemical properties?
5. Mention any four details that can be inferred about organisms from their fossils.
6. Why does it take some time to see objects in dim light when you enter the room from bright sunlight outside?
7. Define Mendeleev's Periodic Law. Give two advantages of Mendeleev's Periodic Table.

8. Why was it necessary to change the basis of classification from atomic mass to atomic number.
9. Define the term unisexual and bisexual giving one example of each.
10. Explain double fertilization in plants.
11. Pankaj is a student of class 7. He is very passionate about doing Science experiments. Recently he visited Delhi with his parents to witness Science fair. He purchased different types of lenses, mirror and other articles. One day, during games period, a student of same class fell down and his lips started bleeding.

    On observation, it was found by physical education teacher that very fine pieces of glass, difficult to observe, stranded over there. Pankaj immediately rushed to Physical Lab and brought a Lens. The bigger image of stranded glass pieces eased the first aid job.

    Read the above passage and answer the following questions:

    (a) Name the lens or mirror brought by Pankaj.
    (b) Draw the ray diagram showing formation of very big image of object by lens. What should be the position of object to get such image?
    (c) What values are shown by Pankaj

    [Value Based Question]
12. An object 3 cm high is placed perpendicular to the principal axis of a concave lens of focal length 15 cm. The image is formed at a distance of 10 cm from the lens. Calculate:
    (a) Distance at which the object is placed.
    (b) Size and nature of the image formed.
13. What is accommodation? Explain how does the ciliary muscles do help in accommodation?
14. What is persistence of vision? How do we make a motion picture possible?
15. "Industrialization is one main cause of deterioration of environment". Discuss.
16. Write the cause of depletion of ozone layer in the atmosphere.
17. What are homologous organs? How do they provide evidence in support of evolution?
18. Explain how a new species is generated.
19. (a) Write the name and symbol of alkali metal with the smallest atomic number.
    (b) Which element has atomic number 14? Give its valency.
    (c) Write IUPAC name of the following:
        (i) CH_3CH_2Br (ii) $CH_3CH_2 - C \equiv CH$
    (d) Give one example each of (i) diprotic acid, (ii) triprotic acid.
    (e) What is meant by catenation? Why does carbon show catenation to maximum extent.

Or

    (a) Write the name and symbol of group 17 elements belonging to second period.
    (b) Write electronic configuration of K (19). To which group of periodic table does it belong?
    (c) What are substitution reactions? Give one example.
    (d) What happens when acetic acid reacts with sodium bicarbonate? Give chemical reaction involved.
    (e) Why does carbon form covalent bond?

20. (a) Name two elements of group 13.
    (b) Name most electro-negative element in periodic table. Write its atomic number.
    (c) Draw electron dot structures of (i) H_2O, (ii) CH_4, (iii) NH_3, (iv) BF_3
    (d) Differentiate between ores and minerals.

Or

    (a) Name elements of group 2 belonging to 3^{rd} and 4^{th} period.
    (b) Name the element having highest ionization energy in periodic table.
    (c) Give limitation of Dobereiner's law of triads.
    (d) Why do ionic compounds not conduct electricity in solid state?
    (e) Name the chief ore or iron. Give its formula.

21. Name two bacterial diseases which are sexually transmitted. Name their causal organisms, symptoms and preventive measures.

Or

    What are the advantages and disadvantages of self and cross pollination? Which of them is better and why?

22. Explain: (i) Analogous organs (ii) Natural selection

Or

    What are homologous organs? How do they differ from analogous organ? How does the study of comparative anatomy provide evidence in favour of Organic Evolution?

23. (i) Define: (a) Centre of curvature (b) Pole of a concave mirror
    (ii) State the mirror formula and its magnification.
    (iii) Using the same find the distance at which an object to be placed for getting a real, inverted enlarged image at 45 cm using a concave mirror of focal length 20 cm.

Or

    (i) State the basic laws of refraction.
    (ii) Describe about refractive index.
    (iii) Does the incident and emergent ray coincide in a glass slab refraction? Give reason.

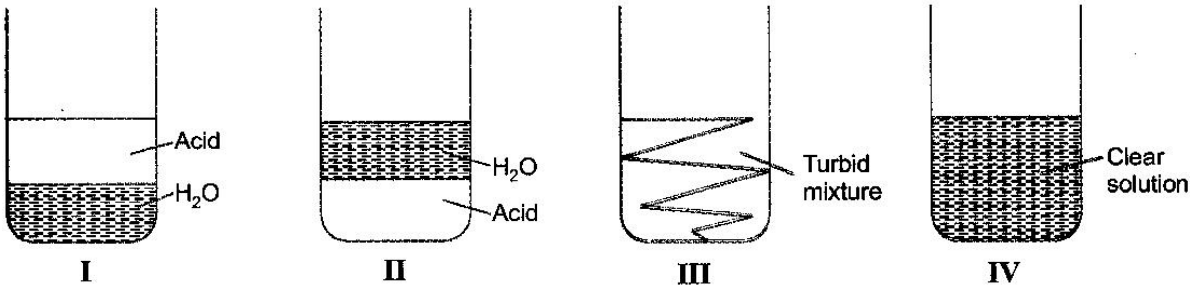
24. Explain how the ray of white light is dispersed. Why does this take place? Which colour deviates more and why?

Or

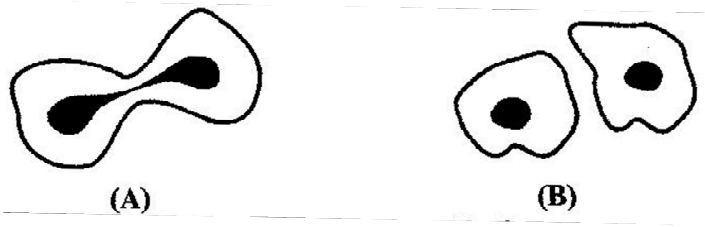
    What is long-sightedness? List two causes for development of long-sightedness. Describe with the ray diagram, how this effect may be corrected by using spectacles.

Section B

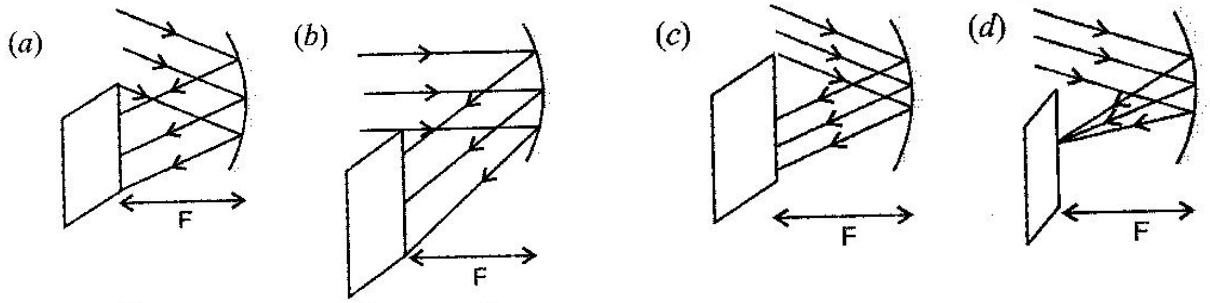
25. Five mL of acetic acid was added to 5 mL of water in a test tube.
    (a) The resulting mixture is correctly represented in which diagram.
    (b) Justify your answer.



26. Which process is shown in the figure of given slides A and B? Give reason also.



27. Which of the following pictures depict the correct image formation and why?



28. Glacial acetic acid is:
    (a) 10% acetic acid (b) 50% acetic acid (c) 100% acetic acid (d) 5% acetic acid

29. Acetic acid, when dissolve in water, it dissociates into ions reversely because it is:
    (a) It is a weak acid. (b) It is a strong acid. (c) It is a weak base. (d) It is a strong base

30. Binary fission occurs in:
    (a) Plasmodium (b) Hydra (c) Pomegranate (d) Paramecium

31. In which of the following reproduction parental identity is lost
    (a) Budding (b) Binary fission (c) Multiple fission (d) All of above

32. The sex of the human child depends on the sex chromosome present in the:
    (a) Egg (b) Sperm (c) Both (a) & (b) (d) None of these

33. Who proposed the law of heredity:
    (a) Darwin (b) Mendel (c) Morgan (d) Dalton

34. The convex lens having surface of same radii is called as:
    (a) Equi-convex lens (b) Equi-planar lens
    (c) Plano-convex lens (d) Water lens

35. If parallel beams, non-parallel to principal axis fall on the convex lens, they converge at a point:
    (a) On principal axis (b) Away from principal axis
    (c) Centre of curvature (d) Called focus on the axis

36. Rajiv put the 10 g raisins in 100 mL distilled water which is at 10^{o} C below the room temperature while Ajay put the same amount of raisins in 100 mL distilled water at 10^{o} C above the room temperature. After an hour, percentage of water absorbed by the raisins will be:
    (a) Same in both cases.
    (b) More in Rajiv's beaker.
    (c) More in Ajay's beaker.
    (d) Exactly twice as much as in Ajay as in Rajiv' beaker.

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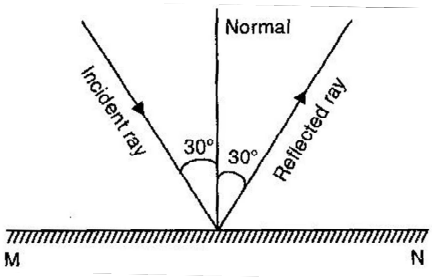
(Solutions)

SECTION-A

1. (i) Carboxyl, (ii) –COOH
2. 

3. Cloth and paper.
4. Chemical properties depend upon valence electrons which depend upon electronic configuration. Electronic configuration depends upon atomic number, therefore chemical properties depend upon atomic number and not upon atomic mass.
   Atomic number is equal to number of protons and also equal to number of electrons in case of neutral atom.

5. (i) Phylogeny can be reconstructed from fossils.
   (ii) The habits and behaviour of extinct organism can be inferred from well preserved fossils.
   (iii) Some fossils indicate the connecting link between two groups of organisms.
   (iv) By analysis of distribution of fossils in different states of rocks, the time in history when different species were forms or become extinct can be inferred.
6. In bright sunlight, the iris contacts the pupil to allow less light to enter the eye and in dim light, the iris expands the pupil to admit more light to see the object so it takes some time to increase the size of pupil in dim light.

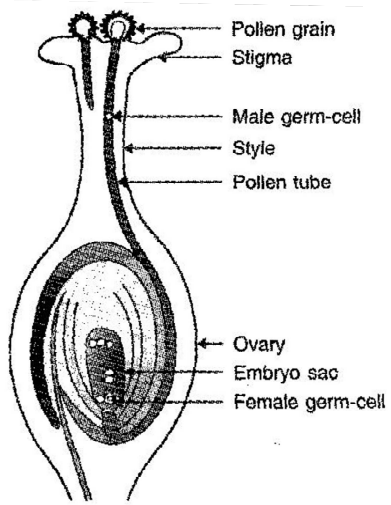
7. **Mendeleev's Periodic Law**: The physical and chemical properties of elements are the periodic function of their atomic masses.
   (a) He could classify all the 63 elements discovered at that time on the basis of similarities in properties.
   (b) He left gaps for some undiscovered elements and predict their properties.

8. Isotopes have different atomic mass therefore they should be given separate place in periodic table which is not possible because they have similar chemical properties. Therefore it was necessary to change the basis of classification from atomic mass to atomic number.

9. **Unisexual** is the plant whose flowers contain either stamens or carpels but not both.
   Example : Papaya, watermelon
   Bisexual is the plant whose flowers contain both stamens and carpels.
   Example : Hibiscus, Mustard

10. **Double Fertilization in plants**. Pollination is followed by fertilization in plants.

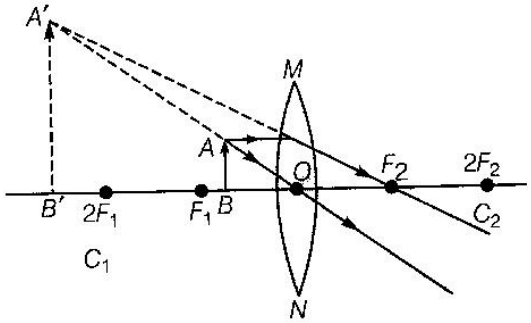
- After the pollen lands on a suitable stigma, it has no reach the female germ cells in the ovary.
- The pollen tube grows out of the pollen grain through the style to reach the ovary.
- After fertilization the zygote divides several times to form an embryo within the ovule.
- The ovule then develops a tough coat and gets converted into a seed.
- The seeds contain the future embryo which develops into seedling.
- The ovary develops and ripens to form a fruit.
- The process of double fertilization occurs inside each embryo sac, in which two fusions, syngamy and triple fusion take place.



Fertilisation in flowering plant

- When one male gamete fuses with the egg contained in the embryo sac of the ovule, this fusion of male and female gametes is called syngamy and its product is the zygote.
- The other male gamete fuses with the two polar nuclei and this process is called triple fusion, where three nuclei are involved in the fusion process, one male gamete and two polar nuclei.

11. (a) Pankaj brought the double convex lens because it forms the magnified image of the object thus it helps to see the fine pieces of glass.
    (b) The object should be placed between optical centre and focus of lens.



    (c) Values shown by Pankaj are sincerity, friendship, concern for others and learning attitude.

12. Here $h = 3$ cm, $f = -15$ cm, $v = -10$ cm

    (a) From lens formula, $\dfrac{1}{f} = \dfrac{1}{v} - \dfrac{1}{u} \quad \Rightarrow \quad \dfrac{1}{u} = \dfrac{1}{v} - \dfrac{1}{f} = \dfrac{1}{(-10)} - \dfrac{1}{(-15)}$

$$\Rightarrow \quad \frac{1}{u} = \frac{1}{15} - \frac{1}{10} = \frac{-1}{30} \qquad \Rightarrow \qquad u = -30 \text{ cm}$$

(b) $m = \frac{h'}{h} = \frac{v}{u} \quad \Rightarrow \qquad h' = \frac{v}{u} \times h = \frac{-10}{-30} \times 3 = +1$

From the above, it is clear that image is formed on the same side of object placed at a distance of 30 cm and image is virtual, erect and of same size.

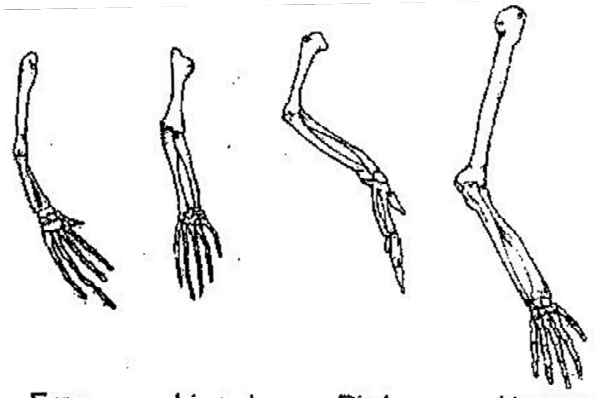
13. The ability of the eye lens to adjust its focal length to see objects at varying distance is called Accommodation.
Eye lens has fibrous jelly like material. The curvature of the eye lens is altered by the ciliary muscles. When the muscles are relaxed, the focal length of the eye lens is 2.5 cm and distant objects can be seen clearly. But when the nearby objects are to be seen, the muscles contract and assume a more rounded shape. This decreases the focal length on the photo-sensitive screen – retina.

14. Image formed on the retina stays for about $\frac{1}{16}th$ of a second after the object is removed. This is called Persistence of vision.
In order to produce smooth sequence of still picture possible in films, the images are to be projected on the screen more than 24 times per second. This principle of more than 24 frames per second makes possible motion picture.

15. Industrialization is one main cause of deterioration of our environment. The main reasons are:
    (i) **Noise pollution**: Pollution caused by machines in the factories disturbs the environment.
    (ii) **Industrial waste**: It is the main cause of water pollution. Plastic, cans, aluminium etc. are highly toxic and major pollutants of our environment.
    (iii) **Poisonous gases**: SO^2, NO^2 and other toxic gases emitted by industries pollute the air.
    (iv) **Thermal pollution**: It is caused by hot water released from factories. This hot water kills many aquatic plants and animals and thus affects aquatic flora and fauna.
    (v) **Acid rain**: Oxides of Nitrogen and Sulphur emitted by industries cause acid rain. This rain damages historical monuments and pollutes water.
    (vi) **Radioactive wastes**: Radioactive wastes are produced from nuclear reactors in the laboratories. They should be set up away from the cities.

16. **Causes of depletion of ozone layer**: There are several reasons for depletion of ozone layer:
    - The foremost is the use of chlorofluorocarbons (CFCs). The other factor responsible for ozone destruction is the pollutant nitrogen monoxide (NO).
    - When the harmful chemicals like chlorofluorocarbons (CFCs) are released into the air, it accumulates in the upper atmosphere and reacts with ozone resulting in reduction of the ozone layer by forming a hole.
    - Thus, the ozone layer in the atmosphere becomes thinner and gets depleted allowing more ultraviolet rays to pass through the earth.
    - The Antarctic hole in ozone layer is caused due to chlorine molecules present in chlorofluorocarbons (CFCs), that are used by human beings.

17. **Homologous organs** are those organs which have the same basic structural design and developmental origin but have different functions and appearance.
Example: The forelimb of a frog, a lizard, a bird and a man seem to be built from the same basic design of bones, but they perform different functions.



Homologous organs

18. When a population of a species splits into two, it cannot reproduce with each other and then a new species is generated. For example:
    - A huge population of beetles feed on bushes spre a wide mountain range.
    - Individual beetle however feed on nearby bushes.
    - There is sub-population of beetles in a neighbourhood and reproduction takes place within the sub-population. Occasionally a migrant beetle enter a different sub-population and reproduce with them, thus genes of the migrant beetle enter in a new population.
    - Change due to genetic drift and natural selection will result in isolation of two sub-population which becomes more and more different from each other.
    - Ultimately these two groups will be incapable of reproducing with each other and two generation of beetles are being generated.
19. (a) Lithium is alkali metal with smallest atomic number. Its symbol is 'Li'.
    (b) Silicon has atomic number 14. Its electronic configuration is 2, 8, 4. Its valency is 4.
    (c) (i) Bromoethane, (ii) But-1-yne
    (d) (i) H2SO4 is diprotic acid. (ii) H3PO4 is triprotic acid.
    (e) Catenation is property due to which an element can form covalent bonds with atoms of same element. Carbon shows catenation to maximum extent due to small size and it can form strong covalent bonds

Or

(a) The element is Fluorine. Its symbol is F.
(b) K (19), 2, 8, 8, 1. It belongs to group 1 of periodic table.
(c) Substitution reaction: These reactions in which an atom or group of atoms are replaced by another atom or group of atoms are called substitution reactions. e.g.

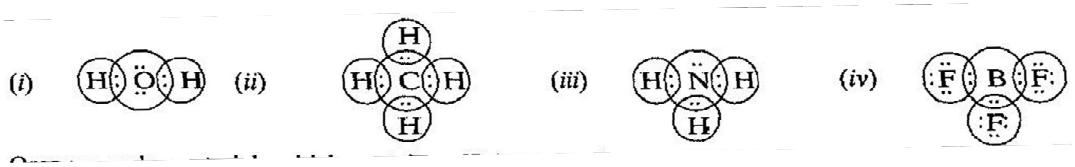
$$CH_4(g) + Cl_2(g) \xrightarrow{\text{Sunlight}} CH_3Cl(g) + HCl(g)$$

(d) Brisk effervescence due to CO_2 will be observed and sodium acetate (CH_3COONa) salt is formed.
$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$

(e) Carbon has four valence electrons. It can neither lose 4 electrons nor gain four electrons because high energy will be needed. Therefore it can share four electrons forming covalent bonds.

20. (a) Boron and Aluminium.

(b) Fluorine is the most electronegative element in periodic table. Its atomic number is 9.

(c) 

(d) Ores are rocky materials which contain sufficient quantity if mineral that metal can be extracted profitably. Minerals are naturally occurring substances from which metal may or may not be extracted profitably

Or

(a) Element belonging to group 2 and 3rd period is Magnisium (Mg) and 4th period is Calcium (Ca).

(b) Helium is element which has highest ionization energy in periodic table.

(c) He could not classify all the elements discovered at that time. He could classify only few element into triads.

(d) It is because in solid state, ions are not free to move, therefore it does not conduct electricity.

(e) The chief ore of iron is haematite. Its formula is Fe_2O_3.

21. Two bacterial diseases which are sexually transmitted are Syphilis and Gonorrhoea.

Syphilis is caused by bacterium Treponema palladium.

Symptoms: It affects the mucus membrane in genital, rectal and oran region and causes lesions.

Prevention: This disease can be easily cured by the use of antibiotic. Intercourse with the diseased person should be prevented.

Gonorrhoea: It is caused by bacterium Neisseria gonorrhoeae.

Symptoms: (i) Inflammation of mucus membrane in urinogenital tract.
(ii) Burning sensation during urination.

Prevention: (i) It may be cured by antibiotic.
(ii) By avoiding prostitution.
(iii) By avoiding homosexuality.
(iv) Penicillin and antibiotic injections can also be used.

Or

Self-pollination is the transfer of pollen grain from the anther if a flower to the stigma of the same plant. It is seen in Pea and China rose plant.

Advantages:

(i) Self pollination is bisexual flowers ensures continuity of the race.

(ii) It helps to preserve the parental characters as the gametes from the same flower are involved.

(iii) It is not necessary for flowers to produce nectar or scent or be colourful.

Disadvantages:

(i) New varieties cannot be obtained by self pollination.

(ii) The genetic defects of the breed cannot be removed.

(iii) Repeated self pollination leads to loss of vigour and vitally of the species.

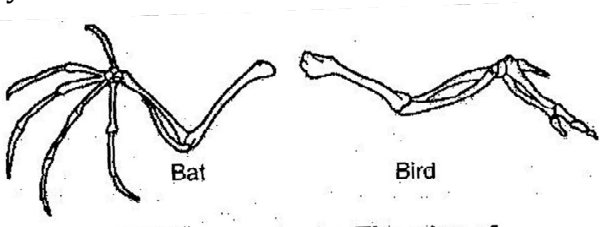
Better method: In nature cross pollination is a better method because:

(i) It avoids recessive lethal or harmful genes to become homozygous.

(ii) It produces healthier plants due to the phenomenon of hybrid vigour.

(iii) It keeps the variability and hence adaptability of race intact.

22. (i) **Analogous organs** are those organs which have different basic structural design and developmental origin but have similar appearance and perform similar functions.



Analogous organs : The wing of a bat and the wing of a bird

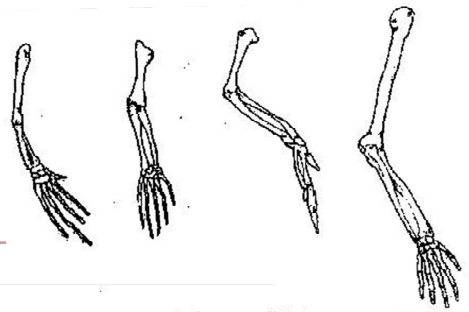
Example: The wings of the birds and bats look similar but have different design in their structure. Wings of the bats are skin folds stretched between elongated fingers but wings of birds are covered by feathers all along the arm.

(ii) **Natural selection** is the process, according to Darwin, which brings about the evolution of new species of animals and plants.

- It was noted that the size of any population tends to remain constant despite the fact that more offsprings are produced than are needed to maintain.
- Darwin found that variations existed between individuals of the population and concluded that disease, competition and other forces acting on the population eliminated those individuals less well adapted to their environment.
- The surviving population would pass the hereditary advantageous characteristics to their offsprings.
- But with time this process would give rise to organisms different from the original population and new species are formed.

Or

Homologous organs are those organs which have the same basic structural design and developmental origin but have different functions and appearance.



Homologous organs

Example: The forelimb of a frog, a lizard, a bird and a man seem to be built from the same basic design of bones, but they perform different functions.

Difference between Homologous organs and Analogous organs:

Homologous Organs	Analogous Organs
(i) These organs have similar embryonic origin and basic structure. (ii) These may look different and may perform different function, e.g. forelimb of man and flipper of a whale.	(i) These organs have different embryonic origin and basic structure. (ii) These look alike and perform same functions, e.g. wings of birds and insects.

The study of comparative anatomy provide evidence in favour of Organic Evolution in the following ways:

(i) Presence of vestigial organs, the organs which are rudimentary and functionless in the evolved form but are complete and functional in the ancestral forms, provides evidence for evolution of organisms, e.g. presence of vestige of pelvic girdle in python and porpoises indicates that they have evolved from four-footed organisms.

(ii) Presence of homologous and analogous organs also provides evidence for common ancestory of organisms.

23. (i) (a) The point on the principal axis, about which the spherical surface is generated is called centre of curvature. Any ray passing through this will retrace its path after reflection in the spherical mirror.

(b) The centre of the spherical surface (reflecting) is called pole. Any ray falling at this point coming from one side of the principal axis, will emerged at the same angle on the other side of the principal axis.

(ii) Mirror formula: $\frac{1}{f}=\frac{1}{v}+\frac{1}{u}$

Magnification: $m=\frac{-v}{u}$

(iii) $v=45$ cm, $f=-20$ cm,

Using $\frac{1}{f}=\frac{1}{v}+\frac{1}{u}$, we get, $\frac{1}{u}=\frac{1}{f}-\frac{1}{v}=\frac{1}{-20}-\frac{1}{45}=-\left[\frac{45+20}{900}\right]=\frac{-65}{900}$

$\Rightarrow \quad u=\frac{-900}{65}=-13.8$ cm

Or

Laws of Refraction:

(i) The incident ray, the normal and the refracted ray all lie in a plane.

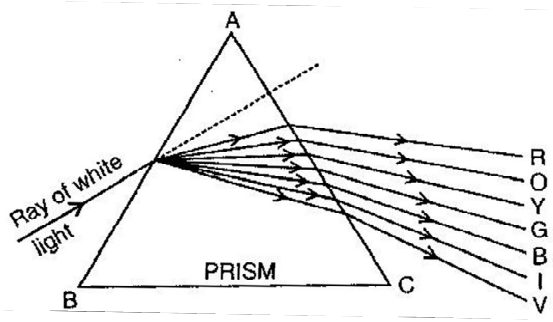
(ii) The ratio of the 'sine' of the angle of the incidence to the 'sine' of the angle of refraction is a constant, i.e. $\frac{\sin i}{\sin r} =$ constant, for the light of a given colour and for the given pair of media. This law is also known as Snell's law of refraction.

Refractive Index: $\frac{\sin i}{\sin r}$ is called refractive index (μ) of one medium with respect to another

(iii) No, since the velocity of light in the two media differ the ray of light after refraction bends. This causes a shift laterally. The emergent ray will be parallel to the incident ray and do not coincide.

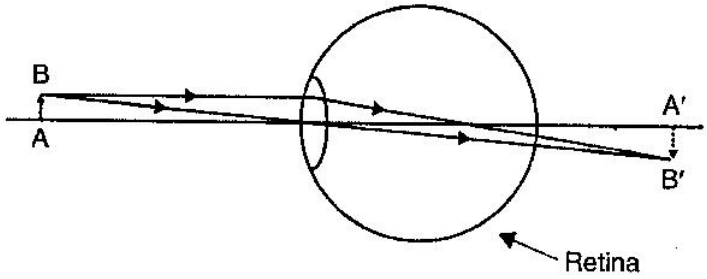
24. **Dispersion**: The splitting of white light into its constituent colours is called Dispersion. The colour sequence is given by the acronym V I B G Y O R – Violet, Indigo, Blue, Green, Yellow, Orange and Red. This colour pattern is called spectrum.

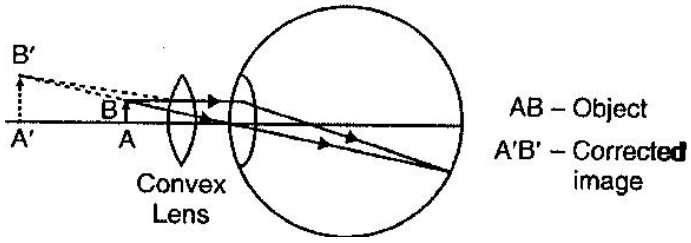
Dispersion occurs because refraction of bending differs with the colour. The speed of light of different colours in a medium like glass, water etc. is different. Varying speed for different colours leads to different refractive indices for different colours. It has been observed that the refractive index of glass for violet colour is more than that of red colour. So red colour deviates less and violet colour deviates more.



Or

Hypermetropia or Long sightnedness: The inability of eye in viewing the nearby objects. The image in this case falls beyond the retina. For hypermetropic eye, there exists a near point. Long sightedness is caused due to (i) greater focal length of the lens or (ii) eye-ball becoming smaller. It is corrected by using a convex lens, which converges and shifts the image to the retina from beyond.





Section B

25. (a) Figure IV is the correct representation of the resulting mixture.
    (b) Acetic dissolves in water forming true solution which is homogeneous solution (clear solution).
26. Slide A – Binary fission in Amoeba, Slide B – Daughter cells of Amoeba.
    In binary fission of Amoeba, nucleus divides first, then the cytoplasm and daughter cells are formed.
27. Figure *d* depicts the correct image formation because parallel beams getting reflected from the concave mirror will converge at focus to produce a sharp image.
28. (c)
29. (a)
30. (d)
31. (b)
32. (b)
33. (a)
34. (a)
35. (b)
36. (c)