# Board Paper 2016

General Instructions :

*(i) The questions paper comprises **two section**, **A** and **B**. You are to attempt both the sections.*

*(ii) **All** questions are **compulsory**.*

(iii) There is no choice in any of the questions.

*(iv) **All** questions of **Section−A** and **all** questions of **Section−B** are to be attempted separately.*

*(v) Question numbers **1** to **3** in **Section−A** are **one** mark questions.*

*(vi) Question numbers **4** to **6** in **Section−A** are **two** marks questions.*

*(vii) Question numbers 7 to **18** in **Section−A** are **three** marks questions.*

*(viii) Question numbers **19** to **24** in **Section−A** are **five** marks questions.*

*(ix) Question numbers **25** to **33** in **Section−B** are multiple choice questions based on practical skills. Each question is a **one** mark question. You are to select one most appropriate response out of the four provided to you*

*(x) Question numbers **34** to **36** in **Section B** are **two** marks questions based on practical skills. These are to be answered in brief.*

Section A

Q1 Write the name and structure of an aldehyde with four carbon atoms in its molecule.

Ans: Aldehyde with four carbon atoms in its molecule is butanal. Its structure is given below.

$$CH_3 - CH_2 - CH_2 - CHO$$
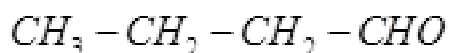
Q2 List two functions of ovary of human female reproductive system.

Ans: The two main functions of the ovary of the human female reproductive system are as follows:

a. Production of female gametes (ova)

b. Production of female hormones: oestrogen and progesterone

Q3 In a food chain of frog, grass, insect and snake, assign trophic level to frog.

Ans: The given food chain can be represented as
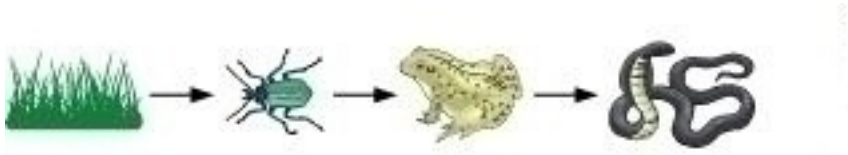
In this food chain, frog will be the secondary consumer.

Q4 The refractive indices of glass and water with respect to air are 3/2 and 4/3, respectively. If speed of light in glass is $2 \times 10^8 \, m/s$, find the speed of light in water.

Ans: Given:

$$Refractive \; index \; of \; the \; glass, n_g = \frac{3}{2} ng$$

$$Refractive \; index \; of \; the \; water, n_w = \frac{4}{3}$$

$$Speed \; of \; light \; in \; the \; glass, v_g = 2 \times 10^8 \, m/s$$

Refractive index of a medium is given by

$$n = \frac{Speed \; of \; light \; in \; the \; air}{peed \; of \; light \; in \; the \; medium} = \frac{c}{v_m}$$

$$\Rightarrow n_g = \frac{c}{v_g} \; and \; n_w = \frac{c}{v_w}$$

$$\Rightarrow \frac{n_g}{n_w} = \frac{3}{2} \times \frac{3}{4} \Rightarrow \frac{v_w}{v_g} = \frac{9}{8}$$

$$\Rightarrow v_w = \frac{9}{8} \times 2 \times 10^8 = 2.25 \times 10^8 \, m/s$$

This is the speed of light in the water.

Q5 List four stakeholders which may be helpful in the conservation of forests.

Ans: Four stakeholders helpful in the conservation of forests are as follows:

a. People who live around forests and depend on forest products for their livelihood

b. The forest department of the government that owns and regulates forest resources

c. Industrialists who utilise forest products for profits

d. Forest conservationists who actively participate in the task of forest conservation

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Q6 The construction of large dams leads to social and environmental problems. List two problems of each category.

Ans: Environmental problems: Construction of dams leads to deforestation, which results in the loss of biodiversity. This, in turn, causes disturbance in the ecosystem.

Social problems: Construction of dams involves building of large reservoirs. In some cases, constructing a reservoir may result in the flooding of nearby towns and villages. The main social problem that the people living nearby places where dams are to be built is that the government displaces a large number of peasants and tribals without adequate compensation or rehabilitation.

Q7 The positions of eight elements in the Modern Periodic Table are given below where atomic numbers of elements are given in the parenthesis.

Period No.		
2	Li (3)	Be (4)
3	Na (11)	Mg (12)
4	K (19)	Ca (20)
5	Rb (37)	Sr (38)

(i) Write the electronic configuration of Ca.

(ii) Predict the number of valence electrons in Rb.

(iii) What is the number of shells in Sr?

(iv) Predict whether K is a metal or a non-metal.

(v) Which one of these elements has the largest atom in size?

(iv) Arrange Be, Ca, Mg and Rb in the increasing order of the size of their respective atoms.

Ans: (i) The electronic configuration of Ca is 2, 8, 8, 2.

(ii) Rubidium is a group 1 element; thus, the number of valence electrons in rubidium is 1.

(iii) Strontium belongs to period 5 of the periodic table; thus, it has 5 shells.

(iv) Potassium has 1 electron in its outermost shell. It has a high tendency to donate an electron and achieve a noble gas configuration. Hence, it is a metal.

(v) The atomic size of elements increases on going down a group and decreases across a period.

Thus, among the given elements, Rb has the largest atom.

(vi) The increasing order of the atomic size of Be, Ca, Mg and Rb is as follows:

Be < Mg < Ca < Rb

Q8 Write three different chemical reactions showing the conversion of ethanoic acid to sodium ethanoate. Write a balanced chemical equation in each case. Write the names of the reactants and the products other than ethanoic acid and sodium ethanoate in each case.

Ans: Three different chemical reactions showing the conversion of ethanoic acid to sodium ethanoate are as follows:

i. $CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + CO_2 + H_2O$

  Sodium bicarbonate   Carbon dioxide   Water

ii. $2\,CH_3COOH + Na_2CO_3 \rightarrow 2\,CH_3COONa + H_2O + CO_2$

  Sodium carbonate   Water   Carbon dioxide

iii. $CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$

  Sodium hydroxide   Water

Q9 An element 'X' belong to 3rd period and group 13 of the Modern Periodic Table.

(a) Determine the number of valence electrons and the valency of 'X'.

Ans: Group of element X = 13

Period of element X = 3

Atomic number of element X = 13

Electronic configuration of element X = 2, 8, 3

(a) Number of valence electrons of element X = 3

Valency of element X = 3

(b) What is the molecular formula of the compound formed when 'X' reacts with an

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element 'Y'? (atomic number = 8).

Ans: Atomic number of element Y = 8

Electronic configuration of element Y = 2, 6

Number of valence electrons of element Y = 6

Valency of element Y = 8 − 6 = 2

Molecular formula of the compound formed by X and Y $= X_2Y_3$

(c) Write the name and formula of the compound formed when 'X' combines with chlorine.

Ans: Atomic number of chlorine = 17

Electronic configuration of chlorine = 2, 8, 7

Number of valence electrons of chlorine = 7

Valency of chlorine = 8 − 7 = 1

Molecular formula of the compound formed by X and $Cl = XCl_3$

X = Aluminium (Al)

Hence, the name of the compound is aluminium chloride $\left(AlCl_3 \right)$.

Q10 An element 'X' has mass number 35 and number of neutrons 18. Write atomic number and electronic configuration of 'X'. Also, write group number, period number and valency of 'X'.

Ans: The atomic number of the element X is 17.

The electronic configuration of the element X is 2, 8, 7.

The group number, the period number and the valency of the element X are 17, 3 and 1, respectively.

Q11 (a) List two reasons for the appearance of variations among the progeny formed by sexual reproduction.

Ans: Following are the reasons for the appearance of variations in progeny during sexual reproduction:

Gamete formation through meiosis

Fusion of the male and female gametes

(b)
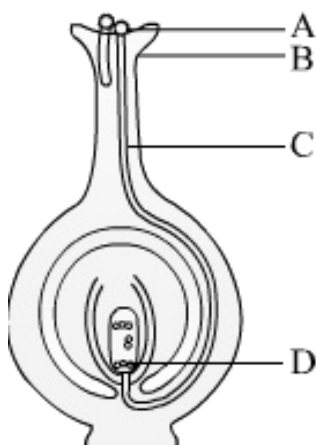
(i) Name the part marked 'A' in the diagram.

(ii) How does 'A' reaches part 'B'?

(iii) State the importance of the part 'C'.

(iv) What happens to the part marked 'D' after fertilisation is over?

Ans:
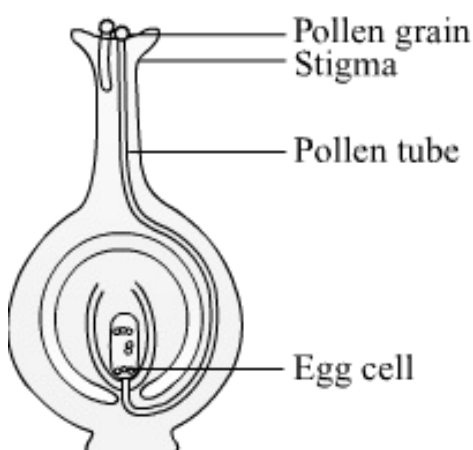
The part labelled A is a pollen grain.

The part labelled B is the stigma. The pollen grain reaches the stigma through pollination.

The part labelled C is the pollen tube, which carries male gametes to the embryo sac for fertilisation.

The part labelled D is the egg; it forms the zygote after fusing with the male gamete during the process of fertilisation.

Q12 Define reproduction. How does it help in providing stability to the population of species?

Ans: Reproduction is a process by which an organism produces its own kind. It is directly linked to the stability of the population of species because it helps in replacing the lost section of population due to death and various other causes, with the new population

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thereby ensuring the survival of species. In the absence of this phenomenon, species would disappear with time.

Q13 Explain the term "Regeneration" as used in relation to reproduction of organisms. Describe briefly how regeneration is carried out in multicellular organisms like _Hydra_.

Ans: Regeneration is a mode of asexual reproduction that occurs in some invertebrates belonging to the animal kingdom. When cut, individual body parts of these animals have the ability to grow into new organisms. Invertebrates such as _Planaria_ and _Hydra_ are capable of regeneration. _Hydra_ is a freshwater coelenterate. _Hydra_ , when cut accidentally, is capable of regeneration. The basal part regenerates the head portion and the head portion regenerates the basal part.
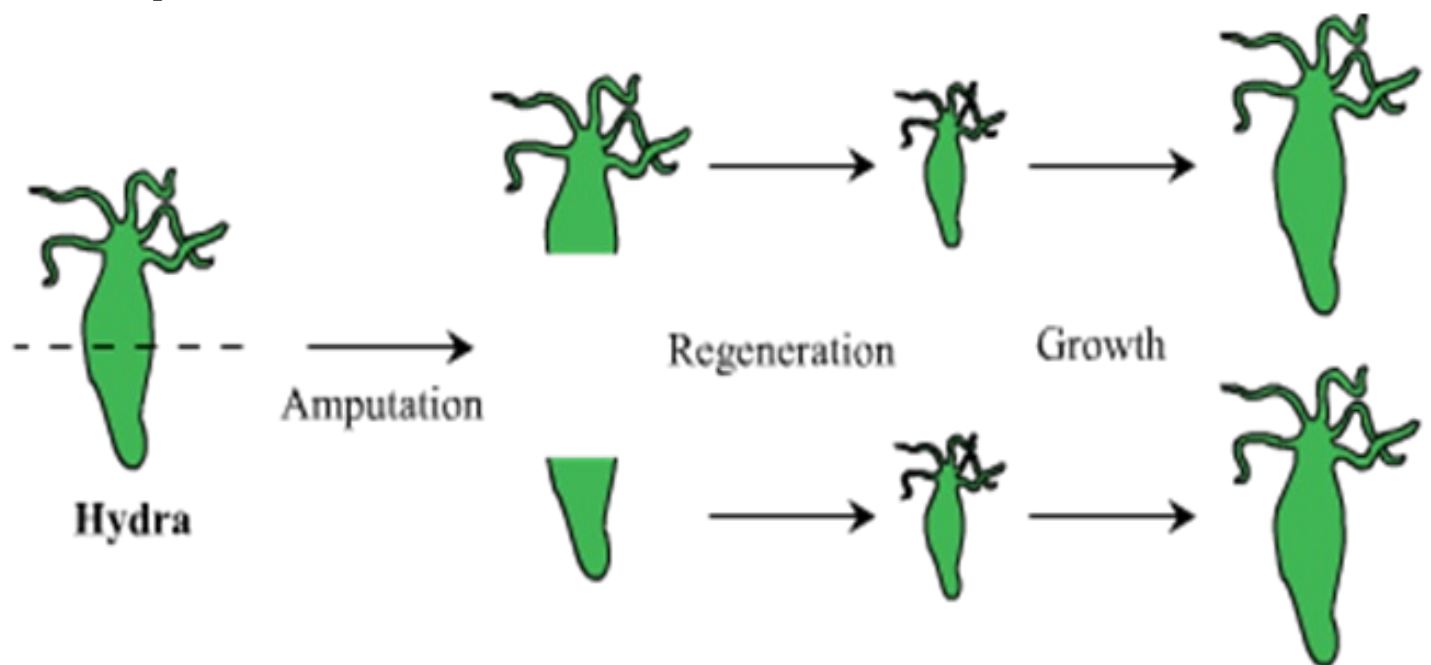
Q14 "Two areas of study namely 'evolution' and 'classification' are interlinked". Justify this statement.

Ans: Classification involves grouping of organisms into a formal system based on similarities in their internal and external structures or evolutionary history.

Two species are more closely related if they have more characteristics in common. When two species are more closely related, they have a more recent common ancestor.

For example, in a family, a brother and a sister are closely related and they have recent common ancestors, that is, their parents. The brother and his cousin are also related but less closely related than the sister and her brother. This is because the brother and his cousin
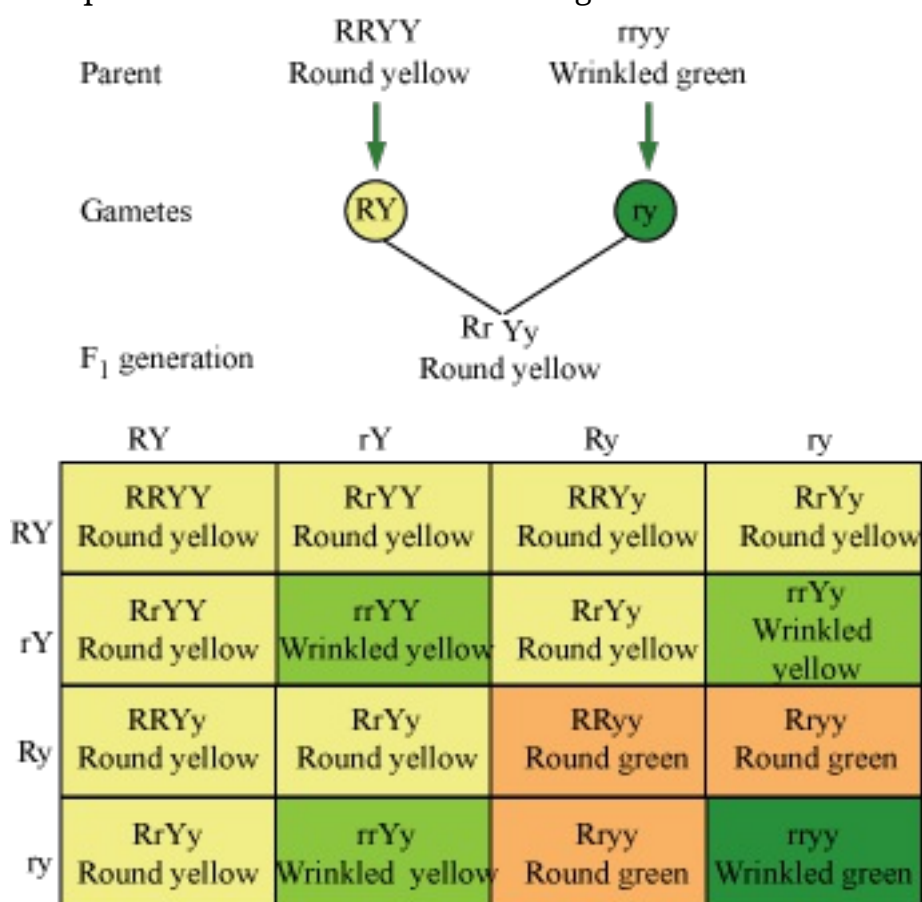
have common ancestors, that is, their grandparents from the second generation. Parents, on the other hand, are from the first generation.

With subsequent generations, variations in organisms become more prominant, making them different from their ancestors.

Thus, classification of species is, in fact, a reflection of their evolutionary relationship

Q15 How does Mendel's experiment show that traits are inherited independently?

Ans: Mendel crossed two varieties of pea plants that differed from each other in two characters. These characters are governed by two separate genes. This is called a dihybrid cross. By performing this cross, he stated the law of independent assortment, which explains that alleles of different genes are assorted independently of each other at the time of gamete formation. A monohybrid cross produces two phenotypes in the ratio 3 : 1, whereas a dihybrid cross produces four phenotypes in the ratio 9 : 3 : 3 : 1. This 9 : 3 : 3 : 1 ratio also shows that the two different genes independently express the phenotypic ratio of 3 : 1 each. This proves that all the traits in an organism are inherited independently.

	RY	rY	Ry	ry
RY	RRYY Round yellow	RrYY Round yellow	RRYy Round yellow	RrYy Round yellow
rY	RrYY Round yellow	rrYY Wrinkled yellow	RrYy Round yellow	rrYy Wrinkled yellow
Ry	RRYy Round yellow	RrYy Round yellow	RRyy Round green	Rryy Round green
ry	RrYy Round yellow	rrYy Wrinkled yellow	Rryy Round green	rryy Wrinkled green

Q16 The activities of man have adverse effects on all forms of living organisms in the

biosphere. Unlimited exploitation of nature by man disturbed the delicate ecological balance between the living and the non-living components of the biosphere. The unfavourable conditions created by man himself threatened the survival not only of himself, but also of the entire living organisms on the mother earth. One of your classmates is an active member of the 'Eco-club' of your school which is creating environmental awareness amongst the school students, spreading the same in the society and also working hard for preventing environmental degradation of the surroundings.

(a) Why is it necessary to conserve our environment?

Ans: We all live in an ecosystem where biotic and abiotic components interact with each other to make the survival of species possible, and the environment plays a crucial role in the proper functioning of the ecosystem. It

1 . provides us with fresh air to breathe

2. provides us with raw materials for the plants to synthesise their own food (CO_2, H_2O)

3. protects us from harmful UV radiations (ozone layer)

4. provides us with a number of useful products such as medicines, wood and paper

However, increased interference of humans with the environment has proved to be detrimental for many plants and animals. Therefore, we need to conserve our environment.

(b) State the importance of green and blue dust-bins in the safe disposal of the household waste.

Ans: Separation of wastes in separate bins like green and blue dustbins is a stepping stone to the safe disposal of the household waste. By adopting this strategy, it will be possible for us to ensure the safe disposal of biodegradable and non-biodegradable wastes separately. This will also ensure the application of the 3 R's of waste management: reduce, reuse and recycle.

(c) List two values exhibited by your classmate who is an active member of the Eco-club of your school.

Ans: The two values exhibited by our classmate are as follows:

1. Aware of his social responsibility: by creating environmental awareness among school students and spreading the same in the society

2. Hard Work: by working hard for preventing environmental degradation of the surroundings

Q17 The image formed by a spherical mirror is real, inverted and is of magnification -2. If the image is at a distance of 30 cm from the mirror, where is the object placed? Find the focal length of the mirror. List two characteristics of the image formed if the object is moved 10 cm towards the mirror.

Ans: Given:

Magnification, $m = -2$

Distance of the image, $v = -30$ cm

Let u be the distance of the object from the mirror.

Since magnification of a mirror is given as

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

$$\Rightarrow u = -\frac{v}{m} = -\frac{(-30)}{(-2)} = -15\,cm$$

Then, using the mirror formula, focal length (f) is found to be

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u} = \frac{1}{-30} + \frac{1}{-15} = -\frac{1}{10}$$

$$\Rightarrow f = -10\,cm$$

If the image is moved to 10 cm towards the mirror, then the new position of the object is given as

$u' = -(15 - 10)$ cm $= -5$ cm

Then, new postion of image is given by

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{-10} - \frac{1}{-5} = \frac{1}{10}$$

$$\Rightarrow v = 10\,cm$$

And

$$m = -\frac{v}{u} = -\frac{10}{-5} = 2$$

Since v is positive, the image will be virtual.

Hence, the new image will be virtual, erect and magnified.

Q18 Describe an activity to show that the colours of white light splitted by a glass prism can be recombined to get white light by another identical glass prism. Also, draw a ray diagram to show the recombination of the spectrum of white light.

Ans: The phenomenon of dispersion of white light through a prism and then its recombination can be explained with the help of two identical glass prisms. For this to happen, white light is made to made to fall on the surface of the prism. Since different colours of white light have different wavelengths, the amount of bending of light is different. Red light bends the least and violet light bends the most. So, we obtain a spectrum of seven colours, with violet light at the bottom and red at the top. This spectrum is then made to fall on an indentical prism, which is kept inverted. When the spectrum passes through the prism, all the colours bend once again, resulting in their recombination (as shown in the figure below). Hence, the light coming out of the second prism will be white.
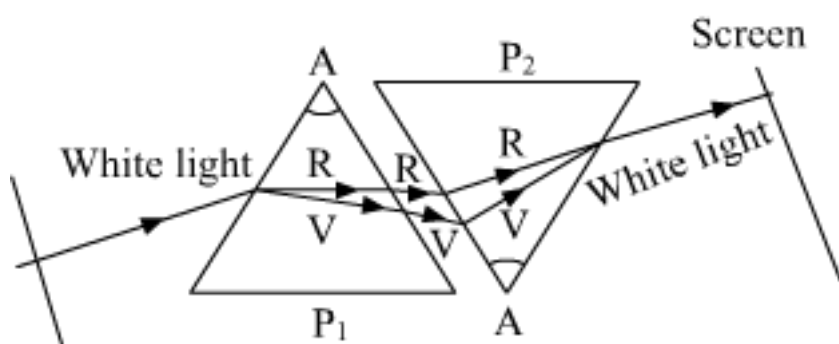
Q19 It is desired to obtain an erect image of an object using concave mirror of focal length 12 cm.

(i) What should be the range of distance of an object placed in front of the mirror?

(ii) Will the image be smaller or larger than the object? Draw a ray diagram to show the formation of image in this case.

(iii) Where will the image of this object be if it is placed 24 cm in front of the mirror? Draw a ray diagram for this situation to justify your answer.

Show the positions of the pole, the principal focus and the centre of curvature in the above ray diagrams.

Ans: (i) To obtain an erect image using a concave mirror, object should be placed between the pole and the focus of the mirror, that is, it should be placed at a distance less than 12 cm.

(ii) The image formed will be larger in size.
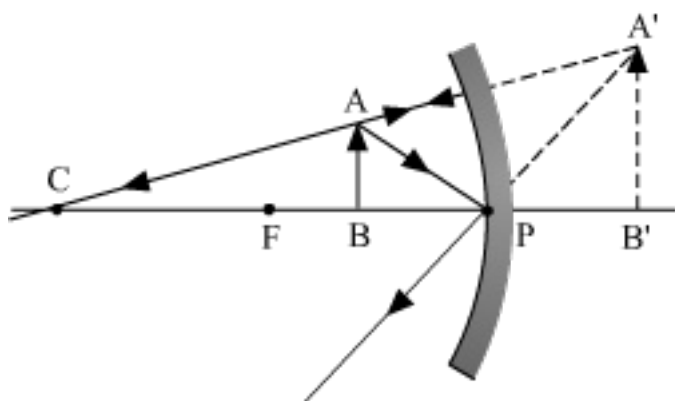
(iii) Since the focus of the mirror is at 12 cm, the centre of curvature will be at 2F, that is, 24 cm. As such, the image formed will be real, inverted and of the same size as the object.
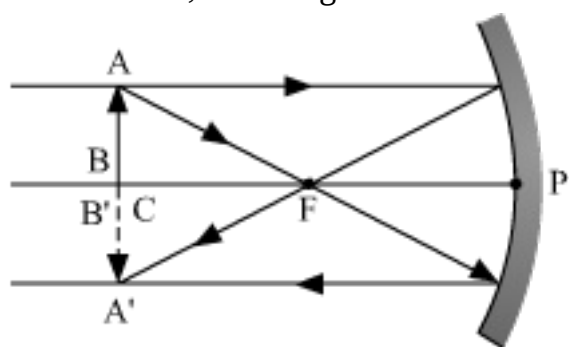
Q20 Define evolution. How does it occur? Describe how fossils provide us evidences in support of evolution.

Ans: Evolution is a gradual process by which an organism becomes better adapted to the environment.

Accumulation of variations in the genetic material for several generations leads to the evolution and finally, the creation of a new species.

Fossils are the remains of the organisms that once existed on the Earth. They represent the ancestors of the plants and animals that are alive today. They provide evidence of evolution by revealing the characteristics of the past organisms and the changes that have occurred in these organisms to give rise to the present organisms. Let us explain the importance of fossils in deciding evolutionary history with the help of the following example.

Around 100 million years ago, some invertebrates died and got buried in the soil. More sediments got accumulated on top of the soil, turning it into sedimentary rock.

At the same place, millions of years later, some dinosaurs died and their bodies got buried on top of the sedimentary rock. The mud containing dinosaurs also turned into a rock.

Then, millions of years later, some horse-like creatures died in that area and got fossilised in rocks above the dinosaur fossils.

Sometime later, due to soil erosion or floods in that area, the rocks containing horse-like fossils get exposed. If that area is excavated deeper, then the dinosaur and invertebrate fossils can also be found. Thus, by digging that area, scientists can easily predict that horse-like animals evolved later than the dinosaurs and the invertebrates.

**Q21 What is placenta? Describe its structure. State its functions in case of a pregnant human female.**

Ans: Placenta is a disc of specialised tissue embedded in the uterine wall and serves as the connecting link between the mother's body and the baby. It contains blood spaces on the

mother's side and thousands of villi (small projections) on the foetal side that provide a large surface area required for the exchange of nutrients and oxygen between the mother and the foetus. The wastes produced by the foetus are also removed through the placenta. It also functions as an endocrine gland and secretes hormones necessary for maintaining pregnancy.
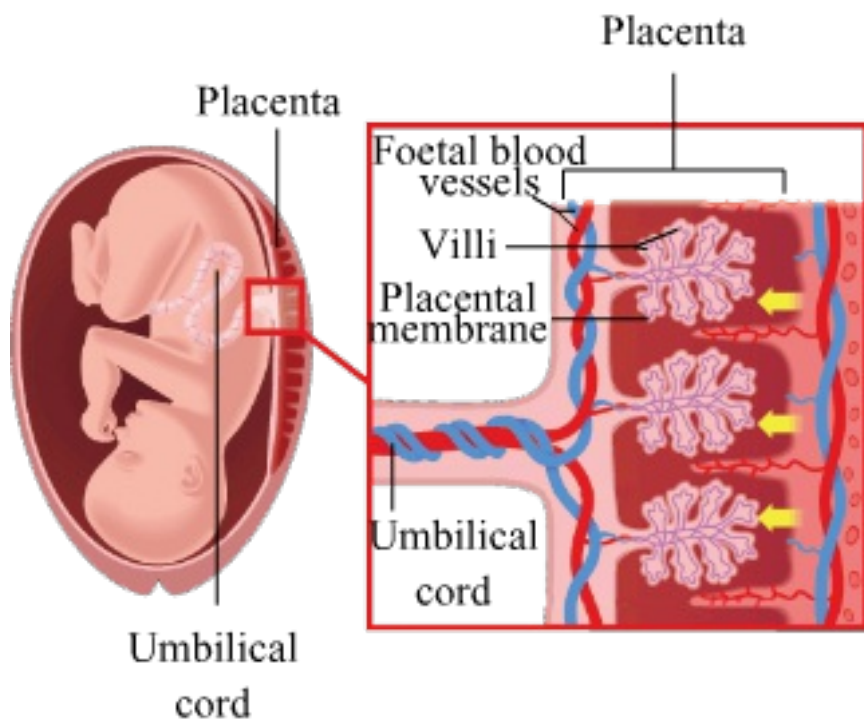
Q22 A carbon compound 'P', on heating with excess conc. H_2SO_4, **forms another carbon compound 'Q', which, on addition of hydrogen in the presence of nickel catalyst, forms a saturated carbon compound 'R'. One molecule of 'R', on combustion, forms two molecules of carbon dioxide and three molecules of water. Identify P, Q and R and write chemical equations for the reactions involved.**

Ans: The given reaction scheme can be represented as follows:

$$P \xrightarrow[\Delta]{Conc.\,H_2SO_4} Q \xrightarrow[Ni]{H_2} 2 \quad R \xrightarrow{O_2} 2CO_2 + 3H_2O$$
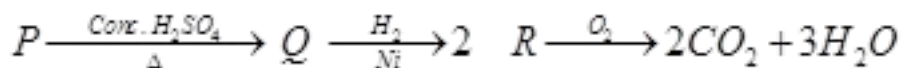
The compound Q formed when compound P is heated in excess of conc. sulphuric acid is an unsaturated compound.

The concentrated sulphuric acid acts as a dehydrating agent in this reaction. It facilitates the removal of a molecule of water from the molecule of P.
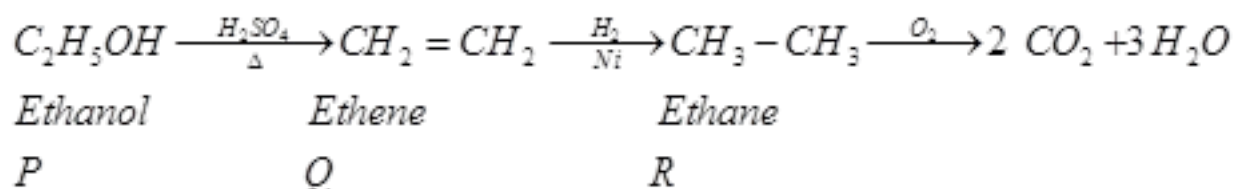
$$P \xrightarrow[H_2SO_4]{Hot\,conc.} Q + H_2O$$
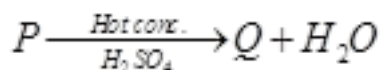
When hydrogen is added to Q in the presence of catalysts such as palladium or nickel,

saturation of the compound takes place to form compound R.

$$Q \xrightarrow[Ni\,catalyst]{H_2} R$$
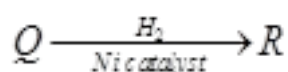
Compound R forming two molecules of carbon dioxide and three molecules of water on combustion suggests that compound R consists of two carbon atoms.

Thus, the complete reaction scheme is as follows:

$$C_2H_5OH \xrightarrow[\Delta]{H_2SO_4} CH_2=CH_2 \xrightarrow{H_2}{Ni} CH_3-CH_3 \xrightarrow{O_2} 2\ CO_2 + 3\ H_2O$$

Ethanol	Ethene	Ethane
P	Q	R

Q23 What is atmospheric refraction? Use this phenomenon to explain the following natural events:

(a) Twinkling of stars

(b) Advanced sunrise and delayed sunset

Draw diagrams to illustrate your answer.

Ans: Atmospheric Refraction

The physical conditions of the atmosphere are not stationary, causing a continuous change in the refractive index of air. Hence, the apparent position of the object seems to fluctuate when seen through air, and this is called atmospheric refraction.

Twinkling of Stars

Light coming from the stars undergoes refraction on entering the Earth's atmosphere. This refraction continues until it reaches the Earth's surface. This happens because of temperature variation of atmospheric air. Hence, the atmospheric air has changing refractive index at various altitudes. In this case, starlight continuously travels from a rarer medium to a denser medium. Hence, it continuously bends towards the normal.
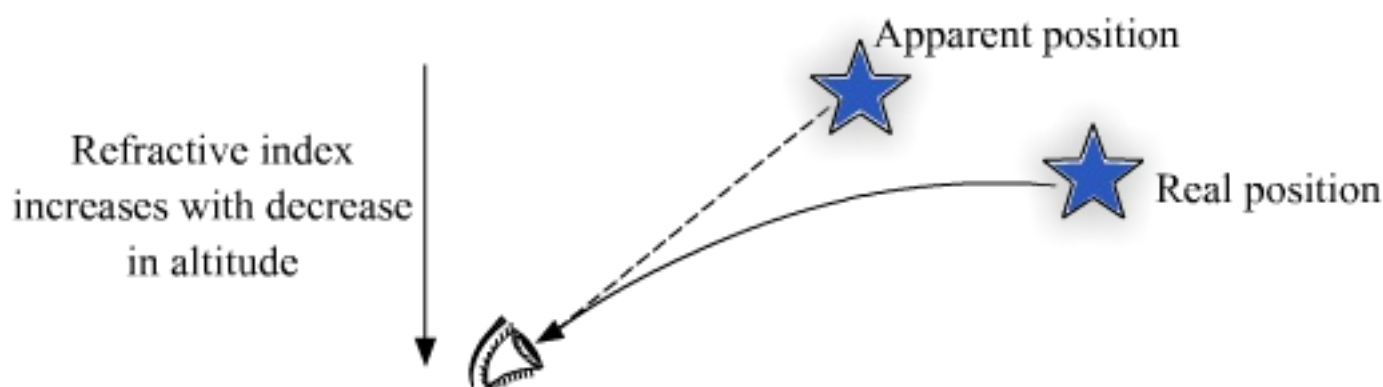
The refractive index of air medium gradually increases with a decrease in altitude. The continuous bending of starlight towards the normal results in a slight rise in the apparent position of the star.
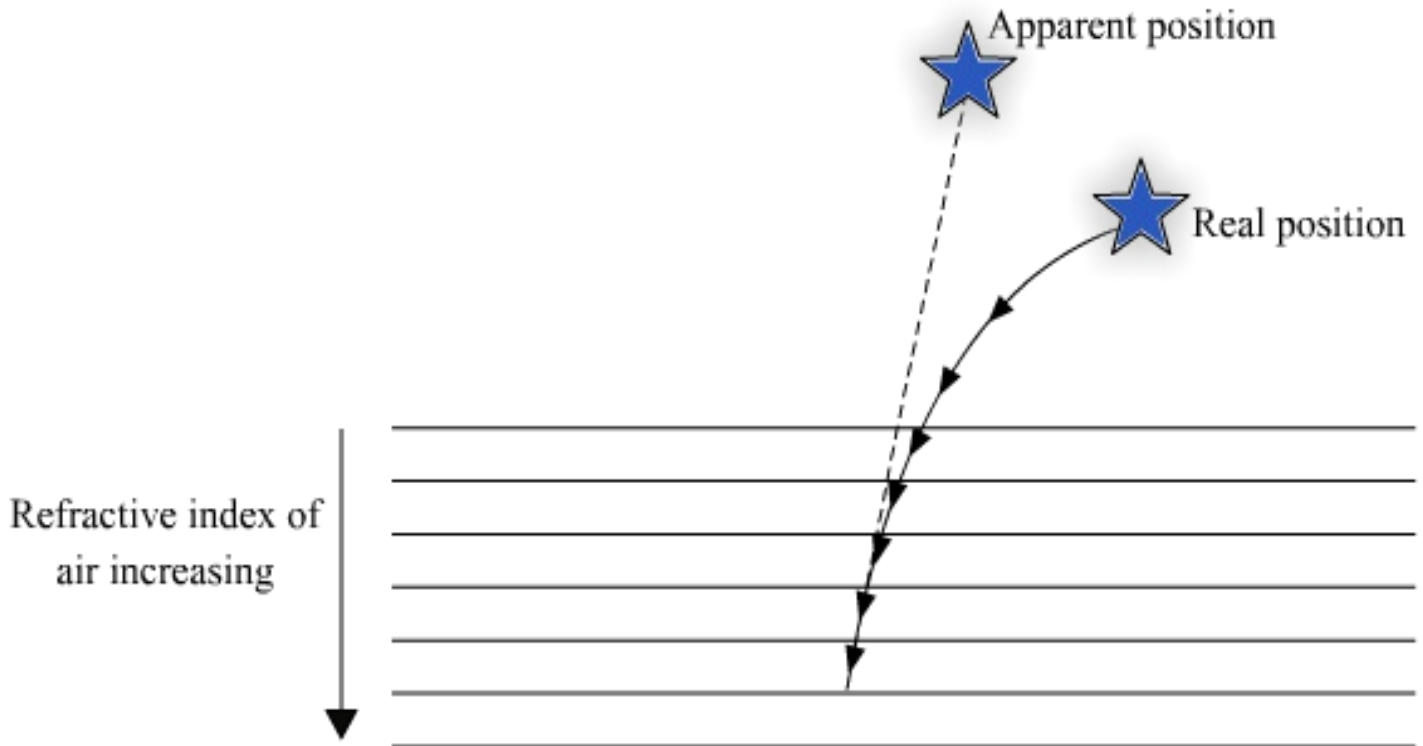
Since the physical conditions of the Earth's atmosphere keeps changing, the apparent position of the star is not stationary. The star changes its position continuously, which makes it twinkle. This happens because starlight travels a very large distance before reaching the observer. However, the path varies continuously because of uneven atmospheric conditions. Hence, the stars seem to be fluctuating, sometimes appearing bright and sometimes dull. All this, together, causes the twinkling effect of stars.

Advanced Sunrise and Delayed Sunset
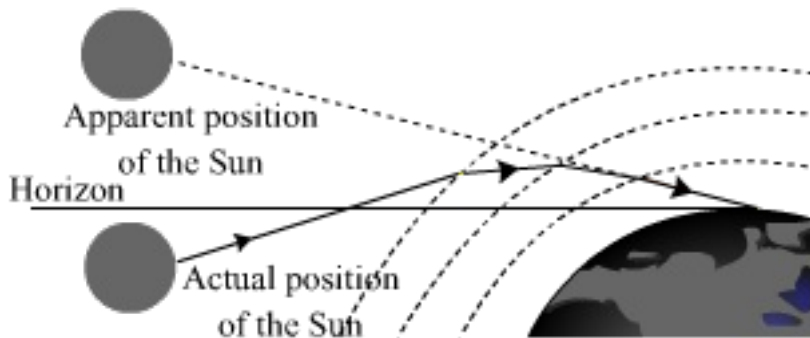
The rays of light from the Sun travel in straight line until they reach the Earth's atmosphere. The rays of light from the Sun enter obliquely in the Earth's atmosphere. The light rays coming from the Sun bend because of refraction, and this bending increases further because

of the further increase in the refractive index of the successive layers. This causes the light rays to bend and we see the Sun early. Similarly, at sunset, the apparent position of the Sun is visible to us and not the actual position because of the same bending of light rays effect. Thus, due to refraction we see the Sun rise about two minutes before it is actually there and during sunset, we see it for around two minutes more, even though it has already moved from that position.

Q24 (a) Define focal length of a divergent lens.

Ans: Focal length of a diverging lens is defined as half the value of radius of curvature of the lens used. For a diverging lens, the sign of focal length is taken to be negative conventionally.

(b) A divergent lens of focal length 30 cm forms the image of an object of size 6 cm on the same side as the object at a distance of 15 cm from its optical centre. Use lens formula to determine the distance of the object from the lens and the size of the image formed.

Ans: Given:

$f = -30$ cm

$h = 6$ cm

$v = -15$ cm

Using the lens formula, we get

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{u} = \frac{1}{v} - \frac{1}{f} = \frac{1}{-15} - \frac{1}{-30} = -\frac{1}{30}$$

$$\Rightarrow u = -30 cm$$

Also, magnification is given as

$$m = \frac{v}{u} = \frac{h'}{h} \quad (h' \text{ is the height of the image})$$
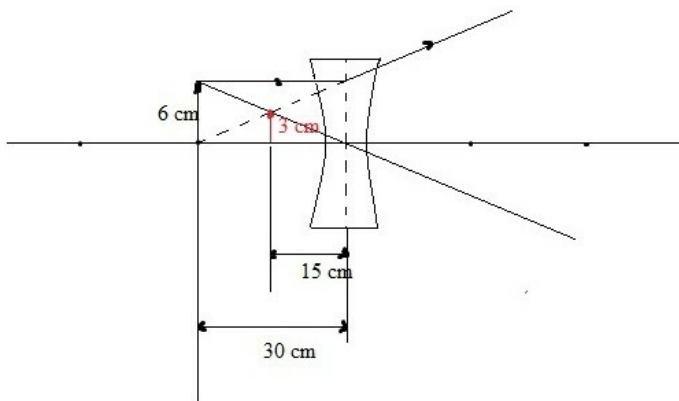
$$\Rightarrow h' = \frac{v}{u} \times h = \frac{-15}{-30} \times 6$$

$$\therefore h' = 3\, cm$$

So, object is at a distance of 30 cm from the pole of the lens. The image formed is diminished and has a height of 3 cm.

(c) Draw a ray diagram to show the formation of image in the above situation.

Ans:

SECTION B

Q25 A student, while observing an embryo of a pea seed in the laboratory, listed various parts of the embryo as given below:

Testa, Tegmen, Radicle, Plumule, Micropyle, Cotyledon

On examining the list, the teacher remarked that only three parts are correct. Select the three correct parts from the above list:

(a) Testa, Radicle, Cotyledon

(b) Tegmen, Radicle, Micropyle

(c) Cotyledon, Plumule, Testa

(d) Radicle, Cotyledon, Plumule

Ans: The parts labelled correctly by the student are radicle, cotyledon and plumule. Among the given options, testa and tegmen are parts of the seed coat. The parts of dicot embryo include radicle, plumule and a pair of cotyledons.
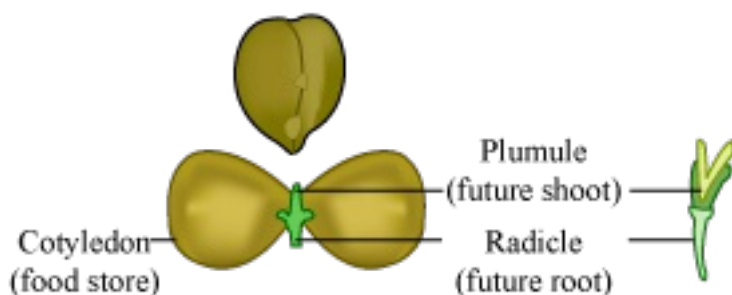
Hence, the correct answer is option (d).

Q26 If you are asked to select a group of two vegetables, out of the following, having homologous structures, which one would you select?

(a) Carrot and radish

(b) Potato and sweet potato

(c) Potato and tomato

(d) Lady finger and potato

Ans: Among the given sets of vegetables, carrot and radish are homologous structures. Homologous structures are those structures that have the same origin but can perform same or different functions in different organisms. Both carrot and radish are modifications of the root for food storage.

Hence, the correct answer is option (a).

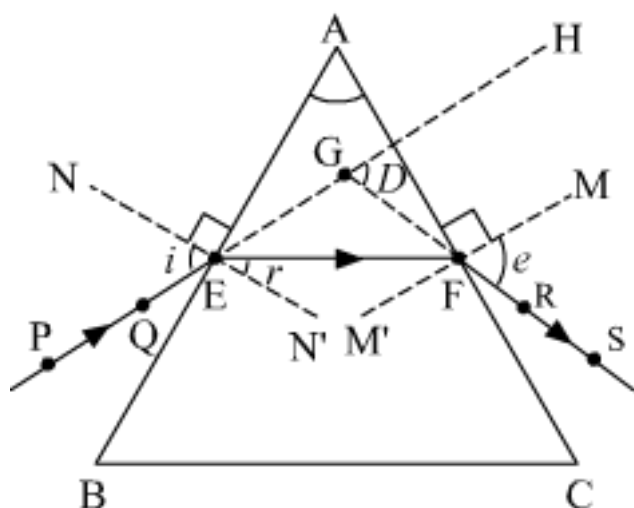**Q27 In the following ray diagram, the correctly marked angles are:**
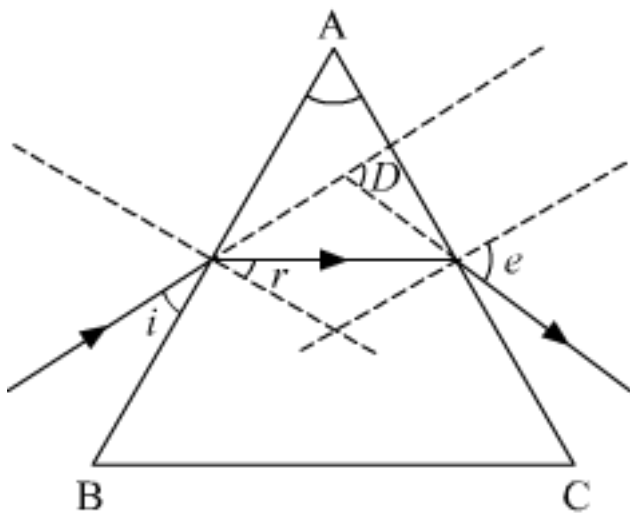
(a) $\angle i$ and $\angle e$

(b) $\angle A$ and $\angle D$

(c) $\angle i, \angle e$ and $\angle D$

(d) $\angle r, \angle A$ and $\angle D$

Ans: The correctly marked angles here are the angle of prism (A), the angle of refraction (r) and the angle of deviation (D). All other angles are incorrectly marked in the figure given below.

Hence, the correct answer is option (d).

Q28 In your laboratory, you trace the path of light rays through a glass slab for different values of angle of incidence (∠i) and in each case, you measure the value of the corresponding angle of refraction (∠r) and angle of emergence (∠e). On the basis of your observations, your correct conclusion is that

(a) $\angle i$ is more than $\angle r$ but nearly equal to $\angle e$

(b) $\angle i$ is less than $\angle r$ but nearly equal to $\angle e$

(c) $\angle i$ is more than $\angle e$ but nearly equal to $\angle r$

(d) $\angle i$ is less than $\angle r$ but nearly equal to $\angle r$

Ans: According to Snell's law, when a ray of light travelling from air undergoes refraction on striking a glass sab, we have
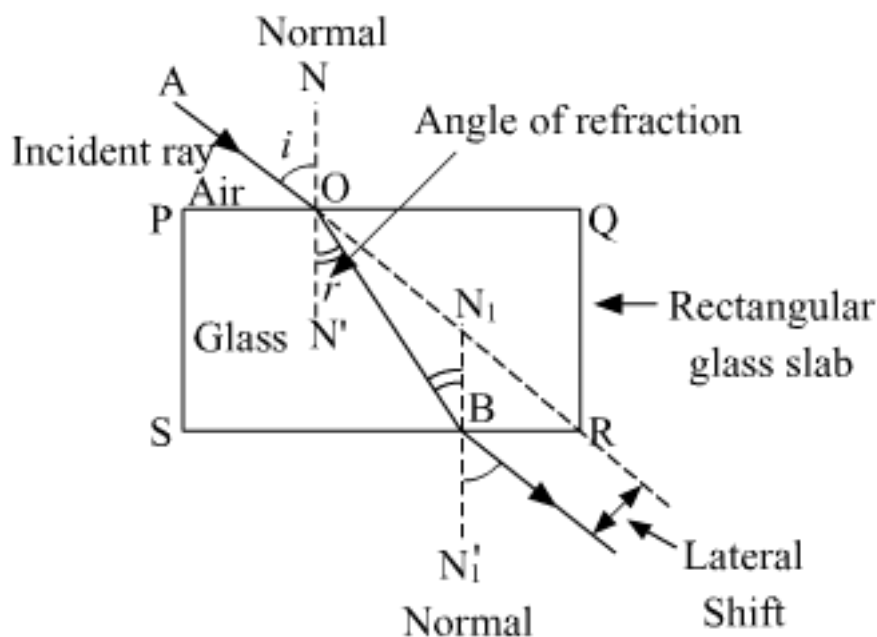
$$\mu = \frac{sini}{sinr}$$

$$\sin r = \frac{\sin i}{\mu} \quad .....(1)$$

∵ $\mu > 1$ for glass slab

$sinr < sini$

$\Rightarrow r < i$

After travelling through the glass slab, the ray of light emerges out with

$$\frac{1}{\mu} = \frac{\sin r}{\sin e} \left(Ray\ travels\ from\ glass\ to\ air \right)$$

$$\sin e = \mu \sin r = \mu \frac{\sin i}{\mu} = \sin i \left[Using\ (1) \right]$$

$$\Rightarrow e = i$$

Hence, the correct answer is option (a).

Q29 To determine the approximate value of the focal length of a given concave mirror, you focus the image of a distant object formed by the mirror on a screen. The image obtained on the screen, as compared to the object, is always
(a) laterally inverted and diminished
(b) inverted and diminished
(c) erect and diminished
(d) erect and highly diminished
Ans: The image obtained on the screen will be always inverted and diminished.
Hence, the correct answer is option (b).

Q30 Suppose you have focused on a screen the image of candle flame placed at the farthest end of the laboratory table using a convex lens. If your teacher suggests you to focus the parallel rays of the sun, reaching your laboratory table, on the same screen,

what you are expected to do is to move the

(a) lens slightly towards the screen

(b) lens slightly away from the screen

(c) lens slightly towards the sun

(d) lens and screen both towards the sun

Ans: In order to focus the distant building on the same screen, the student should slightly move the lens towards the screen.

Hence, the correct answer is option (a).

Q31 For preparing soap in the laboratory, we require an oil and a base. Which of the following combinations of an oil and a base would be best suited for the preparation of soap?

(a) Caster oil and calcium hydroxide

(b) Turpentine oil and sodium hydroxide

(c) Caster oil and sodium hydroxide

(d) Mustard oil and calcium hydroxide

Ans: Soaps are sodium or potassium salts of long-chain fatty acids. They are prepared by the reaction of a long-chain fatty acid with either NaOH or KOH. This reaction is known as saponification reaction. Among the given sets of materials, a soap can be prepared by the reaction between NaOH and castor oil or turpentine oil (long-chain fatty acid). Caster oil adds lather and mosturising properties to the soap, whereas turpentine oil is used more for medicinal purposes. Calcium salts are not used for soaps as they form insoluble scum.

Hence, the correct answer is option (c).

Q32 A student puts a drop of reaction mixture of a saponification reaction first on a blue litmus paper and then on a red litmus paper. He may observe that

(a) there is no change in the blue litmus paper and the red litmus paper turns white

(b) there is no change in the red litmus paper and the blue litmus paper turns red

(c) there is no change in the blue litmus paper and the red litmus paper turns blue

(d) no change in colour is observed in both the litmus paper

Ans: Soaps are sodium or potassium salts of long-chain fatty acids. These salts are basic in nature.

Thus, when a student puts a drop of reaction mixture of a saponification reaction first on a

blue litmus paper and then on a red litmus paper, there is no change in the blue litmus paper and the red litmus paper turns blue.

Hence, the correct answer is option (c).

Q33 In the neighbourhood of your school, hard water required for an experiment is not available. From the following groups of salts available in your school, select a group of salts, each member of which, if dissolved in distilled water, will make it hard:
**(a) Sodium chloride, calcium chloride**
(b) Potassium chloride, sodium chloride
(c) Sodium chloride, magnesium chloride
(d) Calcium chloride, magnesium chloride

Ans: Hard water contains salts such as chlorides, bicarbonates, sulphates of calcium and magnesium. Among the given sets of salts, addition of calcium chloride and magnesium chloride in water will make it hard.

Hence, the correct answer is option (d).

Q34 A student is observing a permanent slide showing, sequentially, the different stages of asexual reproduction taking place in yeast. Name this process and draw diagrams of what he observes in a proper sequence.

Ans: Yeast reproduces asexually by the process of budding. Different stages of budding, as observed by the student, are represented in the diagram given below:
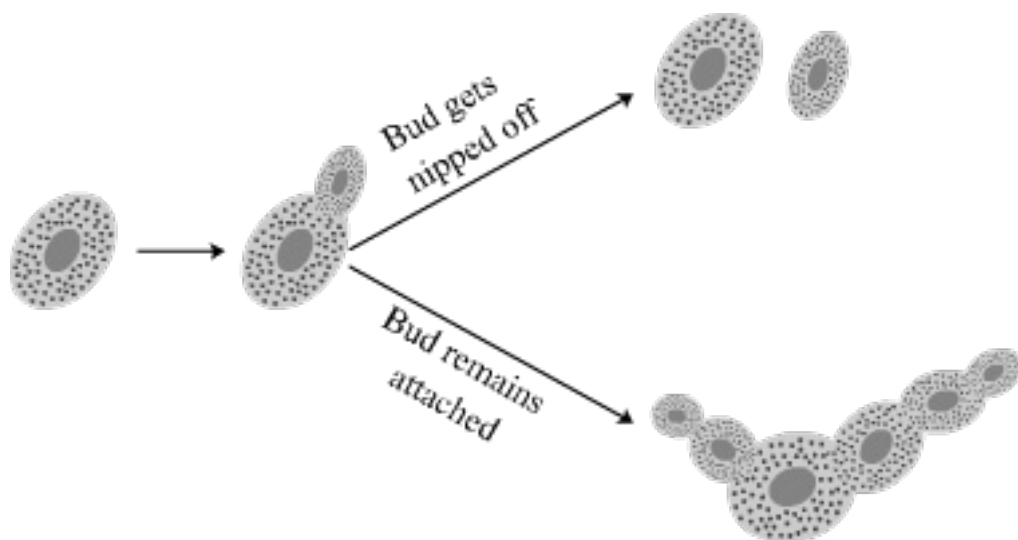
Q35 An object of height 2.5 cm is placed at a distance of 15 cm from the optical centre

'O' of a convex lens of focal length 10 cm. Draw a ray diagram to find the position and size of the image formed. Mark the optical centre 'O', principal focus F and height of the image on the diagram.

Ans: The required ray diagram is drawn as follows:
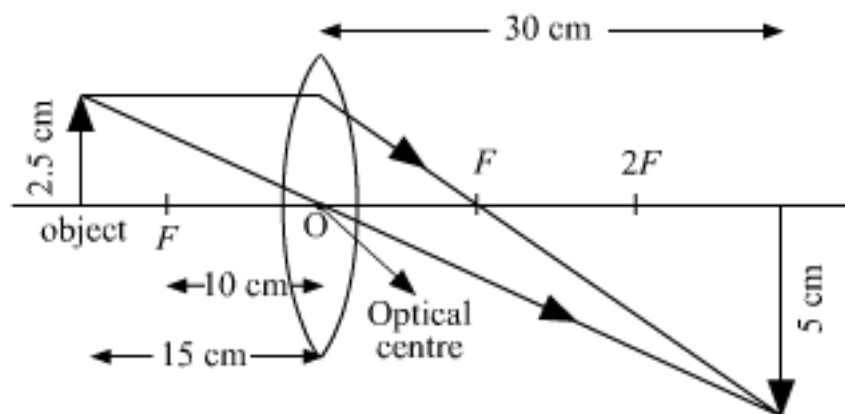
Q36 A student adds a spoon full of powdered sodium hydrogen carbonate to a flask containing ethanoic acid. List two main observations that he/she must note in his/her notebook about the reaction that takes place. Also, write chemical equation for the reaction.

Ans: When sodium hydrogen carbonate is added to a flask containing ethanoic acid, the two observations noted are as follows:

(i) Brisk effervescence is seen because of CO_2 gas escaping out from the reaction mixture.

The gas turns lime water milky.

(ii) Some amount of heat is evolved during the reaction.

Reactions:

$$NaHCO_3 + CH_3COOH \rightarrow CH_3COONa + CO_2 \uparrow + H_2O$$
$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$$