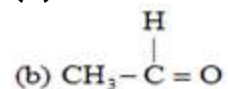
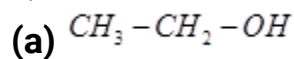


Section A

Q1 Name the following compounds.



Ans: The names of the given compounds are as follows:

(a) Ethanol

(b) Ethanal

Q2 What is DNA?

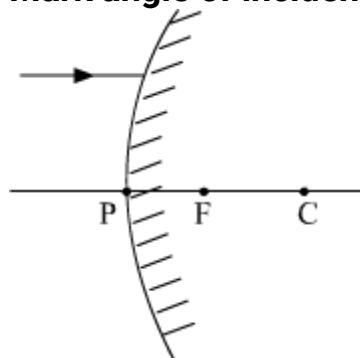
Ans: Deoxyribonucleic acid (DNA) is a genetic material found in all the living organisms except few viruses.

Q3 List two biotic components of a biosphere.

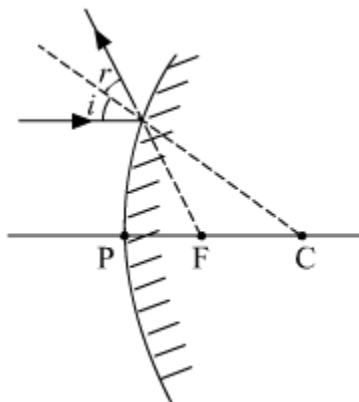
Ans: Two biotic components of a biosphere are as follows:

1. Producers or autotrophs
2. Consumers or heterotrophs

Q4 A ray of light is incident on a convex mirror as shown. Redraw the diagram and complete the path of this ray after reflection from the mirror. Mark angle of incidence and angle of reflection on it.



Ans:



Here,

F = Focus

C = Centre of curvature

P = Pole

i = Angle of incidence

r = Angle of refraction

Q5 Explain giving example where active involvement of local people lead to efficient management of forest.

Ans: Active participation of local people to save forests is another activity towards the conservation of forests and wildlife. The following are two examples of active participation of people in the conservation and management of forests.

Khejri tree case - In 1731, Amrita Devi Bishnoi from Khejrli village, near Jodhpur, established a group of 363 people who sacrificed their lives for the protection of Khejri trees which were ordered to be cut down by the Maharaja of Jodhpur.

Chipko Andolan - This movement originated in a remote village called Reni in Garhwal, in the early 1970s. A contractor was given a permission to cut down the trees in a forest near the village. However, the villagers were against the decision. One day, when the menfolk in the village were away at work, the employees of the contractor visited the forest to cut down the trees. The women of the village then reached the forest and each one wrapped her hands around a tree trunk; thereby preventing the workers from destroying the forest.

Q6 List four advantages of properly managed watershed management.

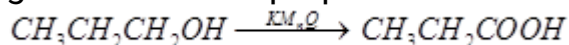
Ans: The advantages of watershed management are as follows:

- It strictly maintains the water quality.
- It helps in equal and sustainable distribution of water.
- It provides protection from floods by controlling the flow of rainwater.
- It helps in enhancing the level of groundwater.

Q7 What is an oxidising agent? What happens when an oxidising agent is added to propanol? Explain with the help of a chemical equation.

Ans: An oxidising agent is a compound that supplies oxygen in a reaction and gets reduced. Examples of oxidising agents are potassium permanganate, potassium dichromate, oxygen and ozone.

When an oxidising agent like potassium permanganate is added to propanol, it gets oxidised to propanoic acid.



Q8 What are covalent compounds? Why are they different from ionic compounds? List their three characteristic properties.

Ans: Covalent compounds are the compounds that are formed by the mutual sharing of valence electrons by the constituent atoms. For example, a molecule of methane (CH_4) is formed when the carbon atom shares one of its four valence electrons with one electron of each of the four H atoms.

Ionic compounds, on the other hand, are the compounds that are formed by the complete transfer of valence electrons between the constituent atoms.

For example, a molecule of sodium chloride (NaCl) is formed when the sodium atom donates its one valence electron to the chlorine atom.

The characteristic properties of covalent compounds are as follows:

- (i) They have low melting and boiling points.
- (ii) They do not conduct electricity.
- (iii) They are not soluble in water, but they dissolve readily in organic solvents.

Q9 An element 'M' with electronic configuration (2, 8, 2) combines separately with $(NO_3)^-$, $(SO_4)^{2-}$ and $(PO_4)^{3-}$ radicals. Write the formula of the three compounds so formed. To which group and period of the Modern Periodic Table does the element 'M' belong? Will 'M' form covalent or ionic compounds? Give reason to justify your answer.

Ans: Electronic configuration of M = 2, 8, 2

Number of valence electrons of M = 2

Valency of M = Number of valence electrons = 2

Valency of the nitrate ion (NO_3^-) = 1

Valency of the sulphate ion (SO_4^{2-}) = 2

Valency of the phosphate ion (PO_4^{3-}) = 3

The formulae of nitrate, sulphate and phosphate formed by M

are $M(NO_3)_2$, MSO_4 and $M_3(PO_4)_2$ respectively.

Since the valency of M is 2 and the atomic number of M is 12 (i.e. 2 + 8 + 2), this element belongs to the group 2 and period 3 of the periodic table.

This element will tend to form ionic compounds by losing two valence electrons to achieve a noble gas electronic configuration, that is, a stable octet in the valence shell.

Q10 Name any two elements of group one and write their electronic configurations. What similarity do you observe in their electronic configurations? Write the formula of oxide of any of the aforesaid elements.

Ans: Two elements that belong to group 1 are lithium and sodium. The electronic configurations of these elements and the formulae of their oxides are mentioned in the table given below.

Element	Symbol	Electronic Configuration	Formula of Oxide
Lithium	Li	2, 1	Li_2O
Sodium	Na	2, 8, 1	Na_2O

Q11 What are the functions of testes in the human male reproductive system? Why are these located outside the abdominal cavity? What is responsible for bringing about changes in appearance seen in boys at the time of puberty?

Ans: The function of testes is to produce sperms and a hormone called testosterone. They are located outside the abdominal cavity, within a pouch

called the scrotum. For the production of sperms, testes require a temperature that is 2–2.5 °C lower than the temperature of the rest of the body. That is why testes are protected inside the scrotum. The hormone testosterone is responsible for the development of secondary sex characteristics in boys.

Q12 Suggest three contraceptive methods to control the size of human population, which is essential for the health and prosperity of a country. State the basic principle involved in each.

Ans: Barrier method: In this method, the fertilisation of the ovum and the sperm is prevented with the help of barriers such as a condom.

Oral contraceptive method: In this method, tablets or drugs are taken orally to prevent fertilisation.

Implants and surgical methods: Contraceptive devices, such as a loop and a copper-T rod, are placed in the uterus to prevent pregnancy. However, they can cause side effects to the uterus.

Some surgical methods such as vasectomy (blocking of the vas deferens in the male body to prevent the transfer of sperms) and tubectomy (blocking of fallopian tubes in the female body to prevent the egg from reaching the uterus) can also be used to block the gamete transfer.

Q13 What is multiple fission? How does it occur in an organism? Explain briefly. Name one organism which exhibits this type of reproduction.

Ans: Multiple fission is a type of asexual reproduction in which the parent cell divides to produce many daughter cells simultaneously. It occurs when the nucleus of the parent cell divides repeatedly, without the separation of the cytoplasm. Later, each nucleus separates along with a part of the cytoplasm to form many daughter cells. This form of reproduction is found in *Plasmodium* .

Q14 How did Mendel interpret his results to show that traits may be dominant or recessive? Describe briefly.

Ans: Mendel interpreted his results by observing the first and second filial generations. He observed that even when not expressed in the first filial generation, alternate forms of a trait could retain their identity in the hybrid

and could re-emerge in the next generation. He concluded that each factor contained information about a form of a trait. The factor associated with the trait that was expressed in the hybrid offspring was dominant and the factor associated with the trait that remained hidden in the hybrid but reappeared in the next generation was recessive.

Q15 List three distinguishing features, in tabular form, between acquired traits and the inherited traits.

Ans:

Acquired Traits	Inherited Traits
Acquired traits are developed by an individual during his/her lifetime.	Inherited traits are distinguishing qualities or characteristics present in an individual since birth.
They are a result of changes in non-reproductive tissues (somatic cells).	They are a result of changes in DNA.
They cannot be passed on to the germ cells or progeny.	They are transmitted to the progeny.

Q16 What is meant by scattering of light? The sky appears blue and the sun appears reddish at sunrise and sunset. Explain these phenomena with reason.

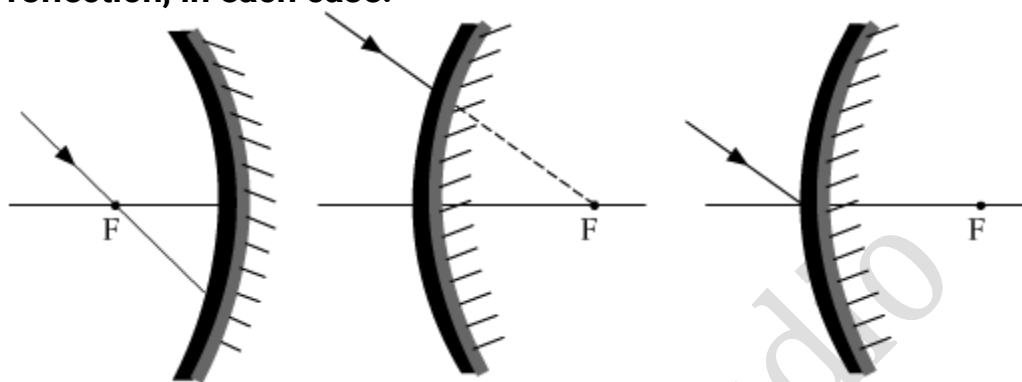
Ans: Scattering of light is a phenomenon in which light moving in a straight line is forced to deviate in different directions by one or more particles present in the medium.

The sky appears blue because of scattering of white light takes place in the atmosphere. As we know there are many air particles and other fine particles suspended in the atmosphere have size smaller than the wavelength of visible light. So, the more effective scattering of light observed for shorter wavelengths (blue light) than longer wave lengths (red light). The red light has a wavelength about 1.8 times greater than blue light. Thus, when sunlight passes through the atmosphere, the fine particles in air scatter the blue light (shorter wavelengths) more strongly than red light.

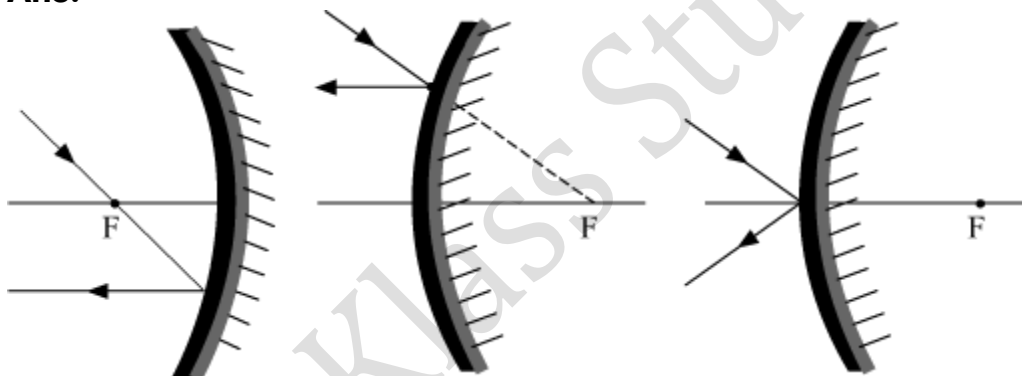
During sunrise and sunset, the Sun is located near the horizon of the Earth. Hence, light has to travel a long distance through the Earth's atmosphere. The red light, which has longer wavelength, is least scattered and is able to reach our eyes; while the blue light, which has shorter wavelength, is scattered by

the particles present in the medium and cannot reach our eyes. Therefore, the Sun appears reddish during sunrise and sunset.

Q17 Draw the following diagram in which a ray of light is incident on a concave/convex mirror on your answer sheet. Show the path of this ray, after reflection, in each case.



Ans:



Q18 Give reason to justify the following:

(a) The existence of decomposers is essential in a biosphere.

(b) Flow of energy in a food chain is unidirectional.

Ans: a) Decomposers are the animals that break down dead plants and animals. They are essential for the proper functioning of an ecosystem. They help in the recycling of minerals by decomposing dead plants and animals and releasing their components into the environment.

b) Food chain is a linear relationship of 'eating' and 'being eaten' between the organisms present in an ecosystem. According to the energy transfer law, only 10% energy is transferred from one trophic level to another. The energy

that is captured at one trophic level cannot move back to the previous trophic level. That is why, the flow of energy in a food chain is always unidirectional.

Q19 (a) Write the functions of the following parts in human female reproductive system:

(i) Ovary

(ii) Oviduct

(iii) Uterus

Ans: (a) The functions of given parts of female reproductive system are as follows:

Ovary: The ovaries are located on each side of the lower abdomen. They produce thousands of eggs in the female body. They also produce a hormone called oestrogen, which brings about the development of secondary sexual characteristics in the female body. The eggs produced in the ovary start maturing on reaching puberty.

Oviduct: One egg from each ovary grows and matures and is carried from the ovary to the uterus by a thin oviduct or the fallopian tube. Fertilisation of the egg also takes place in the oviduct.

Uterus: It is also known as the womb, as the developing embryo gets implanted in the uterus.

(b) Describe the structure and function of placenta.

Ans: Placenta is the connecting link between the mother's body and the baby. It is a disc embedded in the uterine wall. This special tissue contains villi on the embryo's side of the tissue and on the mother's side are blood spaces, which surround the villi. Placenta provides a large surface area for glucose and oxygen to pass from the mother to the baby. The developing embryo generates certain waste substances that can be removed through placenta.

Q20 What is meant by speciation? List four factors that could lead to speciation. Which of them cannot be a major factor in the speciation of a self-pollinating plant species. Give reason to justify your answer.

Ans: The formation of a new species by evolution or any genetic modification of the previously existing species in a population is called speciation.

Following are the factors responsible for speciation:

1. Genetic drift

2. Natural selection
3. Reproductive isolation
4. Geographical isolation

Reproductive isolation is not a major factor in the speciation of a self-pollinating plant species because reproductive isolation refers to the absence of other reproductively compatible plants in the same area. A self-pollinating plant species is not dependent on other compatible plants for pollen transfer.

Q21 (a) Give a chemical test to distinguish between saturated and unsaturated hydrocarbons.

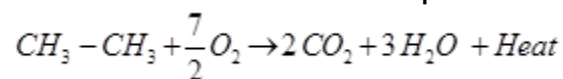
Ans: Chemical test: Bromine water test, if unsaturated hydrocarbons are added to it then the solution turns colourless. The unsaturated hydrocarbon decolourise bromine water. Whereas no change takes place to the solution when saturated hydrocarbons are added to bromine water.

Physical test: Distinction between saturated and unsaturated hydrocarbons: Saturated hydrocarbons burn in the air with clear (blue) flame, whereas burning of unsaturated hydrocarbons (alkenes and alkynes) gives sooty (yellowish) flame. Saturated hydrocarbons contain less percentage of carbon as compared to unsaturated hydrocarbons; therefore, they get completely oxidised by the oxygen present in the air on burning. Unsaturated hydrocarbons require lot of oxygen for complete oxidation whose demand is not fulfilled by air. Due to this reason, unsaturated hydrocarbons burn with a sooty flame. The sooty flame contains partially burnt carbon in the form of soot.

(b) Name the products formed when ethane burns in the air. Write a balanced chemical equation for the reaction showing the types of energies liberated.

Ans: When ethane ($\text{CH}_3\text{-CH}_3$) is burned in air (oxygen), it forms carbon dioxide and water.

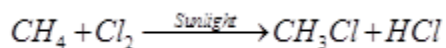
The balanced chemical equation is written as follows:



This reaction is called an exothermic reaction due to evolution of heat.

(c) Why is the reaction between methane and chlorine in the presence of sunlight considered a substitution reaction?

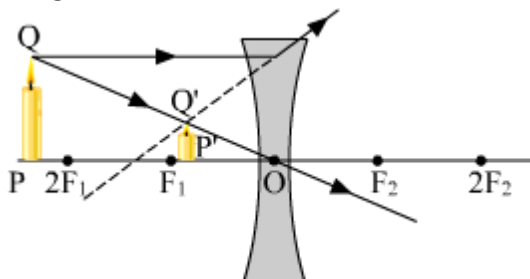
Ans: When methane reacts with chlorine in the presence of light, the following reaction takes place:



It is considered a substitution reaction because in this reaction, replacement of hydrogen with chlorine occurs.

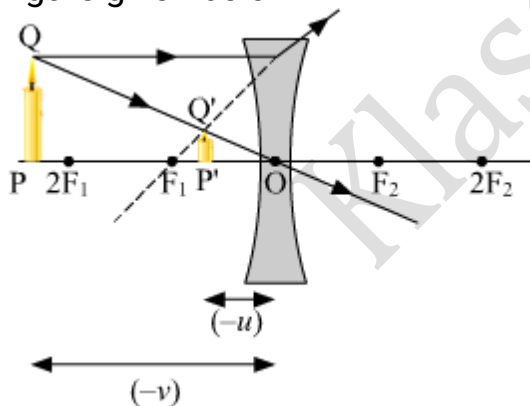
Q22 (a) Draw a ray diagram to show the formation of image by a concave lens when an object is placed in front of it.

Ans:



(b) In the above diagram mark the object distance (u) and the image distance (v) with their proper signs (+ve or -ve as per the new Cartesian sign convention) and state how these distances are related to the focal length (f) of the concave lens in the case.

Ans: The object distance (u) and the image distance (v) are indicated in the figure given below.



Since both the image and the object lie in the direction opposite to the direction of the incoming ray, both will be negative. The relation between u , v and f given by the lens formula is

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

As both u and v are negative, the above equation will be changed to

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

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

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

We know that the focal length of a concave lens is negative. Using the same argument, the above equation will be changed to

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

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

(c) Find the nature and power of a lens which forms a real and inverted image of magnification -1 at a distance of 40 cm from the optical centre.

Ans: Given:

$$u = -40 \text{ cm}$$

$$m = -1$$

Since magnification is given as

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

$$\Rightarrow v = mu = (-1) \times (-40) = 40 \text{ cm}$$

Focal length can be calculated as

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{40} - \frac{1}{(-40)} = \frac{1}{20}$$

$$\Rightarrow f = 20 \text{ cm}$$

Now, the power of the convex lens can be calculated as

$$p = \frac{1}{f(m)} = \frac{100}{20} = 5D$$

Since the power of the lens is positive, the lens will be converging in nature.

Q23 (a) Define the following terms in the context of spherical mirrors:

(i) Pole

(ii) Centre of curvature

(iii) Principal axis

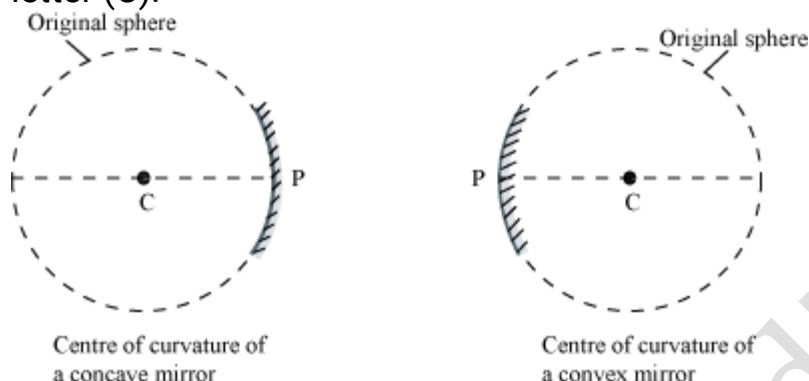
(iv) Principal focus

Ans: (i) Pole of a spherical mirror

The central point of the reflecting surface of a spherical mirror is termed as the pole. It lies on the mirror and is denoted by the letter (P).

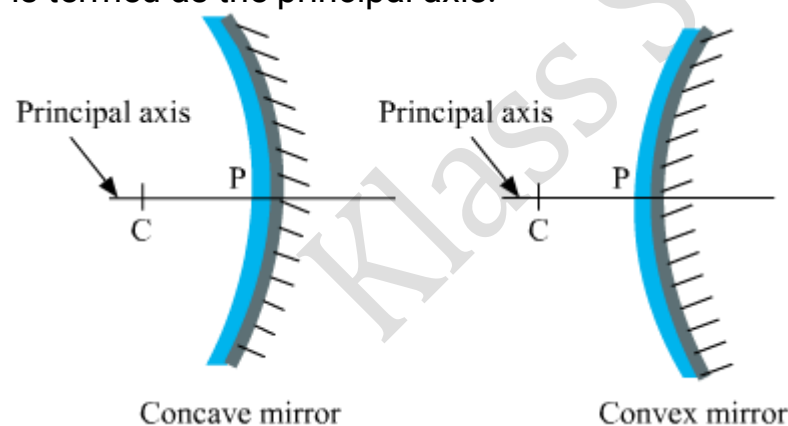
(ii) Centre of curvature

The centre of curvature is the centre of a sphere from which the given spherical mirror (convex or concave) is obtained. It is denoted by the letter (C).



(iii) Principal axis of a spherical mirror

The imaginary straight line joining the pole (P) and the centre of curvature (C) is termed as the principal axis.



(iv) Principal focus of a spherical mirror

The focus (F) is the point on the principal axis of a spherical mirror where all the incident rays parallel to the principal axis meet or appear to diverge from after reflection.

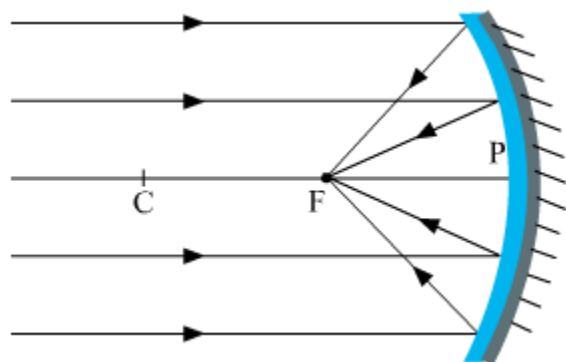
(b) Draw ray diagrams to show the principal focus of a

(i) concave mirror

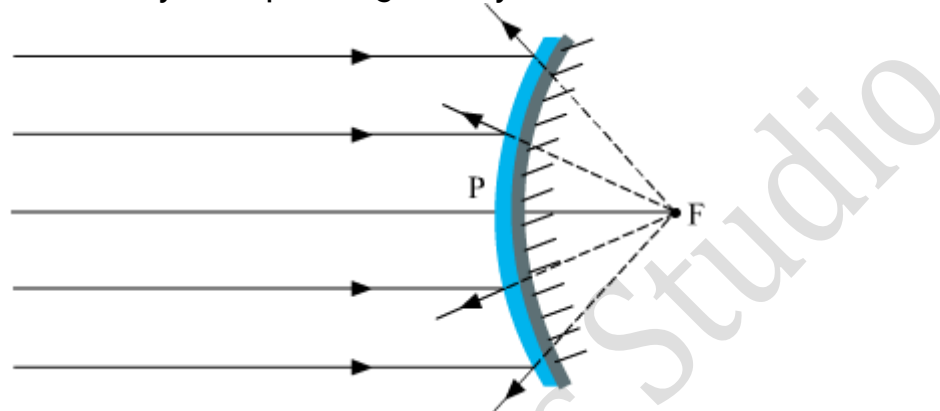
(ii) convex mirror

Ans: For concave mirrors, the focus lies on the same side of the reflecting

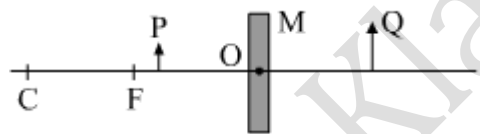
surface.



For convex mirrors, the focus is obtained on the opposite side of the reflecting surface by extrapolating the rays reflected from the mirror's surface.



(c) Consider the following diagram in which M is a mirror and P is an object and Q is its magnified image formed by the mirror.



State the type of the mirror M and one characteristic property of the image Q.

Ans: The given mirror M is a concave spherical mirror. The characteristic property of the image Q is that it is virtual.

Q24 (a) Write the function of each of the following parts of the human eye: Cornea; iris; crystalline lens; ciliary muscles

Ans: The function of cornea: Most of the refraction for the light rays entering the eye occurs at the outer surface of the cornea.

The function of iris: It is a dark, muscular diaphragm that controls the size of the pupil.

The function of crystalline lens: It merely provides the finer adjustment of the

focal length required to focus objects at different distances on the retina. The function of ciliary muscles: When these muscles are relaxed, the lens becomes thin. Thus, its focal length increases. This enables us to see distant objects clearly. When you are looking at the objects closer to the eye, the ciliary muscles contract. This increases the curvature of the eye lens. The eye lens then becomes thicker. Consequently, the focal length of the eye lens decreases. This enables us to see nearby objects clearly.

(b) Millions of people in the developing countries of the world are suffering from corneal blindness. These persons can be cured by replacing the defective cornea with the cornea of a donated eye. A charitable society of your city has organised a campaign in your neighbourhood in order to create awareness about this fact. If you are asked to participate in this mission, how would you contribute in this noble cause?

(i) State the objective of organising such campaigns.

(ii) List two arguments which you would give to motivate the people to donate their eyes after death.

(iii) List two values which are developed in the persons who actively participate and contribute in such programmes.

Ans: (i) The objective of organising such campaigns will be stated as "One pair of eyes gives vision to TWO CORNEAL BLIND PEOPLE" or "By donating our eyes after we die, we can light the life of a blind person".

(ii) Argument 1: As we have got the gift of vision, why not pass it on to somebody who does not have it.

Argument 2: Eye donors can belong to any age group or sex. People who use spectacles or those operated for cataract can still donate their eyes. People who are diabetic, have hypertension, are asthma patients and those without communicable diseases can also donate eyes.

(iii) The values developed in the persons who actively participate and contribute in such programmes are social welfare and awareness.

SECTION B

Q25 Which of the following is a correct set of homologous organs?

(a) Forelimbs of frog, bird and lizard

(b) Spine of cactus and thorn of bougainvillea

(c) Wings of bat and wings of butterfly

(d) Wings of a bird and wings of a bat

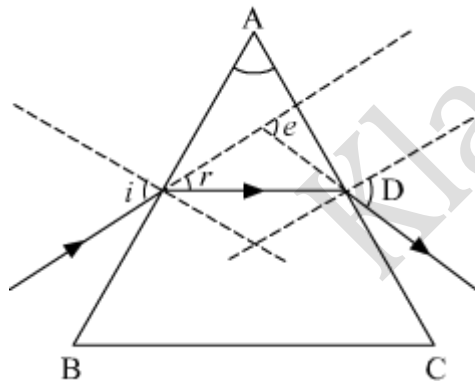
Ans: Homologous organs are the organs that have a similar internal structure (similar origin). Forelimbs of a frog, bird and lizard are homologous organs. Hence, the correct answer is option (a).

Q26 A student has to perform the experiment "To identify the different parts of an embryo of a dicot seed." Select from the following an appropriate group of seeds:

- (a) Pea, gram, wheat
- (b) Red kidney bean, maize, gram
- (c) Maize, wheat, red kidney bean
- (d) Red kidney bean, pea, gram

Ans: Red kidney bean, pea and gram seeds are from dicot plants. Hence, the correct answer is option (d).

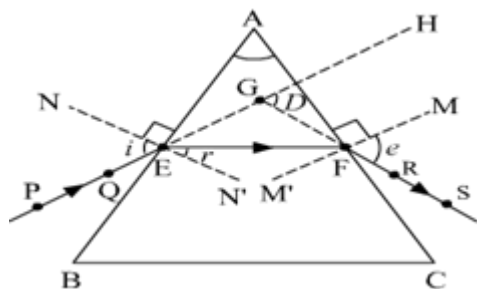
Q27 Study the following figure in which a student has marked the angle of incidence ($\angle i$), angle of refraction ($\angle r$), angle of emergence ($\angle e$), angle of prism ($\angle A$), and the angle of deviation ($\angle D$). The correctly marked angles are



- (a) $\angle A$ and $\angle i$
- (b) $\angle A$, $\angle i$ and $\angle r$
- (c) $\angle A$, $\angle i$, $\angle e$ and $\angle D$
- (d) $\angle A$, $\angle i$, $\angle r$ and $\angle D$

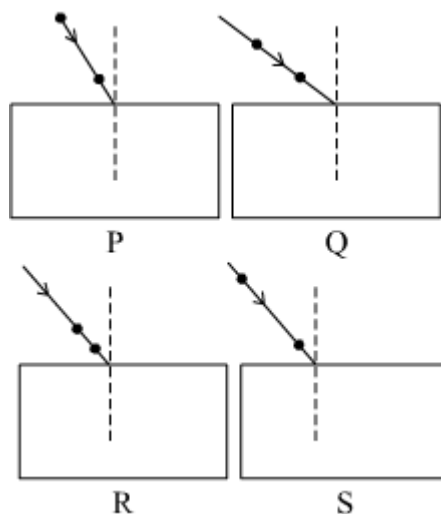
Ans: The correctly marked angles in the given figure are the angle of prism (A) and the angle of incidence (i).

All the angles are correctly marked in the figure shown below.



Hence, the correct answer is option (a).

Q28 Select from the following the best experimental setup for tracing the path of a ray of light passing through a rectangular glass slab.



- (a) P
- (b) Q
- (c) R
- (d) S

Ans: Among the given options, S will be the most suitable setup for tracing a ray of light passing through a rectangular glass slab.

Hence, the correct answer is option (d).

Q29 A student obtained a sharp image of a candle flame placed at the distant end of the laboratory table on a screen using a concave mirror to determine its focal length. The teacher suggested him to focus a distant building, about 1 km away from the laboratory, for getting more correct value of the focal length. In order to focus the distant building on the same screen, the student should slightly move the

- (a) mirror away from the screen
- (b) screen away from the mirror
- (c) screen towards the mirror
- (d) screen towards the building

Ans: In order to focus the distant building, which is 1 km from the laboratory, which means for the given concave mirror, the object (building) is at infinity, and to obtain the sharp building's image, the student should slightly move the screen towards the mirror.

Hence, the correct answer is option (c).

Q30 To determine the approximate focal length of the given convex lens by focussing a distant object (say, a sign board), you try to focus the image of the object on a screen. The image you obtain on the screen is always

- (a) erect and laterally inverted
- (b) erect and diminished
- (c) inverted and diminished
- (d) virtual, inverted and diminished

Ans: The image formed by the lens will be inverted and diminished.

Hence, the correct answer is option (c).

Q31 A student takes four test tubes marked P, Q, R and S of 25 mL capacity and fills 10 mL of distilled water in each. He dissolves one spoon full of four different salts in each as – KCl in P, NaCl in Q, CaCl_2 in R and MgCl_2 in S. He then adds about 2 mL of a sample of soap solution to each of the above test tubes. On shaking the contents of each of the test tubes, he is likely to observe a good amount of lather (foam) in the test tubes marked

- (a) P and Q
- (b) R and S
- (c) P, Q and R
- (d) P, Q and S

Ans: Scum is formed by the reaction of soap with calcium and magnesium salts in water. Test tubes R and S contain calcium chloride and magnesium chloride, respectively. Therefore, scum will be formed in these two tubes.

Test tubes P and Q contain potassium chloride and sodium chloride, respectively. Thus, a good amount of lather is likely to be formed in them.

Hence, the correct answer is option (a).

Q32 Which of the following sets of materials can be used for conducting a saponification reaction for the preparation of soap?

- (a) Ca(OH)_2 and neem oil
- (b) NaOH and neem oil
- (c) NaOH and mineral oil
- (d) Ca(OH)_2 and mineral oil

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 the saponification reaction. Among the given sets of materials, a soap can be prepared by the reaction between NaOH and *neem* oil (long-chain fatty acid). Hence, the correct answer is option (b).

Q33 Consider the following comments about saponification reactions:

I. Heat is evolved in these reactions.

II. For quick precipitation of soap, sodium chloride is added to the reaction mixtures.

III. Saponification reactions are a special kind of neutralisation reactions.

IV. Soaps are basic salts of long-chain fatty acids.

The correct comments are

- (a) I, II and III
- (b) II, III and IV
- (c) I, II and IV
- (d) Only I and IV

Ans: Soaps are sodium or potassium salts of long-chain fatty acids. Since sodium and potassium hydroxides are bases, their solutions in water are alkaline.

Dissolution of sodium or potassium hydroxide in water evolves a large amount of heat. Thus, saponification reactions are exothermic in nature.

Common salt is added in a saponification reaction, as it helps in the precipitation of a soap by decreasing the solubility of the soap.

Thus, statements I, II and IV are correct.

Q34 A student focuses the image of a well-illuminated distant object on a screen using a convex lens. After that, he gradually moves the object

towards the lens and each time focuses its image on the screen by adjusting the lens.

(i) In which direction, towards the screen or away from the screen, does he move the lens?

(ii) What happens to the size of the image? Does it decrease or increase?

(iii) What happens to the image on the screen when he moves the object very close to the lens?

Ans: (i) As the object is moved towards the lens, the image distance increases. Thus, the student moves the lens away from the screen to focus the image.

(ii) The size of the image increases when the object is moved towards the lens.

(iii) When the object is moved very close to the lens, no image is formed on the screen. A virtual image is formed behind the object on the same side of the screen.

Q35 What do you observe when you drop a few drops of acetic acid to test tubes containing

(a) phenolphthalein

(b) distilled water

(c) universal indicator

(d) sodium hydrogen carbonate powder

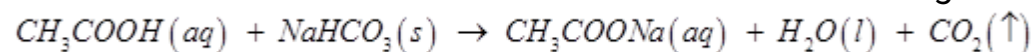
Ans: Acetic acid is a weak acid. The following changes occur when a few drops of acetic acid are added to the given solutions:

(i) Phenolphthalein remains colourless, as acetic acid shows a change in colour in basic substances.

(ii) Acetic acid dissolves in distilled water.

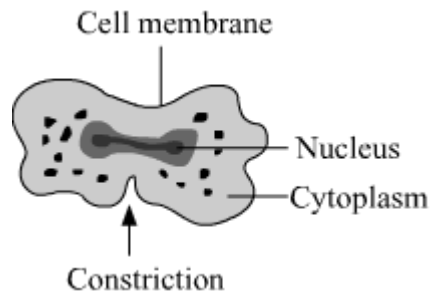
(iii) Acetic acid turns the colour of the universal indicator to pale orange.

(iv) When added to sodium hydrogen carbonate powder, acetic acid causes effervescence because of the evolution of carbon dioxide gas in the process.



Q36 Draw a labelled diagram to show that particular stage of binary fission in amoeba in which its nucleus elongates and divide into two and a constriction appears in its cell membrane.

Ans:



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