Solved Paper 2016
Science
CLASS-X

Time : 3 Hours   **Max. Marks : 90**

General Instructions :

(i) *The question paper comprises **two** Sections, **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. These are to be answered in **one word** or **in one sentence**.*

(vi) *Question numbers **4** to **6** in Section A are two marks questions. These are to be answered in about **30** words each.*

(vii) *Question numbers **7** to **18** in Section A are three marks questions. These are to be answered in about **50** words each.*

(viii) *Question numbers **19** to **24** in Section A are five marks questions. These are to be answered in about **70** words each.*

(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.*

Delhi Set I   **Code No. 31/1/1**

SECTION - A

1. **Write the next homologue of each of the following:**
(i) C_2H_4 **(ii)** C_4H_6 **1**

Ans. **(i)** C_3H_6

(ii) C_5H_8

2. **Name the part of Bryophyllum where the buds are produced for vegetative propagation.**   **1**

Ans. Leaf (notches).

3. **List two natural ecosystems.**   **1**

Ans. Natural ecosystem : Forest/Lake/Pond/River.

                          (Any two) ½+½

4. **State two positions in which a concave mirror produces a magnified image of a given object. List two differences between the two images.**
                                        2

Ans. **Two Positions:**
(i) between its pole and focus
(ii) between the focus and centre of curvature
Two Differences:
(i) the image is virtual and erect
(ii) the image is real and inverted

5. **List four advantages of properly managed watershed management.**   **2**

Ans. **Advantages of watershed management:**
(i) mitigates drought and floods.
(ii) increase the life of the dams and reservoirs downstream.

(iii) increases the biomass production and thereby the income of the watershed community.

(iv) helps in maintaining ecological balance by scientific conservation of soil and water.

     (or any other)   **(Any four)**

6. **Explain giving example where active involvement of local people lead to efficient management of forest.**   **2**

Ans. **(i)** In West Bengal the Sal forests had been very badly degraded.

(ii) A forest officer involved villagers in protection of Sal forest and gave them employment in silviculture and harvesting operations.

(iii) Villagers were allowed to collect firewood and fodder on a nominal payment.

(iv) Within a period of 10 years the previously worthless forests became valuable.

7. **What are covalent compounds ? Why are they different from ionic compounds ? List their three characteristic properties.**   **3**

Ans. **(i)** Covalent compounds are those compounds which are formed by sharing of electrons between two atoms / which contain covalent bonds.

(ii) Covalent compounds are different from ionic compounds because the ionic compounds are formed by the transfer of electrons.

(iii) **Three characteristics of covalent compounds:**
     (i) Generally have low melting and boiling points.

(ii) Generally insoluble or less soluble in water but soluble in organic solvents.

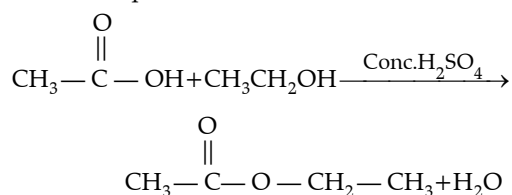**(iii)** Do not conduct electricity. (Or any other characteristic) **(Any three)**

8. When ethanol reacts with ethanoic acid in the presence of conc. H_2SO_4, a substance with fruity smell is produced. Answer the following:

(i) State the class of compounds to which the fruity smelling compounds belong. Write the chemical equation for the reaction and write the chemical name of the product formed.

(ii) State the role of conc. H_2SO_4 in this reaction.

3

Ans. (i) Esters.

Chemical equation:

$$CH_3-\overset{\overset{O}{\parallel}}{C}-OH+CH_3CH_2OH \xrightarrow{Conc.H_2SO_4}$$

$$CH_3-\overset{\overset{O}{\parallel}}{C}-O-CH_2-CH_3+H_2O$$

1

Product's chemical name – Ethyl ethanoate. **½**

(ii) Conc. H_2SO_4 acts as a dehydrating agent (Helps in the removal of water formed in the reaction). **1**

9. Calcium is an element with atomic number 20. Stating reason answer each of the following questions:

(i) Is calcium a metal or non-metal ?

(ii) Will its atomic radius be larger or smaller than that of potassium with atomic number 19 ?

(iii) Write the formula of its oxide. **3**

Ans. (i) It is a metal.

Since it has two electrons in its outermost shell/ two valence electrons, which it can lose easily.

**(ii)** K (19) is placed before Ca (20) in the same period/ fourth period.

Since the atomic radius decreases along a period, the atomic radius of calcium is smaller than that of potassium.

(iii) The formula of oxide of calcium is CaO, because the valency of calcium as well as that of oxygen is 2.

10. 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 elements 'M' belong ? Will 'M' form covalent or ionic compounds? Give reason to justify your answer. 3

Ans. (i) The electronic configuration (2, 8, 2) of the element 'M' suggests that it belongs to group 2 and period 3 of the Modern Periodic Table and its valency is 2.

(ii) The chemical formula of the compounds are:

M $(NO_3)_2$ / Mg $(NO_3)_2$; MSO_4 / $MgSO_4$; M_3 $(PO_4)_2$ / Mg_3 $(PO_4)_2$.
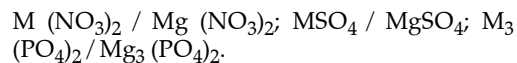
**(iii)** 'M' will form ionic compounds by losing two electrons.

11. How do organisms, whether reproduced asexually or sexually maintain a constant chromosome number through several generations ? Explain with the help of suitable example. **3**

Ans. (i) When organisms reproduce asexually, only mitotic divisions are involved and the chromosome number remains the same. During asexual reproduction the DNA (in the chromosomes) of the cells involved are copied and then equally divided among the two daughter cells formed. Thus, chromosome number remains unchanged.

(ii) In sexual reproduction, organisms produce gametes through a special type of division, meiosis – reductional division, in which the original number of chromosomes becomes half. These two gametes combine to form the zygote and the original number of chromosomes is restored. // In sexual reproduction specialized cells/ germ cells with only half the number of chromosomes are formed. When these germ cells from two individuals combine to form a new individual, the original chromosome number is restored.

(iii) Example: In humans, the parents father and mother each have 46 or 23 pairs of chromosomes. In the gametes – the sperm has half the number of chromosomes *i.e.*, 23 and the egg also has 23 chromosomes, when the sperm and the egg fuse, the zygote has 46 or 23 pairs of chromosomes. Thus, the chromosome number remains constant.

12. Name the parts A, B and C shown in the following diagram and state one function of each. **3**
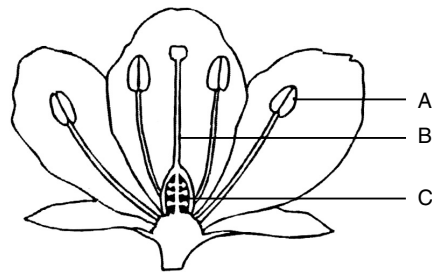
Ans. (A) Anther – it produces pollen grains.

(B) Style – it provides the path through which the pollen tube grows and reaches the ovary.

(C) Ovary – it contains ovules and each ovule has an egg cell/ female gamete. It develops into fruit after fertilization.

13. 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. **3**

Ans. Three methods of contraception:

   (i) Barrier method or mechanical method/ Condom/ Diaphragm, to prevent the meeting of sperms and ova.

   (ii) Chemical method/ Oral pills, Changes the hormonal balance of the female partner so that the eggs are not released.

   (iii) Surgical method – to block the vas deferens in males/ vasectomy or the fallopian tube (oviduct) in females/ tubectomy, to prevent the transfer of sperms or egg and hence no fertilization takes place.

   (iv) IUCDs/ Loop or the copper-T placed in the uterus, to prevent pregnancy.

(Any three)

14. In one of his experiments with pea plants Mendel observed that when a pure tall pea plant is crossed with a pure dwarf pea plant, in the first generation, F_1 only tall plants appear.

   (a) What happens to the traits of the dwarf plants in this case ?

   (b) When the F_1 generation plants were self-fertilised, he observed that in the plants of second generation, F_2 both tall plants and dwarf plants were present. Why it happened ? Explain briefly. **3**

Ans. (a) The dwarf traits of the plants is not expressed in the presence of the dominant tall trait.

   (b) In the F_2 generation, both the tall and dwarf traits are present in the ratio of 3:1. This showed that the traits for tallness and dwarfness are present in the F_1 generation, but the dwarfness, being the recessive trait does not express itself in the presence of tallness, the dominant trait.

OR

(a)

(b)
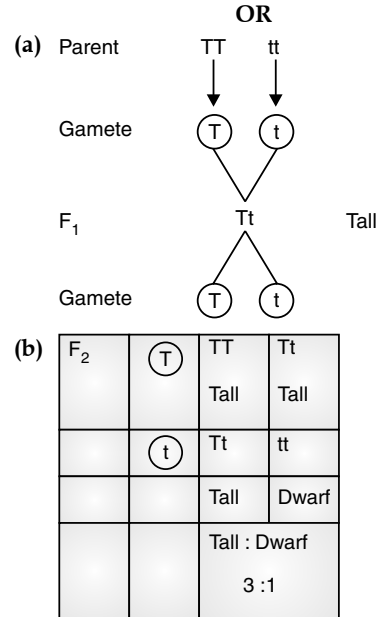
15. List three distinguishing features, in tabular form, between acquired traits and the inherited traits. **3**

Ans.

S. No.	Acquired traits	Inherited traits
1.	Do not bring changes in the DNA of germ cells.	Bring changes in the DNA of germ cells.
2.	Cannot direct evolution.	Can direct evolution.
3.	Cannot be passed on to the progeny.	Can be passed on to the progeny.

16. 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. **3**
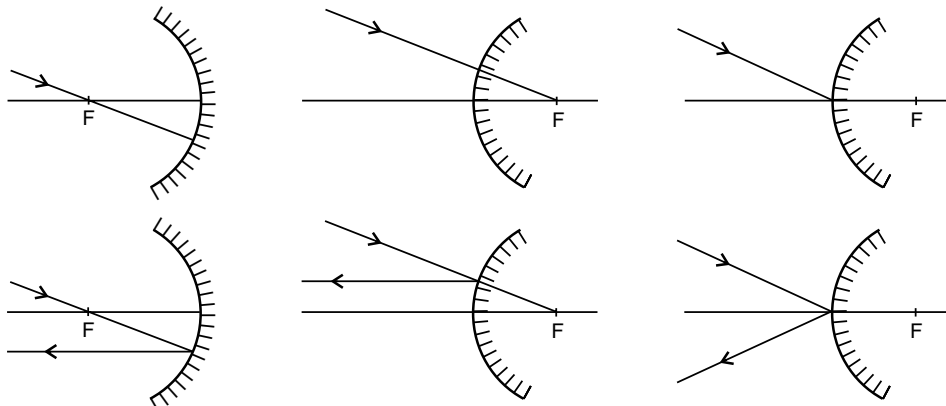
Ans.

17. Why does the sun appear reddish early in the morning ? Will this phenomenon be observed by an observer on the moon ? Justify your answer with a reason. **3**

Ans. Early in the morning, the sun is near the horizon, sunlight reaches us after travelling a longer distance through thick layers of atmosphere. Thus most of the blue light and shorter wavelengths are scattered away by the particles in the atmosphere. The light that reaches us is of longer wavelengths giving a reddish appearance.

This phenomenon will not be observed by an observer on the moon.

Because of the absence of atmosphere on the moon.

18. **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.** **3**

Ans. (a) The existence of decomposers is essential in a biosphere because they breakdown complex organic substances into simple inorganic substances that can be absorbed by the plants. Thus, decomposers:

   (i) replenish the soil naturally

   (ii) helps in removing the biodegradable waste.

   (b) In a food chain the energy moves progressively through the various trophic levels, it is no longer available to the previous level (autotrophs) and the energy captured by the autotrophs does not go back to the solar input. Hence, the flow of energy is unidirectional.

19. (a) **Give a chemical test to distinguish between saturated and unsaturated hydrocarbon.**

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

    (c) **Why is reaction between methane and chlorine in the presence of sunlight considered a substitution reaction ?** **5**

Ans. (a) Pass the vapours of the given samples of saturated and unsaturated hydrocarbons into bromine water taken in two separate test-tubes. The one which discharges the colour of bromine water is that of unsaturated hydrocarbon and the other represents saturated hydrocarbon. **(or any other test)**

   (b) On burning ethane in air, the products obtained are carbon dioxide and water, along with heat and light.

   $2\,C_2H_6\,(g) + 7\,O_2\,(g) \longrightarrow 4\,CO_2\,(g) + 6\,H_2O\,(l)$ + Heat + Light
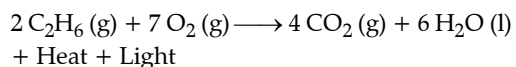
   (c) It is considered a substitution reaction because the hydrogen atoms of methane (CH_4) are replaced by chlorine atoms one by one.

20. (a) **Write the functions of the following parts in human female reproductive system :**

    (i) **Ovary**   (ii) **Oviduct**
    (iii) **Uterus**

    (b) **Describe the structure and function of placenta.** **5**

Ans. (a)

(i)	Ovary—	(i) Production of female hormone (ii) Production of female gamete
(ii)	Oviduct—	(i) Transfer of female gamete from the ovary (ii) Site of fertilization
(iii)	Uterus—	(i) Implantation of the zygote (ii) Nourishment of the developing embryo/placenta formation

   (b) **Structure of Placenta:** It is a disc like structure embedded in the uterine wall connected to the embryo. It has villi on the embryo's side of the tissue and on the mother side, it has blood spaces, which surround the villi.

   Function of Placenta: It provides a large surface area for nutrients/glucose and oxygen to pass from the mother's side to the embryo and waste substances from the embryo's side to mother's blood.

21. **What is meant by speciation ? List four factors that could lead to speciation. Which of these cannot be a major factor in the speciation of a self-pollinating plant species. Give reason to justify your answer.** **5**

Ans. (i) **Speciation:** The process of formation of a new species from a pre-existing one.

   (ii) **Four factors are as:**
   ● Genetic drift
   ● Mutation / Drastic change in the genes or DNA
   (iii) Natural selection
   (iv) Geographical isolation

   (iii) Geographical isolation cannot be a major factor in the speciation of a self-pollinating plant species.

   (iv) **Reason :** Physical barrier cannot be created in self-pollinating plants.

22. (a) **Define the following terms in the context of spherical mirrors:**

    (i) **Pole**

    (ii) **Centre of curvature**

    (iii) **Principal axis**

    (iv) **Principal focus**

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

    (i) **Concave mirror**

    (ii) **Convex mirror**

    (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.**
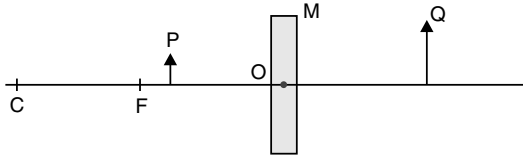
State the type of the mirror M and one characteristic property of the image Q. **5**

Ans. (a) (i) Pole – Centre of the reflecting surface of the mirror.

(ii) Centre of curvature – The centre of the hollow sphere of which the reflecting surface of mirror forms a part.

(iii) Principal axis – Straight-line passing through the pole and the centre of curvature of a spherical mirror.

(iv) Principal focus – Incident rays parallel to principal axis, after reflection, either converge to or appear to diverge from a fixed point on the principal axis called principal focus of the spherical mirror.

**(b)**

(i)

(ii)
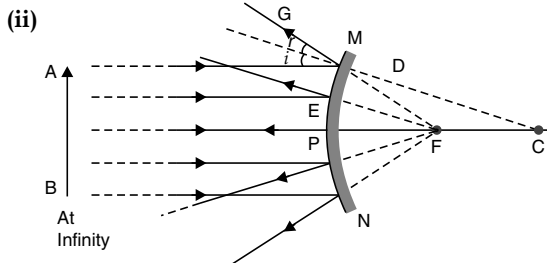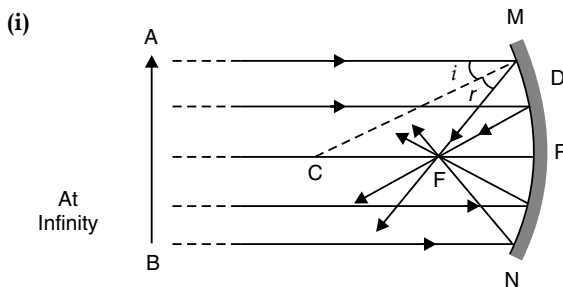
(c) Concave mirror

Image formed is virtual.

23. (a) Draw a ray diagram to show the formation of image by a convex lens when an object is placed in front of the lens between its optical centre and principal focus.

(b) In the above ray 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 convex lens in this case.

(c) Find the power of a convex lens which forms a real, and inverted image of magnification –1 of an object placed at a distance of 20 cm from its optical centre. **5**

Ans. (a)
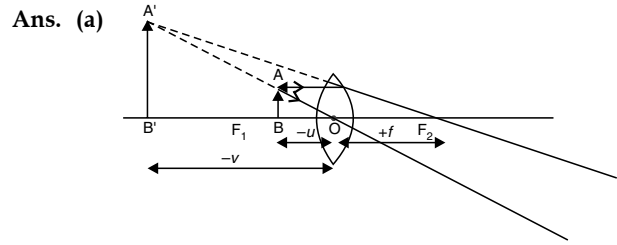
(b) Relation : $\dfrac{1}{f} = \dfrac{1}{v} - \dfrac{1}{u}$

(c) $m = -1; u = -20$ cm; $v = ?, f = ?$

Marking of u & v

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

$\therefore\ \ v = +20$ cm

Thus object is at 2F

i.e., $2f = 20$ cm

$\therefore\ \ f = 10$ cm $= 0.1$m

$$P = \dfrac{1}{f}$$

$$= \dfrac{1}{0.1} = +10\,D$$

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

(b) Millions of people of the developing countries of 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. **5**

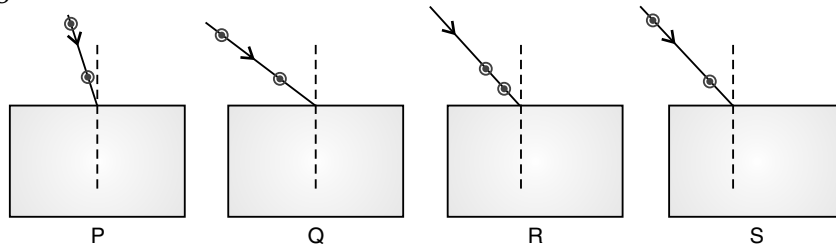**Ans. (a)** Functions of the parts of human eye :

● **Cornea** – Refracts the rays of light falling on the eye.

● Iris – Controls the size of the pupil.

- Crystalline lens – Focuses the image of the object on the retina.
- Ciliary muscles – Holds the eye lens and adjusts its focal length.

(b) (i) Objectives – To make people aware and realize their duties towards society.

(ii) One person can give sight to two people. Our eyes can live even after our death.

(iii) Concern for others/ Responsible behaviour/ Group work/ or any other.

(Any two)

SECTION - B **

25. 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   1

26. A student takes four test tubes marked P, Q, R and S of 25 mL capacity and fill 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   1

27. 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 mixture

III   Saponification reactions are 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   1

28. 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   1

29. 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   1

30. 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 far 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   1

31. 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   1

32. Select from the following the best experimental set-up for tracing the path of a ray of light passing through a rectangular glass slab :
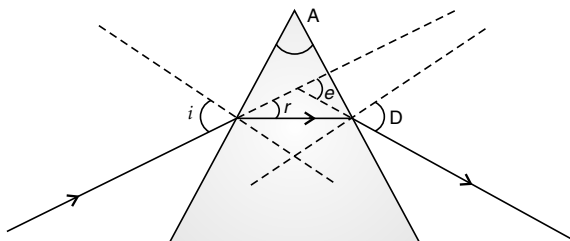

(a) P   (b) Q   (c) R   (d) S   1

** *Practical Part*

33. **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 $\angle D$ **1**

34. **What do you observe when you drop a few drops of acetic acid to a test-tube containing :**

(i) phenolphthalein

(ii) distilled water

(iii) universal indicator

(iv) sodium hydrogen carbonate powder   **2**

35. **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.**   **2**

36. **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 ?**   **2**

Delhi Set II   Code No. 31/1/2

Note: Except these, all other questions are from Set-I.

1. **Name the following compounds:**

(a) $CH_3 — CH_2 — OH$;

(b) $CH_3 — \overset{\overset{\displaystyle H}{|}}{C} = O$
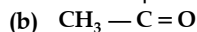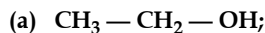
Ans. (a) Ethanol   (b) Ethanal

2. **What is DNA ?**   **1**

**Ans.** It is the carrier of hereditary information from parents to the next generation.

3. **List two biotic components of a biosphere.**   **1**

Ans. Producers, consumers, decomposers.
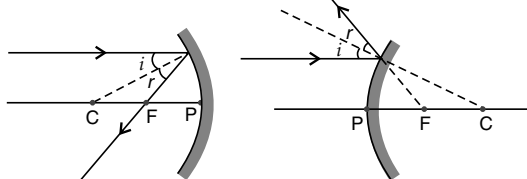
OR

Plants, animals, micro-organisms.   **(Any two)**

4. **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.**   **2**
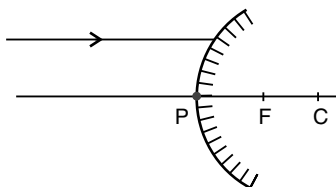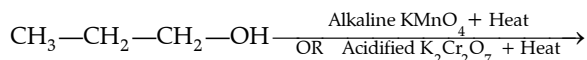

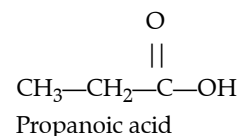
Ans.

Tracing the reflected ray

Marking $\angle i$ & $\angle r$

7. **What is an oxidising agent ? What happens when an oxidising agent is added to propanol ? Explain with the help of a chemical equation.**   **3**

Ans. ● It is a substance which can give oxygen to other substances.

$$CH_3—CH_2—CH_2—OH \xrightarrow[\text{OR} \quad \text{Acidified } K_2Cr_2O_7 + \text{Heat}]{\text{Alkaline KMnO}_4 + \text{Heat}}$$

Propanol

$$CH_3—CH_2—\overset{\overset{\displaystyle O}{||}}{C}—OH$$

Propanoic acid

● Propanol is oxidised to Propanoic acid.

10. **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 element.**   **3**

Ans. ● Two elements of group 1 are Na, K / sodium, potassium.

Electronic configurations Na = 2,8,1; K = 2,8,8,1

● **Similarity:** Both have one valence electron / One electron in outermost shell.

● Oxide – Na_2O / K_2O

11. **What are the functions of testis in the human male reproductive system? Why are these located outside the abdominal cavity ? Who is responsible for bringing about changes**

in appearance seen in boys at the time of puberty ?	3

Ans. **Functions of testis:**

(i) Produce sperms.

(ii) Produces male hormone/ testosterone.

● These are located outside the human body, as sperms need lower temperature than the normal body temperature to mature.

● Testosterone.

13. **What is multiple fission ? How does it occur in an organism ? Explain briefly. Name one organism which exhibits this type of reproduction.**	3

Ans. **Multiple fission:** The process of reproduction in which many individuals are formed or produced from the parent cell.

In this process, the nucleus divides repeatedly to produce large number of nuclei. Each nucleus gathers a bit of cytoplasm around itself, develops a membrane around each structure. Many daughter cells develop which on liberation grow into adult organism.

Plasmodium exhibits this type of fission.

14. **How did Mendel interpret his result to show that traits may be dominant or recessive ? Describe briefly.**	3

Ans. Mendel conducted breeding experiments on Pea plants.

● He selected pure breed tall and dwarf plants.

● He cross-pollinated these plants.

● In the F_1 generation obtained only tall plants. Tallness is the dominant trait.

● Then, he produced F_2 generation by selfing of hybrids / F_1.

● He found that $3/4^{th}$ of the plants were tall and $1/4^{th}$ were dwarf.

● The trait which remains hidden in F_1 generation plants is the recessive traits.

16. **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.**	3

Ans. ● **Scattering of light –** Phenomenon of spreading of light (diffused reflection) by minute particles in a medium.

● The sky appears blue because the blue colour of sunlight scatters much more strongly than the red colour by particles in atmosphere/ air due to its shorter wavelength.

● At sun-rise and sun-set most of the blue light and shorter wavelengths are scattered away by the particles in the atmosphere as the light from the sun near the horizon passes through thick layers of air and larger distance. The light that reaches us is of longer wavelength (red colour) giving a reddish appearance.

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

(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 this case.**

(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 its optical centre.**	5

Ans. **(a)**
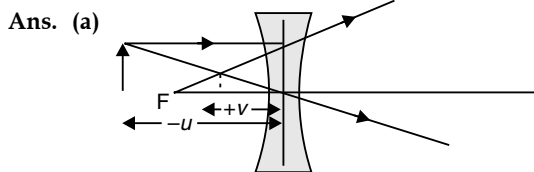
Diagram

(b) Marking – u and – v

Relation:

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

(c) As, $m = -1$ hence, the lens is convex.

$\because$	$m = \dfrac{v}{u}$

$\therefore$	$v = -u$

Thus, object is at 2F

$2f = 40$ cm

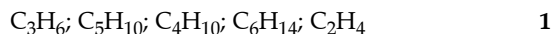$\therefore$	$f = 20$ cm $= 0.2$ m

$$P = \frac{1}{f} = \frac{1}{0.2} = + 5D \text{ (convex lens)}$$

Delhi Set III	Code No. 31/1/3

Note: Except these, all other questions are from Set-I & II.

1. **Select saturated hydrocarbons from the following :**

C_3H_6; C_5H_{10}; C_4H_{10}; C_6H_{14}; C_2H_4	1

Ans. C_4H_{10}; C_6H_{14}.

2. **What happens when a *Planaria* gets cut into two pieces ?**	1

Ans. Each piece regenerates into a new *Planaria*.

3. **Why are green plants called producers ?**	1

Ans. Because the green plants prepare food by photosynthesis by using solar energy.

4. What is meant by power of a lens ? What does its sign (+ve or –ve) indicate ? State its S.I. unit. How is this unit related to focal length of a lens ? **2**

Ans. ● Ability of lens to converge or diverge the light rays.

● +ve sign $\longrightarrow$ converging lens/ convex lens

−ve sign $\longrightarrow$ diverging lens/ concave lens

● S.I. unit – dioptre

1 dioptre = 1/ focal length (m)

6. "Reuse is better than recycling of materials". Give reason to justify this statement. **2**

**Ans.** Reuse refers to the use of the same material again and again.

In reuse of materials no energy is consumed and the resources are saved.

In recycling certain used materials are converted into other useful materials.

In recycling of materials, energy is consumed and the resources may be wasted.

7. Name the compound formed when ethanol is heated in excess of conc. sulphuric acid at 443 K. Also write the chemical equation of the reaction stating the role of conc. sulphuric acid in it. What would happen if hydrogen is added to the product of this reaction in the presence of catalysts such as palladium or nickel ? **3**

Ans. ● Ethene.

● $C_2H_5OH \xrightarrow[\text{443K}]{\text{Conc. H}_2\text{SO}_4 + \text{Heat}}$

$$H_2C=CH_2 + H_2O$$
ethene
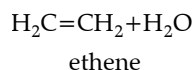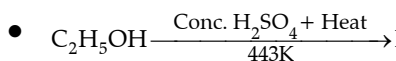
● Conc. H_2SO_4 acts as a dehydrating agent/ removes water from the reactant.

● Ethane/ C_2H_6 will be formed.

* 9. Two elements 'A' and 'B' belong to the 3rd period of Modern periodic table and are in group 2 and 13 respectively. Compare their following characteristics in tabular form :

(a) Number of electrons in their atoms

(b) Size of their atoms

(c) Their tendencies to lose electrons

(d) The formula of their oxides

(e) Their metallic character

(f) The formula of their chlorides **3**

11. What is meant by pollination ? Name and differentiate between the two modes of pollination in flowering plants. **3**

Ans. **Pollination :** The transfer of pollen grains from the anther to the stigma is called pollination.

The two types of pollination :

Self pollination : When the pollen grains from the stamens of a flower fall on the stigma of the same flower, then self pollination occurs.

Cross pollination : When pollen grains from the stamens of a flower fall on the stigma of another flower, then cross pollination occurs.

14. In a monohybrid cross between tall pea plants (TT) and short pea plants (tt) a scientist obtained only tall pea plants (Tt) in the F_1 generation. However, on selfing the F_1 generation pea plants, he obtained both tall and short plants in F_2 generation. On the basis of above observations with other angiosperms also, can the scientist arrive at a law ? If yes, explain the law. If not, give justification for your answer. **3**

Ans. Yes, the scientist may arrive at the law of dominance according to which the trait that is expressed in the F_1 generation is the dominant trait, although both the dominant and recessive traits are present in the F_1 generation. In the F_2 generation the recessive traits is also expressed along with the dominant traits.
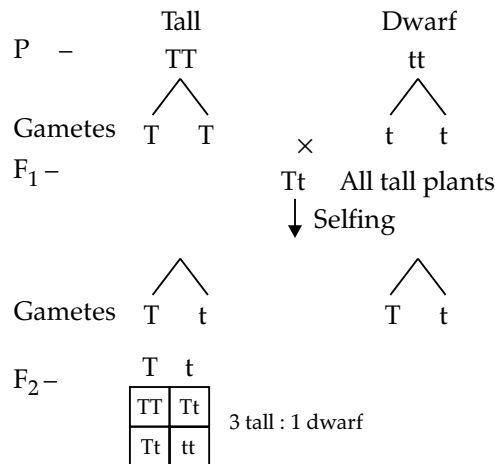
16. (a) Draw a ray diagram to show the refraction of light through a glass slab and mark angle of refraction and the lateral shift suffered by the ray of light while passing through the slab.

(b) If the refractive index of glass for light going from air to glass is 3/2, find the refractive index of air for light going from glass to air. **3**

Ans. (a)

Diagram
Marking $\angle r$ and x
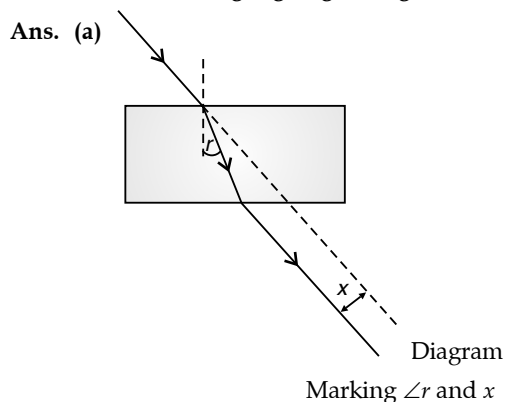
(b) $a^{n}g = \dfrac{3}{2}$

$\therefore \quad _a n_g = \dfrac{1}{a^n g} = \dfrac{1}{3/2} = \dfrac{2}{3}$

Alternately, $\dfrac{c_{air}}{c_{glass}} = \dfrac{3}{2}$

$\therefore \quad \dfrac{c_{glass}}{c_{air}} = \dfrac{2}{3}$

17. **State the cause of dispersion of white light passing through a glass prism. How did Newton show that white light of sun contains seven colours using two identical glass prisms. Draw a ray diagram to show the path of light when two identical glass prisms are arranged together in inverted position with respect to each other and a narrow beam of white light is allowed to fall obliquely on one of the focus of the first prism.** **3**

Ans. **Cause of dispersion of white light –** Different colours of light bend through different angles with respect to the incident ray as they pass through a prism. Violet light bends the most and red the least. Thus, the each colour emerges along different paths.
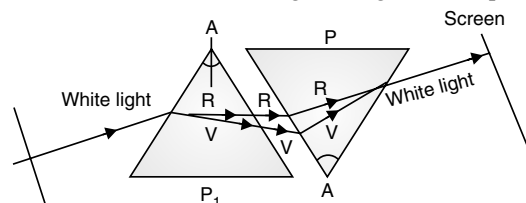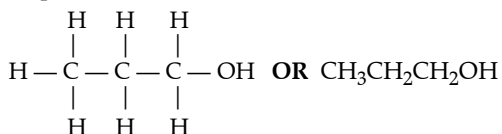

Outside Delhi Set I   **Code No. 31/2/1**

SECTION - A

1. **Write the name and structure of an alcohol with three carbon atoms in its molecule.** **1**

Ans. Propanol,

OR $CH_3CH_2CH_2OH$

2. **What happens when a mature Spirogyra filament attains considerable length ?** **1**

Ans. Its filament breaks up into smaller fragments or pieces, and each fragment grows into a new filament/individual.

3. **The depletion of ozone layer is a cause of concern. Why ?** **1**

Ans. Ultraviolet rays from the sun penetrate down the earth and cause health hazards/skin cancer in human beings

4. **Name the type of mirrors used in the design of solar furnaces. Explain how high temperature is achieved by this device.** **2**

Ans. ● Concave Mirrors / Converging Mirrors.

● When a solar furnace is placed at the focus of a large concave mirror/ reflector, it focuses a parallel beam of light on the furnace, consequently a high temperature is achieved after some time.

5. **"What was Chipko Andolan" ? How did this Andolan ultimately benefit the local people and the environment ?** **2**

Ans. ● Chipko Andolan (Hug the Trees Movement) – Women of Reni village in Garhwal hugged the tree trunks preventing the contractors from felling the trees.

● This Andolan quickly spread to other parts of the country and forced the government to rethink their priorities in the use of forest produce, consequently the local people benefitted.

● The environment was saved from permanent damage/ affected the quality of soil and the sources of water.

6. **"Burning of fossil fuels results in global warming". Give reasons to justify this statement.** **2**

Ans. Burning of fossil fuels produces green house gases (CO, CO_2, water vapour, oxides of nitrogen, sulphur). High concentration of CO_2 causes global warming.

7. **Write chemical equation of the reaction of ethanoic acid with the following:**
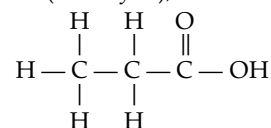**(a) Sodium;**   **(b) Sodium hydroxide;**
(c) Ethanol.
Write the name of one main product of each reaction. **3**

Ans. **(a)** $2CH_3COOH + 2Na \longrightarrow 2CH_3COONa + H_2$
Sodium ethanoate/ Sodium acetate

(b) $CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$
Sodium ethanoate/ sodium acetate

(c) $CH_3COOH + C_2H_5OH \longrightarrow CH_3COOC_2H_5 + H_2O$
Ethyl ethanoate/ ester

8. **An aldehyde as well as a ketone can be represented by the same molecular formula, say C_3H_6O. Write their structures and name them. State the relation between the two in the language of science.** **3**

Ans. ● Propanal (aldehyde);

● Propanone(ketone);

$$H — \overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}} — \overset{\overset{\displaystyle }{||}}{\underset{\underset{\displaystyle O}{}}{C}} — \overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}} — H$$
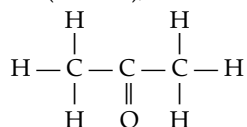
● Isomers (same molecular formula but different structural formula/different functional group)

* 9. An element 'X' belongs to 3rd period and group 16 of the Modern Periodic Table.

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

(b) Molecular formula of the compound when 'X' reacts with hydrogen and write its electron dot structure.

(c) Name the element 'X' and state whether it is metallic or non-metallic. 3

*10. 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'. 3

11. Define reproduction. How does it help in providing stability to the population of species ? 3

Ans. Reproduction : It is a (biological) process by which new individuals of the same species are produced by the existing organisms.

● Populations of organisms live in well defined places called niches in the ecosystem using their ability to reproduce.

● Reproduction involves DNA copying which is the source of information for making proteins thereby controlling body design.

● These body designs allow the organism to use a particular niche for the stability of the population of a species.

● (Minor) variations may also lead to the stability of the species.

12. Explain the term "Regeneration" as used in relation to reproduction of organisms. Describe briefly how regeneration is carried out in multicellular organisms like Hydra. 3

Ans. Regeneration: It is the ability of an organism to give rise to a new organism / individual from their body parts.

Regeneration in hydra:

● When the body of hydra by any means is cut into number of pieces.

● Each piece contains specialized cells.

● These cells proliferate and make large number of cells.

● From this mass of cells different cells undergo changes to become various cell types and tissues finally developing into a new organism.

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

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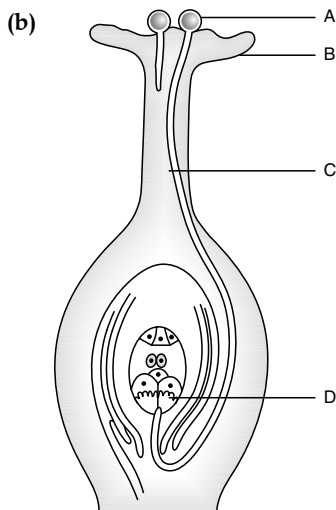
(i) Name the part marked 'A' in the diagram.

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

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

(iv) What happens to the part marked 'D' after fertilisation is over ? 3

Ans. (a) (i) Involvement of two different individuals.

(ii) Creation of new combination of variants.

(b) (i) pollen / pollen grain.

(ii) by pollination / agents of pollination.

(iii) It (pollen tube) helps male gamete to reach egg (ovule).

(iv) Converts into embryo.

14. How do Mendel's experiment show that traits are inherited independently ? 3

Ans. ● When a cross was made between a tall pea plant with round seeds and a short pea plant with wrinkled seeds, the F_1 progeny plants are all tall with round seeds. This indicates that tallness and round seeds are the dominant traits.

● When the F_1 plants are self pollinated the F_2 progeny consisted of some tall plants with round seeds and some short plants with wrinkled seeds which are the parental traits.

● There were also some new combinations like tall plants with wrinkled seeds and short plants with round seeds.

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* *Out of Syllabus*

- Thus it may be concluded that tall and short traits and round and wrinkled seed traits have been inherited independently.

OR

A flow chart depicting the same.

Note: Any other contrasting characters can also be taken

15. "Two areas of study namely 'evolution' and 'classification' are interlinked". Justify this statement.   **3**

Ans. ● Different forms of organisms/ life have evolved during the course of evolution, and classification deals with grouping of these organisms into groups and subgroups based on their similarities and differences.

- The more characteristics any two species have in common more closely they are related/ will have a more recent ancestor (and vice versa).

- Thus classification helps tracing the evolutionary relationships between the two organisms hence classification and evolution are interlinked.

16. The image of an object formed by a mirror is real, inverted and is of magnification – 1. If the image is at a distance of 40 cm from the mirror, where is the object placed ? Where would the image be if the object is moved 20 cm towards the mirror ? State reason and also draw ray diagram for the new position of the object to justify your answer.   **3**
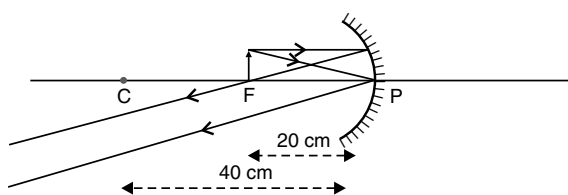
Ans. **Object position :** At C (Centre of curvature)

Object distance = 40 cm

Position of the image - at infinity

Reason: Focal length of the mirror = 20 cm

If the object is moved 20 cm towards the mirror then its new position would be at the focus of the mirror.

(deduct ½ mark if arrows are missing / not marked)

17. Describe an activity to show that the colours of white light splitted by a glass prism can be recombined top get white light by another identical glass-prism. Also draw ray diagram to show the recombination of the spectrum of white light.   **3**

Ans. **Description of activity:** When a glass prism is used to obtain a spectrum of sunlight, a second identical prism in an inverted position with respect to the first position will allow all the colours of spectrum to recombine. Thus a beam of white light will emerge from the other side of the second prism.
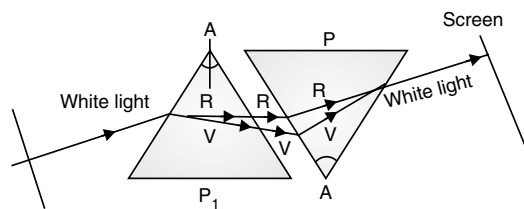
18. The activities of man had adverse effects on all forms of living organisms in the biosphere. Unlimited exploitation of nature by man disturbed the delicate ecological balance between the living and non-living components of the biosphere. The unfavourable conditions created by man himself threatened the survival not only of himself but also of the entire living organisms on the mother earth. One of your classmates in an active member of 'Eco club' of your 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 ?

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

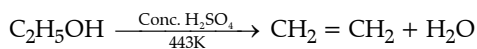**(c)** List two values exhibited by your classmate who is an active member of Eco-clib of your school.   **3**

Ans. Two reasons for the conservation of the environment:

(a) 1. To save air, water and soil from pollution.

  2. To maintain ecological balance in nature.

(b) Green dustbins for biodegradable waste, and blue dustbins for non-biodegradable waste for proper disposal of waste without wasting time and energy in segregating the biodegradable and non-biodegradable wastes.

(c) **Values:** cooperative spirit, concern about environment, civic sense or any other.
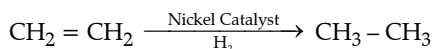
(Any two)

19. 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.   **5**
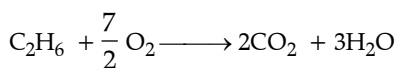
Ans. P = Ethanol / C_2H_5OH

Q = Ethene / $CH_2 = CH_2$

R = Ethane / C_2H_6

$$C_2H_5OH \xrightarrow[443K]{Conc.\ H_2SO_4} CH_2 = CH_2 + H_2O$$
  Ethanol   Ethene

$$CH_2 = CH_2 \xrightarrow[\text{H}_2]{\text{Nickel Catalyst}} CH_3 - CH_3$$
Ethene   Ethane

$$C_2H_6 + \frac{7}{2} O_2 \longrightarrow 2CO_2 + 3H_2O$$

Note : Correct equation even without balancing be given full credit.

20. **What is placenta ? Describe its structure. State its functions in case of a pregnant human female.**   **5**

Ans. **Placenta:** A special tissue that helps human embryo in obtaining nutrition from mother's blood.

Structure: This is a disc which is embedded in the uterine wall which contains villi on the embryo side of the tissue, and on the mother's side are blood spaces which surround the villi.

Function: This provides a large surface area for glucose and oxygen to pass from the mother to the embryo, and the developing embryo will also generate waste substances which can be removed by transferring them into the mothers blood through the placenta.

21. **Define evolution. How does it occur ? Describe how fossils provide us evidences in support of evolution.**   **5**

Ans. **Evolution:** The gradual unfolding of organisms from pre-existing organisms through change since the origin of life.

It occurs because there is an inbuilt tendency to variation during reproduction due to errors in DNA copying and as a result of sexual reproduction.

It is observed that although fossils appeared different from the existing species they may show certain features similar to the existing species thus providing linkages between pre-existing and existing forms.

Provide information about the extinct species which were different from the existing species.

22. **It is desired to obtain an erect image of an object, using concave mirror of focal length of 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 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 ray diagram for this situation also to justify your answer.**
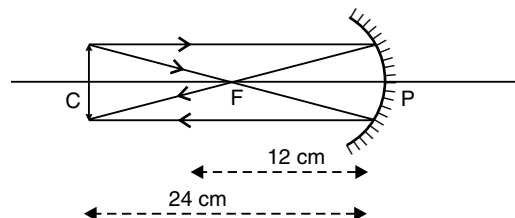
Show the positions of pole, principal focus and the centre of curvature in the above ray diagrams.   **5**

Ans. **(i)** Range of distance: between 0 cm - < 12 cm

   (ii) larger than the object
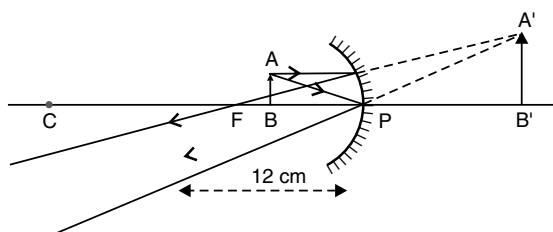
(iii) Image also at 24 cm in front of the mirror

23. **(a)** **Define optical centre of a spherical lens.**

   (b) **A divergent lens has a focal length of 20 cm. At what distance should an object of height 4 cm from the optical centre of the lens be placed so that its image is formed 10 cm away from the lens. Find the size of the image also.**

   (c) **Draw a ray diagram to show the formation of image in above situation.**   **5**

Ans. **(a)** Optical centre: the central point of a lens.

   (b) $f = -20$ cm

$$h_1 = 4 \text{ cm}, v = -10, u = ?, h_2 = ?$$
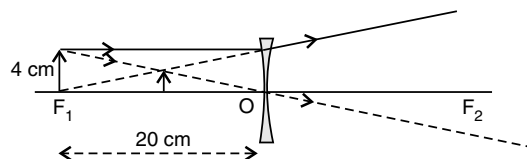
$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{-1}{-10} - \frac{1}{-20} = \frac{-1}{10} + \frac{1}{20}$$

$$= \frac{-2+1}{20} = -\frac{1}{20}$$

$$u = -20 \text{ cm}$$

$$h_i = \frac{v}{u} h_0 = \frac{-10 \text{ cm}}{-20 \text{ cm}} \times 4 = 2 \text{ cm}$$

(c)

24. **What is atmospheric refraction ? Use this phenomenon to explain the following natural events.**

   (a) **Twinkling of stars**

   (b) **Advanced sun-rise and delayed sun-set.**

**Draw diagrams to illustrate your answers.**   **5**

Ans. **Atmospheric refraction:** Refraction of light caused by the earth's atmosphere due to change in the refractive indices of different layers.

(a) **Twinkling of stars:** Stars are distant point sized source of light. The path of the rays of light coming from the star goes on varying due to atmospheric refraction slightly. Thus apparent position of the stars fluctuates and the amount of star light entering the eye flickers giving the twinkling effect
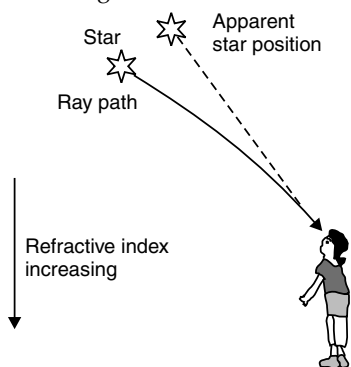
(b) **Advanced sun-rise:** When the sun is slightly below the horizon, light rays coming from the sun travel from the rarer to denser layers of air. Because of atmospheric refraction of light, light appears to come from a higher position above the horizon. Thus sun appears earlier than actual sunrise.

Delayed sunset: Same reason as similar refraction occurs at the sunset.
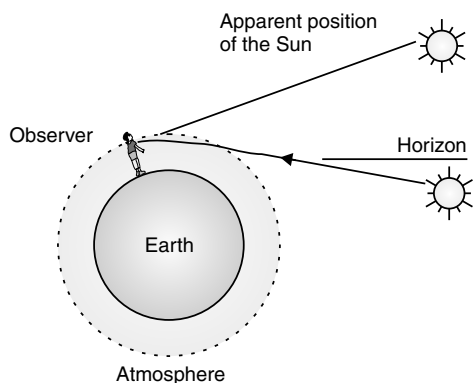
SECTION - B**

25. 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 papers.   1

_____
** *Practical Part*

26. 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) Castor oil and calcium hydroxide
   (b) Turpentine oil and sodium hydroxide
   (c) Castor oil and sodium hydroxide
   (d) Mustard oil and calcium hydroxide   1
27. In the neighbourhood of your school, hard water required for an experiment is not available. Select from the following groups of salts available in your school, a group 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   1
28. 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 three correct parts from the above list :
   (a) Testa, Radicle, Cotyledon
   (b) Tegmen, Radicle, Micropyle
   (c) Cotyledon, Plumule, Testa
   (d) Radicle, Cotyledon, Plumule   1
29. 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   1
30. 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   1
31. 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 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   1

32. In your laboratory you trace the path of light rays through a glass slab for different values of angle of incidence ($\angle i$) and in each case measure the values of the corresponding angle of refraction ($\angle r$) and angle of emergence ($\angle e$).

On the basis of your observation your correct conclusion is:

(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 $\angle e$, but nearly equal to $\angle r$ 1

33. In the following ray diagram the correctly marked angle are :
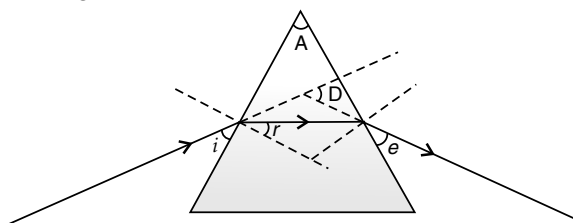
(a) $\angle i$ and $\angle e$ (b) $\angle A$ and $\angle D$

(c) $\angle i$, $\angle e$ and $\angle D$ (d) $\angle i$, $\angle A$ and $\angle D$ 1

34. A student adds a spoon full of powdered sodium hydrogen carbonate to a flask containing ethanoic acid. List two main observations, he must note in his note book, about the reaction that takes place. Also write chemical equation for the reaction.   2

35. A student is observing a permanent slide showing sequentially the different stages of a sexual reproduction taking place in yeast. Name this process and draw diagrams, of what he observes, in a proper sequence.   2

36. 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 optical centre 'O', principal focus F and height of the image on the diagram.   2

Outside Delhi Set II   Code No. 31/2/2

Note : Except these, all other questions are from Set-I.

2. What are those organisms called which bear both the sex organs in the same individual. Give one example of such organism.   1

Ans. Bisexual; Example: Hydra/Earthworm/Mustard/ Hibiscus.   **(Or any other relevant example)**

3. Write one negative effect, on the environment, of affluent life style of few persons of a society.   1

Ans. Use of excessive non-biodegradable material in packaging. Excessive use of natural resources like coal and petroleum which causes pollution. Affluent lifestyle results in generation of excessive waste materials.   **(Any one)**

4. "The magnification produced by a spherical mirror is – 3". List four informations you obtain from this statement about the mirror/image.   2

Ans. Real, inverted and magnified image is formed beyond centre of curvature by a concave mirror.

5. Forests are "biodiversity hot spots." Justify this statement.   2

Ans. The measure of biodiversity of an area is the number of species found there. Since, in a forest we can find a range of different life forms of plants and animals the forests are the biodiversity hot spots.

6. What is water harvesting ? How can this technique help in the conservation of water ?   2

Ans. ● Water harvesting is a technique of capturing rain water when it falls and taking measure to keep the water clean.

● Water is stored underground that remains unpolluted, it recharges wells and provides moisture for vegetation over a wide area.

7. On dropping a small piece of sodium in a test-tube containing carbon compound 'X' with molecular formula C_2H_6O, a brisk effervescence is observed and a gas 'Y' is produced. On bringing a burning splinter at the mouth of the test-tube the gas evolved burns with a pop sound. Identify 'X' and 'Y'. Also write the chemical equation for the reaction. Write the name and structure of the product formed, when you heat 'X' with excess conc. sulphuric acid.   3

Ans. ● X – C_2H_5OH;   Y – H_2 gas

● $2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2 \uparrow$

● Ethene; C_2H_4 $CH_2 = CH_2$

*10. Three elements 'X', 'Y' and 'Z' have atomic numbers 7, 8 and 9 respectively.

(a) State their positions (Group number and period number both) in the Modern Periodic Table.

(b) Arrange these elements in the decreasing order of their atomic radii.

(c) Write the formula of the compound formed when 'X' combines with 'Z'.   3

12. In the context of reproduction of species state the main difference between fission and fragmentation. Also give one example of each.   3

Ans. Fission: It is the method of asexual reproduction in unicellular forms of life.

In this process the parent organism splits to form two or more daughter cells.

Example: Amoeba /Plasmodium /Paramecium.

(or any other relevant example)

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* Out of Syllabus

Fragmentation : It the process found in multicellular organisms.

The filament breaks up into two or more pieces upon maturation. These pieces then grow into new individuals

Example : Spirogyra.

15. **With the help of an example justify the following statement :**

"A trait may be inherited, but may not be expressed." 3

Ans. In one of the Mendel's experiments when (pure) tall pea plants were crossed with (pure) dwarf pea plants, only tall pea plants were obtained in the F_1 generation.

On selfing the F_1 generation pea plants, both tall and dwarf pea plants were obtained in the F_2 generation.

Reappearance of dwarf characters in F_2 generation proves that the dwarf trait was inherited but not expressed in F_1 generation.

OR

Same explanation given with the help of a flow chart.

(for detail Explanation refer Ans. 14, SA-II Topic 1 on page 92)

16. **The image of an object formed by a lens is of magnification – 1. If the distance between the object and its image is 60 m, what is the focal length of the lens ? If the object is moved 20 cm towards the lens, where would the image be formed ? State reason and also draw a ray diagram in support of your answer. 3**

**Ans.** Image with magnification –1 means image is inverted and of the same size.

Therefore, object is at 2F and the image is also at 2F on the other side of the lens.

Therefore, distance between the object and its image is $4f = 60$ cm

$\Rightarrow$ $f = 15$ cm

Object distance $2f = 30$ cm, if the object is shifted towards the lens by 20 cm, the new object distance $= 30$ cm $- 20$ cm $= 10$ cm.

This distance is less than the focal length, and the image formed in this case would be virtual, erect and will form on the same side as the object.
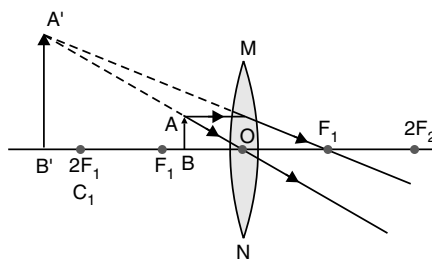
19. **(a)** **Define focal length of a spherical lens.**

(b) **A divergent lens has a focal length of 30 cm. At what distance should an object of height 5 cm from the optical centre of the lens be placed so that its image is formed 15 cm away from the lens ? Find the size of the image also.**

(c) **Draw a ray diagram to show the formation of image in the above situation. 5**

Ans. **(a)** Distance between optical centre and focus of the lens.

(b) $f = -30$ cm; $u = ?$; $h_1 = 5$ cm; $h_2 = ?$, $v = -15$ cm

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

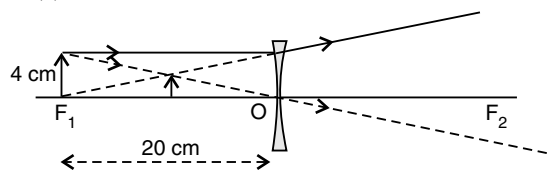$$\Rightarrow \frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

$$\Rightarrow u = \frac{vf}{f-v} = \frac{-15\,\text{cm} \times -30\,\text{cm}}{-30\,\text{cm} - (-15\,\text{cm})}$$

$$= -30\,\text{cm}$$

$$m = \frac{v}{u} = \frac{h_2}{h_1}$$

$$\Rightarrow h_2 = \frac{v}{u} \times h_1 = \frac{-15\,\text{cm}}{-30\,\text{cm}} \times 5\,\text{cm} = 2.5\,\text{cm}$$
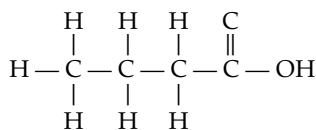
(c)

Outside Delhi Set III **Code No. 31/2/3**

Note : Except these, all other questions are from Set-I & II.

1. **Write the name and structure of an aldehyde with four carbon atoms in its molecule. 1**

Ans. Butanal; $CH_3 — CH_2 — CH_2 — CHO$

Or

2. **List two functions of ovary of human female reproductive system. 1**

Ans. Two functions of ovary of human female reproductive system are:

● To produce female gamete / ovum.

● To secrete female hormones / estrogen / progesterone

3. **In a food chain of frog, grass, insect and snake, assign trophic level to frog. 1**

Ans. Grass $\longrightarrow$ insect $\longrightarrow$ frog $\longrightarrow$ snake / 3rd trophic level

4. **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 × 10^8 m/s, find the speed of light in water.** **2**

Ans. Refractive index of a medium

$$= \frac{\text{Speed of light in air}}{\text{Speed of light in the medium}}$$

$$\frac{3}{2} = \frac{\text{Speed of light in air}}{2 \times 10^8 \, \text{m/s}}$$

Speed of light in air $= 3 \times 10^8$ m/s

Speed of light in water

$$= \frac{3 \times 10^8 \, \text{m/s}}{4/3} = 2.25 \times 10^8 \, \text{m/s}$$

5. **List four stakeholders which may be helpful in the conservation of forests.** **2**

Ans. **Stakeholders helpful in the conservation of forests are:**

- Local people living in villages near the forest.
- Industrialists who use forest produce as raw materials.
- Wild life and nature enthusiasts.
- Forest department of the government.

6. **The construction of large dams leads to social and environment problems. List two problems of each category.** **2**

Ans. **Social problems:**

- Many people are rendered homeless.
- Displacement of large number of tribals without due compensation.
- Migration into the cities for settlements.
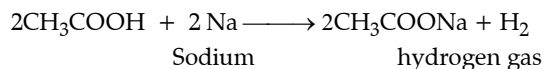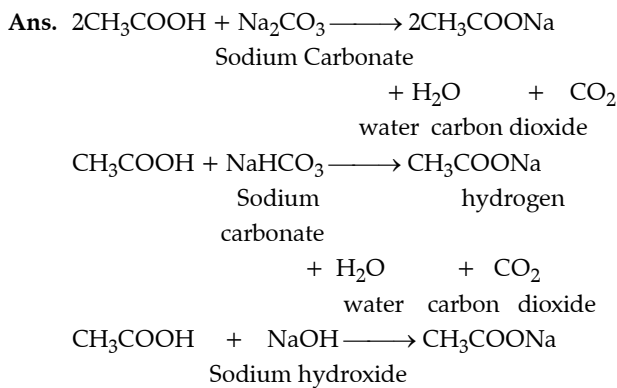
(Any two)

Environmental problems:

- Deforestation / loss of biodiversity
- Soil erosion / ecological imbalance

* 7. **The position of eight elements in the Modern Periodic Table is 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 ?**
(vi) **Arrange Be, Ca, Mg and Rb in the increasing order of the size of their respective atoms.** **3**

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Out of Syllabus

8. **Write three different chemical reactions showing the conversion of ethanoic acid to sodium ethanoate. Write balanced chemical equation in each case. Write the name of the reactants and the products other than ethanoic acid and sodium ethanoate in each case.** **3**

Ans. $2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa$
            Sodium Carbonate
$$+ H_2O \quad + \quad CO_2$$
            water carbon dioxide

$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa$
            Sodium   hydrogen
            carbonate
$$+ H_2O \quad + \quad CO_2$$
            water   carbon dioxide

$CH_3COOH + NaOH \longrightarrow CH_3COONa$
            Sodium hydroxide
$$+ H_2O$$
            water

$2CH_3COOH + 2Na \longrightarrow 2CH_3COONa + H_2$
            Sodium   hydrogen gas

(Any three reactions)

Note : Correct equation allot half mark each, mention of either product or reactants half mark each.

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

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

(b) **Molecular formula of the compound formed when 'X' reacts with an element 'Y' (atomic number = 8).**

(c) **Write the name and formula of the compound formed when 'X' combines with chlorine.** **3**

17. **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.** **3**

Ans. $m = -2, \frac{v}{u} = 2, v = -30 \, \text{cm}, \ u = -15$

$$f = \frac{uv}{u+v}$$

$$= \frac{-15 \, \text{cm} \times -30 \, \text{cm}}{-15 \, \text{cm} + (-30) \, \text{cm}} = \frac{450}{-45} = -10 \, \text{cm}$$

If the object is shifted 10 cm towards the mirror $u = -5$ cm

Therefore the object is between pole and focus and the image formed is

(i) Virtual   **(ii)** Erect

(iii) Magnified   **(Any two)**

24. **(a)** **Define focal length of a divergent lens.**

  (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.**

  (c) **Draw a ray diagram to show the formation of image in the above situation.** **5**

Ans. **(a)** Focal length-distance between pole and principal focus of a divergent lens.

  (b) $f = -30$ cm, $u = ?$, $v = -15$ cm, $h_1 = 6$ cm, $h_2 = ?$ **1**

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

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

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

$$= \frac{-15 \text{ cm} \times -30 \text{ cm}}{-30 \text{ cm} - (-15) \text{ cm}} = \frac{450}{-15} = -30 \text{ cm}$$

$$h_2 = \frac{v}{u} \times h_1 = \frac{-15 \text{ cm}}{-30 \text{ cm}} \times 6 \text{ cm} = 30 \text{ cm}$$

(c)