Section A

1. The molecular formula of 'A' is C\textsubscript{10}H\textsubscript{18} and 'B' is C\textsubscript{18}H\textsubscript{36}. Name the homologous series to which they belong.

Ans. 'A' belongs to alkyne as general formula of alkyne is C\textsubscript{2n-2}H\textsubscript{2n}.
'B' belongs to alkene as general formula of alkene is C\textsubscript{n}H\textsubscript{2n+2}.

[CBSE Marking Scheme, 2012]

2. What is heredity?

Ans. The transmission of characteristics from one generation to another is known as heredity.

3. List two items which can be easily recycled, but we generally throw them in the dustbins.

Ans. Steel cans and paper can be easily recycled, but we generally throw them in dustbins.

4. Why is Government of India imposing a ban on the use of polythene bags? Suggest two alternatives to these bags and explain how this ban is likely to improve the environment.

Ans. Government of India is imposing a ban on the use of polythene bags because they cannot be degraded naturally by the action of microorganisms. Because of their non-biodegradability, they stay in the soil for a long time and continue to poison it with toxic by-products that keep leaching from them. Also, they do not allow water to seep in, as they are waterproof. These polythene bags, when accidentally eaten by stray animals, can harm them and can even lead to their death.

Jute and cloth bags can be used in place of polythene bags.
They are environment-friendly as they are biodegradable.
They are renewable and can be easily recycled.
Thus, using jute and cloth bags will help to reduce pollution.

5. "The chromosome number of the sexually reproducing parents and their offspring is the same." Justify this statement.

Ans. Male individual have 46 chromosomes but because the gametes are always haploid i.e., they have half the number of chromosomes; sperms will be haploid (23 chromosomes). Female individual also contains only 23 chromosomes in egg. It is the fusion of the sperm and egg which leads to an offspring’s with 46 chromosomes.

6. (a) With the help of a diagram demonstrate the process of regeneration as seen in planaria.
(b) Which type of cells are used by such multi-cellular organisms to regenerate? (HOTS)

Ans. (a) Planaria is a type of flatworm. It has the amazing capacity to regenerate its lost bodypart. When the
flatworm is cut horizontally, separating the head from the tail, the tail will regenerate the lost head and the head will regenerate the lost tail. This process is known as regeneration. The diagram illustrating the process of regeneration in Planaria is given below.

\[
\text{Regeneration of Planaria}
\]

(b) Specialized cells or Regenerative cells. [CBSE Marking Scheme, 2015] 2

7. Write the chemical equations for the following chemical reactions and name the carbonic compound obtained.

(i) Reaction of acidified potassium dichromate solution with ethanol on heating.

(ii) Reaction of sodium metal with ethanol.

(iii) Reaction of concentrated sulphuric acid with ethanol at 443 K.

Ans.

- (i) Ethanol is oxidised to ethanoic acid with the help of acidified \( \text{K}_2\text{Cr}_2\text{O}_7 \).

- (ii) Ethanol reacts with sodium metal to form sodium ethoxide and hydrogen gas.

- (iii) Ethene is formed when ethanol is heated at 443 K with concentrated sulphuric acid. Concentrated sulphuric acid acts as a dehydrating agent in this reaction and removes a molecule of water in this reaction.

\[
\text{CH}_3\text{CH}_2\text{OH} + \text{H}_2\text{SO}_4 \rightarrow \text{CH}_2=\text{CH}_2 + \text{H}_2\text{O}
\]

8. What is meant by Isomers? Draw the structure of two isomers of butane, \( \text{C}_4\text{H}_{10} \). Explain why we cannot have isomers of first three members of alkane series.

Ans. Isomers are the compounds which have the same molecular formula but different structural formula.

Isomers of Butane

- (i) \( \text{H} - \text{C} - \text{C} - \text{C} - \text{H} \) (n-butane)
- (ii) \( \text{H} - \text{C} \text{H} - \text{C} - \text{H} \) (iso-butane)

We cannot have isomers of the first three members of the alkane series because of the following laws of isomers:

(i) The parent chain should have the most number of carbon atoms.
(ii) The branching cannot be done from the first on the last atom carbon atom of the structure.

[CBSE Marking Scheme, 2015] 1 + 1 + 1

9. List two tests for experimentally distinguishing between an alcohol and a carboxylic acid and describe how these tests are performed.

Ans. ->> Test 1 (Litmus Test) : Take two strips of blue litmus paper. Place a drop each of the alcohol and carboxylic acid on these strips separately. The blue litmus paper turns red in the case of carboxylic acid and remains unaffected in the case of alcohol.

-> Test 2 (Sodium hydrogen carbonate test/sodium carbonate test): A pinch of sodium hydrogen carbonate or sodium carbonate is added, to both separately. If brisk effervescence with the evolution of a colorless gas is observed, it indicates the presence of carboxylic acid. If no change is observed then it confirms the presence of the alcohol. [CBSE Marking Scheme, 2015] 3

10. Define the following processes of asexual reproduction.

(i) Spore formation (ii) Regeneration (iii) Multiple fission

Ans. (i) Spore Formation is a common method of asexual reproduction in many lower forms of life, like bacteria, fungi etc. It occurs mostly during unfavourable conditions such as extreme heat, dryness etc. The spores are asexual reproducing bodies enclosed in a thick walled structure called sporangium. On return of favourable conditions, the sporangium wall bursts and the spores are released.

(ii) Regeneration means renewal, restoration, and growth. The process of getting back a full organism from its body parts is called regeneration. Some organism like Hydra, Planaria have the capability to develop a whole new organism from its cut body parts. Regeneration of an organism occurs by the process of growth and development. Regeneration occurs in those organisms which have relatively simple body organization consisting of a few specialized cells.

(iii) In multiple fission, the nucleus divides several times simultaneously or successively into a number of daughter nuclei and then the cytoplasm divides into as many cells as there are nuclei while each cell containing a nucleus. It is the common form of asexual reproduction in certain acellular organisms. 1 + 1 + 1

11. What is vegetative propagation? When is it used? List two uses.

Ans. It is an asexual method of reproduction. In this process, vegetative part of a plant body such as stem, leaves, bulbs, tubers are used for growing new plants by cutting, graftings and layering which are identical to parents.

It is used to grow:

(a) Plants that have lost the capacity to produce seeds.

(b) Plants which are genetically similar enough to the parent plants. [CBSE Marking Scheme, 2012] 1 + 1 + 1
12. (a) With the help of a diagram, show asexual reproduction in Rhizopus?
(b) How this method is advantageous for Rhizopus?
Ans. (a) Spore formation takes place in Rhizopus consists of fine thread-like projection called Rhizoids. It has a knob-like structure which is involved in reproduction called sporangia, containing spores, that develop into new Rhizopus.
(b) More number of spores are produced which can easily help the Rhizopus to spread. [CBSE Marking Scheme, 2014] 2 + 1

13. What is the effect of DNA copying, which is not perfectly accurate, on the reproduction process? How does the amount of DNA remain constant though each new generation in a combination of DNA copies of two individuals?
Ans. Reproduction results in the production of offspring similar to parents in body design and form. The exact blue prints of body design is inherited in the offspring due to DNA replication/DNA copying. The imperfect DNA copying results in genetic variations that can be both useful or harmful for the offspring. The useful variations gets selected in nature and helps organism to survive in the changing environment while as harmful variation gets eliminated.
If each new generation is to be the combination of the DNA copies from two pre-existing individuals, then each new generation will end up having twice the amount of DNA that the previous generation had. In sexual reproduction, the gametes usually contain half number of chromosomes compared to the chromosome gametes and same numbers present in the body cells. These haploid gametes when fuse produce a new cell with double number of chromosomes than the gametes and same as the body cells. In this way organisms restrict doubling of DNA and maintain the chromosome number.

14. (a) Name any two plants that reproduce by grafting.
(b) List any two benefits to an organism that reproduces through spores?
Ans. (a) Rose / Sugarcane, Grapes.
(b) (i) Many organisms can be produced at the same time.
(ii) Organisms are able to tide over unfavourable conditions.

15. Define absolute refractive index. Absolute refractive indices of medium A' and medium B' are \( n_a \) and \( n_b \). What is the refractive index of medium B' with respect to medium A'? How does the velocity of light vary with change in the optical density of the media?
16. (i) Ravi kept a book at a distance of 10 cm from the eyes of his friend Hari. Hari is not able to read anything written on the book. Explain why?

(ii) A lens of focal length 5.0 cm is being used by a student in the laboratory as a magnifying glass. His least distance of distinct vision is 25 cm. What magnification is the student getting?

Ans. (i) Because least distance of distinct vision is 25 cm, and book is kept at a distance of 10 cm.

(ii) Given that, \( f = 5 \text{ cm} \)

Let distance of distinct vision = Minimum distinct of object to clear vision = Object distance = \( u = -25 \text{ cm} \),

Use lens formula,

\[
\frac{1}{v} - \frac{1}{u} = \frac{1}{f}
\]

\[
\frac{1}{v} - \frac{1}{-25} = \frac{1}{5}
\]

\[
\frac{1}{v} = \frac{1}{5} + \frac{1}{25} = \frac{5}{25} + \frac{1}{25} = \frac{6}{25}
\]

\[
v = \frac{25}{6} \text{ cm}
\]

Magnification

\[
m = \frac{v}{u} = \frac{25}{-25} = -1
\]

17. Sania and Shreya are best friends and study in grade 4, recently, Sania has been facing difficulty in reading the black-board text from the last desk. Shreya wonders why Sania avoids sitting on the last desk. On observation, she found that Sania often carries junk food in her lunch. Shreya has started sharing her lunch-full of green vegetables and fruits with her. Sania is now better and has also started taking a 'balanced diet'.

(i) Name the eye defect Sania is suffering from?

(ii) What are the two possible deformities related to her eye defect?

(iii) What values are shown by Shreya and Sania? (Value Based Question)

Ans. (i) Myopia, short-sightedness.

(ii) Lens defect (increased thinness), Eye ball defect (shortening)

(iii) Friendship, concern for each other, value and balanced diet.

18. Fossils are the remains, traces or impression of the dead animals and plants of geological past.

Fossils are formed by layer in the earth's crust. Fossils of prokaryotes were found in older rocks than those of eukaryotes. Invertebrates were formed before vertebrates. Among vertebrates, fishes appeared earlier than amphibians and amphibians appeared earlier than reptiles, which are earlier than birds and mammals. Thus, fossils provide evidence for evolution.

Questions:
What is the main factor on which the formation of fossils depends?

(i) Decomposition of organisms.

(ii) What is fossil dating? Why the study of fossils is important?

Ans. (i) The age of fossils can be estimated by fossil dating.

(ii) The study of fossils is important because:

(a) It helps to analyze racial history of plants and animals.

(b) It helps to measure the geological time.

19. Give two examples of covalent compounds which you have studied. State any four properties in which covalent compounds differ from ionic compounds.

Ans. Two examples of covalent compound are ethanol, and ethanoic acid.

Difference between the properties of Covalent and Ionic compounds:

<table>
<thead>
<tr>
<th>Ionic</th>
<th>Covalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal-metal, non-metal-metal</td>
<td>Non-metal</td>
</tr>
<tr>
<td>Total transfer of electrons</td>
<td>Shared electrons</td>
</tr>
<tr>
<td>High melting and boiling points</td>
<td>Low melting and room temperature boiling points</td>
</tr>
<tr>
<td>Solids at room temperature</td>
<td>Liquids and gases at room temperature</td>
</tr>
<tr>
<td>Hard/brittle (inorganic compounds)</td>
<td>Relatively soft (organic compounds)</td>
</tr>
<tr>
<td>Strong bonds</td>
<td>Weak bonds</td>
</tr>
<tr>
<td>Electrically reactive</td>
<td>Does not normally conduct electricity</td>
</tr>
<tr>
<td>Soluble in water</td>
<td>Insoluble in water</td>
</tr>
<tr>
<td>Electron orbitals are separate</td>
<td>Electron orbitals overlap</td>
</tr>
</tbody>
</table>

20. (a) Identify A, B, C and D in the given diagram and write their names.

(b) What is pollination? Explain its significance.

(c) Explain the process of fertilization in flowers. Name the parts of the flower that develop after fertilization into

(i) Seed, (ii) Fruit

Ans. (a) A—Stigma B—Pollen tube C—Ovary

D—Female germ cell/Egg cell

(b) Pollination

Transfer of pollen grains from anther to the stigma of a flower.

Significance of pollination—Process of pollination leads to fertilization as it brings the male and female gametes together for fusion.

(c) After a pollen falls on a suitable stigma, the pollen tube grows out of the pollen grain and travels through the style to reach the ovule in the ovary. Here the male germ cell (carried by the pollen tube) fuses with the female germ cell to form a zygote.

(i) Ovule

(ii) Ovary

[CBSE Marking Scheme, 2015] 14 + 14
21. (i) What is meant by traits of an individual?
(ii) Explain inherited trait and acquired trait.
(iii) Define speciation. List the factors which could lead to the rise of a new species.

**Ans.**
(i) Traits A characteristic feature is called trait.
(ii) Inherited traits are the traits which are transferred from parents to young ones.
Acquired traits are the traits which an organism acquires in life time.
(iii) Formation of new species from the existing ones is called speciation.
Factors which could lead to the rise of new species are: geographical isolation, genetic drift, natural selection.

22. A student wants to project the image of a candle flame on the walls of the school laboratory by using a mirror.
(a) Which type of mirror should he use and why?
(b) At what distance, in terms of focal length 'f' of the mirror, should he place the candle flame to get the magnified image on the wall?
(c) Draw a ray diagram to show the formation of the image in this case.
(d) Can he use this mirror to project a diminished image of the candle flame on the same wall? State 'how' if your answer is 'yes' and 'why not' if your answer is 'no.'

**Ans.**
(a) He should use a concave mirror as it forms real images.
(b) He should place the candle flame between the focus and centre of curvature of the mirror to get the magnified image on the wall.
(c) The ray diagram for the formation of the image is shown below:
(d) Yes, he can get a diminished image of the candle flame when the object is located at infinity.

23. A student has focused the image of a candle flame on a white screen using a concave mirror. The situation is as given below:
The ray diagram for the formation of the image is shown below:
Length of the flame = 1.5 cm Focal length of the mirror = 12 cm Distance of flame from the mirror = 18 cm
If the flame is perpendicular to the principal axis of the mirror, then calculate the following:
(a) Distance of the image from the mirror
(b) Length of the image
If the distance between the mirror and the flame is reduced to 10 cm, then what would be observed on the screen? Draw ray diagram to justify your answer for this situation.

Ans.

If \( f = 1.5 \text{ cm}, u = -12 \text{ cm}, v = -18 \text{ cm}, \) then

\[
\frac{1}{f} = \frac{1}{v} + \frac{1}{u}
\]

\[
\frac{1}{v} = \frac{1}{u} - \frac{1}{f}
\]

\[
= \frac{1}{(-12)} - \frac{1}{(-18)}
\]

\[
= \frac{-2}{36} = \frac{-1}{18}
\]

\[
v = -36 \text{ cm}
\]

\[
h' = \frac{v}{u} \times h
\]

\[
= \frac{-36 \times 1.5}{-18} = -3 \text{ cm} \quad \text{(Magnified Inverted image)}
\]

If \( u = -10 \text{ cm} \)

No distinct image would be formed on the screen. In this case the image formed will be virtual (object will be within focal length).

24. Write any five ways in which the locals and tribal are dependent on the forest?
Ans. (i) The local people obtain large quantities of firewood, timber and thatch from the forests.
(ii) Bamboo is used to make slats for huts and baskets for collecting and storing food materials.
(iii) Implements for agriculture, fishing and hunting are largely made of wood.
(iv) Forests are sites for fishing and hunting.
(v) Also they gather fruits, nuts and medicines from the forests.

SECTION-B

25. The path of a ray of light passing through a glass prism is shown below:

In this diagram, the angle of prism, angle of incidence, angle of emergence and angle of deviation,
respectively, have been represented by:

(A) O, Y, Z and N,
(B) P, Y, M and Z,
(C) O, X, M and Z,
(D) P, X, Z and N.
Ans. (C) O, X, M and Z.

26. A student is observing a diagram showing the path of a ray of light passing through a glass prism. He would find that for all angles of incidence, the ray of light bends:

(A) towards the normal while entering the prism and away from the normal while emerging from the prism.
(B) away from the normal while entering the prism and towards the normal while emerging from the prism.
(C) away from the normal while entering as well as while emerging from the prism.
(D) towards the normal while entering as well as while emerging from the prism.
Ans. (A) towards the normal while entering the prism and away from the normal while emerging from the prism.

27. A student was asked by his teacher to find the image distance for various object distance in case of a given convex lens. He performed the experiment with all precautions and noted down his observations in the following table:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Object distance (cm)</th>
<th>Image distance (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>48</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>36</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td>6</td>
<td>16</td>
<td>48</td>
</tr>
</tbody>
</table>

Ans. (B) 3

28. We need 20% aqueous solution of sodium hydroxide for the study of saponification reaction. When we open the lid of the bottle containing solid sodium hydroxide we observe it in which form?

(A) Colourless transparent beads
(B) Small white beads
(C) White pellets/flakes
(D) Fine white powder
Ans. (C) White pellets/flakes.

29. Rupal took a liquid A in a test-tube and added sodium hydroxide solution in it. The mixture was stirred for sometime. Glyceride and solid B are formed after the reaction.

(A) Soap, oil
(B) Sugar, soap
(C) Oil, soap
(D) Vinegar, soap
Ans. (C) Oil, Soap.
30. Rupal performs saponification reaction in the chemistry laboratory. She takes vegetable oil and an alkali and heats it. Soap starts precipitating but it doesn’t precipitate completely. The solution she forgot to add is:

(A) Sodium sulphate which facilitates precipitation of soap
(B) Sodium carbonate which facilitates precipitation of soap
(C) Sodium chloride which facilitates precipitation of soap
(D) Sodium hydrogencarbonate which facilitates precipitation of soap.

Ans. (C) Sodium chloride which facilitates precipitation of soap.

31. After observing slide of binary fission of Amoeba, teacher asked four students A, B, C, and D to mention the number of individuals involved in this mode of asexual reproduction. Their responses were:

(A) Two individuals are involved  
(B) Only one individual is involved  
(C) No individual is involved  
(D) Three individuals are involved

Ans. (B) Only one individual is involved.

32. A student obtains a blurred image of an object on a screen by using a concave mirror. In order to obtain a sharp image on the screen, he will have to shift the mirror:

(A) towards the screen.
(B) either towards or away from the screen depending upon the position of the object.
(C) away from the screen.
(D) to a position very far away from the screen.

Ans. (B) either towards or away from the screen depending upon the position of the object.

33. The process represented in the diagram below is:

(A) Spore formation in Amoeba.  
(B) Bud formation in Amoeba.
(C) Gamete formation in Amoeba.  
(D) Daughter cell formation in Amoeba.

Ans. (D) Bud formation in Amoeba.

34. Write the names of apparatus/chemicals required to study the following properties of ethanoic acid in the laboratory.

The properties are: Nature, odour, solubility and action on sodium hydrogen carbonate.

Ans. Litmus water, blue litmus water, test-tubes, Passing tubes (any four)

35. What is the significance of asexual reproduction?

Ans. Significance of Asexual reproduction

1. Requirement of one parent to produce offspring, so no need to migrate to other place to reproduce.
2. Numerous offspring can be produced in a short span of time. 
3. Minimize the use of energy and time. (Any two)

36. Observe the following incomplete ray diagram of an object where the image A'B' is formed after refraction of a convex lens.

On the basis of above information fill in the blanks:
(i) The position of object AB would have been ______.
(ii) Size of the object would have been ______ than the size of image.

Ans. (a) Beyond 2F
(b) Greater.