CBSE -10th- 2015 Examination

SCIENCE

SET-3

Paper & Solution

Time: 3 Hrs. Max. Marks: 90

General Instructions:

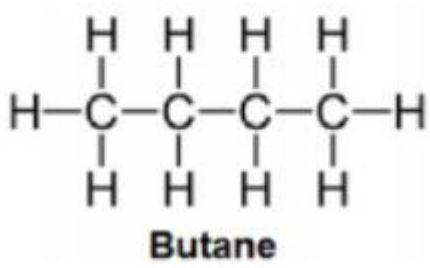
1. The question paper comprises **two** Sections, **A and B**. You are to attempt both the sections.
2. All questions are **compulsory**.
3. All questions of **Section A** and all questions of **Section B** are to be attempted separately.
4. Question numbers **1** to **3** in Section A are one-mark questions. These are to be answered in one word or in one sentence.
5. Question numbers **4** to **7** in Section A are two-mark questions. These are to be answered in about 30 words each.
6. Question numbers **8** to **19** in Section A are three-mark questions. These are to be answered in about 50 words each.
7. Question numbers **20** to **24** in Section A are five-mark questions. These are to be answered in about 70 words each.
8. Question numbers **25** to **42** 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.

SECTION A

1. Write the number of covalent bonds in the molecule of butane, C_4H_{10}.

Answer:

There are thirteen covalent bonds—ten C-H and three C-C bonds—present in a molecule of butane.



Butane

2. Name two simple organisms having the ability of regeneration.

Answer:

Hydra and Planaria have the ability of regeneration.

3. Which of the following are always at the second tropic level of food chains?

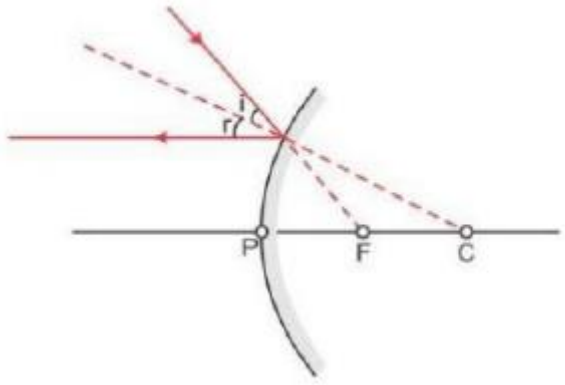
Answer:

Primary consumers (green plants) are always at the second trophic level.

4. Draw a ray diagram to show the path of the reflected ray corresponding to an incident ray of light parallel to the principal axis of a convex mirror and show the angle of incidence and angle of reflection on it.

Answer:

A light ray is incident on a convex mirror parallel to the principal axis. The ray diagram is shown below.



In the above diagram, 'i' is the angle of incidence and 'r' is the angle of reflection.

5. Why is sustainable management of natural resources necessary? Out of the two—reuse and recycle—which, in your opinion, is better to practice? Give reason.

Answer:

Sustainable management of natural resources is necessary to preserve the natural resources for the future generations and also to control environmental pollution.

Reusing is better than recycling because recycling requires a large amount of energy and money, but reusing creates lesser air and water pollution.

6. What is meant by biodiversity? List two advantages of conserving forests and wild life.

Answer:

The existence of many different kinds of plants and animals in an environment is called biodiversity.

Two advantages of conserving forests and wild life:

i. They add to the natural beauty of the environment.

ii. They provide valuable things which are required for our survival.

7. Write the name and general formula of a chain of hydrocarbons in which an addition reaction with hydrogen is possible. State the essential condition for an addition reaction. Stating this condition, write a chemical equation giving the name of the reactant and the product of the reaction.

Answer:

The addition of hydrogen is possible in alkenes and alkynes. This is because of the presence of double and triple bonds, respectively.

The general formula of alkenes is $C_n H_{2n}$ and that of alkynes is $C_n H_{2n-2}$ Conditions for addition reactions are

- Presence of an unsaturated compound, i.e. an unsaturated hydrocarbon.
- Presence of a species to be added to an unsaturated compound.
- Presence of a catalyst such as finely divided palladium or nickel.

$$CH_2 = CH_2 + H_2 \xrightarrow{Ni} CH_3 - CH_3$$

ETHENE ETHANE

$$CH_3 - C = CH + 2H_2 \xrightarrow{Ni} CH_2 = CH - CH_3$$

PROPYNE PROPENE

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

Answer:

Carboxylic acid can be distinguished from an alcohol by performing the following tests:

i. Test with 3 $NaHCO_3$ solution in water.

On adding carboxylic acid to baking soda, carbon dioxide is liberated with brisk effervescence.

On adding a solution of baking soda to alcohol, no brisk effervescence occurs.

ii. Test with blue litmus solution.

Carboxylic acid turns blue litmus red. There is no change in colour when a blue litmus solution is added to alcohol.

Answer:

Given below are some elements of the modern periodic table. Atomic number of the element is given in parentheses.

A (4), B (9), C (14), D(19), E(20)

(a) Select the element that has one electron in the outermost shell. Also, write the electronic configuration of this element.

(b) Which two elements amongst these belong to the same group? Give reasons for your answer.

(c) Which two elements amongst these belong to the same period? Which one of the two has bigger atomic radius?

Answer:

(a) Element D (19) has one electron in its outermost shell.

Its electronic configuration is 2, 8, 8, 1.

(b) Elements A (4) and E (20) have two electrons in their outermost shells.

Electronic configuration of A: 2, 2

Electronic configuration of E: 2, 8, 8, 2

Since they both have a valency of two, they belong to group 2 of the periodic table.

(c) Elements A (4) and B (9) belong to the second period, and elements D (19) and E (20) belong to the fourth period of the periodic table.

Since the effective nuclear charge which pulls the outermost electron closer to the nucleus increases from left to right in a period, the atomic radii of the elements decreases.

A (4) has a bigger atomic radius than B (9) and D (19) has a bigger atomic radius than E (20).

10. Taking the example of an element of atomic number 16, explain how the electronic configuration of the atom of an element relates to its position in the modern periodic table and how valency of an element is calculated on the basis of its atomic number.

Answer:

Atomic number of the element = 16

Electronic configuration = 2, 8, 6

The period number is equal to the number of shells which starts filling up in it.

The atom of an element has three shells. So, the period number is 3.

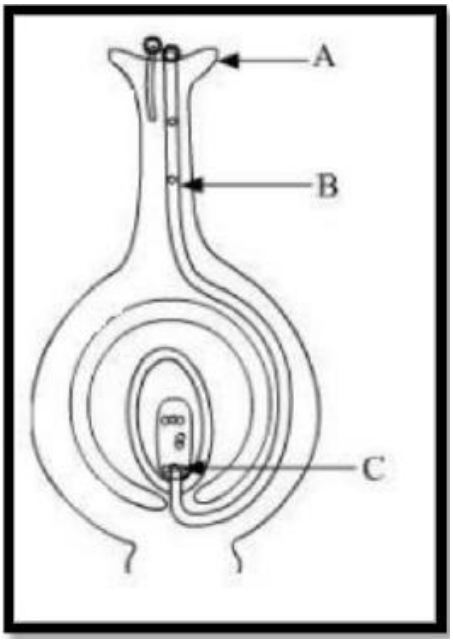
The atom of an element has six valence electrons in the outermost shell.

So, the group number of the element will be 16 (6 + 10).

The valency of an element is determined by the number of valence electrons present in the outermost shell.

The atom of an element has six valence electrons in the outermost shell, so the valency of the element is 2.

11. Name the parts A, B and C shown in the diagram and write their functions



Answer:
A - Stigma
Function: Pollen lands and germination starts
B - Pollen tube
Function: It carries the pollen to the egg cell for fertilisation.
C - Egg cell
Function: It fuses with the male gamete to form a zygote.

12. List any four methods of contraception used by humans. State in brief two advantages of adopting such preventive methods.
Answer:
Four methods of contraception used by humans—
Intrauterine devices, oral contraceptive methods, surgical methods and natural methods (coitus interrupts).
Two advantages of adopting such preventive methods:
i. Helps in preventing unwanted pregnancies
ii. Reduces the chance of getting STDs such as AIDS

13. What are chromosomes? Explain how in sexually reproducing organisms the number of chromosomes in the progeny is maintained.
Answer:
Chromosomes are thread-like structures found in the nucleus at the time of cell division. They are made of proteins and DNA.
In sexually reproducing organisms, the gametes undergo meiosis, and hence, each gamete contains only half a set of chromosomes. When two gametes fuse, the zygote formed contains the full set of chromosomes. Hence, the formation of gametes by meiosis helps to maintain the number of chromosomes in the progeny.

14. Explain the following:
(a) Speciation
(b) Natural Selection
Answer:

(a) Speciation: The process by which new species develop from the existing species is known as speciation. The factors which could lead to speciation are:
i. Geographical isolation of population caused by various types of barriers such as mountain ranges, rivers and seas. This leads to reproductive isolation because of which there is no flow of genes between separated groups of population.
ii. Genetic drift caused by drastic changes in the frequencies of particular genes by chance alone.
iii. Variations caused in individuals because of natural selection.
(b) Natural Selection: Natural selection is the process of evolution of a species whereby characteristics which help individual organisms to survive and reproduce are passed on to their offspring, and those characteristics which do not help are not passed on. Charles Darwin proposed the theory of natural selection. According to him, nature selects the fittest.
There are always changes in the progeny when an animal reproduces by sexual reproduction.
Example: If one of the progeny of deer is tall and the other is short, then the tall one with long legs will survive. Because the progeny with short height cannot reach the leaves of tall trees and cannot get food, they will starve and hence die. Thus, it proves the theory of natural selection.

15. Explain with an example for each, how the following provides evidences in favour of evolution in organisms:
(a) Homologous organs
(b) Analogous organs
(c) Fossils
Ans.
(a) Homologous organs: Organs which have the same basic structure but different functions are called homologous organs.
Example: The forelimbs of a man, lizard, frog, bird and bat have the same basic design of bones, but they perform different functions. The forelimbs of a man are used for grasping, the forelimbs of a lizard are used for running, the forelimbs of a frog are used to prop up the front ends of the body when at rest and the forelimbs of a bird and bat are modified for flying. Hence, all these organisms use their forelimbs for performing different functions, but the forelimbs have originated from the same structural pattern.
(b) Analogous organs: Organs which have different basic structure but similar appearance and perform similar functions are called analogous organs. Example: The wings of an insect and a bird have different structures, but they perform the same function of flying. Because the wings of insects and birds have different structures but perform similar functions, they are analogous organs.
(c) Fossils: The remains of dead animals or plants which lived in the remote past are known as fossils. The fossils provide evidence for evolution. For example, a fossil bird called Archaeopteryx looks like a bird, but it has many other features which are found in reptiles. It has feathered wings like those of birds but teeth and tail like those of reptiles. Therefore, Archaeopteryx is a connecting link between the reptiles and birds and hence suggests that birds have evolved from reptiles.

16. With the help of scattering of light, explain the reason for the difference in colours of the Sun as it appears during sunset/sunrise and noon.
Answer:
At the time of sunrise and sunset, when the Sun is near the horizon, sunlight travels a greater distance through the atmosphere to reach us. During this time, most of the shorter wavelengths present in it are scattered away from our line of sight by the molecules of air and other fine particles in the atmosphere. So,

light reaching us directly from the rising or setting Sun consists mainly of the longer wavelength red colour because of which the Sun appears red.
Thus, at sunrise and sunset, the Sun and the surrounding sky appear red. At noon, the Sun is overhead. So, the sunlight has to travel a relatively shorter distance. Hence, there is only slight scattering of shorter wavelengths of blue and violet colour. Therefore, the Sun appears mostly white.

17.An object of height 5 cm is placed perpendicular to the principal axis of a concave lens of focal length 10 cm. If the distance of the object from the optical centre of the lens is 20 cm, determine the position, nature and size of the image formed using the lens formula.
Answer:
Given: Height of the object = h = 5 cm
Focal length of the concave lens = f = −10 cm
Object distance = u = −20 cm
Using the lens formula, we get

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

$$\Rightarrow \frac{1}{-10}=\frac{1}{v}-\frac{1}{-20}$$

$$\Rightarrow -\frac{1}{10}=\frac{1}{v}-\frac{1}{-20}$$

$$\Rightarrow -\frac{1}{10}-\frac{1}{20}=\frac{1}{v}$$

$$\Rightarrow \frac{-2-1}{20}=\frac{1}{v}$$

$$\Rightarrow \frac{-3}{20}=\frac{1}{v}$$

$$\Rightarrow v=6.67cm$$

Hence, the image is formed 6.67 cm in front of the lens on the same side as the object.
Because v is negative, we can say that the image is virtual.
From the magnification formula for the lens, we get

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

$$h'=\frac{vh}{u}$$

$$\Rightarrow h'=\frac{-6.67(5)}{-20}$$

$$\Rightarrow h'=1.67$$

Hence, the size of the image is h′ = 1.67 cm.
Because the height of the image is positive and smaller than the height of the object, the image is erect and diminished. So, we can conclude that the image is virtual, erect and diminished.

18. Differentiate between biodegradable and non-biodegradable substances with the help of one example each. List two changes in habit that people must adopt to dispose non-biodegradable waste, for saving the environment.

Answer:

Biodegradable wastes	Non-biodegradable wastes
(a) Waste materials which can be broken down to non-poisonous substances in nature in due course of time by the action non-biodegradable wastes	(a) Waste materials which cannot be broken down into non-poisonous or harmless substances in nature are called non-biodegradable wastes
(b) Examples: Cattle dung, wool, paper, compost	(b) Examples: Plastics, polythene bags, metal articles, glass objects

The changes which people must adopt to dispose non-biodegradable wastes for saving the environment are environment are

(a) Household waste, chemical waste and hospital waste should be disposed of by dumping them in the low-lying areas of the ground called a landfill.

(b) Broken plastic articles such as buckets, bowls, cups, plates etc. should be sent to plastic processing factories.

19.Write the importance of ciliary muscles in the human eye. Name the defect of vision that arises due to gradual weakening of the ciliary muscles. What types of lenses are required by the person suffering from this defect to see the objects clearly?

Akshay, sitting in the last row in his class, could not see clearly the words write on the blackboard. When the teacher noticed it, he announced if any student sitting in the front row could volunteer to exchange his seat with Akshay. Salman immediately agreed to exchange his seat with Akshay. He could now see the words written on the blackboard clearly. The teacher thought it fit to send the message to Akshay's parents advising them to get his eyesight checked. In the context of the above event, answer the following questions:

(a) Which defect of vision is Akshay suffering from? Which type of lens is used to correct this defect?

(b) State the values displayed by the teacher and Salman.

(c) In your opinion, in what way can Akshay express his gratitude towards the teacher and Salman?

Answer:

The curvature of the eye lens can be adjusted by the ciliary muscles. This changes the focal length of the lens. The defect which arises because of the gradual weakening of the ciliary muscles is known as presbyopia. A bifocal lens can be used to correct presbyopia. Answers to the context questions:

(a) Akshay is not able to see from a far distance, so he is suffering from myopia or nearsightedness. A concave lens should be used to correct this defect.

(b) The teacher displayed presence of mind and pro-activeness, and she is of a considerate nature. Salman displayed the virtue of friendship and is caring in nature.

(c) Akshay should thank the teacher and Salman in front of the entire class.

20. What is meant by power of a lens? Define its SI unit. [5] You have two lenses A and B of focal lengths +10 cm and –10 cm, respectively. State the nature and power of each lens. Which of the two lenses will form a virtual and magnified image of an object placed 8 cm from the lens? Draw a ray diagram to justify your answer. [5]

Answer:

The power of a lens is defined as the reciprocal of its focal length. It is represented by the letter P. The power P of a lens of focal length f is given as

$$p = \frac{1}{f}$$

The SI unit of power is dioptre (D).

Given: Focal length of lens A, FA = +10 cm = +0.1 m

Focal length of lens B, FB = −10 cm = −0.1 m
To calculate the power of lens A:
The power of lens A,

$$p = \frac{1}{f_A}$$

$$\Rightarrow p = \frac{1}{+0.1}$$

$$\Rightarrow p = +10D$$

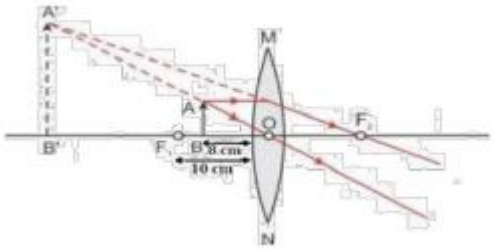
The positive sign indicates that it is a converging or convex lens.
To calculate the power of lens B:
The power of lens B,

$$p = \frac{1}{f_B}$$

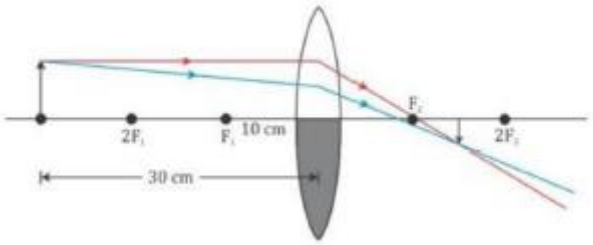
$$\Rightarrow p = \frac{1}{-0.1}$$

$$\Rightarrow p = -10D$$

The negative sign indicates that it is a diverging or concave lens.
In a convex lens, when the object is placed between the pole and focus, the image formed is always virtual and magnified.
On the other hand, a concave lens produces virtual, erect but diminished image. Here the object is placed 8 cm from the lens which is at a distance less than the focal length, i.e. less than 10 cm. Thus, the 8 cm position of the object placed in front of the convex lens will produce a virtual and magnified image. The diagram for the same is as shown below:



21. One half of a convex lens of focal length 10 cm is covered with a black paper.
Can such a lens produce an image of a complete object placed at a distance of 30 cm from the lens?
Draw a ray diagram to justify your answer. A 4 cm tall object is placed perpendicular to its principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 15 cm. Find the nature, position and the size of the image.
Answer:
A convex lens can produce the complete image of the object even though half of the lens is covered. This is because light coming from the object can be refracted from the other half of the lens. However, the intensity of light will be reduced.



Given: Height of the object = h = 4 cm
Focal length of the convex lens = f = 20 cm
Object distance = u = −15 cm
Using the lens formula, we get

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

$$\Rightarrow \frac{1}{20}=\frac{1}{v}-\frac{1}{-15}$$

$$\Rightarrow \frac{1}{20}=\frac{1}{v}+\frac{1}{15}$$

$$\Rightarrow \frac{1}{20}-\frac{1}{15}=\frac{1}{v}$$

$$\Rightarrow \frac{-1}{60}=\frac{1}{v}$$

$$\Rightarrow v=-60$$

Hence, the image is formed 60 cm in front of the lens on the same side as the object.
Because v is negative, we can say that the image is virtual. From the magnification formula for the lens, we get

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

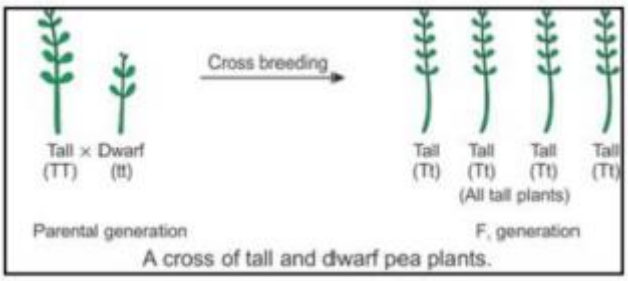
$$h'=\frac{vh}{u}$$

$$\Rightarrow h'=\frac{-60(4)}{-15}$$

$$\Rightarrow h'=16cm$$

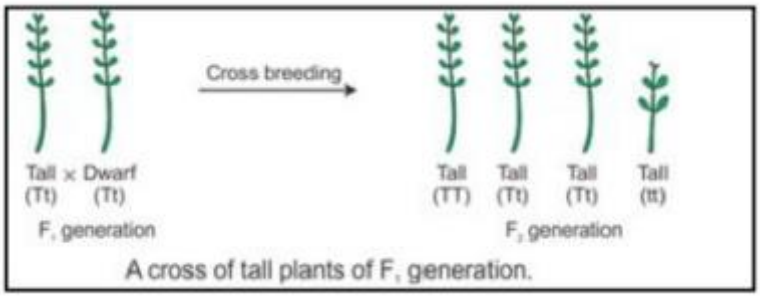
Hence, the size of the image is h′ = 16 cm.
Because the height of the image is positive and greater than the height of the object, the image is erect and magnified. So, we can conclude that the image is virtual, erect and magnified.

22.How do Mendel's experiments show that the
(a) traits may be dominant or recessive
(b) traits are inherited independently
Answer:
(a) Mendel crossed pure bred tall pea plants with pure bred dwarf pea plants and found that only tall pea plants were produced in the first generation and there were no dwarf pea plants. He concluded that the first generation showed the traits of only one of the parent plants—tallness. The trait of the other parent plant—dwarfness— did not show up in the progeny of the first generation.



A cross of tall and dwarf pea plants.

He then crossed the tall pea plants obtained in the first generation (F1 generation) and found that both tall plants and dwarf plants were obtained in the second generation (F2 generation) in the ratio of 3:1.
Mendel noted that the dwarf trait of the parent pea plant which disappeared in the first generation progeny reappeared in the second generation. In this way, Mendel's experiments with tall and dwarf pea plants showed that the traits may be dominant and recessive.



A cross of tall plants of F, generation.

(b) When Mendel crossed pure-bred tall pea plants with pure-bred dwarf pea plants, he found that only tall pea plants were produced in the F1 generation. When he further crossed the tall pea plants of the F1 generation, he found that the tall plants and dwarf plants were obtained in the ratio 3:1 in the F2 generation. Mendel noted that all the pea plants produced in the F2 generation were either tall or dwarf. There were no plants with intermediate height (or medium height) in between the tall and dwarf plants.
In this way, Mendel's experiment showed that the traits (like tallness and dwarfness) are inherited independently. This is because if the traits of tallness and dwarfness had blended (or mixed up), then medium-sized pea plants would have been produced.

23.
(a) Name the human male reproductive organ that produces sperms and also secretes a hormone. Write the functions of the secreted hormone.
(b) Name the parts of the human female reproductive system where
i. fertilisation takes place
ii. Implantation of the fertilised egg occurs Explain how the embryo gets nourishment inside the mother's body.
Answer:
(a) Testes produce sperms and secrete a hormone called testosterone. The function of testosterone is to control the development of male sex organs and male features such as a deeper voice, moustache, beard and more body hair as compared to females.
(b) i. Fertilisation takes place in the oviduct or fallopian tubes.
ii. Implantation of the fertilised egg occurs in the uterus. After implantation, a disc-like special tissue called placenta develops between the uterus wall and the embryo. The placenta helps in the exchange of nutrients, oxygen and waste products between the embryo and the mother. Thus, it provides nourishment to the growing embryo

24. Both soap and detergent are some type of salts. What is the difference between them? Describe in brief the cleansing action of soap. Why do soaps not form lather in hard water? List two problems that arise due to the use of detergents instead of soaps.

Answer:

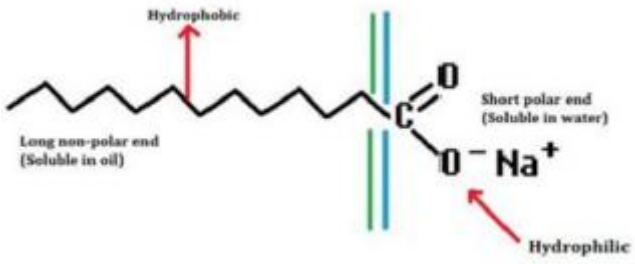
Difference between soap and detergent: The molecules of soap are sodium or potassium salts of long-chain carboxylic acids. Detergents are generally ammonium or sulphonate salts of long chain carboxylic acids.

Cleansing action of soap can be described as follows:

• A soap molecule has a tadpole-shaped structure.

• At one end (long non-polar end) of the soap molecule is a hydrocarbon chain which is insoluble in water but soluble in oil.

• At the other end (short polar end) of the soap molecule, there is a carboxylate ion which is hydrophilic, i.e. water soluble but insoluble in oil.



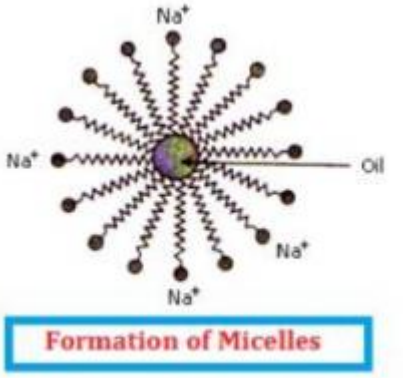
• Soap on mixing with water forms a concentrated solution and causes foaming.

• The long non-polar end of soap gravitates towards and surrounds the dirt and absorbs the dust in it.

• The short polar end with the carboxylate ion repels the water away from the dirt.

• A spherical aggregate of soap molecules is formed in the soap solution in water and is called a micelle.

•Thus, the soap molecule dissolves the dirt and our clothes get clean. Soaps do not form lather in hard water because Hard water contains calcium and magnesium salts. Soap molecules react with calcium and magnesium salts to form an insoluble precipitate called scum. Two problems arise because of the use of detergents instead of soap:



i. Soaps are biodegradable, while detergents are non-biodegradable; hence, detergents accumulate in the environment and cause problems.

ii. Certain phosphate additives are added to detergents. These phosphate additives act as nutrients for algae which form a thick green scum over the river water and upset the animal life in the river.

SECTION B

25. A student traces the path of a ray of light through a rectangular glass slab for the different values of angle of incidence. He observes all possible precautions at each step of the experiment. At the end of the experiment, on analyzing the measurements, which of the following conclusions is he likely to draw?

(A) $\angle i = \angle e < \angle r$

(B) $\angle i - \angle e < \angle r$

(C) $\angle i > \angle e > \angle r$

(D) $\angle i = \angle e > \angle r$

Answer:

(A) $\angle i = \angle e < \angle r$

In refraction through a rectangular slab, the angle of incidence is equal to the angle of emergence. Also, the angle of refraction should be smaller than the angle of incidence.

26.A student traces the path of a ray of light through a triangular glass prism for different values of angle of incidence. On analyzing the ray diagrams, which one of the following conclusions is he likely to draw?

(A) The emergent ray is parallel to the incident ray.

(B) The emergent ray bends at an angle to the direction of the incident ray.

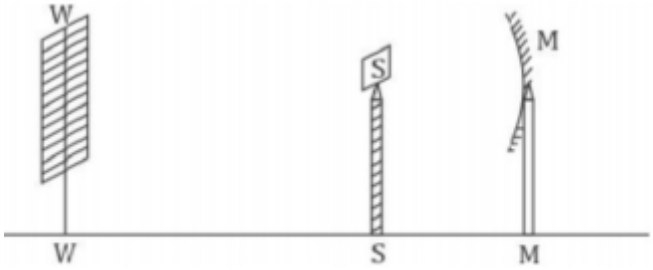
(C) The emergent ray and the refracted ray are at right angles to each other.

(D) The emergent ray is perpendicular to the incident ray.

Answer:

(B) The emergent ray bends at an angle to the direction of the incident ray. In refraction of light through a glass prism, there is deviation or change in the path of light passing through the prism.

27.A student obtains a sharp image of the distant window (W) of the school laboratory on the screen (S) using the given concave mirror (M) to determine its focal length. Which of the following distances should he measure to get the focal length of the mirror?



(A) MW

(B) MS

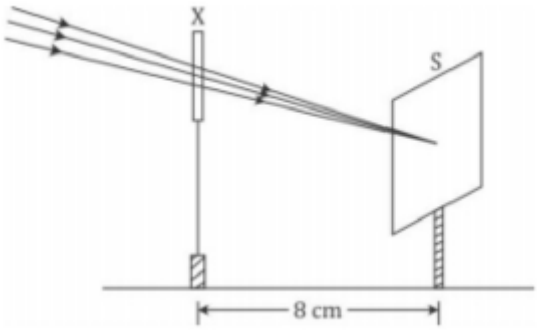
(C) SW

(D) MW − MS

Answer:

(B) MS The focal length of a concave mirror is the distance between its pole and principal focus. That is, the distance of the image formed (screen) from the concave mirror will be equal to the focal length of the concave mirror.

28.A student used a device (X) to obtain/focus the image of a well illuminated distant building on a screen (S) as shown below in the diagram. Select the correct statement about the device (X).



(A) This device is a concave lens of focal length 8 cm.
(B) This device is a convex mirror of focal length 8 cm.
(C) This device is a convex lens of focal length 4 cm.
(D) This device is a convex lens of focal length 8 cm.
Answer:
(D) This device is a convex lens of focal length 8 cm. The incident rays after passing through the lens converge at the focus. So, the device 'X' is a converging or a convex lens. The distance between the lens and the screen gives the focal length of the lens.

29. Given below is the list of vegetables available in the market. Select from these the two vegetables having homologous structures: Potato, sweet potato, ginger, radish, tomato, carrot, okra (Lady's finger)

(A) Potato and sweet potato
(B) Radish and carrot
(C) Okra and sweet potato
(D) Potato and tomato
Answer:
(B) Radish and carrot Radish and carrot are homologous structures as these are modifications of the root. Tomato and okra are fruits. Potato is a modification of the stem.

30. A student was asked to observe and identify the various parts of an embryo of a red kidney bean seed. He identified the parts and listed them as under: [1]
I. Tegmen
II. Testa
III. Cotyledon
IV. Radicle
V. Plumule
The correctly identified parts among these are
(A)I, II and III
(B)II, III and IV
(C)III, IV and V
(D)I, III, IV and V
Answer:
(C) III, IV and V An embryo has two large cotyledons and one embryo axis or tigellum. The upper end of the embryo axis is the plumule, and the lower end of the embryo axis which projects beyond the cotyledons

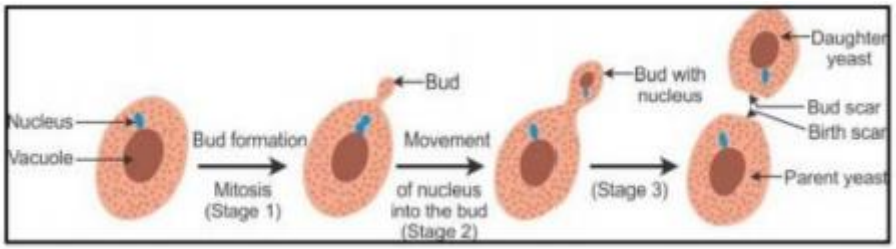
is the radical. The testa is the thick outer seed coat, and the tegmen is the inner transparent seed coat of seeds.

31. While preparing soap a small quantity of common salt is generally added to the reaction mixture of vegetable oil and sodium hydroxide. Which one of the following may be the purpose of adding common salt?
(A)To reduce the basic nature of the soap
(B)To make the soap neutral
(C) To enhance the cleansing power of the soap
(D)To favour the precipitation of the soap
Answer:
(D) To favour the precipitation of the soap During saponification, the soap formed remains in a suspended form in the mixture. It is precipitated as a solid from the suspension by adding common salt to the suspension. This process is called salting out of soap.

32.A student takes about 4 ml of distilled water in four test tubes marked P, Q, R and S. He then dissolves in each test tube an equal amount of one salt in one test tube, namely sodium sulphate in P, potassium sulphate in Q, calcium sulphate in R and magnesium sulphate in S. After that he adds an equal amount of soap solution in each test tube. On shaking each of these test tubes well, he observes a good amount of lather (foam) in the test tube marked.
(A)P and Q
(B)Q and R
(C) P, Q and S
(D)P, R and S
Answer:
(A) P and Q Lather (foam) is formed by the reaction of soap solution with sodium sulphate and potassium sulphate in the test tubes P and Q, respectively. They are dissolved in water to give a neutral solution. Sulphates, chlorides and bicarbonates of calcium and magnesium make the water hard. Thus, the lather is not formed in the test tubes R and S.

33. What do we observe on pouring acetic acid on red and blue litmus papers? [1]
(A)Red litmus remains red and blue litmus turns red.
(B)Red litmus turns blue and blue litmus remains blue.
(C) Red litmus turns blue and blue litmus turns red.
(D)Red litmus becomes colourless and blue litmus remains blue.
Answer:
(A) Red litmus remains red and blue litmus turns red. Acids turn blue litmus paper red.
They have no effect on red litmus paper.

34. Students were asked to observe the permanent slides showing different stages of budding in yeast under high power of a microscope.
(a) Which adjustment screw (coarse/fine) were you asked to move to focus the slides?
(b) Draw three diagrams in correct sequence showing budding in yeast.
Answer:
(A) A fine screw is used to focus the slides of budding in yeast under high power of a microscope.
(B) Sequence showing budding in yeast:



35. When you add sodium hydrogen carbonate to acetic acid in a test tube, a gas liberates immediately with brisk effervescence. Name this gas. Describe the method of testing this gas.

Answer:

Carbon dioxide gas gets liberated. When a pinch of sodium hydrogen carbonate is added to acetic acid in a test tube, a brisk effervescence is produced because of the liberation of carbon dioxide gas. When this gas is passed through the lime water, it turns lime water milky.

This shows that the gas liberated is carbon dioxide gas. The chemical reaction can be represented as

$CH_3COOH\ (aq) + NaHCO_3(s) \rightarrow CH_3COONa\ (aq) + H_2O(l) + CO_2(g) \uparrow$

36. A 4 cm tall object is placed on the principal axis of a convex lens. The distance of he object from the optical centre of the lens is 12 cm and its sharp image is formed at a distance of 24 cm from it on a screen on the other side of the lens. If the object is now moved a little away from the lens, in which way (towards the lens or away from the lens) will he have to move the screen to get a sharp image of the object on it again? How will the magnification of the image be affected?

Answer:

Given that Object distance, u = −12 cm

Image distance, v = 24 cm

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

$$\Rightarrow \frac{1}{f} = \frac{1}{24} - \frac{1}{-12}$$

$$\Rightarrow \frac{1}{f} = \frac{1}{24} + \frac{1}{12}$$

$$\Rightarrow \frac{1}{f} = \frac{1+2}{24} =$$

$$\Rightarrow \frac{-1}{f} = \frac{3}{24}$$

$$\Rightarrow f = 8cm$$

$\therefore$ The focal length of the lens is 8 cm.

Now if the object is moved away from the lens, the screen has to be moved towards the lens. This is because when we move the object away from the lens, the object distance is increased. Hence, by the lens formula, the image distance decreases.

Magnification is given as

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

Because the image distance (v) decreases, the value of magnification also decreases.