CBSE -10th- 2011 Examination

SCIENCE

SET-1 Paper & Solution

Time: 3 Hrs. Max. Marks: 80

General Instructions:

1. The question paper comprises of **two** Sections, **A and B**. You are to attempt both the sections.
2. All questions are **compulsory**.
   There is no overall choice. However, internal choice has been provided in all the three questions of five marks category. Only one option in such question is to be attempted.
3. All questions of **Section A** and all questions of **Section B** are to be attempted separately.
4. Question numbers **1** to **4** in Section A are one-mark questions. These are to be answered in one word or in one sentence.
5. Question numbers **5** to **13** in Section A are two-mark questions. These are to be answered in about 30 words each.
6. Question numbers **14** to **22** in Section A are three-mark questions. These are to be answered in about 50 words each.
7. Question numbers **23** to **25** in Section A are five-mark questions. These are to be answered in about 70 words each.
8. Question numbers **26** to **41** 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

Question 1. Why is it necessary to conserve our environment?

Solution: Conservation of environment is required for preventing damage to the environment and depletion of natural resources.

Marks: 1

Question 2. Distinguish between biodegradable and non-biodegradable wastes.

Solution:

Biodegradable wastes	Non-biodegradable wastes
Substances which are easily decomposed by microorganisms are called biodegradable wastes.	Substances which are not decomposed by microorganisms are called non-biodegradable wastes.

Marks: 1

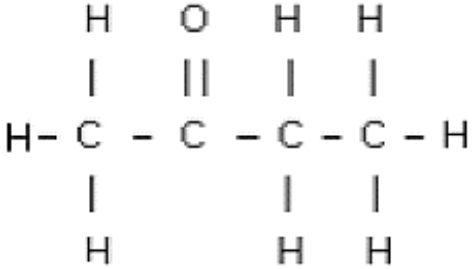
Question 3. What will be the colour of scattered sunlight when the size of the scattering particles is relatively large?

Solution: If the size of the scattering particles is relatively large, then the scattered light will appear white.

Marks: 1

Question 4. Draw the structure of Butanone molecule, $CH_3COC_2H_5$.

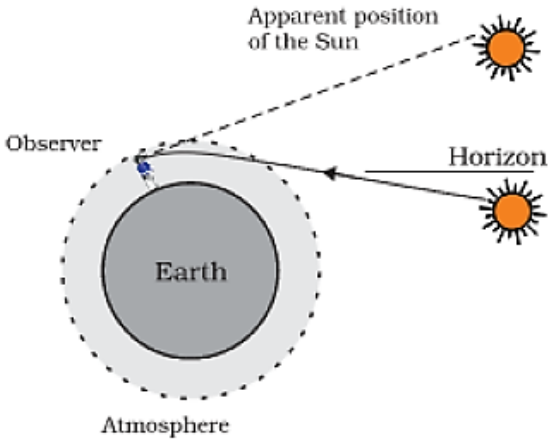
Solution: Structure of butanone, $CH_3COC_2H_5$



Marks: 1

Question 5. Explain with the help of a diagram, how we are able to observe the sunrise about two minutes before the Sun gets above the horizon.

Solution: Sunrise takes place when the sun is just above the horizon. But due to refraction of sunlight caused by the atmosphere, we can see the rising sun about 2 minutes before it is actually above the horizon. This happens because when the sun is slightly below the horizon, the sun's light coming from less dense air to more dense air is refracted downwards as it passes through the atmosphere. Because of this atmospheric refraction, the sun appears to be raised above the horizon when actually it is slightly below the horizon.



Marks: 2

Question 6. List any four reasons for vegetative propagation being practised in the growth of some type of plants.

Solution: Reasons for vegetative propagation:

i. It is done for plants which have lost the capacity to produce seeds.

ii. To produce plants which are genetically similar to the parent plant.

iii. It helps in producing those plants which either produce very few seeds or produce such seeds which are not viable.

iv. It can be used to produce plants which reach maturity and produce fruits and seeds faster.

Marks: 2

Question 7. State the role of

i. Seminal vesicle

ii. Prostate gland in the human body.

Solution: i. Seminal vesicles - secrete alkaline secretions which lower the pH of semen and provide nourishment.

ii. Prostate Gland - secretions of these glands keep the sperm active and mobile.

Marks: 2

Question 8. List any four disadvantages of using fossil fuels for the production of energy.

Solution: Disadvantages of using fossil fuels for the production of energy:

i. Burning of fossil fuels (e.g. coal and petroleum products) causes air pollution.

ii. The oxides of carbon, nitrogen and sulphur which are released on burning fossil fuels are acidic oxides. These cause acid rain which adversely affects our water and soil resources.

iii. Green house gases like carbon dioxide released during the combustion of fossil fuels enhances the process of global warming.

iv. Fossil fuels were formed over millions of years ago and have limited reserves. If we were to continue consuming these sources at such alarming rates, we would soon run out of energy.
Marks: 2

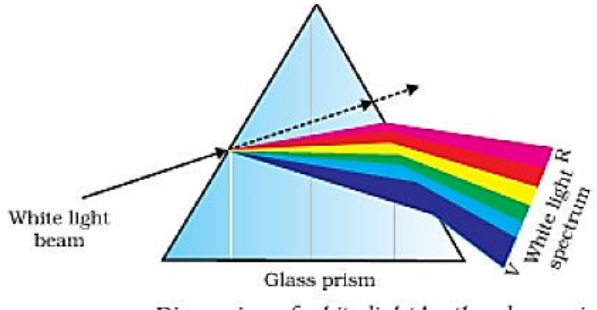
Question 9. Give two examples for each of the following:
i. Renewable sources or energy
ii. Non-renewable sources of energy
Solution: i. Solar energy and wind energy are the renewable sources of energy.
ii. Fossil fuels and uranium are the non-renewable sources of energy.
Marks: 2

Question 10. How does the metallic character of elements change along a period of the periodic table from the left to the right and why?
Solution: Metallic character decreases from left to right along a period of the periodic table because on moving from left to right, size of the atoms decreases and nuclear charge increases. Hence, the tendency to release electrons decreases. Thus, the electropositive character decreases.
Marks: 2

Question 11. In the modern periodic table, the element calcium (atomic number = 20) is surrounded by elements with atomic numbers 12, 19, 21 and 38. Which of these elements has physical and chemical properties resembling those of calcium and why?
Solution: Ca: Electronic configuration is: 2,8,8,2
The physical and chemical properties of elements with atomic number 12 and 38 will resemble those of calcium.
This is because they all belong to the second group and all of them have two electrons in the valence shell.
Marks: 2

Question 12. State any four characteristics of the image of the objects formed by a plane mirror.
Solution: Four characteristics of images formed by a plane mirror are:
i. The image formed by a plane mirror is always virtual.
ii. The image formed by a plane mirror is always erect.
iii. Size of the image is same as the size of the object and the image is laterally inverted.
iv. The image formed by a plane mirror is at the same distance behind the mirror as object is in front of it.
Marks: 2

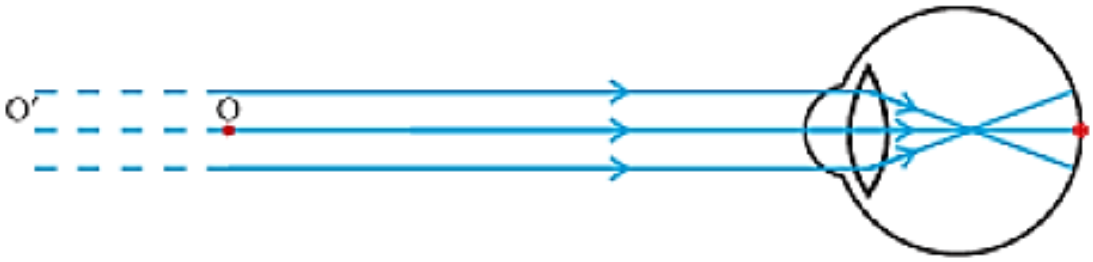
Question 13. Draw a diagram to show dispersion of white light by a glass prism. What is the cause of this dispersion?
Solution:



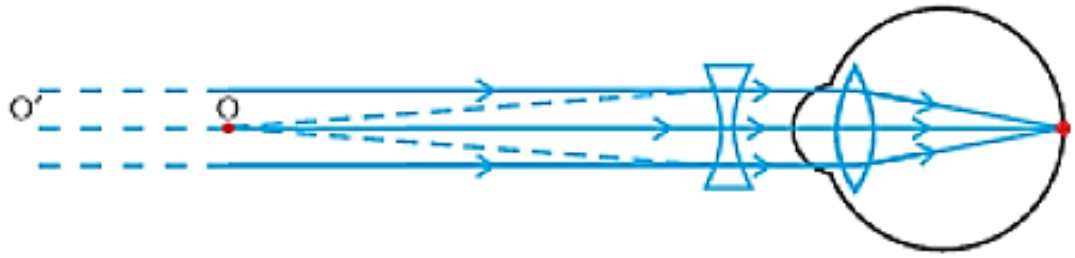
Dispersion of white light by the glass prism

Different colours of white light bend through different angles with respect to the incident ray, as they pass through a prism. Thus the rays of each colour emerge along different paths and become distinct. It is the band of distinct colours that we see in a spectrum.
Marks: 2

Question 14. (a) What is meant by the power of accommodation of an eye?
(b) A person with a myopic eye cannot see objects beyond 1.2 m directly. What should be the type of the corrective lens used? What would be its power?
Solution: (a) The process by which the ciliary muscles change the focal length of an eye lens to focus distant or near objects clearly on the retina is called the accommodation of the eye. The ability of the eye to do this is called the power of accommodation of the eye.
(b) The person is able to see nearby objects clearly, but he is unable to see objects beyond 1.2 m. This happens because the image of an object beyond 1.2 m is formed in front of the retina and not at the retina, as shown in the given figure.



To correct this defect of vision, the person must use a concave lens. The concave lens will bring the image back to the retina as shown in the given figure.



Focal length of the corrective lens used = − (Distance of far point of the myopic eye) = −1.2 m

Power of the lens $= \frac{1}{\text{focal length}} = \frac{1}{-12} = -0.83\text{D}$

Marks: 3

Question 15. What does HIV stand for? Is AIDS an infectious disease? List any four modes of spreading AIDS.
Solution: HIV stands for Human Immuno Deficiency Virus.
Yes, HIV is an infectious agent which spreads through sexual contact.
Modes by which can HIV spread:
i. Through sexual contact.
ii. From pregnant mothers to the growing foetus.
iii. Through transfusion of infected blood.
iv. By sharing of needles or syringes.
Marks: 3

Question 16. Describe any three ways in which individuals with a particular trait may increase in population.
Solution: Different ways in which individuals with a particular trait may increase in population are variation, natural selection and genetic drift.
Variation: Variation is defined as the occurrence of differences among the individuals. No two individuals are exactly alike. Variations arising during the process of reproduction can be inherited and lead to increased survival of the individuals.
Natural selection: It results in adaptations in population to fit their environment better. Thus, natural selection directs evolution in the population of a particular species.
Genetic drift: The change in the frequency of certain genes in a population over generations is called genetic drift.
Marks: 3

Question 17. State the evidence we have for the origin of life from inanimate matter.
Solution: J.B.S. Haldane suggested that life must have developed from the simple inorganic molecules which were present on Earth soon after it was formed. He speculated that the conditions on Earth at that time could have given rise to more complex organic molecules which were necessary for life. The first primitive organisms would arise from further chemical synthesis. Later on, Stanely L. Miller and Harold C. Urey conducted experiments to understand the origin of organic molecules. They created an atmosphere similar to that thought to exist on early Earth (this had molecules like ammonia, methane and hydrogen sulphide, but no oxygen) over water. This was maintained at a temperature just below 100 °C and sparks were passed through the mixture of gases to simulate lightning. At the end of a week, 15% of the carbon (from methane) had been converted to simple compounds of carbon including amino acids which make up protein molecules. This is considered as evidence for origin of life on the Earth from inanimate matter.
Marks: 3

Question 18. Give an example of body characteristics used to determine how close two species are in terms of evolution and explain it.
Solution: Homologous organs, analogous organs and vestigial organs help to identify evolutionary relationships.
Homologous organs are those organs which have similar basic structure but have been modified to perform different functions. *Example* - forelimbs of reptiles, frog, lizard, bird and humans are homologous organs. Such homologous characteristics help to identify an evolutionary relationship between apparently different species.
Analogous organs are those organs which are different in basic structure but perform the same function. *Example* - wings of bird and wings of bat.
Vestigial organs are certain reduced and non-functional organs present in some organisms. *Example* - vermiform appendix in human body.
Marks: 3

Question 19. Write chemical equations to show what happens when:
i. Ethanol is heated with concentrated sulphuric acid at 443 K.
ii. Ethanol reacts with ethanoic acid in the presence of an acid acting as a catalyst.
iii. An ester reacts with a base.
Solution: i. $CH_3CH_2OH \xrightarrow{\text{conc.sulphuric acid at 443 K}} CH_2 = CH_2 + H_2O$

ii. $CH_3CH_2OH + CH_3COOH \xrightarrow{acid} CH_3COOCH_2CH_3 + H_2O$

iii. $CH_3COOCH_2CH_3 + NaOH \longrightarrow CH_3COONa + CH_3CH_2OH$

Marks: 3

Question 20. The atomic number of an element is 16. Predict

i. the number of valence electrons in its atom

ii. its valency

iii. its group number

iv. whether it is a metal or a non-metal

v. the nature of oxide formed by it

vi. the formula of its chloride

Solution: Atomic number = 16

Electronic configuration = 2, 8, 6

i. Number of valence electrons in its atom = 6

ii. Valency = 2

iii. Group number =16

iv. It is a non-metal

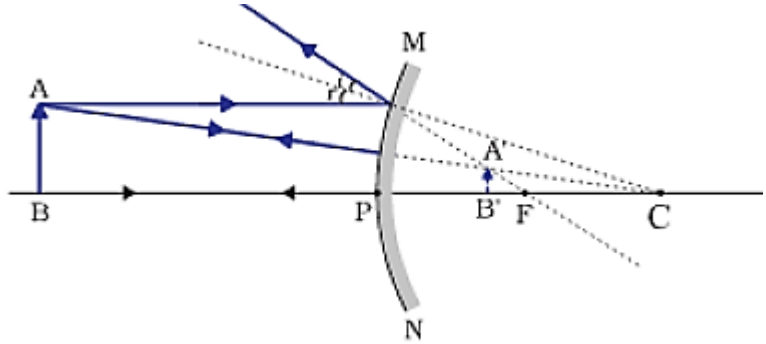
v. Acidic oxide

vi. XCl_2

Marks: 3

Question 21. An object is placed between infinity and the pole of a convex mirror. Draw a ray diagram and also state the position, the relative size and the nature of the image formed.

Solution:



An object is placed between infinity and the pole of a convex mirror, the image formed is:

i. Behind the mirror at focus (F),

ii. Virtual and erect,

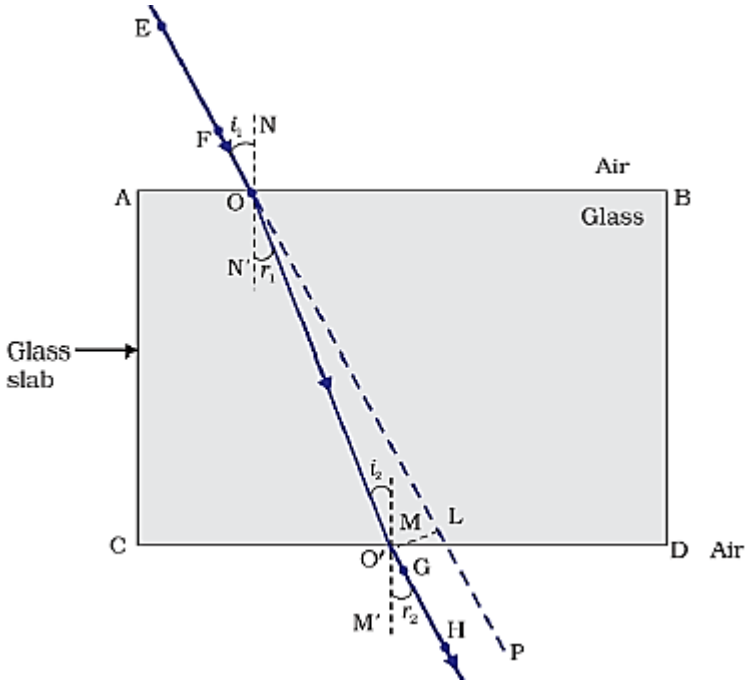
iii. Highly diminished

Marks: 3

Question 22. What is the principle of reversibility of light? Show that the incident ray of light is parallel to the emergent ray of light when light falls obliquely on a side of a rectangular glass slab.

Solution: The principle of reversibility of light states that light will follow exactly the same path if its direction of travel is reversed.

When light falls obliquely on a rectangular glass slab, the incident ray is parallel to the emergent ray; as shown in the figure. Angle of incidence is equal to the angle of emergence.



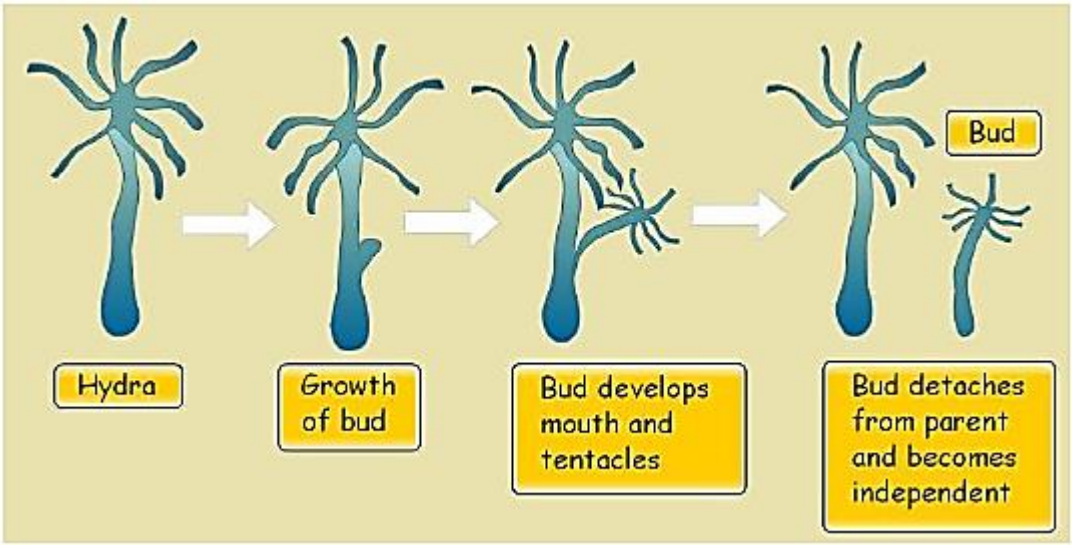
Marks: 3

Question 23. With the help of suitable diagrams, explain the various steps of budding in Hydra.

OR

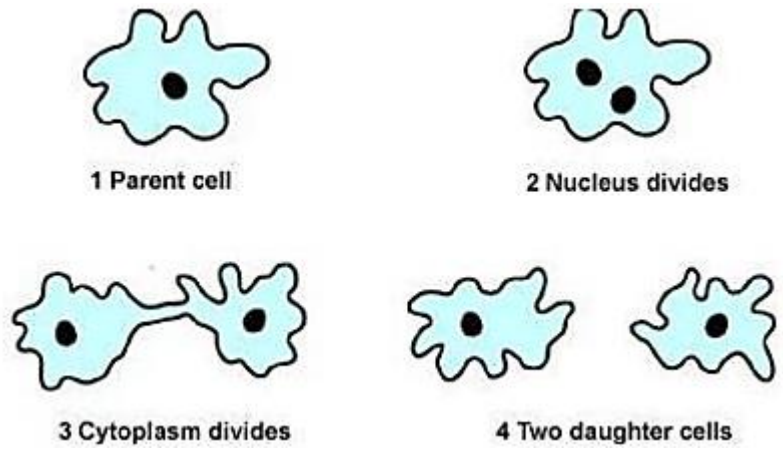
What is binary fission in organisms? With the help of suitable diagrams, describe the mode of reproduction in Amoeba.

Solution: In Hydra, a bud develops as an outgrowth due to repeated cell divisions at one specific site. These buds develop into tiny individuals and when fully mature, detach from the parent body and become new independent individuals.



OR

Binary fission is an asexual method of reproduction. Amoeba reproduces by this method. During this process, nuclear division takes place first, followed by the appearance of a constriction in the cell membrane, which gradually increases inwards and divides the cytoplasm into two parts. Finally, two daughter organisms are formed.



Marks: 5

Question 24. (a) State two properties of carbon which lead to a very large number of carbon compounds. (b) Why does micelle formation take place when soap is added to water? Why are micelles not formed when soap is added to ethanol?

OR

Explain isomerism. State any four characteristics of isomers. Draw the structures of possible isomers of butane, C_4H_{10}.

Solution: (a) Two properties of carbon which lead to a very large number of carbon compounds are:

i. Tetravalency: Carbon has valency 4 i.e., it is tetravalent. Hence, it is capable of bonding with four other atoms of other monovalent elements.

ii. Catenation: Carbon has the unique ability to form bonds with other atoms of carbon to form long chains.

(b) A soap molecule has two parts –one hydrophobic part and the other hydrophilic part. When added to water, the hydrophobic part arranges itself towards the dirt and the hydrophilic end arranges itself towards the water.

Micelle formation does not take place when soap is added to ethanol because the hydrophobic part of soap molecules is soluble in ethanol.

OR

Isomers are compounds with same molecular formula but different structures.

Four characteristics of isomers:

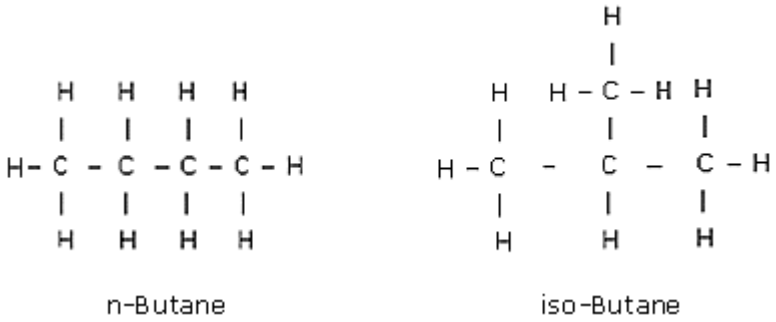
i. Isomers have different physical properties.

ii. Isomers may have same or different chemical properties.

iii. All isomers have the same number of atoms.

iv. Isomers have different structural arrangements.

Isomers of butane, C_4H_{10}.



n-Butane iso-Butane

Marks: 5

Question 25. (a) What is meant by 'power of a lens'?

(b) State and define the S.I. unit of power of a lens.

(c) A convex lens of focal length 25 cm and a concave lens of focal length 10 cm are placed in close contact with each other. Calculate the lens power of this combination.

OR

(a) Draw a ray diagram to show the formation of image of an object placed between infinity and the optical centre of a concave lens.

(b) A concave lens of focal length 15 cm forms an image 10 cm from the lens. Calculate

i. The distance of the object from the lens.

ii. The magnification for the image formed

iii. The nature of the image formed.

Solution: (a) The degree of convergence or divergence of light rays achieved by a lens is expressed in terms of its power. The power of a lens is defined as the reciprocal of its focal length. The power P of a lens of focal length f is given by:

$$P = \frac{1}{f\,(\text{in meters})}$$

(b) The S.I. unit of power of a lens is 'dioptre'.

1 dioptre is the power of a lens whose focal length is 1 metre.

(c) Focal length of convex lens = +25 cm

Power of convex lens, $P_1 = \frac{100}{25} = 4$ D

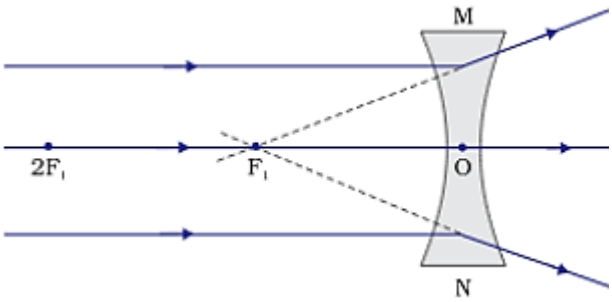
Focal length of concave lens = −10 cm

Power of concave lens, $P_2 = \frac{100}{-10} = -10$ D

Hence, power of this combination, $P = P_1 + P_2 = (4\text{ D}) + (-10\text{ D}) = -6$ D

OR

(a) Ray diagram showing the formation of image of an object placed between infinity and optical centre of a concave lens:



(b) A concave lens always forms a virtual, erect image on the same side of the object.

Focal length of concave lens, f = −15 cm

Image distance, v = −10 cm

i. Let 'u' be the object distance; then using lens formula:

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

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

Substituting the values,

$$\frac{1}{u}=\left(\frac{-1}{10}\right)-\left(\frac{-1}{15}\right)=\left(\frac{-1}{30}\right)$$

Or, u = −30 cm = −0.3 m

Thus, object distance is 30 cm

ii. Magnification, $m=\frac{v}{u}=\frac{-10}{-30}=\frac{1}{3}=0.33$

iii. The positive sign shows that the image is erect and virtual. The image is one-third the size of the object.

Marks: 5

SECTION B

Question 26. The shape of yeast cells is

(a) Only spherical

(b) Only oval.

(c) Irregular

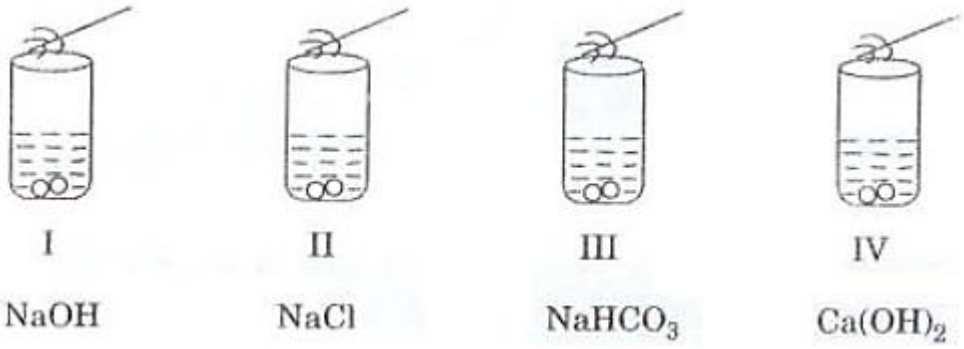
(d) Both oval and spherical.

Solution: (b) Only oval.

Yeast cells are usually oval.

Marks: 1

Question 27. A student added acetic acid to test tubes I, II, III and IV containing the labeled substances and then brought a burning splinter near the mouth of each test tube.



The splinter would be extinguished when brought near the mouth of test tube.

(a) I

(b) II

(c) III

(d) IV

Solution: (c) III

Sodium bicarbonate reacts with acetic acid to release carbon dioxide gas which is a nonsupporter of combustion.

Marks: 1

Question 28. Acetic add reacts with solid sodium hydrogen carbonate,

(a) Slowly forming no gas

(b) Vigorously with effervescence

(c) Slowly without effervescence

(d) Vigorously without gas formation

Solution: (b) Vigorously with effervescence
Acetic acid reacts with solid sodium hydrogen carbonate vigorously and effervescence is produced due to evolution of CO_2 gas.
Marks: 1

Question 29. Vapours of acetic acid smell:
(a) Pungent like vinegar
(b) Sweet like rose
(c) Suffocating like sulphur dioxide
(d) Odorless like water
Solution: (a) Pungent like vinegar
Vapours of acetic acid smell pungent like vinegar.
Marks: 1

Question 30. A clean aluminium foil was placed in an aqueous solution of zinc sulphate. When the aluminium foil was taken out of the zinc sulphate solution after 15 minutes, its surface was found to be coated with a silvery grey deposit. From the above observation it can be concluded that:
(a) Aluminium is more reactive than zinc
(b) Zinc is more reactive than aluminium
(c) Zinc and aluminium both are equally reactive
(d) Zinc and aluminium both are non-reactive
Solution: (a) Aluminium is more reactive than zinc
Aluminium is more reactive than zinc and is hence able to displace zinc from its solution.
Marks: 1

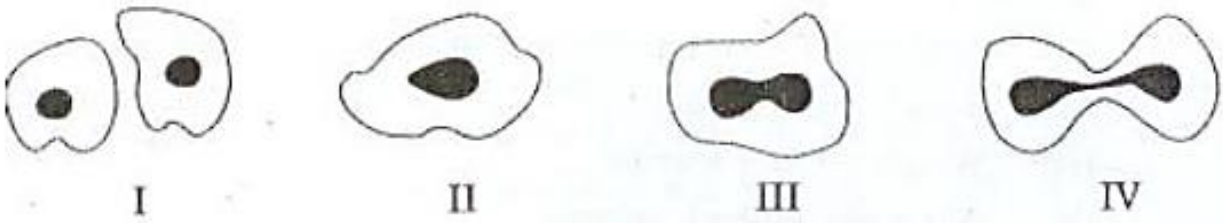
Question 31. The colour of raisins as used in the experiment, 'To determine the percentage of water absorbed by raisins', was
(a) White
(b) Yellow
(c) Dark brown
(d) Pink
Solution: (c) Dark brown
The raisins are dark brown in colour.
Marks: 1

Question 32. Following are the steps involved in the experiment- 'To determine the percentage of water absorbed by raisins'. They are not in proper sequence.
I. Soak the raisins in fresh water.
II. Weight dry raisins.
III. Weigh soaked raisins.
IV. Wipe out soaked raisins.
The correct sequence of steps is
(a) I, II, III, IV
(b) II, I, IV, III
(c) II, I, III, IV

(d) I, II, IV, III
Solution: (b) II, I, IV, III
The correct sequence is- II, I, IV, III
Marks: 1

Question 33. During the course of an experiment, to determine the percentage of water absorbed by raisins, the raisins are weighed
(a) Every half an hour.
(b) Every hour.
(c) Once- only after completing the experiment.
(d) Two times- Before soaking and after soaking for three hours.
Solution: (d) Two times− Before soaking and after soaking for three hours.
Raisins are weighed two times– before soaking and after soaking for three hours.
Marks: 1

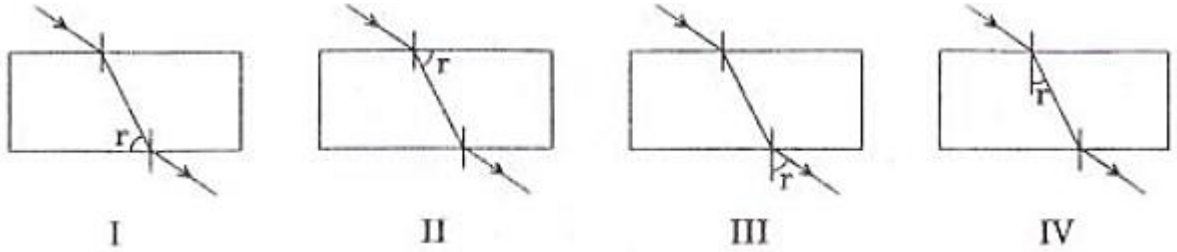
Question 34. The given figures illustrate binger fission in Amoeba in improper order.



The correct order is
(a) III, IV, II, I
(b) IV, III, II, I
(c) II, III, IV, I
(d) I, III, IV, II
Solution: (c) II, III, IV, I
The correct order of binary fission is- II, III, IV, I
Marks: 1

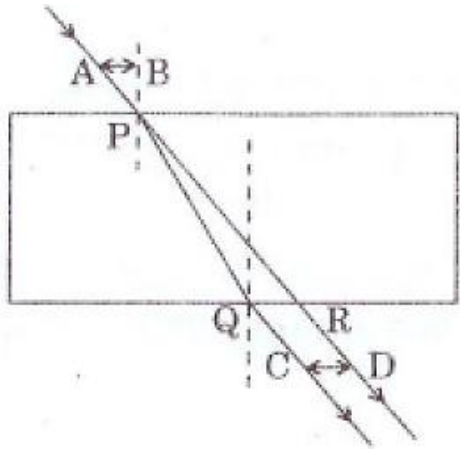
Question 35. The steps involved in observing a slide under a microscope are given below. They are not in proper sequence.
I. Focus the object under high power of the microscope.
II. Place the slide on the stage of the microscope.
III. Arrange the mirror to reflect maximum light to the slide.
IV. Focus the object under low power of the microscope.
The proper sequence of steps is
(a) II, III, IV, I
(b) I, II, III, IV
(c) IV, III, II, I
(d) III, I, II, IV
Solution: (a) II, III, IV, I
The steps to observe a slide under the microscope are- II, III, IV, I
Marks: 1

Question 36. In which diagram the angle of refraction r has been correctly depicted?



(a) I
(b) II
(c) III
(d) IV
Solution: (d) IV
Angle of refraction is measured with respect to the normal at the first point of incidence.
Marks: 1

Question 37. For a ray of light passing through a glass slab, the lateral displacement was correctly measured as:



(a) AB
(b) PQ
(c) CD
(d) PR
Solution: (c) CD
Lateral displacement is the sideways shift of the emergent ray from the direction of the incident ray.
Marks: 1

Question 38. Iron nails were dipped in an aqueous solution of copper sulphate. After about 30 minutes, it was observed that the colour of the solution changed from
(a) Colorless to light green.
(b) Blue to light green.
(c) Blue to colourless.
(d) Green to blue.
Solution: (b) Blue to light green
The blue coloured copper sulphate solution changes to light green iron sulphate solution after displacement of copper by iron from copper sulphate solution.
Marks: 1

Question 39. To find the focal length of a concave mirror, Sita should choose which one of the following
(a) A mirror holder and screen holder
(b) A screen holder and a scale
(c) A mirror holder, a screen holder and a scale
(d) A screen, a mirror, holders for them and a scale
Solution: (d) A screen, a mirror, holders for them and a scale
A screen, a mirror, holders for them and scale are needed to find the focal length of a concave mirror.
Marks: 1

Question 40. By using a convex lens, a student obtained a sharp image of his classroom window grill on a screen. In which direction should he move the lens to focus a distant tree instead of the grill?
(a) Towards the screen
(b) Away from the screen
(c) Very far away from the screen
(d) Behind the screen
Solution: (a) Towards the screen
The lens should be moved towards the screen because the distant tree can be considered an object at infinity whose image will be formed at the focus, while earlier the image of nearer grill was formed at a distance farther than the focal length.
Marks: 1

Question 41. To determine the focal length of a convex lens by obtaining a sharp image of a distant object, the following steps were suggested which are not in proper sequence.
I. Hold the lens between the object and the screen.
II. Adjust the position of the lens to form a sharp image.
III. Select a suitable distant object.
IV. Measure the distance between the lens and the screen.
The correct sequence of steps to determine the focal length of the lens is
(a) III, I, II, IV
(b) III, I, IV, II
(c) III, IV, II, I
(d) I, II, III, IV
Solution: (a) III, I, II, IV
The proper sequence to determine the focal length of a convex lens is:
III - Select a suitable distant object.
I - Hold the lens between the object and the screen.
II - Adjust the position of the lens to form a sharp image.
IV - Measure the distance between the lens and the screen.
Marks: 1