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

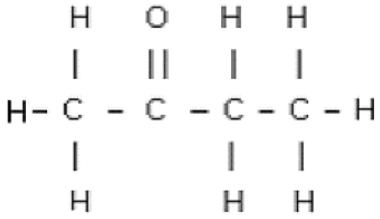
Question 2. Distinguish between biodegradable and non-biodegradable wastes.
Solution:

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 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 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

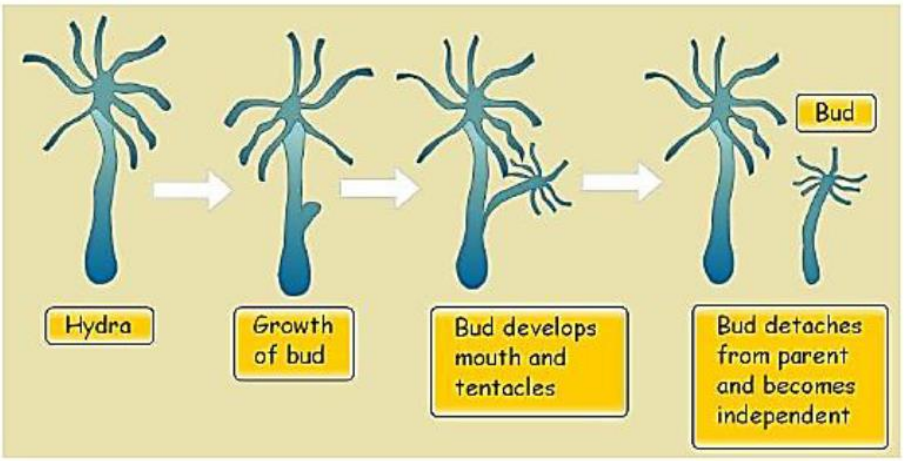
Marks: 3

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

OR

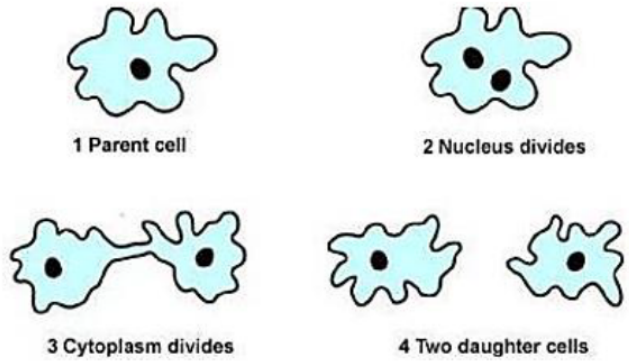
What is binary fission in organisms? With the help of suitable diagrams, describe the mode of reproduction in Amoeba.

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:

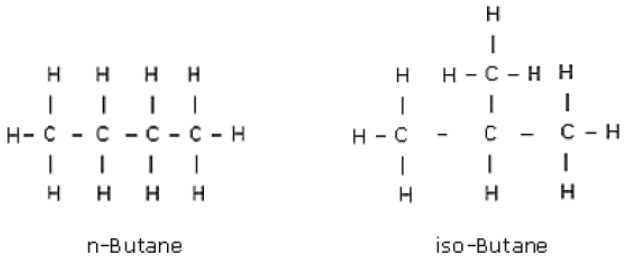
i. Isomers have different physical properties.

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}.



Marks: 5

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 1. Name the functional group present in each of the following organic compounds:
i. CH_3COCH_3
ii. C_2H_5COOH
Solution: i. Ketone
ii. Carboxylic acid
Marks: 1

Question 3. Which class of carbon compounds are responsible for the depletion of ozone layer at the higher level of the atmosphere?
Solution: Chlorofluorocarbons (CFCs) are responsible for the depletion of the ozone layer.
Marks: 1

Question 4. Select two non-biodegradable substances from the following waste generated in a kitchen: Spoilt food, paper bags, milk bags, vegetable peels, tin cans, used tea leaves.
Solution: Milk bags and tin cans.
Marks: 1

Question 5. Define the term puberty. List two changes observed in girls at the time of puberty.
Solution: It is the age at which the reproductive system becomes functional in human beings. The changes observed in girls at the time of puberty are:
i. Breast enlargement.
ii. Fat tissue starts depositing in areas like the breasts, hips, buttocks and thighs.
Marks: 2

Question 6. What is meant by asexual reproduction? List any two of its different forms.
Solution: It is a mode of reproduction in which new individuals are produced from a single parent without the involvement of fusion of gametes. The two forms of asexual reproduction are - budding and binary fission.
Marks: 2

Question 7. What are the advantages of water stored in the ground?
Solution: Advantages of water stored in the ground:
i. Stored ground water does not evaporate.
ii. It does not provide breeding grounds for mosquitoes like stagnant water collected in ponds or artificial lakes.
iii. It provides moisture for vegetation over a wide area.
iv. Ground water stored does not get contaminated by human and animal wastes.
Marks: 2

Question 8. "Burning fossil fuels is a cause of global warming." Justify this statement.
Solution: Fossil fuels like coal and petroleum are huge reservoirs of carbon and its compounds. On burning fossil fuels, huge reservoirs of carbon present in fossil fuels get converted to carbon dioxide and go into air. The amount of carbon dioxide thus increases in the atmosphere which leads to an increased green house effect leading to excessive heating of the Earth i.e., global warming.
Marks: 2

Question 14. F, Cl and Br are elements each having seven valence electrons. Which of these:
i. has the largest atomic radius
ii. is most reactive?
Justify your answer stating reason for each.
Solution: i. F, Cl and Br all are in the same group and thus have the same effective nuclear charge. Br has the largest atomic radius among all because it uses the largest number of electron energy levels since the valence electrons are placed in larger orbitals i.e. the principal quantum number increases on going down the group.
ii. Fluorine is the most reactive since it has the greatest tendency to gain electrons because it has a higher effective nuclear charge and uses fewer energy levels than Br and Cl.
Marks: 3

Question 15. Explain the meaning of sexually transmitted diseases (STD's). Give two examples of STD's each, caused due to
i. bacterial infection
ii. viral infection.

State in brief how the spread of such diseases may be prevented.
Solution: Sexually transmitted diseases (STD's) are diseases which are usually passed through sexual contact with an infected partner.
i. Sexually transmitted diseases caused due to bacterial infection: Gonorrhea and Syphilis.
ii. Sexually transmitted diseases caused due to viral infection: AIDS and Herpes.
A key strategy in the prevention of STD's involves screening, diagnosis and treatment of patients as well as their sexual partners to interrupt transmission.
Prevention of transmission of STD's:
(a) Having sex with an infected or any unknown person should be avoided.
(b) Sharing of needles, syringes etc. must be prohibited.
(c) Surgical and dental instruments should be sterilised properly before use.
(d) Avoid blood transfusion from an infected person. Blood should be tested before transfusion.
(e) Adequate medical treatment should be provided to the pregnant woman to protect the child from getting infected.
Marks: 3

Question 18. A blue colour flower plant denoted by BB is crossbred with a white colour flower plant denoted by bb.
(a) State the colour of flower you expect in their F_1 generation plants.
(b) What must be the percentage of white flower plants in F_2 generation if flowers of F_1 plants are self-pollinated?
(c) State the expected ratio of the genotypes BB and Bb in the F_2 progeny.
Solution: (a) Blue

(b) 25%
(c) 1 : 2
Marks: 3

Question 24. What is the difference between the chemical composition of soaps and detergents?
State in brief the soaps in removing an oily spot from a shirt. Why soaps are not considered suitable for washing when water is hard?

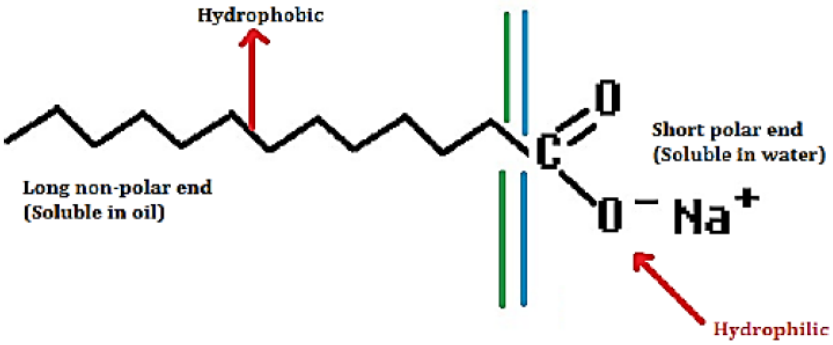
OR

List in tabular form three physical and two chemical properties on the basis of which ethanol and ethanoic acid can be differentiated.

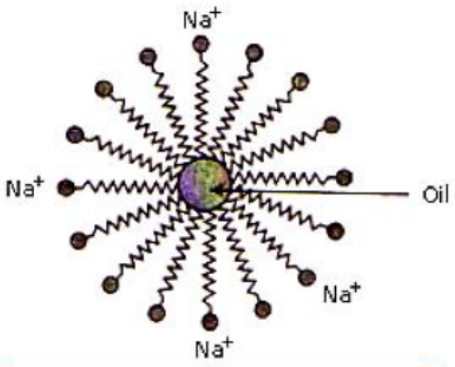
Solution: Detergents are generally ammonium or sulphonate salts of long chain carboxylic acids whereas molecules of soap are sodium or potassium salts of long-chain carboxylic acids.

Action of soap:

1. Soaps are cleansing agents capable of reacting with water and dislodge the unwanted particles from cloth or skin.
2. The molecules of soap are sodium or potassium salts of long chain carboxylic acids.
3. A soap molecule has a tadpole shaped structure.
4. One end (long non polar end) of a soap molecule is a hydrocarbon chain which is insoluble in water but soluble in oil.
5. The other end (short polar end) of a soap molecule is a carboxylate ion which is hydrophilic i.e., water soluble but insoluble in oil.



6. Soap on mixing with water forms a concentrated solution and causes foaming.
7. The long non-polar end of soap gravitates towards and surrounds the dirt and absorbs the dust in it.
8. The short polar end with the carboxylate ion turns the water away from the dirt.
9. A spherical aggregate of soap molecules is formed in the soap solution in water and is called a micelle.
10. The soap molecule thus helps in dissolving the dirt in water and help to wash our clothes clean.



Formation of Micelles

Hard water contains calcium and magnesium salts. When soap is used in hard water it forms an insoluble substance scum which remains even after washing hence soaps are not considered suitable for washing in hard water.

Difference in physical properties:

S. No.	Ethanol	Ethanoic acid
1.	It exists only in liquid form.	It can exist both in liquid as well as solid form.
2.	It belongs to the functional group alcohols.	It belongs to the functional group carboxylic acids.
3.	It has a specific smell but not like vinegar.	It smells like vinegar.

Difference in chemical properties:

S. No.	Ethanol	Ethanoic acid
1.	Reaction with sodium bicarbonate: No salt formation occurs and carbon dioxide gas is also not evolved.	Reaction with sodium bicarbonate: It will react with sodium bicarbonate to form a salt and carbon dioxide gas will be released.
2.	It does not give litmus test i.e., no change in the colour of litmus solution..	It turns blue litmus red.

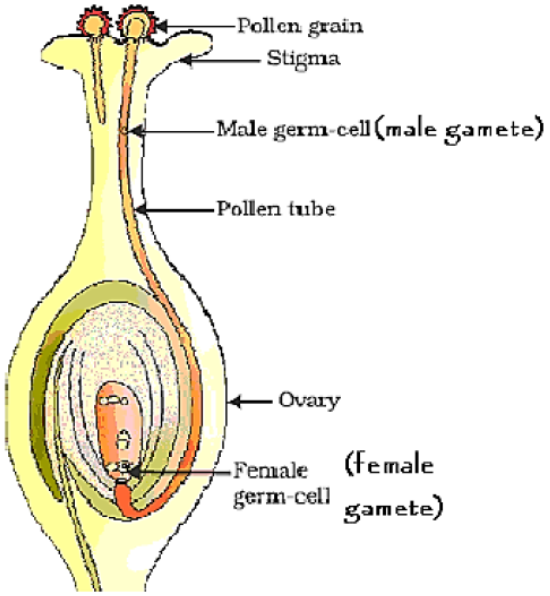
Marks: 5

Question 25. Define the terms pollination and fertilisation. Draw a diagram of a pistil showing pollen tube growth into the ovule and label the following: pollen grain, male gamete, female gamete and ovary.

OR

Describe in brief the role of
i. testis
ii. seminal vesicle
iii. vas deferens
iv. ureter
v. prostate gland in human male reproductive system.

Solution: Pollination- Transfer of pollen grains from the anther to the stigma is called pollination.
Fertilisation - The process of fusion of male and female gametes to form a zygote which eventually develops into an embryo is called fertilisation.



Germination of pollen on stigma

OR

i. Testis: It is the organ which produces sperms and the male sex hormone, testosterone.
ii. Seminal vesicle: It produces fluid which makes up a significant percentage of semen.

iii. Vas deferens: Vas deferens is a tube transporting spermatozoa from the epididymis to the prostate part of the urethra.
iv. Ureter: It carries urine from the kidneys to the urinary bladder.
v. Prostate gland in human male reproductive system: It contributes additional fluid to the ejaculate. Prostate fluids also help to nourish the sperms.
Marks: 5

SECTION B

Question 26. After observing the prepared slides of binary fission in Amoeba and budding in yeast, the following observations were reported:
a. Single cells of Amoeba and Yeast were undergoing binary fission and budding respectively.
b. Cytokinesis was observed in the Yeast cell.
c. Elongated nucleus was dividing to form two daughter nuclei in Amoeba.
d. A chain of buds were observed due to reproduction in Amoeba.
The correct observation(s) is/are:
(a) d, a and c
(b) c and d
(c) b only
(d) a and c
Solution: (d) a and c
The correct observations are:
i. Single cells of Amoeba and Yeast were undergoing binary fission and budding respectively.
ii. Elongated nucleus was dividing to form two daughter nuclei in Amoeba.
Marks: 1

Question 27. A student after viewing a prepared slide illustrates budding in yeast in the following order which is not correct:

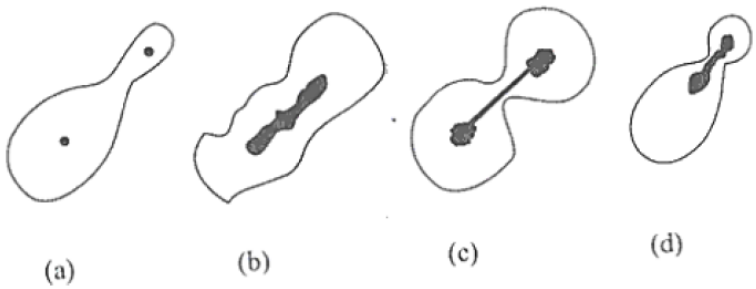
(a) (b) (c) (d) (e)

The correct order should be:
(a) b, d, e, c, a
(b) b, e, d, c, a
(c) b, c, d, e, a
(d) b, d, c, e, a
Solution: (d) b, d, c, e, a
The correct sequence is b, d, c, e, a
Marks: 1

Question 28. A student has to observe a permanent slide of binary fission in Amoeba. Find the correct sequence of steps given below for focusing the object under a microscope.

a. Place the slide on the stage, look through the eye-piece and adjust the mirror to get proper illumination.
b. Focus the slide sharp using fine adjustment screw.
c. Look through the eye-piece and raise the objective lens using coarse adjustment screw till the object is focused.
d. Look through the eye-piece and move the slide till the object is visible.
(a) a, c, d, b
(b) d, c, b, a
(c) a, b, d, c
(d) a, d, c, b
Solution: (d) a, d, c, b
The correct sequence is a, d, c, b
Marks: 1

Question 29. After viewing different slides, a student draws the following diagrams. Select the one which depicts binary fission in Amoeba:



(a) (b) (c) (d)

(a) d
(b) b
(c) a
(d) c
Solution: (c) a
Figure (a) shows binary fission in Amoeba.
Marks: 1

Question 30. Dry raisins were soaked in water for 2 hours to determine the percentage of water absorbed by raisins. Before final weighing of swollen raisins, the extra water left on the surface of soaked raisins was removed by:
(a) Dry cotton wool
(b) Hot air blower
(c) Gently rubbing with cotton cloth
(d) Filter paper
Solution: (d) Filter paper
Filter paper is used to soak raisins.
Marks: 1

Question 31. While performing the experiment with raisins to determine the percentage of water absorbed by them, a student made the following measurements:
Mass of water in the beaker = 40 g

Mass of raisins before soaking = 5 g
Mass of raisins after soaking for 2 hours = 8 g
Mass of water left in the beaker after three experiments = 35 g
The percentage of water absorbed by raisins is:

(a) $\frac{8\,g-5\,g}{8\,g}\times 100$

(b) $\frac{40\,g-35\,g}{40\,g}\times 100$

(c) $\frac{40\,g-35\,g}{35\,g}\times 100$

(d) $\frac{8\,g-5\,g}{5\,g}\times 100$

Solution: (d) $\frac{8\,g-5\,g}{5\,g}\times 100$

Marks: 1