

## Section A

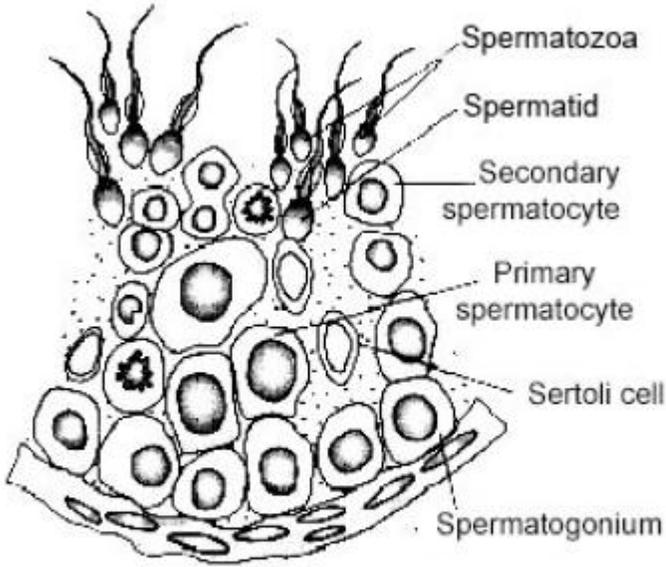
<b>Section A</b>		
1.	<p><b>The turkey usually produces females for several generations. How is this possible?</b></p> <p>In turkey, female gametes undergo development without fertilization. This is called parthenogenesis.</p>	1
2.	<p><b>Name the microbes that help production of Statin.</b></p> <p><i>Monascuspurpureus</i></p>	1
3.	<p><b>In plants, how is alien DNA introduced into the host cell?</b></p> <p>The plant cells are bombarded with high velocity micro - particles of gold or tungsten coated with DNA in a method known as biolistics or gene gun .</p>	1
4.	<p><b>Expand the following (i) PCR (ii) Bt</b></p> <p>(i) Polymerase Chain Reaction ½ m</p> <p>(ii) <i>Bacillus thuringiensis</i> ½ m</p>	1
5.	<p><b>When is the structure and composition of a community expected to remain unchanged?</b></p> <p>When the environment remains unchanged. 1m</p>	1
<b>Section B</b>		
6.	<p><b>Mention one application for each of the following :</b></p> <p>(a) <b>Passive immunization</b></p> <p>(b) <b>Antihistamine</b></p> <p>(c) <b>Colostrum</b></p> <p>(d) <b>Cytokinin-barrier</b></p> <p>(a) Provide preformed antibodies / anti-toxins for quick response in case of infection by deadly microbes(tetanus) or snake bite = ½</p> <p>(b) Reduces symptoms of allergy = ½</p> <p>(c) Provides passive immunity / antibodies / Ig A to new born = ½</p> <p>(d) Protection of non-infected cells from further viral infection = ½</p>	2

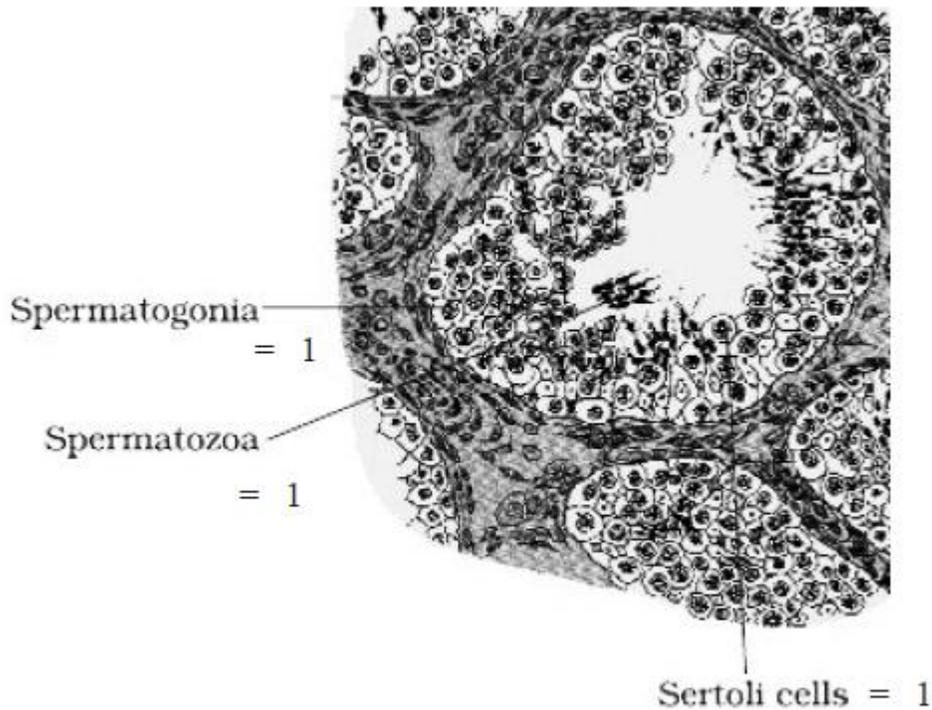
7.	<p><b>Write the desirable characters a farmer looks for in his sugarcane crop.</b></p> <p>High yield , thick stem,high sugar content , ability to grow in their areas = <math>\frac{1}{2} \times 4</math></p> <p>OR</p> <p><b>Honey collection improves when beehives are kept in crop-fields during flowering season. Explain.</b></p> <p>Bees visit flowers for collecting nectar / pollen (for honey) , more the number of flowers (during flowering season) larger is the nectar / pollen collection (hence more honey production) = 1 + 1</p>	2
8.	<p><b>Specify the use of restriction endonuclease in the formation of recombinant DNA.</b></p> <p>Same restriction endonuclease binds to both the vector and the foreign DNA , cut each of the two strands of the double helix at specific points in their sugar phosphate backbone of recognition sequence for restriction endonucleases / palindromic sequence of vector and foreign DNA , to cut strand a little away from the centre of the palindrome sites, creates overhanging stretches /sticky ends = <math>\frac{1}{2} \times 4</math></p>	2
9.	<p><b>Plants, bacteria, fungi and animals whose genes have been altered by manipulation are called Genetically Modified Organisms. How Genetic modification has benefitted these plants?</b></p> <p>Genetic modification has:</p> <p>(i) made crops more tolerant to abiotic stresses (cold, drought, salt, heat).</p> <p>(ii) reduced reliance on chemical pesticides (pest-resistant crops).</p> <p>(iii) helped to reduce post harvest losses.</p> <p>(iv) increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil).</p> <p>(v) enhanced nutritional value of food, e.g., Vitamin 'A' enriched rice. [Any two ]</p>	2
10.	<p><b>Loss of Biodiversity will lead to ecological instability. Write any four causes of</b></p>	2

	<p><b>biodiversity loss.</b></p> <p>(i) Habitat loss and fragmentation(ii) Over-exploitation(iii) Alien species invasions(iv) Co-extinctions</p>	
<p><b>Section C</b></p>		
11.	<p><b>The graph given below shows the distribution of biomes:</b></p> <p><b>(a) What do the ‘X’ and ‘Y’ axis represent?</b></p> <p><b>(b) Identify the ‘grassland’ and ‘coniferous forest’ biomes, from the above figure.</b></p> <p><b>(c) Why is ‘F’ located at the given position in the graph?</b></p> <p>a) ‘X’ axis - Mean annual precipitation (cm) <math>\frac{1}{2} \times 2 = 1</math>  ‘Y’ axis - Mean annual temperature (0C)</p> <p>b) Grassland - B <math>\frac{1}{2} \times 2 = 1</math>  Coniferous forest - E</p> <p>c) The mean annual temperature ranges from -12 to 20C (error accepted <math>\pm 2</math>) and mean annual precipitation ranges from 10 - 125 cm, these are the optimum conditions in tundra biome <math>\frac{1}{2} \times 2 = 1</math></p>	3
12.	<p><b>Describe the inter-relationship between productivity, gross primary productivity and net productivity.</b></p> <p>Productivity is the rate of biomass production per unit area over a period of time</p> <p>Gross primary productivity is the rate of production of organic matter during photosynthesis in an ecosystem ,</p> <p>Net productivity is the gross primary productivity minus respiration losses (R) = 1+1+1</p>	3
13.	<p><b>The diversity of plants and animals is not uniform throughout the world but shows a rather uneven distribution. The largely tropical Amazonian rain forest in South America has the greatest biodiversity than temperate or polar areas. What is so</b></p>	3

	<p><b>special about tropics that might account for their greater biological diversity?</b></p> <ul style="list-style-type: none"> <li>- tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species diversification</li> <li>- (b) Tropical environments, unlike temperate ones, are less seasonal, relatively more constant and predictable. Such constant environments promote niche specialisation and lead to a greater species diversity and</li> <li>(c) There is more solar energy available in the tropics, which contributes to higher productivity; this in turn might contribute indirectly to greater diversity.</li> </ul> <p style="text-align: right;">1+1+1</p>	
14.	<p><b>a) An electrostatic precipitator in a thermal power plant is not able to generate high voltage of several thousands. Write the ecological implication because of it.</b></p> <p>Air Pollution // particulate matter / dust particles released in the air. 1m</p> <p><b>b) List four benefits to human life by eliminating the use of CFCs.</b></p> <p>(i) Delay in aging of skin (ii) Prevent damage to skin cells        (iii) Prevent skin cancer (iv) Prevent snow blindness / inflammation of cornea        (v) Prevent cataract (vi) Prevents ozone depletion (vii) Prevents global warming (viii) Reduces greenhouse effect (ix) Reduces odd climatic changes or El Nino effect (Any Four) = <math>\frac{1}{2} \times 4</math></p>	3
15.	<p><b>Explain the various steps involved in the production of artificial insulin.</b></p> <p>Two DNA sequences corresponding to A and B polypeptide chains of human insulin were prepared, these were introduced into E.coli to produce A and B chains separately, these chains were extracted and combined by creating disulphide bonds = 1+1+1</p> <p>OR</p> <p>a) Bt corn <math>\frac{1}{2}</math></p> <p>b) Cry I Ab/ Bt toxin gene codes for crystal protein; the Bt toxin protein exists as an inactive protein, but once an insect ingests it, it gets converted into an active</p>	3

	form due to the alkaline pH of the gut which solubilizes the crystal. The activated toxin binds to the surface of mid gut and creates pores that cause swelling, lysis and eventually death of the insect. $\frac{1}{2} \times 5 = 2\frac{1}{2}$	
16.	<p><b>Name and explain the technique that helps in the separation of DNA fragments for DNA recombinant technology experiments. How can these separated DNA fragments be visualised?</b></p> <p>Gel electrophoresis , Since DNA fragments are negatively charged , they move towards anode(under an electric field ) through a medium / matrix / agarose gel , The fragments separate (resolve) according to their size through sieving effect provided by agarose gel , The separated DNA fragments can be visualised after staining the DNA with ethidium bromide , followed by exposure to UV radiation</p> <p><math>[\frac{1}{2} \times 6 = 3 \text{ marks}]</math></p>	3
17.	<p><b>Doctors observed that a child is down with illness frequently. After several molecular diagnoses, they found that the child is suffering from lack of an enzyme which is essential for normal functioning of immune system. Name the enzyme and Why this enzyme is deficient in the body? Describe How it can be treated.</b></p> <p>Adenosine de aminase./due to the deletion of the gene for adenosine deaminase/bone marrow transplantation/enzyme replacement therapy-functional ADA is given to the patient by injection. /no cure permanently./ Gene therapy – permanent cure.</p> <p>6 X <math>\frac{1}{2}</math></p>	3
18.	<p><b>Describe how do ‘flocs’ and ‘activated sludge’ help in Sewage Treatment.</b></p> <p>Flocs - Aerobic microbes consume the major part of the organic matter in the effluent , significantly reduces BOD = 1 + 1</p> <p>Activated sludge - Small part of activated sludge is used as inoculum and pumped back to aeration tank / pumped into anaerobic sludge digesters where microbes or bacteria grow anaerobically to produce <math>\text{CH}_4</math> or <math>\text{H}_2\text{S}</math> or <math>\text{CO}_2</math> or biogas = 1</p>	3
19.	<b>(a) What is green revolution? Mention the steps that led to it.</b>	3

	<p><b>(b) Name the scientist whose contribution led to development of semi-dwarf wheat varieties in India.</b></p> <p>(a) Dramatic increase in food production (wheat and rice) during the mid 1960's is termed as Green Revolution = 1</p> <p>Various plant breeding techniques / better management practices / use of agrochemicals (fertilizers and pesticides) (Any two) = <math>\frac{1}{2} + \frac{1}{2}</math></p> <p>(b) Norman E. Borlaug = 1</p>	
20.	<p><b>a) In the table given below, select and enter one correct device out of the following Oral pill, condom, Copper T, Saheli, Vasectomy, Diaphragm, Tubectomy, Cervical cap</b></p> <p>a) Barrier = Diaphragm/ condom/cervical cap 1UD = Copper T Surgical technique = Vasectomy/Tubectomy Hormonal administrations = Oral pill/saheli (<math>\frac{1}{2} \times 4</math>) = 2</p> <p>b) Effective for longer duration</p>	3
21.	<p><b>Draw a labelled diagrammatic sectional view of a human seminiferous tubule.</b></p>  <p><i>(Any three correct labellings) = (1 × 3 = 3)</i></p>	3



22. **Explain the process of pollination in Vallisneria. How is it different in water-lily, which is also an aquatic plant ?**

3

In Vallisneria pollination takes place through water , the female flower reach the surface of water by long stalk , male flowers / pollen grain released on to the surface of water , carried passively by water current reaching the female flowers / stigma =  $\frac{1}{2} \times 4$   
 In Water lily pollination takes place through wind or insect , female flower emerges above the surface of water and gets pollinated =  $\frac{1}{2} \times 2$

### Section D

23. During a visit to a government office with his father, young Pratap saw dirty spittoons in every corner of the building. Some people were spitting paan and gutka through the window grills. As soon as he objected to their action, Pratap was scolded by some persons and the quarrel between the two parties became a matter of concern. The very next week Pratap was amazed to see the walls cleaned, no spittoons and a notification hung to maintain cleanliness and hygiene inside the office. The officer appreciated

4

Pratap.

- a) What values are promoted through the incident?
- b) Which diseases are transmitted through droplets and air?
- c) How does chewing paan or gutka cause health hazard?

1+1+1

Ans-a) Self Awareness, boldness, insight and commitment towards community health

Ans-b)



Ans-b)

Ans-c) Gutka contains heavy amounts of magnesium as well as calcium carbonate which are very toxic chemicals. High amounts of magnesium carbonate in the human body can cause respiratory and cardiac depression, while calcium carbonate or lime damages the mucosa, causing chronic mucosal injuries and ulcers in the mouth.

Apart from this, gutka can also cause hypertension and cause reproductive health dysfunction.

Possible problems: Hypertension and cardiovascular diseases, nervous system disorders, liver and kidney diseases, reproductive health dysfunctions, oro-dental problems, metabolic disorders including diabetes and obesity, and psychological disorders including addiction, can be caused by excessive consumption of gutka.

1+1+1

**Section E**

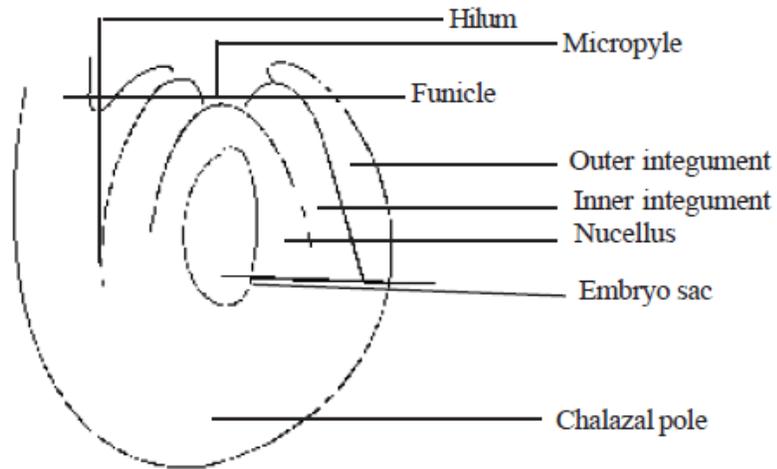
24

(a) Draw a longitudinal sectional view of a typical anatropous ovule to show the site where double-fertilization takes place. Label any four major parts of the ovule. (b) How do the male gametes that are present in the pollen grains reach the site mentioned by

5

you in part (a) to cause double fertilization?

A. (i)



(ii) Any four labels

Micropyle; Integument outer; Inner integument; chalazal pole; Nucellus; Hilum; Funicle; Micropyle ( $\frac{1}{2} \times 4$ ) = 2

(b) Pollen grain land on the stigma; emergence of pollen tube; growth of pollen tube in style; movement/ transfer of 2 male gametes into the pollen tube; entry of pollen tube in ovule through micropyle; pollen tube enters embryo sac/female gametophyte through synergids; pollen tube release 2 male gametes in the embryo sac; one gamete fuses with egg cell resulting in syngamy; the other male gamete fuses with 2 polar nuclei to form primary endosperm nucleus; results in double fertilization. (Open ended)

3

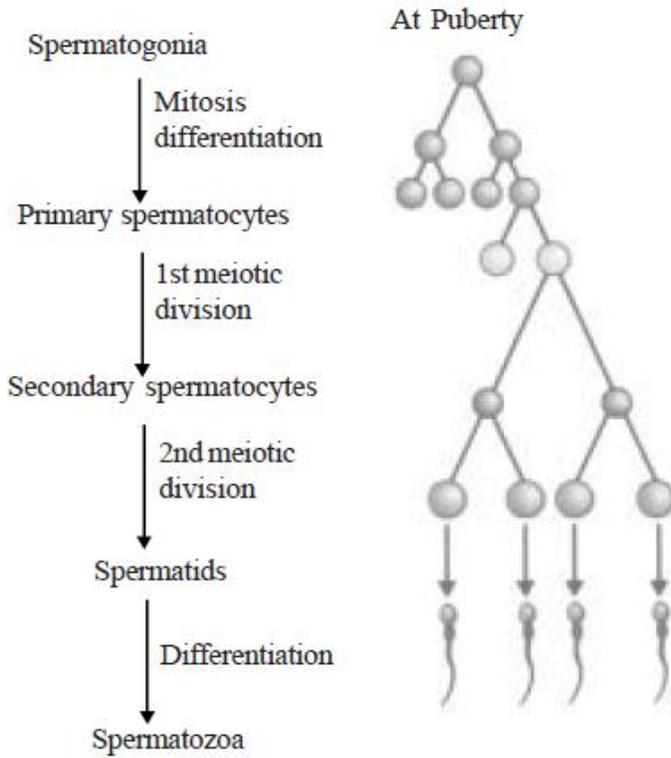
OR

(a) When and where does spermatogenesis in a human male begin to take place?

(b) With the help of schematic labelled diagrams trace the development of mature spermatozoa in a human male.

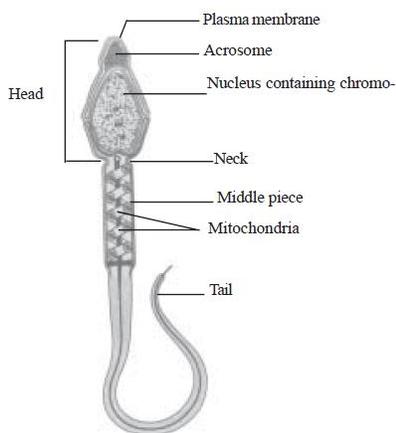
(c) Describe the structure of a human sperm.

(a) Puberty; in seminiferous tubules in testes 1



Schematic representation of Spermatogenesis

$\frac{1}{2} \times 4 = 2$



Structure of a sperm/description (1 + 1) = 2

25 (a) What precaution(s) would you recommend to a patient requiring repeated

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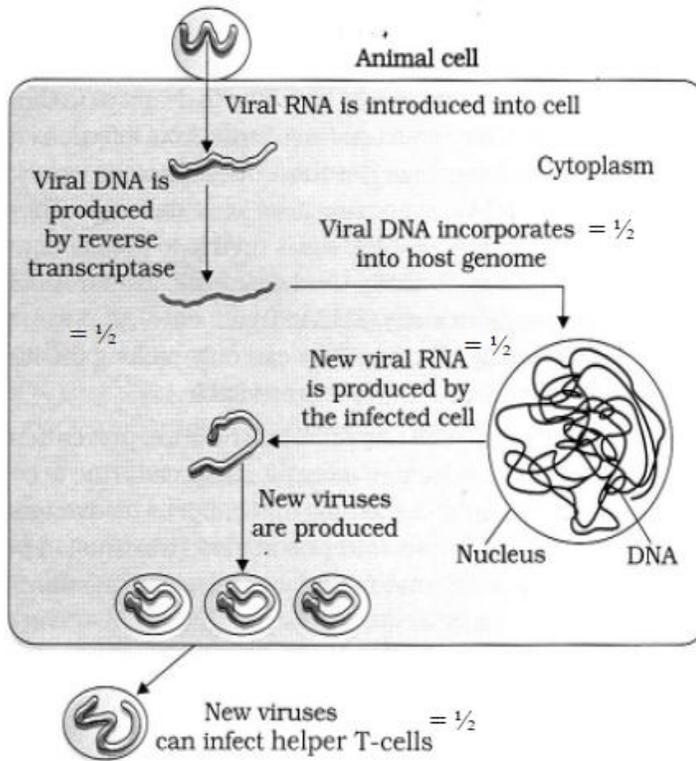
**blood transfusion?**

**(b) If the advice is not followed by the patient, there is an apprehension that the patient might contract a disease that would destroy the immune system of his/her body. Explain with the help of schematic diagram only how the immune system would get affected and destroyed.**

**(c) Name the type of immunity the colostrum provides to a newborn baby. Write giving an example where this type of immunity should be provided to a person.**

(a) Ensuring blood (from blood banks) is safe from HIV / screening blood for HIV / AIDS / Hepatitis / ensuring use of only disposable needles and syringes in (public and private) hospitals /clinic = 1

(b)



$(\frac{1}{2} \times 4 = 2)$

(c) Passive Immunity = 1

In case of infection by deadly microbes(tetanus) / snake bite where quick immune response is required = 1

	<p>OR</p> <p>Microbes Play a vital role in our day to day life. Explain how the following microorganisms are useful to us.</p> <p>a) <i>Streptococcus</i> - streptokinase- clot buster</p> <p>b) <i>Trichodermapolysporum</i> – cyclosporine A- Immuno suppressive agent</p> <p>c) <i>Monascuspurpureus</i> - blood cholesterol lowering agent</p> <p>d) Baculoviruses – act as biocontrol agent</p> <p>e) <i>Azospirillum</i>- act as biofertilisers 5 X 1=5</p>											
26	<p>Taking the example of a lake as a simple aquatic ecosystem, interpret how various functions of this ecosystem are carried out. Make a food chain that is functional in this ecosystem.</p> <table border="1" data-bbox="170 840 1404 1438"> <tr> <td>i) Productivity - conversion of inorganic into organic material with the help of solar energy by the autotrophs</td> <td><math>\frac{1}{2} \times 2 = 1</math></td> </tr> <tr> <td>ii) Energy flow - unidirectional movement of energy towards higher trophic level (and its dissipation and loss as heat to the environment)</td> <td><math>\frac{1}{2} \times 2 = 1</math></td> </tr> <tr> <td>iii) Decomposition - fragmentation, leaching, catabolism, humification, mineralization by bacteria, fungi and flagellates (abundant at the bottom of lake)</td> <td><math>\frac{1}{2} \times 2 = 1</math></td> </tr> <tr> <td>iv) Nutrient cycling - decomposition of dead matter to release the nutrients back to be re-used by the autotrophs</td> <td><math>\frac{1}{2} \times 2 = 1</math></td> </tr> <tr> <td>Food chain in aquatic ecosystem (lake)</td> <td>1</td> </tr> </table> <p>Phytoplanktons <math>\rightleftharpoons</math> Zooplanktons <math>\rightleftharpoons</math> Small fish <math>\rightleftharpoons</math> Big fish (Any other appropriate example)</p> <p>OR</p> <p>a) Colonization of a rocky terrain is a natural process. Mention the group of organisms which invade this area first. Give an example.</p> <p>b) Over the years, it has been observed that some of the lakes are disappearing due to urbanization. In absence of human interference, depict by making a flow chart, how do the successional seres progress from hydric to mesic condition.</p> <p>c) Identify the climax community of hydrarch and xerarch succession.</p>	i) Productivity - conversion of inorganic into organic material with the help of solar energy by the autotrophs	$\frac{1}{2} \times 2 = 1$	ii) Energy flow - unidirectional movement of energy towards higher trophic level (and its dissipation and loss as heat to the environment)	$\frac{1}{2} \times 2 = 1$	iii) Decomposition - fragmentation, leaching, catabolism, humification, mineralization by bacteria, fungi and flagellates (abundant at the bottom of lake)	$\frac{1}{2} \times 2 = 1$	iv) Nutrient cycling - decomposition of dead matter to release the nutrients back to be re-used by the autotrophs	$\frac{1}{2} \times 2 = 1$	Food chain in aquatic ecosystem (lake)	1	5
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Food chain in aquatic ecosystem (lake)	1											

	<p>a) Pioneer species, lichen</p> <p>b) Phytoplankton - hydric</p> <p style="text-align: center;">↓</p> <p>Submerged plant stage</p> <p style="text-align: center;">↓</p> <p>Submerged free floating plant stage</p> <p style="text-align: center;">↓</p> <p>Reed swamp stage</p> <p style="text-align: center;">↓</p> <p>Marsh - meadow stage</p> <p style="text-align: center;">↓</p> <p>Scrub stage</p> <p style="text-align: center;">↓</p> <p>Forest stage - Mesic</p> <p>c) Forest</p>	<p><math>\frac{1}{2} \times 2 = 1</math></p> <p><math>\frac{1}{2} \times 7 = 3\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>
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