11 Microbes and Human Welfare

- There is diversity in microbes which can not be seen by naked eyes. e.g. Protozoa, Bacteria, Fungi, Virus. Except some microbes many microbes are useful to mankind. These microbes are exploited in different ways for human welfare by the broad knowledge of modern biotechnology and genetic engineering.
- **Microbes in household products :**

  Some food materials which we take in our daily diet are obtained by microbial process. Likely curd from milk which is very old technique; dosa, idli, bread, pickle. Some of the traditional drinks, cheeze and fish, soybean and bamboos plays an important role for the food material products from these by microbes. It is termentation of carbohydrates in green plant tissue.

(1) Which organisms are necessary for genetic engineering and biotechnology ?

(A) Animals (B) Microbes (C) Plants (D) None of the above

(2) Which bacteria are useful to produce curd from milk ?

(A) Lacto streptococcus (B) Lacto bacillus (C) Lacto methanogens (D) Lacto coccus

(3) What is produced by LAB during curd formation from milk ?

(A) Base (B) Acids (C) Salt (D) All the above

(4) Which is the substrate digested by LAB in Milk ?

(A) Carbohydrates (B) Lipids (C) Proteins (D) Nucleic acids

(5) Which nutrient's quality is increased by Lactobacillus ?

(A) Vit - K (B) Vit - B_{12} (C) Vit - C (D) Vit - D

(6) Which is the correct option for the bacteria that provides protection from harmful bacteria in human stomach ?

(A) Lactobacillus (B) Azotobactor (C) Methanogens (D) Clostridium

(7) Which are the microbes used in fermentation to prepare Idli and Dosa ?

(A) Virus (B) Protozoa (C) Fungi (D) Bacteria

(8) Choose the correct match for uses of Lactic acid.

(A) It is useful to prepare curd from milk

(B) To increase quality of Vit - B_{12}

(C) In fermentation to prepare pickles

(D) All of the above

(9) Which is the fungi used to prepare bread ?

(A) *Aspergillus niger* (B) *Rhizopus nigricans*

(C) *Propioni bacterium* (D) *Saccharomyces cerevisiae*

(10) Which biomolecule is fermented to prepare ensilage (food for cattle) from green plants ?

(A) Lipid (B) Protein (C) Carbohydrates (D) Vitamins

(11) What is prepared by *Propioni bacterium sharmanii* ?

(A) Roquefort cheese (B) Brewer's Yeast (C) Swiss cheese (D) Toddy drink

Answers : (1-B), (2-B), (3-B), (4-C), (5-B), (6-A), (7-C), (8-D), (9-D), (10-C), (11-C)

- **Microbes in Industrial products :**
  - Many products useful to mankind are synthesized at commercial level through microbes e.g. beverages, antibiotics, carbonic acids, alcohol, enzymes, proteins, industrial chemicals, steroids, vaccines, amino acids, energy fuel etc.
  - Useful microbes are grown in large vessel on industrial scale. Wine, beer, whisky, brandy or rum like beverage are produced. *Saccharomyces cerevisae* yeast helps for the beverages. Ethanol is produced from creals and fruit juices with the help of this yeast. Methane which is used as a energy resource is produced by using methanogenic bacteria.
  - Antibiotics available from market are one type of chemicals. Penicillin is obtained from *Penicillium notatum*. Carbomycin, *bacitracin, fumagillin*, tetracycline are other antibiotics. Carbonic acids like citric acid, acetic acid, *butyric acid*, lactic acid, amino acid, enzymes, vitamins, steroids etc. are produced by bacteria and fungi.

(12) Which organism plays an important role in production of Ethanol ?

(A) LAB (B) *Saccharomyces cerevisiae*

(C) *Monoscus purpureus* (D) *Arabia gossipe*

(13) Which organisms are useful as energy resources ?

(A) Ethanogenic bacteria (B) *Acetobactor aceti*

(C) Methanogenic bacteria (D) *Clostridium butyricum*

(14) Which gas is produced as energy fuel by photosynthetic microbes ?

(A) N_2 (B) H_2 (C) CO_2 (D) O_2

(15) Which organism is used to produce Penicillin ?

(A) *Aspergillus niger* (B) *Acetobactor aceti*

(C) *Penicillium notatum* (D) *Clostridium butyricum*

(16) Which is not the correct option for antibiotics ?

(A) Carbomycin (B) Acetracin

(C) Fumagillin (D) Tetracycline

(17) Which organism is useful to prepare citric Acid ?

(A) *Aspergillus niger* (B) *Clostridium butyricum*

(C) *Acetobactor aceti* (D) *Lacttobacillus aceti*

(18) What is useful as immunosuppressive agent in Organtransplantation ?

(A) Cyclosporin (B) Cyclosporin a

(C) L - malic acid (D) L - Lysine

(19) For what streptokinase is used ?

(A) To remove oily stains from clothes. (B) To decrease cholesterol in blood.

(C) as immunosuppressive agent during organ transplantation in patients.

(D) to prevent blood clotting in blood vessels

(20) What is useful to decrease cholesterol level in blood ?

(A) *Streptococcus* (B) *Rhizopus nigricans*

(C) *Monoscus purpureus* (D) *Trichoderma polysporum*

(21) What is produced by *Arabia Gossipeae* ?

(A) Vit - B_{12} (B) Riboflavin (C) Lipase (D) Glucomylase

Answers : (12-D), (13-C), (14-B), (15-C), (16-B), (17-A), (18-B), (19-D), (20-C), (21-B)

- **Sewage treatment and microbes in production of biogas :**
  - Municipal or city waste water method for cleaning of urban sewage is known as sewage treatment. Such water is treated through heterotrophic bacteria which passes through the clearing process. Such plants are known as sewage treatment plants. Sewage treatment occurs in two phases.

    (1) Primary treatment process : Physical particles present in a sewage are removed through filtration and sedimentation. Which forms primary sludge.

    (2) Secondary treatment method : It is an aerobic process. These bacteria associated with filaments of molds present in the water and form flocks, Microbes, including bacteria consume organic matter present in effluent hence most amount of organic matter present in a water is utilized due to chemical reaction. So BOD of effluent decreases.
  - Biogas is the mixture of gases, which is used as fuel. Due to their anaerobic respiration like metabolic activities, such mixture of gases are produced in biogas plants. Biogas is known as gobar gas by the people also.

(22) Which are the processes used to remove floating debris and grit ?

(A) Filtration and Leaching (B) Filtration and Sedimentation

(C) Sedimentation and Distalization (D) Filtration and Distalization

(23) Choose the correct option for effluent.

(A) bottom water of sludge producd in primary treatment of STPs.

(B) Upper free water of sludge produced by Filtration and sedimentation.

(C) Remnant water of STP.

(D) Remnant water of activated sludge in STPs.

(24) Which is the biological process of STPs ?

(A) Distalization (B) Filtration (C) Secondary (D) Sedimentation

(25) Where does flocks-formation and flocks sedimentation occur ?

(A) In aeration tank, In effluent settling tank

(B) In anaerobic sludge digestor, Primary tank

(C) Primary tank, Secondary tank

(D) anaerobic sludge digestor, settling tank

(26) Which is the correct sequence for purification in STPs ?

(A) Effluent - Primary sludge - flocks - Activated sludge - Biogas

(B) Flocks - Activated sludge - Effluent - Biogas

(C) Primary sludge - Flocks - Activated sludge - Effluent - Biogas

(D) Primary sludge - Effluent - Flocks - Activated sludge - Biogas

(27) Which is the correct sequence to purify dirty water in cities ?

(A) Aerobic process - Physical process - Anaerobic process

(B) Physical process - Anaerobic process - Aerobic process

(C) Physical process - Aerobic process - Anaerobic process

(D) Anaerobic process - Aerobic process - Physical process

(28) Which are useful bacteria for biogas production ?

(A) *Streptococcus* (B) *Methanotrophs* (C) *Eubacteria* (D) *Methanogens*

(29) Which gas is not present in biogas ?

(A) H_2S (B) CH_4 (C) CO_2 (D) NO_2

(30) On which material bacteria act in biogas production ?

(A) Glycogen (B) Cellulose (C) Lignin (D) Suberin

(31) Which institute of India has put efforts to develop biogas technology ?

(A) IVRI (B) KVIC (C) IARI (D) B and C both

Answers : (22-B), (23-B), (24-C), (25-A) (26-D), (27-C), (28-D), (29-D), (30-B), (31-D)

- **Microbes as Biocontrol Agents and Biofertilisers :**
  - The factors which harm crops in the field of agriculture are normally consider as pest. Mainly insects from fungi, bacteria are important pests decreasing crop production. For their control many synthetic insecticides. Pesticides, fungicides chemicals are available in market. But there is pollution in soil, water, air due to heavy use of pesticides. Now, as an alternative to such chemicals, biochemicals are produced through biocontrol agents. By using such pesticides, natural balance (balance of ecosystems is maintained) *Bt*-Cotton by the help of *Bacillus thuringiensis*, *Trichoderma*, *Baculo viruses* etc act as bio controllers.
  - Biofertilizers are developed as alternative to the pollution. Causing chemical fertilizers. Bacteria, Fungi and Cyanobacteria are useful, microorganisms viz, *Rhizobium, Azospirillium* and *Azotobacter* like bacteria, *Glomus fungi, Anabaena*, Nostoc, Oscillatoria like autotrophs algae, etc.

(32) What is used to control nematodes in cereal crops, vegetables and fruits ?

(A) Fungicides (B) Weedicides (C) Bionemedicides (D) Pesticides

(33) Which Bioinsecticide is used to produce disease in insects and some arthropods ?

(A) *Pseudomonas* (B) *Trichoderma* (C) *Baculo virus* (D) *Rhizobium*

(34) Which organism produces Pest Quantum 4000 that is proved effective for cereals and vegetable crops ?

(A) *Pseudomonas* (B) *Cyanobacteria* (C) *Baculo virus* (D) *Trichoderma Fungi*

(35) Which group of organism is used as biofertilizer ?

(A) *Pseudomonas, Rhizobium, Trichoderma* (B) *Baculo virus, Azospirillum, Cyano bacteria*

(C) *Rhizobium, Azotobactor, Anabaena, Nostoc* (D) *Anabaena, Bacillus thurengiensis, Trichoderma*

(36) Mycorrhiza means...

(A) Symbiotic association of bacteria and fungi (B) Symbiotic association of fungi and plant

(C) Symbiotic association of bacteria and plant (D) None of the above

(37) Which group of organism is N_2 fixative ?

(A) *Azotobactor* and *Azospirillum* (B) *Anabaena* and *Nostoc*

(C) *Azotobactor* and *Oscillatoria* (D) *Azospirillum* and *Anabaena*

(38) Which is the correct option for free living and symbiotic fungi ?

(A) *Glomus* and *Azospirillum* (B) *Trichoderma* and *Glomus*

(C) *Glomus* and *Rhizopus* (D) *Trichoderma* and *Azospirillum*

(39) Which is the common organism for Flocks and Mycorihiza ?

(A) Bacteria (B) Fungi (C) Algae (D) Virus

(40) Which is not proper for Mycorrhiza ?

(A) Increases immunity. (B) Absorbs phosphorus from soil.

(C) Fixes free N_2 (D) Protects against salinity and drought.

(41) Which of the following group is autotrophic ?

(A) *Oscillatoria, Anabaena, Rhizopus*

(B) Nostoc, Aspergillus, Anabaena, Rhizopus

(C) Oscillatoria, Amoeba, Nostoc, Cyanobacteria

(D) Oscillatoria, Anabaena, Nostoc, Cyanobacteria

Answers : (32-C), (33-C), (34-A), (35-C), (36-B), (37-A), (38-B), (39-B), (40-C), (41-D)

- **True - False (T - F) Type questions :**

Choose the correct option for true and false statements.

(42) (1) Lactobacillus produces Lactic acid.

(2) Lactobacillus is useful to produce curd from milk.

(3) Lactobacillus increase quality of Vitamin K.

(4) Lactobacillus partially digests lipids.

(A) T, F, F, T (B) T, T, F, F (C) T, T, F, T (D) T, T, T, F

(43) (1) Organic matter and Microbes are present in sewage.

(2) Water is released into rivers after purification by autotrophic bacteria in sewage.

(3) Aerobic and anaerobic both type of bacteria are used in sewage treatment.

(4) Ethane, CO_2 and H_2S gases are produced in sewage treatment.

(A) T, F, T, T (B) T, F, F, F (C) T, F, T, F (D) F, T, F, T

(44) (1) Statins are obtained by *Trichoderma polysporum*.

(2) Statins are useful to decrease cholesterol level in blood.

(3) Cyclosporin A is used as an immunosuppressive agent in organ transplant.

(4) Riboflavin is obtained by *Rhizopus nigricans.*

(A) F, T, T, F (B) T, F, F, T (C) F, T, F, T (D) T, F, T, F

(45) (1) Biogas is produced by anaerobic bacteria.

(2) Methane is produced in more amount in biogas.

(3) Methanogens are present in lumen of cattle.

(4) Biogas is mixture of Methane, hydrogen sulphide and carbon dioxide.

(A) T, F, F, T (B) F, F, F, F, (C) T, F, T, T (D) T, T, T, T

(46) (1) Mycorrhiza absortbs sulphur from soil.

(2) Mycorrhiza is symbiotic association of *Trichoderma* fungi and plant.

(3) *Azospirillum* and *Azotobactor* fix N_2 during their symbiotic association.

(4) *Trichoderma* is free living fungi.

(A) F, F, F, T (B) T, T, T, F, (C) T, F, F, T (D) F, T, T, F

Answers : (42-B), (43-C), (44-A), (45-D), (46-A)

- **A - Assertion, R - Reason Questions :**

  Choose the correct option of the following :

  (A) A and R both are correct. R is the correct explanation of A.

  (B) A and R both are correct. R is not correct the explanation of A.

  (C) A - True, R - False

  (D) A - False, R - True

(47) Assertion A : Livorotatory lysin is a type of acid.

Reason R : Pickles are the result of citric acid fermentation of citrus fruits and vegetables.

(A) (B) (C) (D)

(48) Assertion A : Trichoderma helps the plants to obsorb phosphorus.

Reason R : Quantum - 4000 is prepared by Pseudomonas.

(A) (B) (C) (D)

(49) Assertion A : *Bacillus thurengiensis* is useful to control diseases in crops.

Reason R : Some species of fungi is also used to control diseases in plants.

(A) (B) (C) (D)

(50) Assertion A : Bacteria associated with filaments of molds prepare flocks.

Reason R : Upper free water of primary sludge is called effluent.

(A) (B) (C) (D)

(51) Assertion A : Enzyme Proteases are produced by microbes.

Reason R : Proteases are used to remove oily stains in laundry.

(A) (B) (C) (D)

(52) Assertion A : Photosynthetic microbes produces N_2.

Reason R : These microbes are able to convert solar energy into chemical energy.

(A) (B) (C) (D)

(53) Assertion A : As an alternative to chemical pesticides biochemicals are produced through biocontrol agents.

Reason R : By using biopesticides, natural balance is maintained.

(A) (B) (C) (D)

(54) Assertion A : Large amount of methanogens are present in dung of catlle.

Reason R : Cattle dung is useful in biogas

(A) (B) (C) (D)

(55) Assertion A : Ensilage is food for cattle.

Reason R : Ensilage is prepared by fermentation of proteins present in plants.

(A) (B) (C) (D)

(56) Assertion A : CyclosporinA is useful as immuno-suppressive agent in organtransplantation.

Reason R : CyclosporinA is obtained from *Trichoderma polysporum*.

(A) (B) (C) (D)

(57) Assertion A : LAB increases quality of Vit- B12

Reason R : Lactic acid is produced by Lactobacillus.

(A) (B) (C) (D)

Answers : (47-C), (48-D), (49-B), (50-B), (51-C), (52-D), (53-A), (54-A), (55-C), (56-B), (57-B)

(58) Choose the correct pair :

Column - I	**Column - II**	
(p) *Rhizobium*	(i) Leguminous plants	(A) p - i. q - ii, r - iii, s - iv
(q) *Anabaena*	(ii) Autotrophic N_2 fixative	(B) p - ii, q - i, r - iii, s - iv
(r) *Azotobactor*	(iii) Free living N_2 fixative	(C) p - iii, q - i, r - ii, s - iv
(s) *Glomus*	(iv) Absorption of phosphorus	(D) p - i, q - ii, r - iv, s - iii

(59) Choose the correct pair :

Column - I	**Column - II**
(p) BOD	(i) Food for animals
(q) Flocks	(ii) Association of bacteria and filament of molds
(r) Ensilage	(iii) To check pollution level in water
(s) Biogas	(iv) Anaerobic digestion of biological waste
(A) p - iii. q - ii, r - i, s - iv	(B) p - iv, q - i, r - ii, s - iii
(C) p - i, q - iv, r - iii, s - ii	(D) p - ii, q - i, r - ii, s - iii

(60) Choose the correct pair :

Column - I	**Column - II**	
(p) Streptokinase	(i) To prevent blood clotting	(A) p - i, q - ii, r - iii, s - iv
(q) Penicillin	(ii) To decrease cholesterol	(B) p-i, q - iv, r - ii, s - iii
(r) Statins	(iii) To decrease immunity	(C) p - ii, q - i, r - iii, s - iv
(s) Cyclosporin - A	(iv) Antibiotic	(D) p - iii, q - iv, r - ii, s - i

(61) Choose the correct pair :

Column - I	**Column - II**	
(p) Blue green algae	(i) Causes disease in Arthropods	(A) p - iv, q - i, r - ii, s - iii
(q) Baculo virus	(ii) To increase organic matter in soil	(B) p - i, q - ii, r - iii, s - iv
(r) *Bacillus thurengiensis*	(iii) Bio control agent	(C) p - ii, q - i, r - iv, s - iii
(s) *Trichoderma*	(iv) Produces toxins	(D) p - iii, q - iv, r - i, s - ii

(62) Choose the correct pair :

Column - I	**Column - II**	
(p) *Cyanobacteria*	(i) N_2 fixation	(A) p - iv, q - iii, r - i, s - ii
(q) *Pseudomonas*	(ii) Biogas	(B) p - iii, q - ii, r - iv, s - i
(r) *Rhizobium*	(iii) Biofertilizer in Paddy fields	(C) p - ii, q - iv, r - i, s - iii
(s) *Methanogens*	(iv) Quantum - 4000	(D) p - iii, q - iv, r - i, s - ii

(63) Choose the correct pair :

Column - I	**Column - II**	
(p) *Aspergillus niger*	(i) Butyric Acid	(A) p - ii, q - iii, r - iv, s - i
(q) *Clostridium butyricum*	(ii) Acetic Acid	(B) p - iv, q - i, r - ii, s - iv
(r) *Acetobactor aceti*	(iii) Lactic Acid	(C) p - iii, q - ii, r - i, s - iv
(s) *Lactobacillus*	(iv) Citric Acid	(D) p - i, q - ii, r - iv, s - iv

(64) Choose the correct pair :

Column - I	**Column - II**	
(p) CyclosporinA	(i) *Rhizopus nigricans*	(A) p - iv, q - ii, r - i, s - iii
(q) Hydroxy progesterone	(ii) *Monoscus purpureus*	(B) p - iii, q - i, r - ii, s - iv
(r) Statins	(iii) *Arabia gossipiae*	(C) p - iv, q - i, r - ii, s - iii
(s) Riboflavin	(iv) *Trichoderma polysporum*	(D) p - iii, q - i, r - iii, s - ii

Answers : (58-A), (59-A), (60-B), (61-C), (62-D), (63-B), (64-C)

- **Questions for NEET :**

(65) Which organism is useful to prepare biofertilizer ?

(A) Azolla (B) E. coli (C) Spirogyra (D) Cassia

(66) Scientist who invented antibiotic ..... .

(A) Louis Pasteur (B) R. Koch (C) W. Fleming (D) A. Fleming

(67) BOD is measurement of what ?

(A) Organic matter present in water

(B) Industrial waste present in waterbodies

(C) amount of CO combined with Hb

(D) amount of O_2 necessary for plants during night

(68) Choose the correct match for BOD.

(A) Microbes (B) Organic matter

(C) Microbes and Organic matter (D) None of the above

(69) The BOD of polluted water is ..... than norml water.

(A) more (B) less (C) normal (D) zero

(70) Which bacteria helps in production of biogas ?

(A) *Methanogens* (B) *Methanotrophs* (C) *Organotrophs* (D) *Eubacteria*

(71) Which is appropriate pair of the following ?

(A) Rhizobium - Parasite living on Leguminous plants

(B) Mycorrhiza - Enables phosphorus to plants

(C) Yeast - Production of biogas

(D) Slime mold - Ringworm disease

(72) Which is inappropriate pair of the following ?

(A) Yeast - Ethanol (B) *Penicillium* - Penicillin

(C) Methanogens - Biogas (D) *Streptococcus* - Statins

(73) Bio-fertilizer means ...

(A) Cow dung and agricultural waste (B) Crop showing rapid growth

(C) Anabaena and Nostoc (D) None of the above

(74) *Bacillus thurengiensis* is useful for production of ..... .

(A) Bio insecticids (B) Biofertilizer

(C) Bio metalogical method (D) Biomineralization

(75) Which is the character of Bt-Cotton ?

(A) Immunity is more (B) Medium production and long fibres

(C) Long fibre and more production (D) Clustaceary and molo-meshy inhibitor

(76) Constituents of Biogas

(A) 50 - 70 % CH_4 (B) Less CH_4

(C) 30 - 40 % CH_4 (D) 80 % C_2 H_6

(77) In which of the following country Alcohol is used as fuel ?

(A) Germany (B) U.S.A. (C) Brazil (D) China

(78) Which of the following provides energy and fertilizer ?

(A) Petrocrop (B) Biogas (C) Energ crop (D) All of the above

(79) By which process products like Cheese and Toddy are obtained ?

(A) Distillation (B) Pasteurization (C) Fermentation (D) Dehydration

(80) *Azotobacter* and *Azospirillum* are examples of what ?

(A) Symbiotic N_2 fixatives (B) Free living N_2 fixative

(C) Decomposers (D) Pathogens

Answers : (65-A), (66-D), (67-A), (68-C), (69-A), (70-A), (71-B), (72-D), (73-C), (74-A), (75-A), (76-A), (77-C), (78-B), (79-C), (80-B)

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