Kamla Nehru Mahavidyalaya, Nagpur
Department of Biotechnology
MCQ Question Bank
B.Sc. VI Sem Paper I

Wastewater Treatment (Paper I Unit I)

1. Screening and comminution are preliminary treatment processes.
a) True
b) False

Answer: a
Explanation: Screening and comminution are preliminary treatment processes utilized to protect mechanical equipment in the treatment works, to aid downstream treatment processes by intercepting unacceptable solids and to alter the physical form of solids so they are acceptable for treatment.

2. _____ devices remove materials which would damage equipment or interfere with a process.
a) Grit
b) Screening
c) Oxidation
d) Reduction

Answer: b
Explanation: Screening devices remove materials which would damage equipment or interfere with a process or piece of equipment. Screening devices have a varied application of wastewater treatment facilities.

3. _____ represents the heavier inert matter in wastewater.
a) Debris
b) Waste
c) Screens
d) Grit

Answer: d
Explanation: Grit represents the heavier inert matter in wastewater which will not decompose in treatment processes. It is identified with matter having a specific gravity of about 2.65 and design of grit chambers is based on the removal of all particles of about 0.011 inch or larger (65 mesh).

4. Supplemental means of aeration are often employed with an equalization basin to provide better mixing.
a) True

b) False

Answer: a
Explanation: supplemental means of aeration are often employed with an equalization basin to provide better mixing, chemical oxidation of reduced compounds, some degree of biological oxidation, agitation to prevent suspended solids from settling.

5. Which of the following should be provided in the case where aeration is absent?
a) Screening devices
b) Mechanical mixers
c) Grit removers
d) Sedimentation tank

Answer: b
Explanation: If aeration is not provided, baffles or mechanical mixers must be provided to avoid stratification and short circuiting in equalization basins. The size and shape of an equalization facility will vary with the quantity of waste and the patterns of waste discharge.

6. Which process is employed to gain sufficient head for the wastewater?
a) Screening
b) Pumping
c) Oxidation
d) Fermentation

Answer: b
Explanation: Pumping facilities may be employed to gain sufficient head for the wastewater to flow through the treatment works to the point of final disposal. Pumping is also generally required for recirculation of all or part of the flow around certain units within the plant. Pumping facilities are classified as influent, effluent, or recirculation stations and perform a critical function.

7. What is the most common used coagulant?
a) Alum
b) Ferric sulphate
c) Limestone
d) Coal

Answer: a
Explanation: Sedimentation using chemical coagulation has been implied mainly to pre-treatment of industrial or process wastewaters and removal of phosphorus from domestic wastewaters. Alum is mostly used as it is cheap and easily available.

8. What is the intermediate zone composed of in aerobic-anaerobic ponds?
a) Algae
b) Aerobic bacteria
c) Facultative bacteria
d) Organic solids

Answer: c
Explanation: Aerobic-anaerobic ponds consist of three zones: a surface zone of algae and aerobic bacteria in a symbiotic association; an intermediate zone populated with facultative bacteria

(aerobic or anaerobic); and an anaerobic bottom zone where settled organic solids are decomposed by anaerobic bacteria.

9. Nitrification efficiency is significantly suppressed as the temperature is _____
a) Increased
b) Decreased
c) Neutral
d) Maintained

Answer: b
Explanation: Two important considerations in nitrification are the maintenance of a proper pH and temperature. Nitrification is a very temperature-sensitive system and the efficiency is significantly suppressed as the temperature decreases.

10. _____ is a process which involves further removal of the nitrogen.
a) Nitrification
b) Denitrification
c) Ammonification
d) Reduction

Answer: b
Explanation: As with nitrification, denitrification is a process which involves further removal of the nitrogen by conversion of the nitrate to nitrogen gas. This represents a process for the ultimate removal of nitrogen from wastewater.

11. In rotating biological contractors, what percent of corrugated plastic discs are submerged?
a) 20
b) 50
c) 80
d) 40

Answer: d
Explanation: In the process of rotating biological contractors, the large diameter corrugated plastic discs are mounted on a horizontal shaft and placed in a tank. The medium is slowly rotated with about 40 percent of the surface area always submerged in the flowing wastewater

12. In the activated sludge process

- (A) Aeration is continued till stability
- **(B) Aeration is done with an admixture of previously aerated sludge**
- (C) Sludge is activated by constant stirring
- (D) Water is removed by centrifugal action

13. The grit chambers of sewage treatment plants, are generally cleaned after

- (A) 2 days
- (B) 7 days

(C) 12 days

(D) 14 days

14. The asbestos cement sewers are

(A) Light in weight

(B) Not structurally strong to bear large compressive stress

(C) Susceptible to corrosion by sulphuric acid

(D) All the above

15. The coagulant which is generally not used for treating the sewage, is

(A) Alum

(B) Ferric chloride

(C) Ferric sulphate

(D) Chlorinated coppers

16. The gas which may cause explosion in sewers, is

(A) Carbondioxide

(B) Methane

(C) Ammonia

(D) Carbon monoxide

17. Pick up the incorrect statement from the following:

(A) The process of decomposing the organic matter under controlled anaerobic conditions, is called sludge digestion

(B) Sludge digestion is carried out in sludge tank

(C) The gases produced in sludge digestion process, contain 75% carbon dioxide

(D) The gases produced in sludge digestion process, contain 75% methane

18. The more oxidizable organic material, the lesser the BOD.
A. True
B. False
Answer: B

Clarification: The magnitude of the BOD is related to the amount of organic material in the wastewater-i.e., the more oxidizable organic material, the higher the BOD.

19. Which of the following is a strict anaerobe?
A. Enterobacter
B. Alcaligenes
C. Pseudomonas
D. Methanosarcina

Answer: D

Clarification: Methane producers are strict anaerobes e.g., Methanobacterium, Methanosarcina, Methanococcus. They produce methane and carbon dioxide as end products.

20. In which of the following treatment involve oxidation of organic constituents of the wastewater?
A. Primary treatment
B. Secondary treatment
C. Advanced treatment
D. Final treatment

Answer: B

Clarification: Secondary or biological treatment is done to adsorb and ultimately oxidize organic constituents of the wastewater, i.e, to reduce the BOD.

21. The upper region of the trickling filter is favorable for the growth of _____
A. fungi
B. protozoa
C. algae
D. bacteria

Answer: C

Clarification: The upper region of the trickling filter is favorable for the growth of algae, and at times their growth may become so extensive that it impairs the operation of the filter.

22. Activated sludge usually employs an aeration period of_____
A. 1 hour
B. 24 hours
C. 10-15 hours
D. 4-8 hours

Answer: D

Clarification: The activated sludge process usually employs anaeration period of 4 to 8 hours, after which the mixture is piped toa sedimentation tank.

23. Oxidation ponds are very deep ponds.
A. True
B. False

Answer: B

Clarification: Oxidation ponds also called lagoons are shallow ponds which are 2 to 4 ft in depth designed to allow algal growth on the wastewater effluent.

24. Trickling filter is used in which of the following waste water treatment processes?
A. Primary treatment
B. Secondary treatment
C. Advanced treatment
D. Final treatment

Answer: B

Clarification: The trickling filter is used in secondary treatment in which a stationary microbial culture is fed by a continuous supply of nutrients. It is used for filtration processes.

25. Belt filter presses are used in which of the following process?
A. Thickening
B. Stabilization
C. Dewatering
D. Disposal

Answer: C

Clarification: Dewatering is done by vacuum filters, belt filter presses and centrifuges and is often enhanced by the addition of polymer or other chemical coagulant aids.

26. Which of the following gases are produced in large amounts during sludge digestion?
A. methane
B. carbon-dioxide
C. hydrogen
D. nitrogen

Answer: A

Clarification: About 60-70% methane is produced during sludge digestion with smaller amounts of carbon dioxide, hydrogen and nitrogen.

27. The term 'Sullage' refers to:
a) Fresh wastewater
b) Septic wastewater
c) Wastewater from kitchen, laundry
d) Toxic wastewater

Answer: Wastewater from kitchen, laundry

28. Wastewater can become septic by the loss of:
a) Dissolved oxygen content
b) Carbon content
c) Organic compounds
d) Water content

Answer: Dissolved oxygen content

29. One of the major objectives of water treatment plants is the removal of turbidity.
a) True
b) False

Answer: True

30. Which of the following is the main source of eutrophication?
a) Effluent quality
b) Nitrogen
c) Salty water
d) Pure water

Answer: b

Clarification: Nitrogen contamination is the main source of eutrophication of surface water, during microbiological examination, the relative concentration of organism at the time of stress is useful in determining the changes in effluent quality of water, salty water is found abundantly in seas, pure water doesn't contain any impurities, however these does not cause eutrophication.

31. Which of the following organisms represent the natural living style as biofilms?
a) Microbial communities

b) Fungi
c) Protozoa
d) Animals

Answer: a

Clarification: Biofilms represent the natural living style of Microbial communities, fungi grow by producing mycelium, protozoa and animals don't grow by forming biofilms.

32. The biofilms can be engineered for bio degradation and biotransformation.
a) True
b) False

Answer: a

Clarification: The biofilms play a very important in the bio-geochemical cycles of the environment and it can be genetically modified for degradation of persistent pollutants in the environment i.e. it can be used for can be engineered for biodegradation and bio transformation.

33. Pathogens can be removed by action of microbial biofilms.
a) True
b) False

Answer: a

Clarification: Pathogens from waste water can be removed by action of microbial biofilms as they grow using them as the carbon source.

34. _____ method is used for water disinfection.
a) Chlorination
b) Floatation
c) Flocculation
d) Filtration

Answer: a

Clarification: Chlorination is a method which is used for water disinfection by adding chlorine to the water whereas floatation is the method in which solids float in the water, flocculation is a method of sedimentation and filtration is a physical method of separation.

35. Which of following physical methods cannot be used for treatment of waste water?
a) Sedimentation
b) Floatation
c) Filtration
d) Chlorination

Answer: d

Clarification: Chlorination is a chemical process used for treatment of water whereas sedimentation, floatation, filtration is a physical method for waste water treatment.

36. Efficient wastewater treatment is done by segregating various waste streams and treating them separately.
a) True
b) False

Answer: a

Clarification: Efficient wastewater treatment is done by segregating various waste streams and treating them separately using various waste water treatment techniques before mixing together for final treatment.

37. Reverse osmosis is used in the treatment of waste water to remove the suspended solids from the water.
a) True
b) False

Answer: a

Clarification: Reverse osmosis is reverse process of osmosis in which water moves from higher concentration to lower concentration through semi permeable membrane and then there is a movement from high solute concentration to low solute removing suspended solids from the water.

38. Bioaugmentation involves

(a) eliminating sludge

(b) plants usage for bioremediation

(c) addition of microbes to a cleanup site

(d) bioventing

Answer: (c)

39. This cleanup approach includes removal of groundwater or soil from its natural setting to permit for bioremediation

(a) Bioaugmentation

(b) in situ bioremediation

(c) ex situ bioremediation

(d) Phytoremediation

Answer: (c)

40. At this stage of wastewater treatment, methanogenic microbes are the most significant

(a) Sludge digestion

(b) Primary treatment

(c) Secondary treatment

(d) Biological oxidation

Answer: (a)

41. This bioremediation technique includes mixing contaminated water and soil, fertilizers and carbon dioxide in a bioreactor to stimulate biodegradation

(a) Composting

(b) Slurry-phase bioremediation

(c) In situ hybridization

(d) Biopile treatment

Answer: (b)

42. Bioremediation

(a) usage of microbes to create new organisms

(b) usage of anaerobic bacteria to create new antibiotics

(c) usage of microbes to destroy environmental pollutants

(d) usage of aerobic bacteria to create new vaccines

Answer: (c)

43. Ananda Chakraborty received the first U.S. patent for a GM entity. The entity was

(a) The GloFish

(b) a transgenic mouse expressing the growth hormone gene

(c) Cloned E.Coli

(d) Pseudomonas engineered to degrade petroleum

Answer: (d)

44. A process using microbes to convert toxic industrial wastes to less toxic or non-toxic compounds is

(a) Precipitation

(b) Complement fixation

(c) Bioconversion

(d) Bioremediation

Answer: (d)

45. _____ bacterium can withstand the dosage of radiation, which are several times higher than what human cells can tolerate

(a) *Escherichia coli*

(b) *Conus magus*

(c) *Deinococcus radiodurans*

(d) *Staphylococcus aureus*

Answer: (c)

46. The bioremediation process involving the usage of plants to degrade pollutants is

(a) Composting

(b) Biopile

(c) Phytoremediation

(d) Land farming

Answer: (c)

47. This is not an indigenous microbe used for bioremediation

(a) *Pseudomonas aeruginosa*

(b) *Piscirickettsia salmonis*

(c) *Phanerochaete sordida*

(d) *E. coli*

Answer: (b)

48. The bioremediation process involving the usage of plants to degrade pollutants is _____

A) Composting
B) Biopile
C) Phytoremediation

S) Land farming
Answer: C

49. Which of the following is not an indigenous microbe used for bioremediation ?
A) Pseudomonas aeruginosa
B) Piscirickettsia salmonis
C) Phanerochaete sordida
D) E. coli
Answer: B

50. Bioaugmentation involves _____
A) eliminating sludge
B) plants usage for bioremediation
C) addition of microbes to a cleanup site
D) bioventing
Answer: C

51. Which cleanup approach includes removal of groundwater or soil from its natural setting to permit for bioremediation?
A) Bioaugmentation
B) in situ bioremediation
C) ex situ bioremediation
D) Phytoremediation
Answer: C

52. Ananda Chakraborty received the first U.S. patent for a GM entity. The entity was _____
A) The GloFish
B) a transgenic mouse expressing the growth hormone gene
C) Cloned E.Coli
D) Pseudomonas engineered to degrade petroleum
Answer: D

53. In-situ based bio remediation involves introducing _____ to contaminated areas.
A) Oxygen and nutrients
B) Carbon dioxide and methane
C) Nitrogen and CO2
D) CO and methane
Answer: D

54. Which of the following major technique is not employed during in-situ bioremediation?
A) Biosparging,
B) Bioventing
C) Injection recovery
D) Bio-luminescence
Answer: D

55. Which of the following is used in bio degradation of xenobiotics?
A) Enzymes

B) Chemicals
C) Physical sorting
D) PAHs
Answer: A

56. During which stage of wastewater treatment are methanogenic microbes most important?
A)Primary treatment
B)Sludge digestion
C)Biological oxidation
D)Secondary treatment
Answer : B

57. A process using microbes to convert toxic industrial wastes to less toxic or non-toxic compounds is _____
A) Precipitation
B) Complement fixation
C) Bioconversion
D) Bioremediation
Answer: D

58. Which bacterium can withstand the dosage of radiation, which are several times higher than what human cells can tolerate.
A) Escherichia coli
B) Conus magus
C) Deinococcus radiodurans
D) Staphylococcus aureus
Answer: C

59. To increase the speed and efficiency of Soil banking method _____ is used.
A) Engineered biopiling
B) Soil slurry bioreactors
C) Land farming
D) Bio-sparging
Answer: A

60. What is the preferable range of temperature for bioremediation by soil microorganisms?
A) 0-50 °C
B) 50-60 °C
C) 80-100 °C
D) 120-150 °C
Answer: A

61. Which of the following type of soil is suitable for soil remediation?
A) Peaty Soil
B) Sandy soil
C) Less or no organic content soil
D) Soil with gravels
Answer: A

62. Which of the following treatment options is not suitable for areas where contaminants don't cause a potential harm to human health and the environment?
A) Natural attenuation
B) Passive remediation
C) Bio attenuation
D) Live attenuated
Answer: D

63. What is the uses of Bioremediation ?
A) microbes to create new organisms
B) anaerobic bacteria to create new antibiotics
C) microbes to destroy environmental pollutants
D) aerobic bacteria to create new vaccines
Answer: C

64. Which of the following compound gets accumulated as a result of degradation by the anaerobic microorganisms?
A) Liquid Nitrogen
B) Crude oil
C) Oxygen
D) Nitrogen
Answer: B

65. _____ technique is usually done within the earthwork banking that has been constructed.
A) Land farming
B) Bio sparging
C) Bio-accumulation
D) Bio-degradation
Answer: A

66. Which of the following process is not involved in the pretreatment stage of land farming?
A) Soil excavation
B) Soil screening
C) Storage
D) Bio-magnification
Answer: D

67. In Soil slurry reactor, the slurry is thickened and dewatered using _____
A) Clarifiers
B) Biosparging
C) Bio-accumulation
D) Bio-degradation
Answer: A

68. Which of the following is the best method to degrade xenobiotic compounds?
a) Microbial degradation
b) Chemical degradation

c) Water degradation
d) Physical agents

Answer: a
Explanation: Microbial degradation is the best method to degrade xenobiotic compounds founds in disposal pits, sewage treatment plants etc., as the microorganisms are used to degrade xenobiotic compounds is the best method. It can degrade all the pollutants efficiently, thereby causing no harm to the environment. Chemical degradation is harmful to the environment, water degradation doesn't remove any pollutants and using physical agents it is very difficult to remove or separate the pollutants.

69. Which of the following doesn't use microbial degradation method?
a) Sewage sludge
b) Pesticide disposals
c) Polluted water
d) Redox potential

Answer: d
Explanation: Redox potential, pH, ion concentration and temperature are the factors that influence the decomposition of xenobiotic compounds and is not a system that helps degrade the pollutants using microorganisms, whereas, sewage sludge, pesticide disposals and polluted water uses microbial degradation method to degrade xenobiotic compounds.

70. Which of the following microbes are known to degrade xenobiotic compounds?
a) Planktonic algae
b) Cyanobacteria
c) Fungi
d) Goldfish

Answer: d
Explanation: Goldfish is not a microbe which can be used to degrade the pollutants present in various wastes, whereas, Planktonic algae, cyanobacteria, fungi, protozoa, bacteria etc., are the microbes used to degrade xenobiotic compounds. Also, it can degrade all the pollutants efficiently, thereby causing no harm to the environment.

71. Which of the following fungi is not known to degrade DDT insecticide?
a) *Aspergillus niger*
b) *Mucor alternans*
c) *Penicillium sp.*
d) *Bacillus cereus*

Answer: d
Explanation: *Bacillus cereus* is a bacterium which is known to degrade DDT insecticide but it is not a fungus, whereas, *Aspergillus niger, Mucor alternans, Penicillium sp.* are the fungi that are known to degrade DDT insecticide. As the microorganisms are used to degrade xenobiotic

compounds, it is the best method. It can degrade all the pollutants efficiently and don't cause any harm to the environment.

72. Which of the following bacteria is not known to degrade Aldicarb insecticide?
a) *E. coli*
b) *P. putida*
c) *Bacillus sp.*
d) *Mucor sp.*

Answer: d
Explanation: *Mucor sp.* is a particular type of fungi that can degrade Aldicarb insecticide, *E. coli, P. putida, Bacillus sp.* are bacteria that help in degradation Aldicarb insecticide. Biological methods are usually the best method to degrade xenobiotic compounds or any type of insecticide. The microorganisms used can degrade all the pollutants efficiently and don't cause any harm to the environment.

73. *Sphingomonas paucimobilis* can degrade which of the following toxic compound?
a) Lindane
b) Carbon dioxide
c) Lithium
d) Magnesium

Answer: a
Explanation: Lindane is the toxic compound that can be degraded by *Sphingomonas paucimobilis*, and it can effectively degrade it into simple compounds which are not harmful to the environment. Also, *Sphingomonas paucimobilis* can effectively degrade HCH i.e. Hexachlorocyclohexane molecule which is known to be more toxic. Carbon dioxide, Lithium and Magnesium are not toxic to the environment as Lindane.

74. Which of the following microbes can degrade carbaryl most efficiently?
a) *Pseudomonas melophthora*
b) *Sphingomonas paucimobilis*
c) *P. putida*
d) *E. coli*

Answer: a
Explanation: *Pseudomonas melophthora* is known to degrade carbaryl most efficiently and thereby degrading it to several metabolites, decreasing their toxicity and harm to the environment. Lindane can be degraded by *Sphingomonas paucimobilis*. Whereas, *E. coli, P. putida, Bacillus sp.* are bacteria that help in degradation Aldicarb insecticide.

75. Pyrethroids are susceptible to microbial degradation.
a) True
b) False

Answer: a
Explanation: Degradation of toxic compounds, particularly the toxic ones and the hydrocarbon are co-metabolic in nature. Pyrethroids are known to be highly unstable chemicals and hence, they are mostly susceptible to microbial degradation, also, can be degraded by chemical hydrolysis.

76. Which of the following system is affected by pyrethroids?
a) Ovulation
b) Circulatory system
c) Nerves
d) Digestive system

Answer: a
Explanation: Pyrethroids usually affects ovulation in females, they harm the ovules and the follicular cells by decreasing their number. They also affect oocytes and various female endometrial glands. But the molecule doesn't interfere with the activity of the ionic permeability of nerve cell membranes, or circulatory system or digestive system. These are certainly not affected by the pyrethroids or any micro pollutants.

77. Tolerant cyanobacteria strain has higher esterase activity.
a) True
b) False

Answer: a
Explanation: The tolerant strain of cyanobacteria, developed due to extended exposure to high levels of insecticide concentrations, usually show high esterase activity than the strains that are usually sensitive. Cyanobacteria *Anabaena sp.* are known to degrade Pyrethroids with high efficiency.

B.Sc. VI Sem Paper I Unit II MCQ's

1.Biological magnification is caused by poisons/chemicals that can be broken down by organisms…

True

False

2.Which ends up with the most poison/chemicals due to biological magnification?

a. Producers,
b. **Organisms of a high trophic level**,
c. Organisms of a low trophic level,
d. Tertiary consumers

3.Chemicals/poisons that accumulates through biomagnification cannot be excreted

True

False

4.Examples of non-biodegradable chemicals:

a) DDT, PCBs, and dieldrin
b) Cellulose, starch and glycogen
c) Amylase, pepsin and protease

5.Ppm means:

a) Photosynthetic particle mass
b) Parts per meter
c) Particles per million
d) **Parts per million**

6.Bioaccumulation is measured by parts per million (ppm)

True

False

7.What is the other way of saying "Biological Magnification?"

a) Biological build-up

b) Biomultiplication
c) Bioaccumulation
d) Biological enlargenment

8. The amount of toxicants and chemicals that accumulates in the ecosystem after the transfer is called as _____
a) Bio accumulated
b) Bio-polluted
c) Bio hazard
d) Bio degradation

Answer: a

Explanation: Bio accumulated is the term used for the amount of toxicants and chemicals that accumulates in the ecosystem after the transfer between various subsystems of the ecosystem whereas bio hazard is the term used for describing something the ill effects of a pollutant, bio polluted is the pollution caused by biological things, biodegradation is the breaking down of organic compounds by microorganisms.

9. Volatilization is the main pathway through which the toxicant returns to the air.
a) True
b) False

Answer: a

Explanation: Volatilization is the pathway through which the toxicant returns to the air from its source.

10. The chemicals get accumulated in the subsystems of ecosystem and gets transferred at specific transfer rates.
a) True
b) False

Answer: a
Explanation: The chemicals or the toxicants get accumulated in the subsystems of ecosystem like air, water and soil and are exchanged between at specific transfer rates.

11. The chemical escapes into the environment through excretion and exudation.
a) True
b) False

Answer: a

Explanation: The chemical can escape from the food chain and enter into the environment through excretion and exudation

12. Upon which of the following factors the accumulation kinetics depend?
a) Accumulation phase
b) Steady-state
c) Elimination phase
d) Toxicant concentration

Answer: d

Explanation: The concentration of the toxicant is very much dependent upon the accumulation of xenobiotics, whereas, in aquatic organism, bio accumulation of toxic materials in organisms occurs via several phases like Accumulation phase, Steady-state, Elimination phase.

13. Beyond a certain concentration range the accumulation kinetics is not altered.
a) True
b) False

Answer: a

Explanation: An increase in the concentration beyond a particular limit doesn't affect the accumulation kinetics of the toxicant.

14. Which of the environmental condition is not favorable of the toxicant accumulation?
a) Nutrient load
b) Temperature
c) Biochemical degradation
d) pH

Answer: c
Explanation: The toxicant accumulation depends upon certain environmental conditions like Nutrient load, Temperature, pH, whereas, biochemical degradation is the degradation of bio-accumulated chemicals stored in the organism and hence, is not an environmental factor.

15. Which of the following factors can influence the physio chemistry of membrane lipids, hence, affecting the rate of Bio accumulation?
a) Temperature
b) Pressure
c) Food type
d) Size of animal

Answer: a
Explanation: Temperature can affect the rate of toxicant uptake by influencing the physio chemistry of membrane lipids, whereas, the physio chemistry is not affected by pressure, food type and Size of animal.

16. Elimination of one species affects the energy transfer in the biota.
a) True
b) False

Answer: b
Explanation: Elimination of one species does not lead to discontinuity in the matter and also, does not affect the energy transfer in the biota.

17. Metabolically active organisms accumulate more amount of toxicant.
a) True
b) False

Answer: a
Explanation: Metabolically active organisms accumulate more amount of toxicant as it gets accumulated by active membrane transport particularly those toxicants which are either metals or charged ion.

18. Sometimes bio accumulation depends upon the tissue organization and composition.
a) True
b) False

Answer: a
Explanation: Bio accumulation depends upon the type of tissue, tissue organization and composition whereas, organism can metabolize the accumulated toxicant to facilitate its own growth and recover from toxic stress.

19. The organs with high lipid content can accumulate more number of lipophilic toxicant, like in _____
a) Liver
b) Blood
c) Heart
d) Kidney

Answer: a

Explanation: The organs with high lipid content can accumulate more number of lipophilic toxicant than the organs which have less lipid content like in organs like Liver, brain, whereas blood, kidney and heart does not accumulate lipid

20. In young organism, steady state can be achieved very fast.
a) True
b) False

Answer: a
Explanation: In young organisms, within hours of exposure to acute concentration of toxicants, steady state can be achieved very fast.

21. The soil humic substances make complexes with metal ions adversely affecting _____
a) Membrane permeability rate
b) Bioaccumulation
c) Rate of active transport
d) Rate of active transport

Answer: b
Explanation: The soil humic substances make covalent bonds with metal ions reducing their availability in the soil, hence, adversely affecting bioaccumulation, whereas, Membrane permeability rate, rate of active transport, and rate of active transport are the factors that influence the uptake of toxicants during bio accumulation.

22. Which of the following is not a sub division of Metal – Microbe Interactions?
a) Intra cellular accumulation
b) Transformation of metals
c) Cell wall-metal interaction
d) Hydrolysis

Answer: d
Explanation: Hydrolysis is not a sub division of Metal – Microbe interactions that happens between microorganisms and metal, it is a method which refers to the breakdown of chemical substances by means of water, whereas, metal – Microbe Interactions can be sub divided into intra cellular accumulation, transformation of metals, cell wall-metal interaction, polymer metal interactions and volatilization of metals.

23. Which of the following functions is not important to assimilation of metals by bacteria?
a) Detoxification
b) Enzyme functions
c) Physical properties of cell
d) Resistance

Answer: d
Explanation: Resistant population is selected over the original strain, that affects the microbial population, may also lead to reduction in abundance and diversity of species but this is not relevant to assimilation of metals by bacteria, whereas, detoxification, enzyme functions, physical properties of cell are important during bacterial assimilation of metals in the cells.

24. Which of the following is not considered toxic metals?
a) Zinc
b) Copper
c) Uranium
d) H_2O

25. A large number of bacteria can accumulate which metal?
a) Cadmium
b) Water
c) Carbon dioxide
d) Fungus

Answer: a
Explanation: Cadmium metal is found to be accumulated by a lot of bacterial species. Transport of cadmium inside the cell is dependent on the transport of the cell. Whereas, water and carbon dioxide are not metals. Also, Fungus itself is a microorganism and not a metal, so, cadmium is the right option.

26. What happens after death of the bacteria that has metal accumulation?
a) Metal species released
b) Metal species degraded
c) Free metal species released
d) Free metal species dissolves

Answer: a
Explanation: Metal species released after death of the bacteria that has metal accumulation is compared less toxic than the actual free metal species released in the environment. If the metal is not assimilated by the bacteria and released in the environment, it shows higher toxic potential. After the death of the bacteria, the microorganisms produce aggregates that form complexes with the metals and hence, released into the surrounding after the death of the bacteria.

27. Using microorganisms to extract metals from ores and mine waste is called as?
a) Biomining
b) Bioleaching
c) Afforestation
d) Hydrolysis

Answer: a
Explanation: Hydrolysis is a method which refers to the breakdown of chemical substances by means of water, whereas, afforestation is planting of trees in the forest to restore the flora and fauna and help control pollution the environment, Biomining is the extraction of metals from their ores or mine waste using of microbes, whereas, bioleaching is dissolution of metals from ores using various microorganisms.

28. Intracellular machinery degrades metals.
a) True
b) False
View Answer
Answer: a
Explanation: The intracellular machinery of the bacteria that accumulates metals has the potential to degrade the metals to a much less toxic form, as, they use enzymes to convert the

toxic metal into less toxic form in the intracellular region, which further does not result in accumulation

29. In-situ based bio remediation involves introducing _____ to contaminated areas.
a) Oxygen and nutrients
b) Carbon dioxide and methane
c) Nitrogen and CO_2
d) CO and methane

Answer: d
Explanation: Oxygen and nutrients are introduced to contaminated areas during bio remediation, CO_2, methane, Nitrogen, CO, methane is not required to treat contaminated lands.

30. Which of the following major technique is not employed during in-situ bioremediation?
a) Biosparging,
b) Bioventing
c) Injection recovery
d) Bio-luminescence

Answer: d
Explanation: In-situ bioremediation involves certain techniques like Biosparging, Bioventing and Injection recovery whereas bioluminescence is an inherent light emitting property of biological organisms.

31. What is the major benefit of in-situ based treatment?
a) Low intrusion
b) High intrusion
c) High contamination risk
d) High cost

Answer: a
Explanation: Low intrusion is the major benefit of in-situ based treatment whereas High intrusion, High contamination risk, High cost problems are not associated with in-situ based bio remediation.

32. Which of the following technique is used to re-mediate contamination at the boundary level of water table?
a) Biosparging
b) Bio-accumulation
c) Bio-degradation
d) Bio-magnification

Answer: a
Explanation: Biosparging is the technique which is used to re-mediate contamination at the boundary level of water table, Bio-magnification is the process by which toxic substances get

deposited in the food chain, Immobilization uses Bio-accumulation processes, bio-degradation is the process that leads to degradation of compounds with the help of bacteria.

33. Which of the following process involves super-aeration of groundwater?
a) Biosparging
b) Bio-accumulation
c) Bio-degradation
d) Bio-magnification

Answer: a
Explanation: Biosparging is the technique which involves super-aeration of groundwater, Bio-magnification is the process by which toxic substances get deposited in the food chain, Immobilization uses Bio-accumulation processes, bio-degradation is the process that leads to degradation of compounds with the help of bacteria.

34. Increasing the oxygenation of the stratum, it ultimately benefits the overall efficiency of soil remediation.
a) True
b) False

Answer: a
Explanation: When the oxygen supply of the stratum is increased it leads to further mixing of the contents, growth of aerobic microbes and hence this ultimately increases the efficiency of soil remediation.

35. _____ is the amount of oxygen required to oxidize only organic matter in sewage.
a) Turbidity
b) BOD
c) COD
d) DO

Answer: b
Explanation: BOD is the amount of oxygen required to oxidize only organic matter in sewage. It is always less than COD as COD oxidizes both organic and inorganic matter.

36. The full form of BOD is _____
a) Biodegradable oxygen demand
b) Biological oxygen demand
c) Biochemical oxygen demand
d) Bandwidth on demand

Answer: c
Explanation: The full form of BOD is biochemical oxygen demand. It is measured in ppm or mg/L.

37. The biochemical oxygen demand is computed by _____
a) Dissolved oxygen / Dilution factor
b) Dissolved oxygen + Dilution factor
c) Dissolved oxygen – Dilution factor
d) Dissolved oxygen * Dilution factor

Answer: d
Explanation: BOD = Dissolved oxygen * Dilution factor.
Where Dilution factor = Volume of diluted sewage sample / Volume of undiluted sewage sample.

38. _____ is determined by measuring the dissolved oxygen used by microorganisms during the biochemical oxidation of organic matter in 5 days at 20˚C.
a) BOD5
b) COD
c) TOC
d) ThOD

Answer: a
Explanation: BOD5 is the oxygen equivalent of organic matter. It is determined by measuring the dissolved oxygen used by microorganisms during the biochemical oxidation of organic matter in 5 days at 20˚C.

39. How are many forms of nitrogen present in wastewater?
a) 3
b) 4
c) 2
d) 5

Answer: b
Explanation: There are different types of nitrogen present in wastewater. Basically, our types of nitrogen are present. They are organic nitrogen, ammonia nitrogen, nitrate nitrogen and nitrite nitrogen.

40. After how many days will nitrogen will be oxidized to nitrite and nitrate?
a) 9
b) 10
c) 10-12
d) 14-15

Answer: c
Explanation: After 10-12 days, nitrogen will be oxidized to nitrite and then nitrate. Nitrogen in the presence of oxygen gets converted to nitrite and then gets converted to nitrate.

41. _____ is determined by measuring the dissolved oxygen used during the chemical oxidation of organic matter in 3 hours.
a) COD
b) BOD
c) ThOD
d) TOC

Answer: a
Explanation: It is the oxygen equivalent of organic matter. Chemical Oxygen Demand is determined by measuring the dissolved oxygen used during the chemical oxidation of organic matter in 3 hours.

42. At what temperature the bottles for the BOD test are incubated?
a) 25 degree Celsius
b) 35 degree Celsius
c) 20 degree Celsius
d) 30 degree Celsius

Answer: c
Explanation: The bottles to be tested in order to calculate the amount of BOD present is kept at 20 degree Celsius. This is incubated for 5 days. This is done to estimate the ultimate BOD.

43. What is the mathematical expression of BOD?
a) BOD = [(D1-D2)-(B1-B2)f]/P
b) BOD = [(D1-D2)-(B1-B2)f].
c) BOD = [(D1-D2) f]/P
d) BOD = [(D1-D2)-(B1-B2)]/P

Answer: a
Explanation: BOD = [(D1-D2)-(B1-B2) f]/P. Where D1 is the dissolved oxygen of the diluted sample right after the preparation. D2 is the Dissolved Oxygen of the sample after incubation.B1 is the Dissolved oxygen of the control before incubation. B2 is the dissolved oxygen of the control after incubation. F is the fraction of diluted water in the sample to the dilution of water in the control. P is the fraction of waste water sample volume to the total combined volume

44. The BOD test is carried out for how many days?
a) 1 day
b) 2 days
c) 5 days
d) 6 days

Answer: c
Explanation: The BOD test is carried out for 5 days. BOD is a biological oxygen demand. It is the amount of Dissolved oxygen utilized by bacteria to carry out biochemical reactions.

45. In terms of percentage how much BOD is oxidised in 5 days?
a) 90%
b) 70-90%
c) 60-70%
d) 50%
Answer: c
Explanation: In 5 days 60-70% BOD is oxidised. It takes around 20 days to oxidise the carbonaceous organic matter to 90-95%. The rate of oxidation is proportional to the amount of organic matter present in the water.

46. How is COD calculated?
a) Waste water is oxidised chemically using sodium in acid solutions
b) Waste water is oxidised chemically using dichromate in acid solutions
c) Waste water is oxidised chemically using bromine in acid solutions
d) Waste water is oxidised chemically using strontium in acid solutions

Answer: b
Explanation: Waste water is oxidised chemically using dichromate in acid solutions. High COD value indicates that the presence of inorganic compounds is high. Inorganic compounds get chemically oxidised and this results in the increase of organic compounds in the sample.

47. What is the ratio of BOD/COD in untreated waste?
a) 1-3
b) 0.3-0.8
c) 0.1-0.2
d) 3-5

Answer: b
Explanation: The ratio of BOD/COD is 0.3-0.8 in untreated waste. The ratio of BOD/TOC in untreated waste is 1.2-2. The ratio of BOD/COD after primary settling is 0.4-0.6.

48. What is the ratio of BOD/COD in the final effluent?
a) 0 8-1.2
b) 0.2-0.5
c) 0.1-0.3
d) 0.4-0.6

Answer: c
Explanation: The ratio of BOD/COD is 0.1-0.3 in the final effluent. The ratio of BOD/TOC in the final effluent is 0.2-0.5. The ratio of BOD/TOC from the primary settling tank is 0.8-1.2.

49. How is TSS calculated?
a) MPN
b) HPLC
c) Filtration
d) Mass spectrometer

Answer: c
Explanation: TSS is calculated by the filtration method. A filter paper is used to filter the water sample and the filtrate is then weighed. The amount of filtrate obtained is considered as the amount of TSS present.

50. Which of these is the used as the indicator when the titration is carried out to determine the amount of COD present in a sample.
a) Methyl Orange
b) Methyl blue
c) Ferroin
d) Phenolphthalein
Answer: c
Explanation: Ferroin is the indicator used while titration is carried out to determine the COD present in a water sample. The sample is titrated against ferrous ammonium sulphate. Titration is carried out until the solution turns to reddish brown.

51. Which of these is not a method to determine the number of colonies of bacteria present in a sample?
a) Multiple Tube fermentation
b) Pour and spread plate method
c) Membrane filter technique
d) Toxicity test

Answer: d
Explanation: Toxicity test is used to assess the environmental conditions of aquatic life. This is used to assess the effects of wastewater treatment methods. This is not used to determine the number of colonies of bacteria present in a water sample.

52. _____ represents the bacterial density that is most likely to be present in water.
a) BOD
b) COD
c) MPN
d) Coliform index

Answer: c
Explanation: Most Probable Number is a number that indicates the bacterial density present in water.BOD and COD are the terms related to the oxygen required by microorganism to oxidize organic and inorganic matter.

53. Which of the following is a better test to identify Coliforms?
a) Coliform index
b) Multiple tube fermentation
c) MPN test
d) Membrane filter technique

Answer: d
Explanation: Membrane filter technique is a better and simpler technique to identify Coliforms. Various results are obtained in a shorter time than the multiple tube fermentation technique. MPN test and coliform index are not used now.

54. What is the temperature at which MPN test is performed?
a) 35^{o}C
b) 37 ^{o}C
c) 40^{o}C
d) 45 ^{o}C

Answer: b
Explanation: MPN test is performed at 37^{o}C where different samples of water are mixed with lactose broth and incubated in test tubes for 48 hours.

55. Which of the following statement is/are correct regarding coliform bacteria?
i. It is gram negative
ii. It is rod shaped bacteria
iii. It is a harmless aerobic microorganism
a) i, ii, iii
b) ii, iii
c) i, iii
d) i, ii

Answer: a
Explanation: Coliform bacteria is a gram negative, rod shaped and harmless aerobic microorganism which is found in the intestine of warm blooded animals including human beings.

57. The number of bacterial colonies by Agar plate count test should not exceed ____ per ml for potable water.
a) 1
b) 10
c) 100
d) 1000

Answer: c
Explanation: Agar plate count test is a test to count the number of bacterial colonies growing on a specified medium and the permissible limit for the number of bacterial colonies is 100 per ml.

58. If the acid and gas are formed in the multiple tube fermentation technique, the test is _____
a) Positive
b) Continued
c) Negative
d) Discarded

Answer: a
Explanation: The acid and gas formation in the Multiple tube fermentation technique indicates that the test is positive and there are coliform bacteria in the sample.

59. Which bacteria cause the reddish brown deposits in the tank?
a) Escherichia coli bacteria
b) Bacterium coli bacteria
c) Iron bacteria
d) Sulphur bacteria

Answer: c
Explanation: The growth of Iron bacteria causes the discoloration of tank due to reddish brown deposits and turbidity in water.

60. Which bacteria results in the corrosion of iron and steel pipes embedded in soil?
a) Escherichia coli bacteria
b) Bacterium coli bacteria
c) Iron bacteria
d) Sulphur bacteria

Answer: d
Explanation: Sulphur bacteria cause the corrosion of iron and steel pipes embedded in soil. They are both aerobic and anaerobic and are more destructive in marshy or clay soils where anaerobic conditions prevails.

61. In acid fast staining the counter stain is
a) Methylene blue
b) Alcohol
c) Crystal violet
d) Carbol Fuchsin

62. Pore size of membrane filter is
a) 0.45 micron
b) 0.54 micron
c) 0.35 micron
d) 0.25 micron

63. In acid fast staining, the primary dye is

(a) Methylene blue
(b) Alcohol
c) Crystal violet
d) Carbol Fuchsin

64. Example of acid fast bacteria
a) Straphyllococcus aureus
b) E.coli
c) Mycobacterium tuberculosis
d) Salmonella typhi

65. CFU stands for ……
a) cell forming unit
b) colony forming unit
c) cells per feet unit
d) colony per feet unit

66. Alpha naphthol and KOH is used for
a) Voges-Proskauer test
b) Indole test
c) Citrate test
d) Methyl red test

67. In MR-VP test, pink colour produced by
a) E coli
b) Mycobacterium
c) Kiebsiella
d) Cocci

B. Sc. VI Sem Paper I Unit III & IV

The Golden Rice variety is rich in

a. Vitamin C
b. B-carotene and ferritin
c. Biotin
d. Lysine

Which of the following is the quality of improved transgenic basmati rice?

a. Gives high yield but no characteristic aroma
b. Gives high yield and is rich in vitamin A
c. Does not require chemical fertilizers and growth hormones
d. Resistant to insects and diseases

The first transgenic plant to be produced is

a. Brinjal
b. Tobacco
c. Rice
d. Cotton

Which is a genetically modified crop?

a. Bt-cotton
b. Bt-brinjal
c. Golden rice
d. All

Plasmids are used as cloning vectors for which of the following reasons?

a. Can be multiplied in culture
b. Self-replication in bacterial cells
c. Can be multiplied in laboratories with the help of enzymes
d. Replicate freely outside bacterial cells

SCP stands for _____
a) Single Cell Protein
b) Stress Cultivated Plant
c) Somatic Cultivated Plantlet

d) Soma Clonal Plants

Answer: a
Explanation: SCP stands for Single Cell Protein. Single-cell protein is protein-rich cell biomass of unicellular or multicellular organisms which is used as food or feed.

How much per cent of the human population is suffering from hunger and malnutrition?
a) 75 per cent
b) 5 per cent
c) 25 per cent
d) 50 per cent

Answer: c
Explanation: More than 25 per cent of the human population is suffering from hunger and malnutrition. One of the alternate sources of proteins for animal and human nutrition is SCP

Which of the following algae can be grown on wastewater?
a) *Spirogyra*
b) *Volvox*
c) *Spirulina*
d) *Chlamydomonas*

Answer: c
Explanation: Microbes are being grown on an industrial scale as a source of good protein. Blue-green algae like *Spirulina* can be grown easily on materials like wastewater from potato processing plants that contain starch

On which of the following material, *Spirulina* cannot grow?
a) Straw
b) Molasses
c) Animal manure
d) Lava

Answer: d
Explanation: *Spirulina* can be easily grown on materials like straw, molasses, animal manure and even sewage, to produce large quantities and can serve as food rich in protein, minerals, fats and carbohydrates and vitamins. Incidentally, such utilisation also reduces environmental pollution.

Which of the following bacterial species is known for its high rate of biomass production?
a) *Methylophilus methylotrophus*
b) *Xanthomonas*
c) *Clostridium*
d) *Rhizomonas*

Answer: a
Explanation: Certain bacterial species like *Methylophilus methylotrophus* have a high rate of biomass production and growth and are known to produce 25 tonnes of protein.

Which of the following is the most common source of SCP?
a) Multicellular yeast
b) Single-celled yeast
c) Unicellular algae
d) Unicellular bacteria

Answer: b
Explanation: The most common source of single-cell protein is single-celled yeasts (e.g., *Candida utilis*) and filamentous fungus-like *Fusarium graminearum*. Single-cell protein is rich in good quality protein.

Which of the following is not an organic matter on which microorganisms are raised for SCP?
a) Sawdust
b) Paddy straw
c) Acids
d) Whey

Answer: c
Explanation: Microbial biomass can be raised using low-cost organic matter like that of sawdust, paddy straw, paddy husk and industrial organic wastes and effluents like whey. However, care has to be taken to remove excess nucleic acids and heavy metals or toxins present in organic wastes

Which of the following is not an advantage of SCP?
a) Used as a protein-rich diet
b) Reduce environmental pollution
c) Increase in supply of protein
d) Increases water pollution

Answer: d
Explanation: SCP can be used as a protein-rich supplement of human diet and can take off the pressure from the agricultural system for increasing the protein content of food articles. It also increases the protein supply and use of organic wastes and industrial effluents helps in reducing environmental pollution

Which of the following microbe is used in the production of blue cheese?
a) Streptococcus thermophilus
b) Lactobacillus bulgaricus
c) Penicillium roqueforti

d) Rhizopus stolonifer

Answer: c
Explanation: For the production of blue cheese or Roquefort cheese, it is necessary to inoculate the curd with the microorganism, Penicillium roqueforti which brings about the necessary changes.

Pickled cucumber is made from fermented salt-stock pickles.
a) True
b) False

Answer: b
Explanation: Most commercial sweet, sour, mixed pickles are made from fermented salt-stock pickles. The other major type of pickled cucumber is the fermented dill pickle.

Bacterial cell grown on hydrocarbon wastes from the petroleum industry are a source of _____
a) carbohydrates
b) proteins
c) vitamins
d) fats

Answer: b
Explanation: The microorganisms can be cultivated on industrial wastes or by-products as nutrients and yield a large cell crop that is rich in protein. Bacterial cell grown on hydrocarbon wastes from the petroleum industry are a source of protein in France, Japan, Taiwan, and India.

Yeast-cell crops harvested from the vats are used to produce which of the following compounds?
a) alcoholic beverages
b) enzymes
c) antibiotics
d) organic acids

Answer: a
Explanation: Yeast-cell crops harvested from the vats used to produce alcoholic beverages have been used as a food supplement for generations.

How many tons of protein can be produced by algae grown in pond in a year?
a) 1000
b) 1
c) 50
d) 20

Answer: d
Explanation: Algae grown in ponds can produce 20 tons (dry weight) of protein per acre per year.

What is the range of protein content in yeast cells?
a) 69%
b) 12-15%
c) 20-40%
d) 40-50%

Answer: d
Explanation: The protein content of microbial cells is very high. Yeast cells have a protein content in a 40 to 50 percent range.

7. Which of the following microorganism have high vitamin content?
a) bacteria
b) yeast
c) algae
d) protozoa

Answer: b
Explanation: Some microorganisms, particularly yeasts, have a high vitamin content. The growth medium for yeast cells consists of hydrocarbons supplemented with mineral salts.

8. The principal microorganism for yogurt is _____
a) Streptococcus thermophilus
b) Leuconostoc citrovorum
c) Lactobacillus acidophilus
d) Streptococcus lactis

Answer: a
Explanation: Streptococcus thermophilus and Lactobacillus bulgaricus are among the principal microorganisms responsible for producing yogurt by fermentation.

9. Which of the following products have higher acidity and lacks aroma?
a) Cultured buttermilk
b) Cultured sour cream
c) Bulgarian milk
d) Acidophilus milk

Answer: c
Explanation: For production of Bulgarian milk by Lactobacillus bulgaricus, incubation of inoculated milk at 37 degree C is carried out and the product differs from commercial buttermilk in having higher acidity and lacking aroma.

10. Shredded cabbage is the starting product for which of the following fermented food?
a) Sauerkraut
b) Pickles
c) Green olives
d) Sausage

Answer: a
Explanation: Shredded cabbage acts as a starting product for producing fermented product sauerkraut. Enterobacter cloacae is used in the early stage of fermentation.

Solvents and enzymes are found in which of the following categories of microbial products?
a) Pharmaceutical chemicals
b) Commercially valuable chemicals
c) Food supplements
d) Alcoholic beverages

Answer: b
Explanation: Solvents, enzymes, and intermediate compounds for the synthesis of other substances are representative of the kinds of substances produced commercially by microorganisms.

Which of the following is not a desired characteristic of the organism to be used for industrial application?
a) should produce less amount of product
b) should be readily available
c) should grow rapidly
d) should be nonpathogenic

Answer: a
Explanation: The organism to be used must be able to produce appreciable amount of the product. It should be readily available and should grow rapidly and vigorously. It should be nonpathogenic

Which of the following product is used for the treatment of blood clots?
a) insulin
b) interferon
c) urokinase
d) somatostatin

Answer: c
Explanation: The pharmaceutical industry has already produced several products for human therapy by the help of genetic engineering such as urokinase that is used for the treatment of blood clots; human insulin and interferons.

VP3 protein is isolated from which of the following viruses?
a) TMV
b) HIV
c) HRV
d) FMDV

Answer: d
Explanation: VP3 is the protein from the shell of the foot-and-mouth disease virus (FMDV), which can act as a vaccine for immunizing livestock against foot-and-mouth disease.

Yeast is used for the production of

(a) Tetracycline

(b) Butanol

(c) Ethanol

(d) Citric Acid

In which of the following the microorganisms grow on the surface of the medium?
a) Submerged fermentation
b) Surface fermentation
c) Solid state fermentation
d) Batch fermentation

Answer: b
Explanation: In surface fermentation, the microorganisms are allowed to grow on the surface of the liquid culture medium. It is also called as the surface culture fermentation. However, it is time-consuming and requires a large space.

Which of the following is not required in surface fermentation?
a) Aeration
b) Baffles
c) Agitation
d) Stirrer

Answer: c
Explanation: Agitation is not provided or done in the surface culture fermentation. In this, microorganisms grow on the surface of the liquid medium without agitation. The filtrate is separate from the cell mass and is processed to recover the desired product after an appropriate incubation time.

Which of the following grows on the surface of the medium when *Aspergillus niger* is inoculated?
a) Slime layer
b) Mycelium layer
c) Foam layer

d) Capsule

Answer: b
Explanation: When *Aspergillus niger* is allowed to grow on the surface of the liquid medium in surface culture fermentation, a layer of mycelium grows on the surface of the medium. It appears as a mycelial mat which is thick and floating over the medium.

In which of the following the microorganisms grow inside the medium?
a) Submerged fermentation
b) Surface fermentation
c) Solid state fermentation
d) Batch fermentation

Answer: a
Explanation: In submerged fermentation, the microorganism grows inside the liquid medium. The nutrients or enzymes or reactive compounds which are required for the growth of microorganisms are added to the medium.

Which of the following is not true for submerged liquid fermentation?
a) The concentration of media is lower
b) Small-size bioreactors are used
c) Easy sampling
d) Expensive downstream processing

Answer: b
Explanation: Usually in submerged liquid fermentation, the bioreactor used are of larger size because the concentration of media is less and is diluted. The small-sized bioreactors can be used in the solid-state fermentation. However, the sampling is easy for biomass measurement but the downstream processing is difficult and very expensive.

Which of the following process proceeds with having a rich fermentation broth and high oxygen concentration?
a) Submerged fermentation
b) Surface fermentation
c) Solid state fermentation
d) Batch fermentation

Answer: a
Explanation: Submerged fermentation proceeds with having a rich fermentation broth and high concentration of oxygen. However, the concentration of broth is very much lower as compared to that of water content and is diluted.

Which of the following process occurs in the absence of free liquid?
a) Submerged fermentation
b) Batch fermentation
c) Solid state fermentation

d) Continuous fermentation

Answer: c
Explanation: Solid state fermentation (SSF) occurs in the absence or near absence of free liquid. In this method, the waste products like agro-industrial wastes are utilized as a substrate which is a source of nutrients for the production of products like enzymes, etc.

Which of the following is not true of solid state fermentation (SSF)?
a) Easy downstream process
b) Small-size bioreactors are used
c) Greater chances of contamination
d) Less consumption of energy

Answer: c
Explanation: The chances of contamination are low because of less availability of water. However, the chances of contamination are more in submerged liquid fermentation. The consumption of energy is less for gas transfer and small-size bioreactors are used. The downstream processing is cheap, easy and time-saving.

Which of the following bioreactor is used in group-1 SSF?
a) Rotating drum
b) Stirred-bed
c) Packed bed
d) Tray

Answer: d
Explanation: Tray bioreactor is used in group-1 solid state fermentation. In group-1, the aeration is not produced naturally and is effortless. Agitation is also not required and is static. Packed bed bioreactors are used in group-2, rotating drum bioreactor is used in group-3, and stirred-bed bioreactor is used in group-4.

Which of the following requires a substrate as support?
a) Submerged fermentation
b) Surface fermentation
c) Solid state fermentation
d) Batch fermentation

Answer: c
Explanation: Solid state fermentation (SSF) requires a substrate as solid support. The substrate should be natural and inert and must not be reactive. The substrates like bran, bagasse, and paper pulp are most commonly used.

Which of the following physicochemical factor does not affect SSF?
a) Pressure
b) Temperature
c) pH
d) Moisture content

Answer: a
Explanation: Pressure has no role to play in the affection of SSF. Factors like temperature, pH, moisture content, gaseous environment, aeration, particle size affect the solid-state fermentation.

Which of the following bioreactor mix intermittently without forced aeration?
a) Packed-bed bioreactors
b) Rotating drum bioreactors
c) Spouted-bed bioreactors
d) Fluidized-bed bioreactors

Answer: b
Explanation: Rotating drum bioreactors mix intermittently without forced aeration. It operates on semi-continuous or continuous mode where the rotating drum is a horizontal cylinder filled with a bed of substrate.

TQM stands for:

A. Total quantity maintained
B. Total quality management
C. Total quantity measurable
D. None of the above

ICH Q 10 guidelines refer to:

A. Pharmaceutical quality system
B. Pharmaceutical product lifecycle management
C. Development and manufacture of drug substances
D. Stability testing of new drug substances

In ICH guidelines, EWG means:

A. Efficacy with generics
B. Expert working group
C. Effectiveness with generics
D. None of the above

ISO9000 defines:

A. Vocabulary related to improving various processes for customer quality
B. Actions to be taken for process improvement
C. Manpower requirement for quality improvement
D. Premises requirement for process improvement

ISO14000 series of guidelines are related to:

A. organizing and applying information about environmental management
B. organizing manufacturing processes in sequence
C. managing customer feedback on products
D. None of the above

GLP means:

A. Good laboratory protocols
B. Good laboratory practices
C. Good laboratory planning
D. None of the above

If a product has to be formulated with higher dose, it will undergo:

A. Prospective validation
B. Retrospective validation
C. Revalidation
D. Concurrent validation

If data from previous batches is analysed to assess consistency of process:

A. Concurrent validation
B. Prospective validation
C. Reworking
D. Retrospective validation

Double shelf system in materials management means:

A. Supply time is half the purchasing interval
B. Storing materials on top of each other
C. Storing new and old materials in shelves
D. None of the above

Lead time with respect to material procurement means:

A. Average time for using the issued materials
B. Average time for disposing the unused materials
C. Average time for ordering the materials
D. Average time between placing an order and receipt of materials