Ultimate KCET Crash Course 2026

BOTANY

DPP: 1

Microbes in human welfare Organisms and populations

Q1 Anaerobic sludge digesters mainly function to:
(A) Pump air for aerobic microbial growth
(B) Remove primary sludge from sewage
(C) Digest bacteria and fungi anaerobically to produce gases
(D) Release treated water into rivers

Q2 Which inference correctly explains why free-living nitrogen-fixing bacteria are considered biofertilisers despite lacking a symbiotic host plant?
(A) They convert organic nitrogen into atmospheric nitrogen
(B) They increase soil nitrogen by fixing atmospheric nitrogen independently
(C) They mobilise phosphorus through enzymatic secretion
(D) They enhance soil fertility only after plant root colonisation

Q3 Which vitamin's level is enhanced by Lactic Acid Bacteria (LAB) in curd?
(A) Vitamin B_{12} (B) Vitamin C
(C) Vitamin E (D) Vitamin B

Q4 ___A___ enzyme is used to remove clots from the blood vessels of patients who have undergone ___B___ leading to heart attack.
(A) A – Streptokinase; B – Myocardial infarction
(B) A – Lipases; B – Arteriosclerosis
(C) A – Proteases; B – Myocardial infarction
(D) A – Pectinases; B – Atherosclerosis

Q5 Which steps are part of primary sewage treatment ?
(i) Physical separation by sequential filtration
(ii) Physical separation by sedimentation
(iii) Reduction in biochemical oxygen demand
(iv) Anaerobic, digestion by the bacteria
(A) i and ii only
(B) iii and iv only
(C) i and iv only
(D) i and iii only

Q6 In sewage treatment plants, activated sludge is divided into two fractions after settling. One fraction is recycled, while the other is transferred to anaerobic digesters. This operational decision is best justified by which integrated explanation?
(A) Recycling increases sludge mass and anaerobic digestion efficiency
(B) Recycled sludge acts as microbial inoculum, while excess supports methane generation
(C) Anaerobic digesters require aerobic microbes for biogas production
(D) Sludge recycling prevents oxygen depletion in rivers

Q7 The technology of biogas production was developed in India mainly due to the efforts of
(A) IRRI (B) IPM
(C) IARI and KVIC (D) ICAR

Q8 What does a higher BOD value in waste water indicate?
(A) Less organic matter present
(B) Low polluting potential
(C) More organic matter and high polluting potential
(D) Faster sedimentation

Q9 Which bacteria is utilized in gobar gas plant?
(A) Methanogens
(B) Nitrifying bacteria
(C) Ammonifying bacteria
(D) Denitrifying bacteria

Q10 Baculoviruses are excellent candidate for
(A) Speceis-specific narrow spectrum pesticidal applications
(B) Speceis-specific broad spectrum pesticidal applications
(C) Speceis-specific narrow spectrum insecticidal applciations
(D) Speceis-specific borad spectrum insecticidal applications

Q11 Commercial fruit juices appear clearer than home-made juices mainly because:
(A) They undergo distillation
(B) They contain fewer fibres naturally
(C) Microbial enzymes degrade suspended substances
(D) They are filtered at low temperature

Q12 Which of the following microbe is used for ripening of Swiss cheese ?
(A) Penicillium roqueforti
(B) Penicillium camemberti
(C) Propionibacterium sharmanii
(D) Streptomyces griseus

Q13 Which of the following in sewage treatment removes suspended solids?
(A) Secondary treatment
(B) Primary treatment
(C) Sludge treatment
(D) Tertiary treatment

Q14 The full therapeutic potential of Penicillin as an antibiotic was established by:
(A) Fleming alone
(B) Louis Pasteur and Koch
(C) Ernest Chain and Howard Florey
(D) Jenner and Lister

Q15 The selective lethality of Bacillus thuringiensis towards insect larvae without harming non-target organisms is primarily due to:
(A) Toxin activation only under alkaline gut conditions of larvae
(B) Inability of spores to survive outside crop plants
(C) Restricted spraying methods used in organic farming
(D) Rapid degradation of toxin in soil and water

Q16 If lotus plants in a pond increase from 20 to 28 in one year, the birth rate is:
(A) 0.2 (B) 0.3
(C) 0.4 (D) 0.8

Q17 The death rate of a fruitfly population where 4 out of 40 individuals die in a week is:
(A) 0.01 (B) 0.04
(C) 0.1 (D) 10

Q18 Which attribute is present in a population but not in an individual?
(A) Age (B) Death
(C) Sex (D) Sex ratio

Q19 A population with a pyramid showing a broad base and narrow top represents:
(A) A declining population
(B) A stable population
(C) A growing population
(D) A population without age structure

Q20 Statement I: Lotus plants in a pond constitute a population.
Statement II: A single banyan tree in an area represents a population.
(A) Both statements true
(B) Both statements false
(C) Statement I true, Statement II false
(D) Statement I false, Statement II true

Q21 Assertion (A): The shape of an age pyramid reflects whether the population is growing, stable, or declining.
Reason (R): Age pyramids display per cent individuals of different ages.
(A) A and R true, but R does not explain A
(B) A and R true, and R explains A
(C) A true, R false
(D) A false, R true

Q22 Population density (N) may be misleading when:
(A) The number of individuals is very small
(B) Counting individuals is easy
(C) Individuals differ greatly in size or biomass
(D) Population is growing

Q23 The tiger census in national parks is often based on:
(A) Actual direct counting of individuals
(B) Birth rates
(C) Pug marks and fecal pellets
(D) Measurement of biomass

Q24 When population density increases because the number of births plus immigrants exceeds deaths plus emigrants, the equation used to express this change is:
(A) dN/dt = rN
(B) N(t+1) = Nt + [(B + I) – (D + E)]
(C) Nt = N0 e^rt
(D) dN/dt = rN (K – N)/K

Q25 Which process contributes to a decrease in population density?
(A) Natality
(B) Immigration
(C) Mortality
(D) Increase in intrinsic rate (r)

Q26 Which of the following are the characteristics of expanding population?
(i) Pyramid-shaped age structure.
(ii) An urn- shaped age structure.
(iii) Pre-reproductive and reproductive age groups become more or less equal in size.
(iv) Rapidly growing population with high birth rate.
(A) (i) and (iii) (B) (i) and (iv)
(C) (iii) and (iv) (D) (ii) and (iii)

Q27 The given age pyramid represents a:

(A) Fast expanding population
(B) Slowly expanding population
(C) Stable population
(D) Declining population

Q28 Which attribute is present in a population but not in an individual?
(A) Age (B) Death
(C) Sex (D) Sex ratio

Q29 What type of human population is represented by the given age pyramid?

(A) Expanding population
(B) Vanishing population
(C) Stable population
(D) Declining population

Q30 Age structure of a population influences population growth because _____.

(A) Different age groups have different reproductive capabilities

(B) Different age groups have same reproductive capabilities

(C) More young individuals indicates decreasing population

(D) All of the above

Answer Key

Q1	C
Q2	B
Q3	A
Q4	A
Q5	A
Q6	B
Q7	C
Q8	C
Q9	A
Q10	C
Q11	C
Q12	C
Q13	B
Q14	C
Q15	A
Q16	C
Q17	C
Q18	D
Q19	C
Q20	C
Q21	A
Q22	C
Q23	C
Q24	B
Q25	C
Q26	B
Q27	C
Q28	D
Q29	D
Q30	A

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

Digest bacteria and fungi anaerobically to produce gases

Video Solution:

Q2 Text Solution:

Free-living bacteria inhabit soil without plant association.

They possess enzymes to fix atmospheric nitrogen.

Fixed nitrogen is converted into organic forms.

This enriches soil nitrogen content.

Crops subsequently utilise this nitrogen for growth.

Video Solution:

Q3 Text Solution:

Lactic Acid Bacteria (LAB) increase the levels of certain B vitamins, particularly Vitamin B_{12}, during the fermentation of milk into curd.

Video Solution:

Q4 Text Solution:

A – Streptokinase; B – Myocardial infarction

Streptokinase is an enzyme used to dissolve blood clots in the blood vessels of patients who have suffered a myocardial infarction (heart attack). This enzyme helps in restoring blood flow by breaking down the clots, thus reducing damage to the heart muscle.

Video Solution:

Q5 Text Solution:

(A)

Primary treatment uses physical separation.

Filtration removes large debris.

Sedimentation removes suspended solids.

It reduces BOD.

It is the first step in sewage treatment.

Video Solution:

Q6 Text Solution:

1. Activated sludge contains actively growing microbial populations.
2. Recycling provides immediate inoculum for incoming effluent.
3. Excess sludge is transferred to anaerobic digesters.
4. Anaerobic microbes digest biomass to produce biogas.
5. Thus sludge serves both treatment continuity and energy generation.

Video Solution:

Q7 Text Solution:

C. IARI and KVIC

The technology for biogas production in India was significantly advanced through the efforts of the Indian Agricultural Research Institute (IARI) and the Khadi and Village Industries Commission (KVIC). They played a crucial role in developing and popularizing biogas technology for rural and agricultural applications.

Video Solution:

Q8 Text Solution:

1. BOD is the amount of oxygen consumed when organic matter is oxidised by bacteria.
2. It is an indirect measure of organic matter present in water.
3. If organic matter is high, microbes consume more oxygen.
4. Therefore, greater BOD = more organic matter.
5. Hence, higher BOD means greater polluting potential.

Video Solution:

Q9 Text Solution:

Methanogens are any of various archaebacteria that produce methane; they include genera such as Methanobacillus and Methanothrix.

Methanogens are obligate anaerobes found in oxygen deficient environments, such as marshes, swamps, sludge and the digestive systems of ruminants. They are also utilised in gobar gas plants.

Video Solution:

Q10 Text Solution:

(C) Species-specific narrow spectrum insecticidal applications

Baculoviruses, particularly nucleopolyhedroviruses (NPVs), are used as biological control agents against insect pests.

They specifically target certain insect species without harming beneficial insects, humans, or the environment.

Their host specificity makes them ideal for integrated pest management (IPM) in agriculture and forestry.

Unlike chemical pesticides, baculoviruses are eco-friendly and do not cause resistance in pest populations.

Video Solution:

Q11 Text Solution:

1. Bottled juices use enzymes.
2. Pectinases and proteases are involved.
3. Suspended particles are broken down.
4. Juice clarity increases.
5. Fermentation is not involved.

Video Solution:

Q12 Text Solution:

C: *Propionibacterium shermanii*.

Propionibacterium shermanii is the bacterium used in the production and ripening of Swiss cheese. This microbe produces carbon dioxide during fermentation, which creates the characteristic holes or "eyes" in Swiss cheese and contributes to its distinct flavor.

Video Solution:

Q13 Text Solution:

Primary or physical treatment is the process of removal of small and large, floating and suspended solids from sewage through two processes of filtration and sedimentation.

Video Solution:

Q14 Text Solution:

Chain and Florey purified and developed Penicillin further.

Their work enabled medical application on a large scale.

They tested its effectiveness extensively.

This made Penicillin a practical antibiotic.

Their contributions earned them a Nobel Prize.

Video Solution:

Q15 Text Solution:

Bt is ingested by insect larvae during feeding.

The toxin remains inactive outside the larval gut.

Alkaline gut conditions activate the toxin.

Activated toxin damages larval gut epithelium.

Other organisms remain unaffected due to lack of activation.

Video Solution:

Q16 Text Solution:

Birth rate = offspring added / initial population.

Offspring added = 8.

Initial population = 20.

Birth rate = 8/20 = 0.4.

Video Solution:

Q17 Text Solution:

Death rate = deaths / initial population.

4 deaths out of 40 4/40.

4/40 = 0.1 individuals per fruitfly per week.

Rates are always expressed per capita in populations.

Video Solution:

Q18 Text Solution:

Individuals can be male or female, but only populations have a sex ratio.

Sex ratio example: 60% females, 40% males.

Age and death occur in individuals too.

Population-level attributes include birth/death rate and sex ratio.

Video Solution:

Q19 Text Solution:

Broad base = many young individuals.

Indicates high future reproductive output.

Age pyramids show age distribution of males and females.

Shape reflects whether population is growing, stable, or declining.

Video Solution:

Q20 Text Solution:

A population is a group living in a well-defined geographical area.

Lotus plants in a pond occur as many individuals, so they form a population.

A single banyan tree cannot be considered a population.

Therefore only Statement I is correct.

Video Solution:

Q21 Text Solution:

Age pyramids show age distribution in percentage.

Growth status (growing/stable/declining) is inferred from pyramid shape, not merely age data.

R is true but does not logically explain how growth status is determined.

Therefore option A fits.

Video Solution:

Q22 Text Solution:

The banyan vs. carrot grass example.

A single banyan tree has a far larger ecological role than 200 small weeds.

Counting numbers alone underestimates large organisms.

Therefore biomass or percent cover becomes a better measure.

Hence density can be misleading when individuals differ in size.

Video Solution:

Q23 Text Solution:

Tiger census uses pug marks and fecal pellets.

Counting tigers directly is difficult.

Shows indirect estimation of population density.

Used commonly in ecological studies.

Works even when the population is elusive.

Video Solution:

Q24 Text Solution:

Births (B) and immigration (I) increase population density.

Deaths (D) and emigration (E) reduce population density.

Net change is represented by adding gains and subtracting losses.

The expression relates population at time t to t+1.

This relationship helps assess whether the population increases or declines.

Video Solution:

Q25 Text Solution:

Mortality is defined as the number of deaths in a population.

Deaths directly reduce the number of individuals.

It contributes to population decline along with emigration.

Death rate affects net population change.

It is one of the four fundamental processes influencing density.

Video Solution:

Q26 Text Solution:

B) (i) and (iv)

An expanding population is characterized by:

- (i) Pyramid-shaped age structure, which indicates a higher number of young individuals.
- (iv) Rapidly growing population with a high birth rate, leading to an overall increase in population size.

The other options describe more stable or declining populations.

Video Solution:

Q27 Text Solution:

The given age pyramid is bell shaped and represents a stable population as the percentage of individuals in the pre-reproductive age group and reproductive age group are nearly the same.

Video Solution:

Q28 Text Solution:

Individuals can be male or female, but only populations have a sex ratio.

Sex ratio example: 60% females, 40% males.

Age and death occur in individuals too.

Population-level attributes include birth/death rate and sex ratio.

Video Solution:

Q29 Text Solution:

D. Declining population

In an urn-shaped age pyramid, the number of individuals below the reproductive age is fewer than those in the reproductive age group. This structure suggests that fewer young individuals are entering the population, indicating a declining population over time, as there are not enough younger individuals to replace the older generation.

Video Solution:

Q30 Text Solution:

A: Different age groups have different reproductive capabilities

Age structure affects population growth because different age groups contribute differently to reproduction. Younger individuals, especially females, are generally more capable of reproducing, which impacts the overall growth rate of the population.

Video Solution: