

KATHMANDU UNIVERSITY
End of Semester Examination
August/September, 2017

AUG 3 2017

Level : B. Tech.

Year : III

Course : BIOT 307

Semester : II

Exam Roll No. :

Time: 30 min

F. M. : 20

Registration No.:

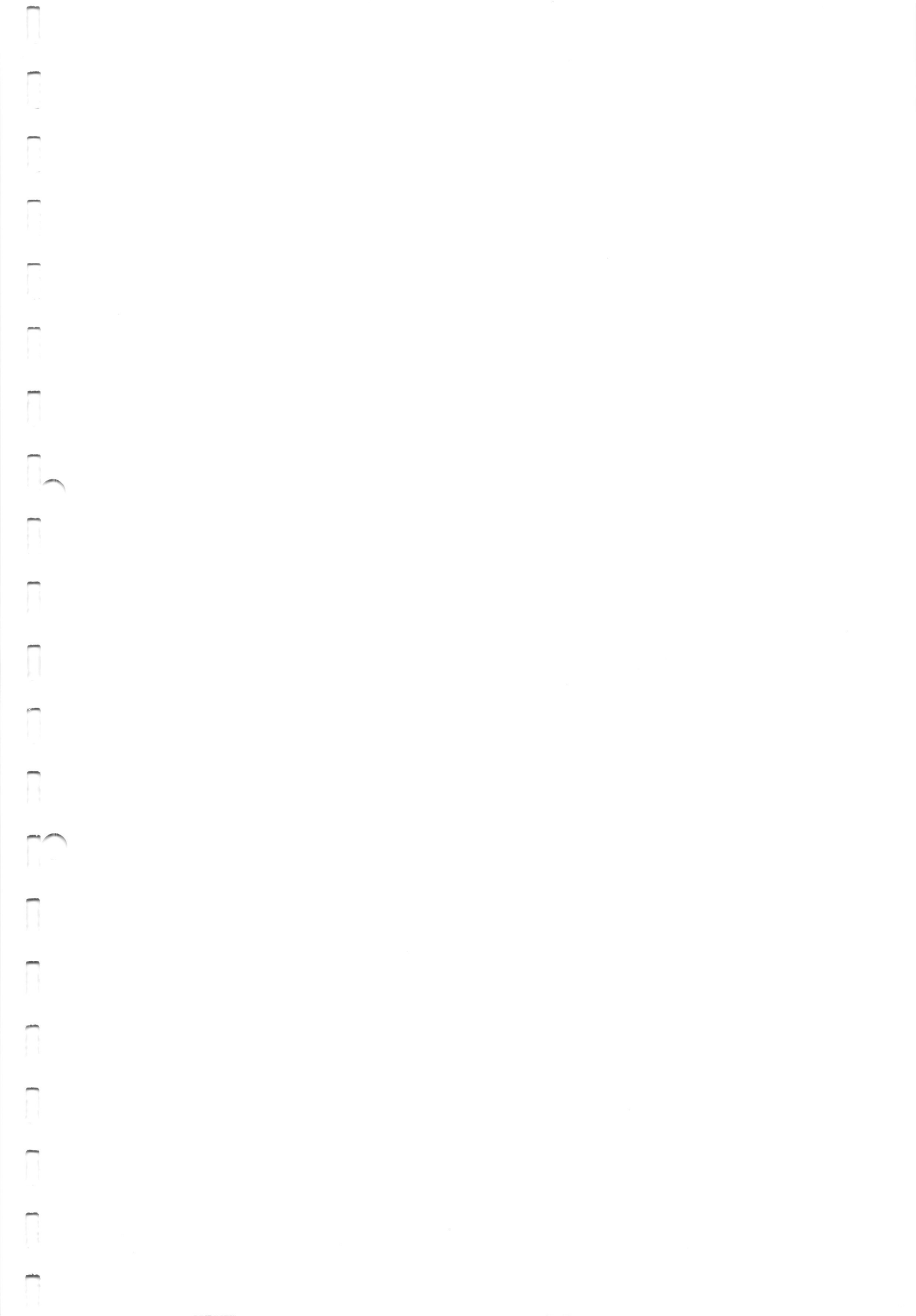
Date :

SECTION "A"

[10 Q × 1 = 10 marks]

Choose the most appropriate answer.

1. *E. coli* cannot grow in the rumen due to presence of high amounts of lactic acid produced by rumen anaerobes is the function of,
 Amensalism Mutualism Synergism Commensalism
2. The defining features of micro-organisms that make them ideal for environmental management, except;
 small sizes of microorganisms Metabolic flexibility & versatility
 Ease of gene transfer & mobilization agents that cause diseases
3. The addition of excess nutrients in aquatic habitats can result in
 oxygenation oligotrophication eutrophication stratification
4. Which of the following compounds is MOST likely to be degraded rapidly in soils or water?
 2, 4-dichlorophenol Pentachlorophenol
 2, 4, 5-trichlorophenol 2, 4, 6-trichlorophenol
5. The wastewater treatment system consists of a series of closely spaced circular discs that are partially submerged in wastewater and rotate slowly through it.
 Tapered activated sludge Rotating biological contractor
 Trickling filter Stabilization pond
6. The incubation time and temperature for BOD₅ test is;
 5 days at 20°F 48 hrs at 37°C 5 days at 20°C 5 days at 37°C
7. Which of the following is true about the organisms involved in bioremediation?
 Bacteria, fungi, and plants can all work together in bioremediation.
 Bacteria, fungi, and plants all work against one another in bioremediation.
 Bacteria produce the contaminants that are then remediated by fungi or plants.
 Plants make the environment inhospitable for bacteria and fungi, slowing down bioremediation.
8. The inherent drawback in the processes using living biosorbents.
 Metabolism independent binding Adsorption to extracellular polysaccharides
 Biomass separation after use Adsorption to cell wall
9. The acceleration of microbiological processes by the addition of known active microorganisms to soils, waters, or other complex systems.
 Biodegradation Biostabilization Bioaugmentation Biostimulation
10. *Eisiniatetida* is most widely used in,
 Phytoremediation Bioleaching Vermicomposting Biocontrol

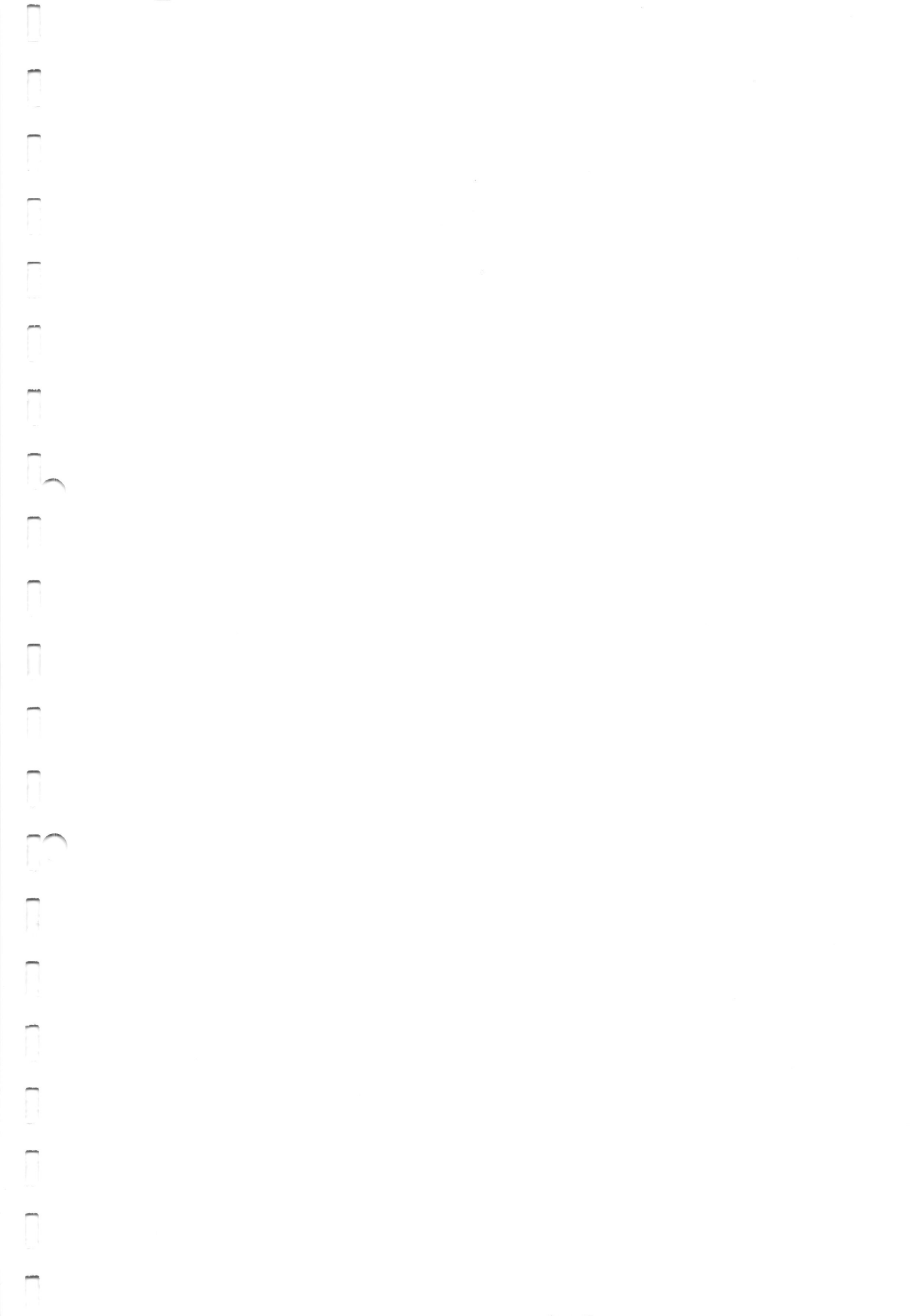


SECTION "B"
[10 Q × 1 = 10 marks]

AUG 30 2017

Fill in the blanks.

11. Growth rates above the optimal population density are strongly influenced by _____ interactions.
12. When organisms within a habitat modify the habitat in such a way that permit new populations to develop is termed as _____.
13. An association of two or more different species is _____.
14. _____ is an association in which the growth of one organism either depends on or is improved by growth factors, nutrients, or substrates provided by another organism growing nearby.
15. Sulfate-reducing bacteria grow in the anaerobic mud of a water environment and reduce sulfate compounds to _____.
16. _____ consists of a bed of highly permeable media to which microorganisms are attached and through which wastewater is percolated.
17. In an aerobic biological oxidation process the wastewater is aerated in the presence of a flocculent mixed microbial culture known as _____.
18. _____ is the indigenous level of contaminant biodegradation that occurs without any stimulation or treatment.
19. The _____ in biogas gives it the ability to be used as a fuel.
20. _____ is defined as inhibition of the growth of one microorganism by another as a result of diffusion of antibiotics, Lytic enzymes and other byproducts.



KATHMANDU UNIVERSITY
End of Semester Examination
August/September, 2017

Level : B. Tech.
Year : III
Time : 2 hrs. 30 mins.

Course : BIOT 307
Semester : II
F. M. : 55

SECTION "C"

(Long answer question)

[4Q × 7=28 marks]

Attempt *ANY FOUR* questions.

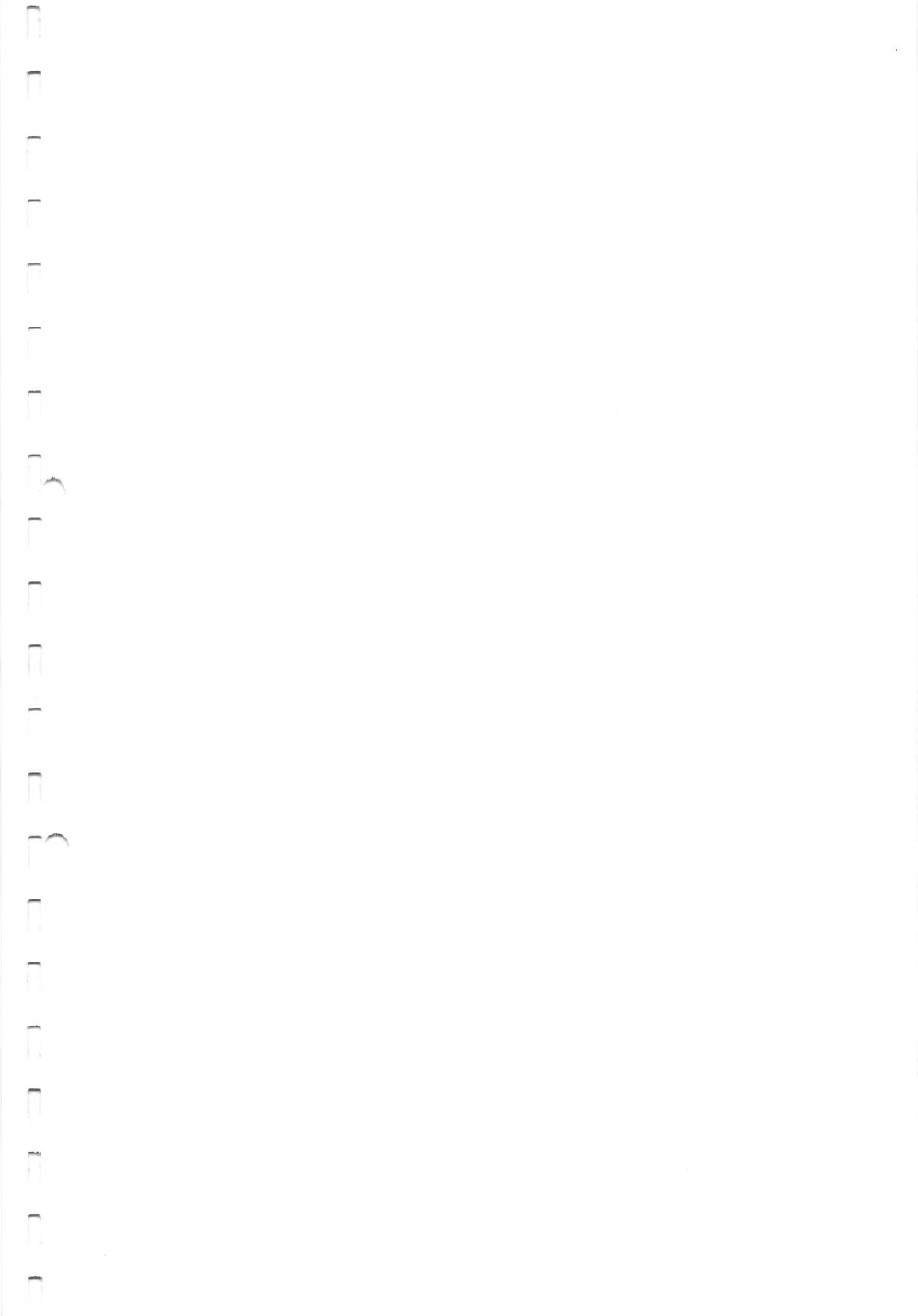
1. Differentiate between fixed film and suspended biofilm treatment technology with example.
2. Explain the autotrophic reactions of concern in sanitation technology with advantages and disadvantages.
3. Why is there concern about the presence of organic contaminants in the environment? Describe the different factors that can limit biodegradation of organic contaminants in the environment.
4. What is bioremediation? Describe the different practices used in bioremediation technologies with examples.
5. Write in detail about composting and the factors affecting it.

SECTION "D"

(Short answer questions)

Attempt *ALL* questions.

6. How do microorganisms cope with the target pollutants that are not proximal? [3]
7. "Co-metabolism plays an important role in initiating the metabolism of many xenobiotic compounds" Justify the statement with example. [4]
8. Comprehend any two mutualistic relationships between microbes and animals. [4]
9. Calculate BOD of sewage sample if the initial DO, final DO and dilution percentage are 10 mg/l, 2 mg/l and 1% respectively. [3]
10. Draw schematic diagram for a complete waste water treatment system. [3]
11. Distinguish between: [3 × 3 = 6]
 - a. Slow sand filtration and rapid sand filtration
 - b. Tapered aeration and step aeration activated sludge technology
12. Write short notes on (*ANY TWO*): [2 × 2 = 4]
 - a. Sludge digestion
 - b. Rhizosphere effect
 - c. biocontrol agents



KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2017

Mark Scored:

Level : B. Sc.

Year : III

Exam Roll No. :

Time: 30 min

Registration No.:

AUG 30 2017
Course : PHYS 312

Semester : II

F. M. : 20

Date :

SECTION "A"

[20 Q × 1 = 20 marks]

Choose and tick (✓) the most appropriate answer.

- A tube of water is travelling at $0.5c$ relative to the laboratory frame when a beam of light travelling in the same direction as the tube enters it. The the speed of light in the water relative to the laboratory frame (The index of refraction of water is $4/3$) is:
[a] $(2/3)c$ [b] $(10/11)c$ [c] c [d] $(5/6)c$
- The π^- mesons coming out of an accelerator have a velocity of $0.99c$. If they have a mean lifetime of 2.6×10^{-8} sec in the frame. The distance they can travel before decay is:
[a] 27.62 m [b] 100 m [c] 54.62 m [d] 200 m
- A meson having a mass of 2.4×10^{-28} kg travels at a speed of $v = 0.8c$. Its kinetic energy is equal to:
[a] 2.4×10^{-11} J [b] 5.4×10^{-11} J [c] 8.44×10^{-11} J [d] 1.44×10^{-11} J
- If the kinetic energy of an electron is 5 MeV, its velocity is equal to:
[a] $0.352 c$ [b] $0.652 c$ [c] $0.952 c$ [d] $0.852 c$
- A rocket travelling away from the earth with a speed of $0.5c$ fires off a second rocket at a speed of $0.6c$ with respect to the first one. Then the speed of the second rocket with respect to the earth is
[a] $0.846 c$ [b] $0.146 c$ [c] $0.446 c$ [d] $0.746 c$
- An object passes at a speed of $0.8c$. Its length is measured to be 72.5 m. The length of the object measured when it is at rest would be:
[a] 200.8 m [b] 150.8 m [c] 100.8 m [d] 120.8 m
- A person on a rocket travelling at a speed of $0.5c$ with respect to the earth observes a meteor coming from behind and passing him at a speed $0.5c$. The speed of the meteor with respect to the Earth must be:
[a] $0.8 c$ [b] $0.2 c$ [c] $0.5 c$ [d] $0.9 c$
- The four momentum is
[a] null cone [b] space like vector [c] time like vector [d] both [b] and [c]
- In inertial frame S, two events occur at the same instant in time and $3c$ minutes apart in space. In inertial frame S', the same events occur at $5c$ minutes apart. What is the time interval between the events in S'?
[a] 16 min [b] 8 min [c] 1 min [d] 4 min

10. The mean lifetime of a muon at rest is 2.6×10^{-6} sec. Its lifetime as measured in the laboratory, if it is travelling at $v = 0.6c$ with respect to the laboratory will be:
[a] 3×10^{-6} sec [b] 2×10^{-6} sec [c] 6×10^{-6} sec [d] 9×10^{-6} sec

Fill in the blanks.

11. When the particle velocity is greater than velocity of light such a particle is known as _____
12. The postulates of special theory of relativity are applicable to _____ frames.
13. If a charged pion that decays in 10^{-8} sec in its own rest frame travels 30 m in the laboratory before decaying, the pion's speed must be most nearly _____ m/s.
14. The ratio of mass of electron to its rest mass, when it is moving with kinetic energy 50.59 MeV is equal to _____
15. The rest energy of electron is equal to _____ MeV.
16. A positive kaon has a rest mass of $494 \text{ MeV}/c^2$, whereas a proton has a rest mass of $938 \text{ MeV}/c^2$. If a kaon has a total energy that is equal to the proton rest energy, the speed of the kaon is most nearly equal to _____
17. A photon strikes an electron of mass m that is initially at rest, creating an electron-positron pair. The photon is destroyed and the positron and two electrons move off at equal speeds along the initial direction of the photon. The energy of the photon was _____
18. The interval between two events in Minkowski space is _____ of the frame of reference.
19. In an inertial reference frame S , two events occur on the x -axis separated in time by Δt and in space by Δx . In another inertial reference frame S' , moving in the x -direction relative to S , the two events could occur at the same time only if _____
20. The special theory of relativity deals with the events in the frame of reference which move with constant _____