UG/I/BIOT/H/II/18

2018

BIOTECHNOLOGY

[Honours]

PAPER – II

Full Marks : 90

Time : 4 hours

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

GROUP – A

(*Microbiology*)

Answer any **two** questions from the following : 15×2

1. (*a*) What are the characteristics of antibiotics that qualify them as chemotherapeutic agents ?

   (*b*) Define pure culture. Briefly describe streak plate technique for obtaining pure culture.

(*c*) Deduce the mathematics of exponentially growing bacterial culture.

(*d*) What happens in a chemostat if the dilution rate exceeds the maximal growth rate of the organism ?

(*e*) Explain how do buffers maintain constant pH in the medium. 3 + (1 + 3) + 4 + 2 + 2

2. (*a*) Briefly mention the structure and chemistry of outer membrane of gram negative bacteria. What is LPS ?

(*b*) Classify a bacterial cell according to arrangement of flagellar structure.

(*c*) Describe the replication of viral RNA and discuss the variation in the structure of bacteriophage.

(*d*) Define the term "sterile". How did Pasteur's experiments using swan-necked flasks defeat the theory of spontaneous generation ?
(3 + 1) + 3 + 5 + 3

3. (*a*) How many molecules of CO_2 and pairs of electrons are released per molecule of pyruvic acid oxidized in the citric acid cycle ?

(*b*) What is the role of NAD^+/NADH in glycolysis ?

(*c*) Schematically trace the E.D. Pathway.

(*d*) What is the difference between a naked virus and an enveloped virus ?

(*e*) Define the following :

(*i*) Virulent

(*ii*) Lysogeny

(*iii*)Prophage.

(*f*) Write a brief note on HIV. 2 + 2 + 3 + 2 + 3 + 3

4. (*a*) Draw the structure of the β-lactam ring and indicate the site of β-lactamase activity.

(*b*) Mention the mechanism by which each

of the following inhibits or kill micro-organism :

(*i*) Penicillin

(*ii*) Sulfa drug.

(*c*) Name two semisynthetic penicillin. Why are they superior in action than natural penicillin ?

(*d*) Name one antifungal antibiotic with name of the microorganism responsible for its production. 3 + (3 + 3) + 4 + 2

GROUP – B

(*Genetics*)

Answer any **five** questions from the following : 6 × 5

5. (*a*) Explain how interrupted mating experiments are used for determining the location of genes on bacterial chromosome.

(*b*) How does an *Hfr* cell differ from F^+ cell ? 4 + 2

6. Write short notes on any *three* : 2 × 3

   (*i*) Sickle cell anaemia

   (*ii*) Gene pool

   (*iii*) Turner syndrome

   (*iv*) Satellite DNA.

7. Give an example of one biological, one chemical and one physical mutagen and describe the mechanism by which each causes mutation. 2 + 2 + 2

8. (*a*) What are the major differences between insertion sequences and transposons ?

   (*b*) Write a note on extrachromosomal genetic material of bacteria. 3 + 3

9. What is C-value paradox ? Briefly explain population growth curve. 2 + 4

10. Differentiate between crossing over and independent assortment and mention the significance of gene linkage. 3 + 3

11. (*a*) Discuss in brief the mitochondrial genome organization.

(*b*) What is pseudogene ? 4 + 2

12. What are chromosomal aberrations ? Explain with examples. 2 + 4

GROUP – C

(*Computer Application and Bioinstrumentation*)

Answer any **five** questions from the following : 6 × 5

13. Discuss the principle and working of pulse field gel electrophoresis. 3 + 3

14. Discuss the X-ray crystallographic technique with the help of an appropriate diagram. 6

15. (*a*) Where are data and programme stored when the processer uses them ?

(*b*) What characteristics of ROM makes it useful ?

(*c*) What is a light pen ?

(*d*) What is meant by dedicated computer ?

(*e*) How is the output quality of a printer measured ? 1 + 2 + 1 + 1 + 1

16. (*a*) What are the similarities between gas chromatography and liquid chromatography ?

(*b*) Write down the principles of reverse phase HPLC. 4 + 2

17. Write down the principle and applications of NMR. 3 + 3

18. (*a*) What are the major advantages of electron microscope over light microscope ?

(*b*) What major advantage does phase-contrast microscopy have over staining ?

(*c*) How can cells be made to fluoresce ?

(*d*) What type of electron microscope would be used to observe internal cell structure ? 1 + 2 + 2 + 1

19. (*a*) Which device is required for Internet connection ?

(*b*) Mention the characteristics of second generation computer.

(*c*) Which programming languages are classified as low level language ?

(*d*) What is FORTRAN ? 1 + 3 + 1 + 1

20. Write notes on :

(*i*) Windows explorer

(*ii*) Custom animation

(*iii*) Digital logic number systems. 2 + 2 + 2