

DSE 1B : Microbiology

1. Answer any *eight* questions :

$$\frac{1}{2} \times 8 = 4$$

(a) The Gram staining technique, used to differentiate bacterial species, was developed by _____.
(Fill in the blank)

(b) Prion diseases are primarily associated with which type of tissue in mammals?

(c) The enzyme reverse transcriptase is present in which type of virus?

(d) Endotoxins are primarily related with gram negative bacteria.
(True/False)

(e) The normal flora of the intestine plays a crucial role in vitamin synthesis.
(True/False)

(f) Bacterial DNA replication is initiated at a specific site called the _____.
(Fill in the blank)

(g) Conjugation requires cell-to-cell contact.
(True/False)

(h) Give an example of enveloped positive-sense (+) RNA virus.

(i) Spiroplasma possesses _____ shape.
(Fill in the blank)

(5)

(j) Name a bacterium lacking cell wall.

(k) Teichoic acid is only found in cell wall of _____.
(Fill in the blank)

(l) A population of cells derived from a single cell are called _____.
(Fill in the blank).

2. Answer any *two* questions :

$$2\frac{1}{2} \times 2 = 5$$

(a) What are some factors that influence bacterial growth in culture media?

(b) What is the difference between F⁺ and F⁻ cells?

(c) Briefly explain BAC library.

(d) Discuss moist heat sterilization process in detail.

3. Answer any *four* questions :

$$4 \times 4 = 16$$

(a) How does antigenic switching help bacteria evade the host immune response?

(b) Write the causative agent, symptoms and preventive measures of polio.

(c) Briefly describe the Carl Woese's Three-Domain System.

(d) Write a short note on Koch's postulates.

P.T.O.

(6)

- (e) Explain different growth phases of bacteria with suitable diagram.
 - (f) Give a brief idea on *Hfr* conjugation.
 - (g) Write a short note on enriched media.
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DSE-1B : (Microbiology)

1. Answer any *eight* questions as directed : $\frac{1}{2} \times 8 = 4$

- (a) Give an example of eukaryotic pathogen.
- (b) _____ is an infectious protein that causes a neurodegenerative disease. (Fill in the blank)
- (c) Who is known as father of medical microbiology?
- (d) Vaccine for rabies was discovered by _____. (Fill in the blank)
- (e) Name the location of respiratory enzymes in bacteria.
- (f) All fungi have _____ in their cell wall. (Fill in the blank)
- (g) HIV virus enters the host cells with the help of _____ receptors present on the T lymphocytes. (Fill in the blank)
- (h) Which virus can be seen by light microscope?
- (i) Viruses that infect bacteria are referred to as _____. (Fill in the blank)
- (j) Give an example of bacterium causing foodborne intoxication.
- (k) Which disease is known as "break-bone fever"?
- (l) Give an example of complex media for bacteria culture.

(5)

2. Answer any *two* questions :

$2\frac{1}{2} \times 2 = 5$

- (a) Write a short note on bacterial endospore.
- (b) Briefly describe the harmful effects of normal bacterial flora of human body.
- (c) Name the causative agent with clinical symptoms of typhoid. $1+1\frac{1}{2}$
- (d) Write a short note on simple media.

3. Answer any *four* questions :

$4 \times 4 = 16$

- (a) Describe how bacterial cells adhere to its host cell.
 - (b) Write a short note on staphylococcal food poisoning.
 - (c) Describe the mechanism of DNA transfer during bacterial conjugation through F plasmid.
 - (d) Give an account of beneficial and harmful normal bacterial flora of intestinal tract.
 - (e) Write a note on bacterial endotoxin.
 - (f) Write the clinical symptoms, pathogenesis and preventive measures of dengue. $1+2+1$
 - (g) Write a short note on enriched media.
-

Paper : DSE-1(B)

(Microbiology)

1. Answer any eight questions :

 $\frac{1}{2} \times 8 = 4$

- (a) Teichoic acid is only found in cell wall of _____. (Fill in the blank)
- (b) Bacteria can be classified according to their shape. (True or False)
- (c) The scientist usually considered the first to see microorganisms, which he called "animalcules", was _____. (Fill in the blank)
- (d) An acellular infectious agent consisting only of protein is called _____. (Fill in the blank)
- (e) Domain concept proposed by Carl Woese was based on _____. (Fill in the blank)
- (f) The process whereby pathogens enter host cells or tissues and spread in the body is called _____. (Fill in the blank)
- (g) An organism's _____ is the degree of harm inflicted on its host. (Fill in the blank)
- (h) Murein is exclusively found in bacterial cell-wall. (True or false)
- (i) Bacterial pili are locomotory structures. (True or false)

(5)

- (j) _____ is the genetic transfer process by which free DNA is incorporated into a recipient cell and brings about genetic change. (Fill in the blank)
- (k) When small bunches or tufts of flagella emerge from the same site of a bacterium, the condition is called _____. (Fill in the blank)
- (l) Give an example of vertical transmission of pathogen.

2. Answer *any two* questions :

$2\frac{1}{2} \times 2 = 5$

- (a) Write a short note on glycocalyx.
- (b) Write the causative agent and clinical symptoms of dengue. $1 + 1\frac{1}{2} = 2\frac{1}{2}$
- (c) Briefly describe bacterial chromosome.
- (d) Differentiate between Gram-positive and Gram-negative bacteria.

3. Answer *any four* questions :

$4 \times 4 = 16$

- (a) Briefly describe domain concept of Carl Woese.
- (b) Give an account of beneficial and harmful bacterial flora of mouth.
- (c) Write a note on antigenic switching.
- (d) Explain briefly Koch's postulates.

P.T.O.

(6)

- (e) Write a note on specialized transduction.
- (f) Write the causative agent, clinical symptoms and preventive measures of typhoid. 1+2+1
- (g) Write a short note on selective media.
-

2024

(7)

DSE-1B : Microbiology

Answer *all* the questions.

1. Prepare a smear with sample provided and stain it with Gram stain. Identify and write the characteristics features of a gram positive bacteria. $1+2+1+1=5$
2. Answer any *one* question (**To be selected by lottery**) :

(A) Write the principle, materials required, procedure and interpretation of result of Sugar fermentation test for glucose/ sucrose/ lactose/ mannitol. $1+1+2+1=5$

(B)



- (i) What type of microbial culture technique is this?
- (ii) State the principle of this technique.
- (iii) Write the requirements and procedure of this process.

$$1+1+(1+2)=5$$

3. Laboratory Notebook.

2

4. Viva-voce.

3

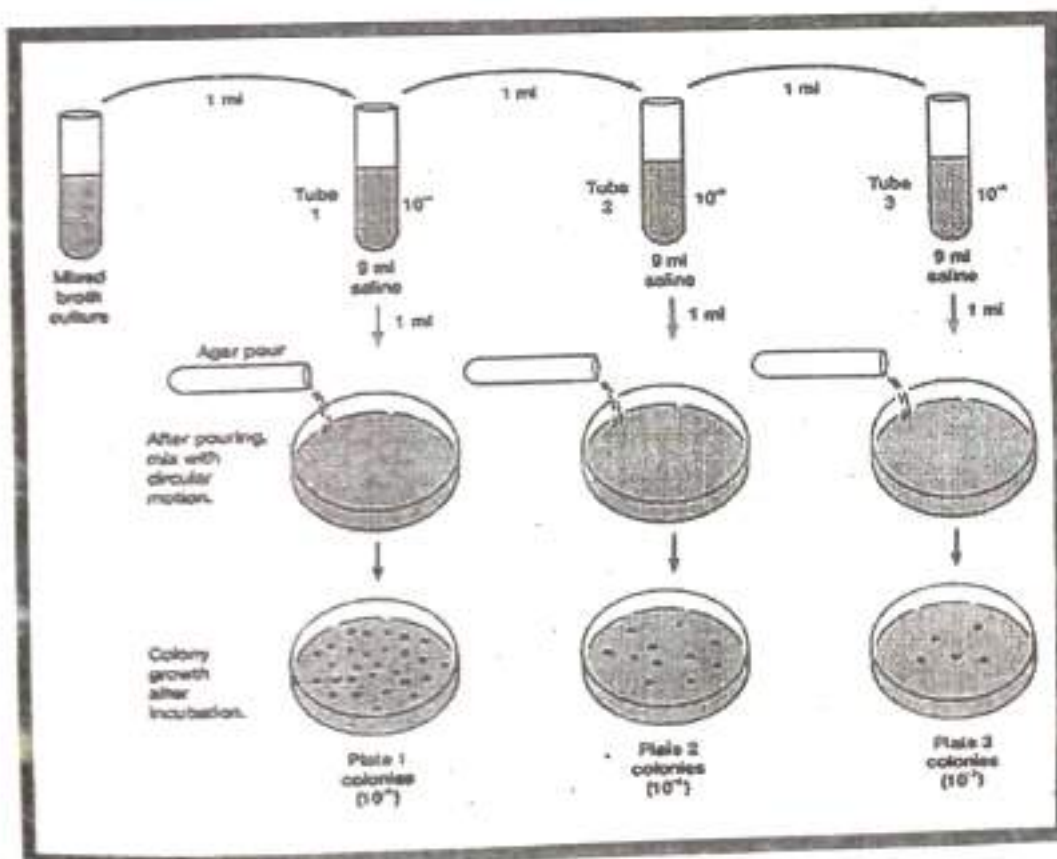
DSE-1B : Microbiology

Answer *all* the questions.

1. Make a smear with the supplied sample and stain it using Gram stain. Identify and state the distinctive features of the gram positive bacteria. 1+2+1+1=5
2. Answer *any one* question :

(A) State the principle, materials required, protocol and interpretation of result of methylene blue reductase test or sugar fermentation test for glucose/sucrose/lactose/mannitol. 1+1+2+1=5

(B)



P.T.O.

(6)

- (i) Name the type of microbial culture method shown in the figure.
- (ii) Write the principle of this method.
- (iii) Name the materials required and state the protocol of this process. 1+1+(1+2)=5

3. Laboratory Notebook. 2

4. Viva-voce. 3

OR

- (i) Write the principle of PCR.
- (ii) A researcher is performing PCR to amplify a sample of DNA. Unfortunately, he/she forgot to add the DNA primer prior to starting the experiment. What will be the result and why?
- (iii) Name the enzyme used in this technique and why?
 $1+(1+1)+(1+1)=5$
3. Presentation on any topic related to tools and techniques of biotechnology along with submission of a write up.
 $3+2$
4. Laboratory Notebook. 2
5. Viva-voce. 3

DSE 1B : Microbiology

2022

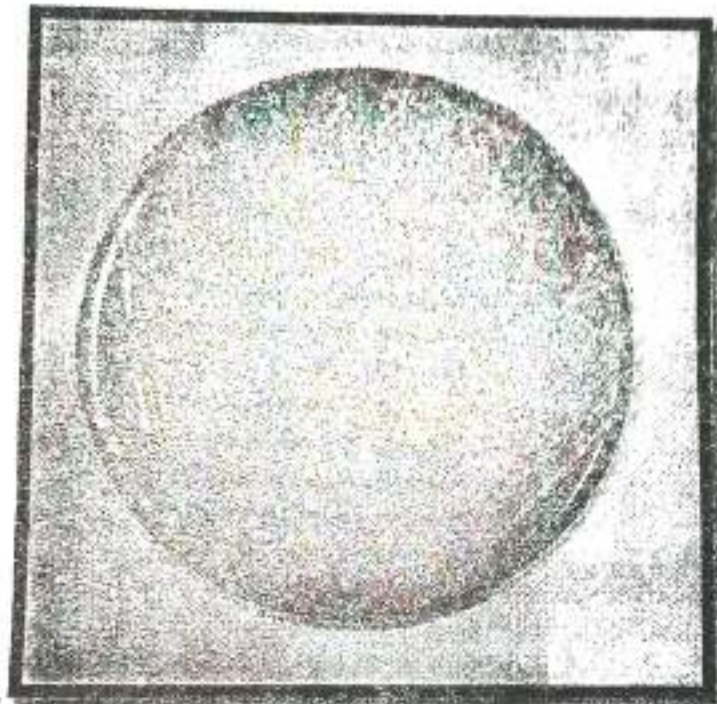
Answer any *two* from question no. 1

1. (A) Prepare a smear with sample provided and stain it with Gram stain. Identify and write the characteristics features of a gram positive bacteria.
 $1+2+1+1=5$
- (B) Write the principle, requirements, procedure and interpretation of result of Sugar fermentation test for glucose/sucrose/lactose/mannitol. $1+1+2+1=5$

P.T.O.

(4)

(C)



- (i) What type of microbial culture technique is this ?
- (ii) State the principle of this technique.
- (iii) Write the requirements and procedure of this process.

1+1+(1+2)=5

2. Laboratory Notebook.

2

3. Viva-voce.

3

2024

ZOOLOGY (Honours)

Paper Code : ZOOH DSE-1A/1B

(Animal Biotechnology/Microbiology)

(Practical)

Full Marks : 15

Time : Two Hours

The figures in the margin indicate full marks.

DSE-1A : Animal Biotechnology

Answer *all* the questions.

1. Answer any *two* questions taking at least one question from B to E (**Based on lottery**) :

(A) State the principle, materials required and steps for plasmid DNA isolation from *E.coli*.

1+1+3=5

P.T.O.

(2)

(B) A DNA molecule of 5000 bp long gives the following size fragments when treated with these restriction enzymes : 5

Eco-RI = 4000 bp, 1000 bp

Bam-HI = 1500 bp, 3000 bp, 500 bp

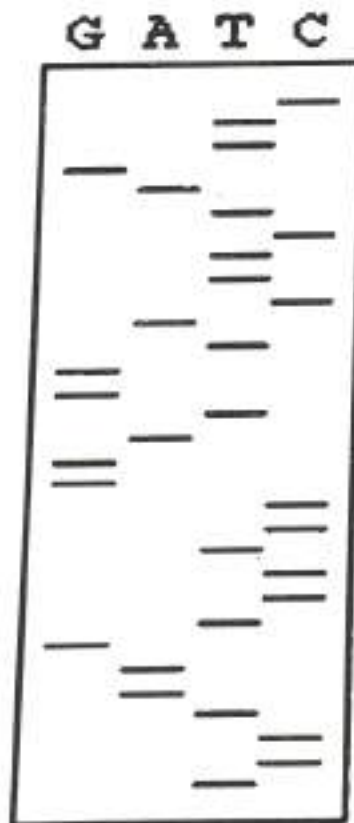
Eco-RI+Bam-HI = 500 bp, 1000 bp, 2000 bp, 1500 bp

Construct a restriction map from above data.

(3)

- (C) A cloned fragment of DNA was sequenced by using the dideoxy method. A part of the autoradiogram of the sequencing gel is represented here. The letters over the lanes indicate which dideoxy nucleotide was used in the sample being represented by that lane. Answer the following questions based on this autoradiogram.

$$2+2+(\frac{1}{2}+\frac{1}{2})=5$$



- (i) Write out the nucleotide sequence of the DNA molecule synthesized from the primer. Label the polarities of the strand.

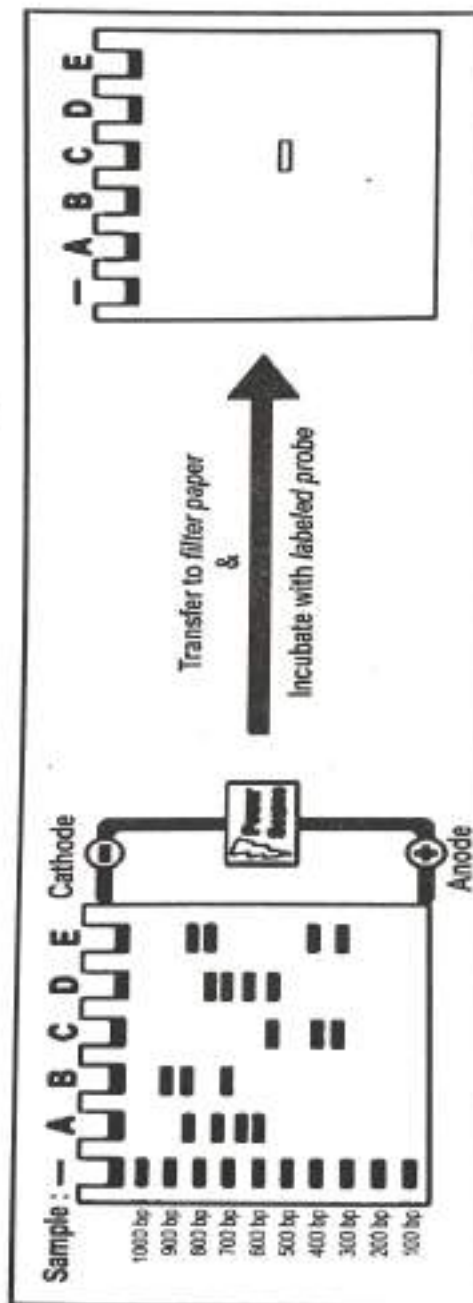
P.T.O.

(4)

- (ii) Write out the nucleotide sequence of the DNA molecule used as the template strand. Label the polarities of the strand.
- (iii) What is the other name of this technique? Who discovered this technique?

(5)

- (D) (i) Mention the steps of Southern blotting.
- (ii) By analysing the Southern Blot results below, which of the samples contains the gene of interest? Give reasons.



- (iii) State two applications.

2+2+1=5

P.T.O.

(6)

- (E) (i) Write the principle of Western blot.
- (ii) A researcher is performing Western blot to detect his/her protein of interest. Unfortunately, the primary antibody for the protein is not available for his/her experiment. Is it possible for him/her to conduct the experiment? Give reasons.
- (iii) Name the membrane used in this technique and why? $1+(1+1)+(1+1)=5$

- (F) Give a presentation on any subject pertaining to biotechnology tools and techniques along with submission of a report and viva-voce related to it. 5

2. Laboratory Notebook. 2

3. Viva-voce. 3

UG/5th Sem (H)/22/(CBCS)

2022

ZOOLOGY (Honours)

Paper Code : ZOOH DSE-1A/1B

Full Marks : 25

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

Paper : DSE-1(A)

(Animal Biotechnology)

1. Answer any *eight* questions :

$\frac{1}{2} \times 8 = 4$

- (a) The entire genetic complement of a living organism is known as _____. (Fill in the blank)
- (b) Bacteria may have linear or multipartite DNA. (True or False)
- (c) Who discovered restriction enzymes?
- (d) Klenow fragment is derived from _____. (Fill in the blank)
- (e) YAC is used to clone yeast gene only. (True or False)

P.T.O.

(2)

- (f) Chemical degradation method for DNA sequencing was invented by _____. (Fill in the blank)
- (g) Polyethylene glycol is used in _____. (Fill in the blank)
- (h) The optimal temperature for *Taq* polymerase is _____. (Fill in the blank)
- (i) Give an example of plasmid vector.
- (j) Sickle cell anaemia results from substitution of _____ for glutamic acid. (Fill in the blank)
- (k) The full form of cDNA is cyclic deoxyribonucleic acid. (True or False)
- (l) After cleaving the sequence, the nature of the ends created by the type II endonuclease is _____. (Fill in the blank)

2. Answer any two questions :

$$2\frac{1}{2} \times 2 = 5$$

- (a) What do you mean by HAT selection?
- (b) Write a short note on YAC.
- (c) Write the characteristic features of an expression vector.
- (d) Distinguished between genomic library and cDNA library.

3. Answer any four questions :

$$4 \times 4 = 16$$

- (a) Outline the process for construction of cDNA library.

(3)

- (b) Write a short note on Sanger's method of DNA sequencing.
 - (c) Discuss the process of Southern blotting.
 - (d) Give a brief account of attenuated vaccine.
 - (e) Write a short note on molecular diagnosis of thalassemia.
 - (f) Briefly describe the process of gene cloning by using pUC 19 cloning vector.
 - (g) Mention the uses of DNA finger printing in forensic science.
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P.T.O.

UG/5th Sem (H)/23/(CBCS)

2023

ZOOLOGY (Honours)

Paper Code : ZOOH DSE-1

(Animal Biotechnology / Microbiology)

Full Marks : 25

Time : Two Hours

The figures in the margin indicate full marks.

*Candidates are required to give their answers
(by selecting either DSE-1A : Animal Biotechnology
or DSE-1B : Microbiology) with their own words
as far as practicable.*

DSE-1A : (Animal Biotechnology)

1. Answer any *eight* questions as directed : $\frac{1}{2} \times 8 = 4$

- (a) Give an example of restriction endonuclease that produces sticky ends.
- (b) DNA molecules are always linear in eukaryotes.
(True/False)
- (c) Give an example of lymphocyte cell line of human.
- (d) Which vector holds the largest pieces of DNA?
- (e) Which type of bond is synthesized by DNA ligase?

P.T.O.

(2)

- (f) Which chemical is used to view DNA fragments in agarose gel?
- (g) In which technique dideoxynucleosides are used?
- (h) Bacteria protect themselves from viruses by fragmenting viral DNA with _____.
(Fill in the blank)
- (i) PCR technique was invented by _____.
(Fill in the blank)
- (j) Sticky-end ligation is generally more efficient than blunt-end ligation.
(True or False)
- (k) Sendai virus is used for _____.
(Fill in the blank)
- (l) Give an example of reporter gene.

2. Answer any *two* questions : $2\frac{1}{2} \times 2 = 5$

- (a) How recombinant and non-recombinant colonies can be differentiated in gene cloning?
- (b) Describe briefly how sickle cell anaemia can be diagnosed using molecular technique.
- (c) Write about the role of restriction endonuclease.
- (d) Write a short note on HAT selection.

3. Answer any *four* questions : $4 \times 4 = 16$

- (a) Describe the process of Western blotting technique.

(3)

- (b) Write a short note on DNA microarray.
 - (c) What do you mean by passive immunization? Give an example. Write its merits and demerits. 1+1+2
 - (d) Briefly describe a phagemid. How is it used? 3+1
 - (e) Describe briefly the principle and steps involved in PCR.
 - (f) Describe the process of DNA sequencing using Maxam-Gilbert method.
 - (g) Describe the process of DNA Fingerprinting. Write any two uses of this technique. 3+1
-

UG/5th Sem (H)/24/(CBCS)

2024

ZOOLOGY (Honours)

Paper Code : ZOOH DSE - 1A/1B

[Animal Biotechnology / Microbiology]

Full Marks : 25

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
(by selecting either DSE-1A : Animal Biotechnology
Or DSE-1B : Microbiology) in their own words
as far as practicable.*

DSE 1A : Animal Biotechnology

1. Answer any *eight* questions : $\frac{1}{2} \times 8 = 4$

(a) The *lacZ* gene in a cloning vector is often used for blue-white screening for recombinant colonies.

(True/False)

(b) Give an example of a live attenuated vaccine.

(c) The primary purpose of creating knockout mice is to enhance physical abilities. (True/False)

(d) Sickle cell anemia results in the substitution of which amino acid?

P.T.O.

- (c) Which enzyme is used to synthesize cDNA from mRNA?
- (f) Nuclear transplantation can be used to produce genetically identical organisms. (True/False)
- (g) HAT medium selects for both fused and unfused cells. (True/False)
- (h) The technique used to separate DNA fragments based on their size is _____. (Fill in the blank)
- (i) Name the scientist who discovered the technique of DNA fingerprinting.
- (j) Name a test for cell viability.
- (k) Write full form of TALEN.
- (l) The limited replicative capacity of human cells in culture is called Hayflick limit. (True/False)

2. Answer any *two* questions :

$$2\frac{1}{2} \times 2 = 5$$

- (a) Write a short note on knockout mice.
- (b) How is DNA fingerprinting used in forensic investigations?
- (c) Write a brief note on applications of transgenic animals in production of donor organs.
- (d) Write a brief note on c-DNA library.

(3)

3. Answer any *four* questions :

4×4=16

- (a) Outline the process of monoclonal antibody production in brief.
 - (b) Describe the process of Southern blotting technique.
 - (c) Write a short note on expression vector.
 - (d) Write a short note on molecular diagnostics of thalassemia.
 - (e) Write a short note on DNA microinjection.
 - (f) What are the types of restriction enzymes? Which type of restriction enzyme is commonly used in biotechnology and why? 2+2
 - (g) Explain the principle of Sanger's chain termination method.
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UG/5th Sem (H)/Pr/22/(CBCS)

2022

ZOOLOGY (Honours)

Paper Code : DSE-1A/1B

[Animal Biotechnology / Microbiology]

(Practical)

Full Marks : 15

Time : Two Hours

DSE 1A : Animal Biotechnology

The figures in the margin indicate full marks.

Answer any *two* from questions 1, 2 and 3

1. Write the principle, list of requirements and procedure of genomic DNA isolation from *E.coli*. 1+1+3=5

OR

Construct a restriction map from the given data : 5

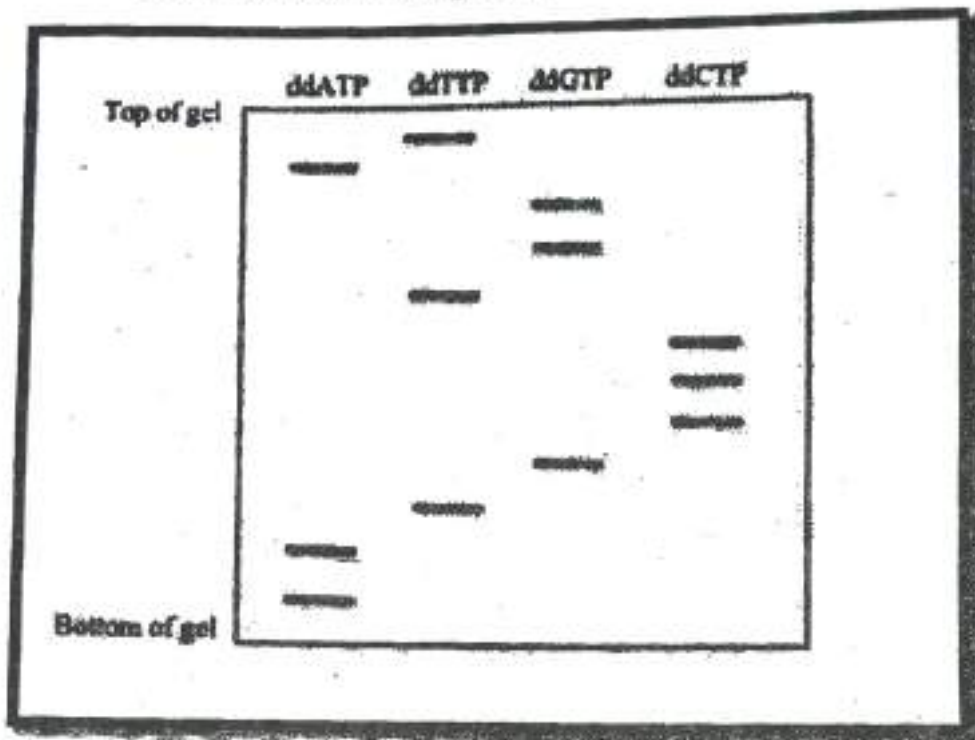
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Digestion with BamHI: 7.5 kb + 2.3 kb + 6.2 kb

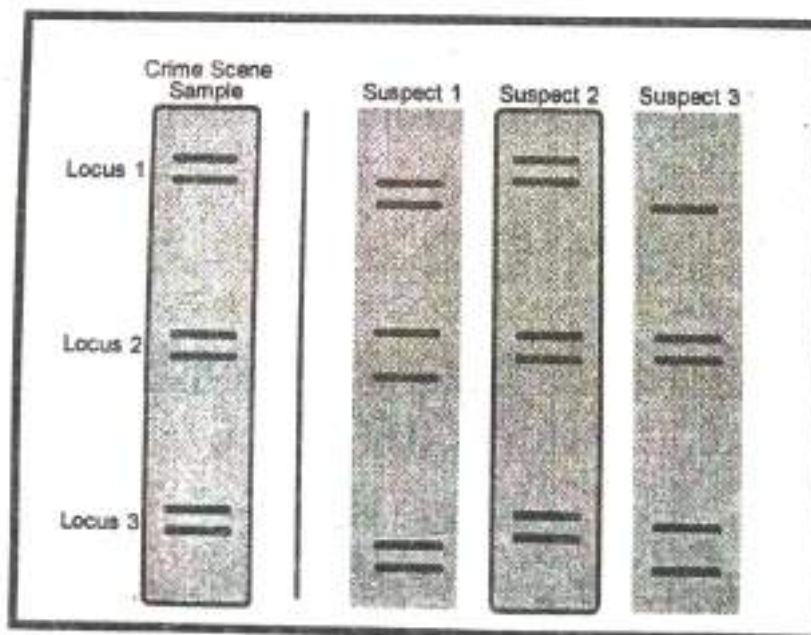
Digestion with EcoRI and BamHI: 2.8kb + 4.7kb
+ .9kb + 1.4kb + 3.4kb + 2.8kb

P.T.O.

2. (i) Determine the sequence of DNA with its polarity from the chromatogram. 3+2=5



- (ii) Identify the suspect who committed the crime from the chromatogram. Justify your answer.



(3)

OR

- (i) Write the principle of PCR.
- (ii) A researcher is performing PCR to amplify a sample of DNA. Unfortunately, he/she forgot to add the DNA primer prior to starting the experiment. What will be the result and why?
- (iii) Name the enzyme used in this technique and why?
 $1+(1+1)+(1+1)=5$
3. Presentation on any topic related to tools and techniques of biotechnology along with submission of a write up.
 $3+2$
4. Laboratory Notebook. 2
5. Viva-voce. 3

DSE 1B : Microbiology

2022

Answer any *two* from question no. 1

1. (A) Prepare a smear with sample provided and stain it with Gram stain. Identify and write the characteristics features of a gram positive bacteria.
 $1+2+1+1=5$
- (B) Write the principle, requirements, procedure and interpretation of result of Sugar fermentation test for glucose/sucrose/lactose/mannitol.
 $1+1+2+1=5$

P.T.O.

UG/5th Sem (H)/Pr/23/(CBCS)

2023

ZOOLOGY (Honours)

Paper Code : ZOOH DSE-1

(Animal Biotechnology/Microbiology)

(Practical)

Full Marks : 15

Time : Two Hours

The figures in the margin indicate full marks.

DSE-1A : Animal Biotechnology

Answer *all* the questions.

1. Answer any *two* questions taking at least one question from B to E :

(A) State the principle, materials required and steps for plasmid DNA isolation from *E.coli*. 1+1+3=5

(B) A linear DNA molecule 1000 bp long gives the following size fragments when treated with these restriction enzymes : 5

Eco-RI =300 bp, 700 bp

Bam-HI =150 bp, 200 bp, 250 bp, 400 bp

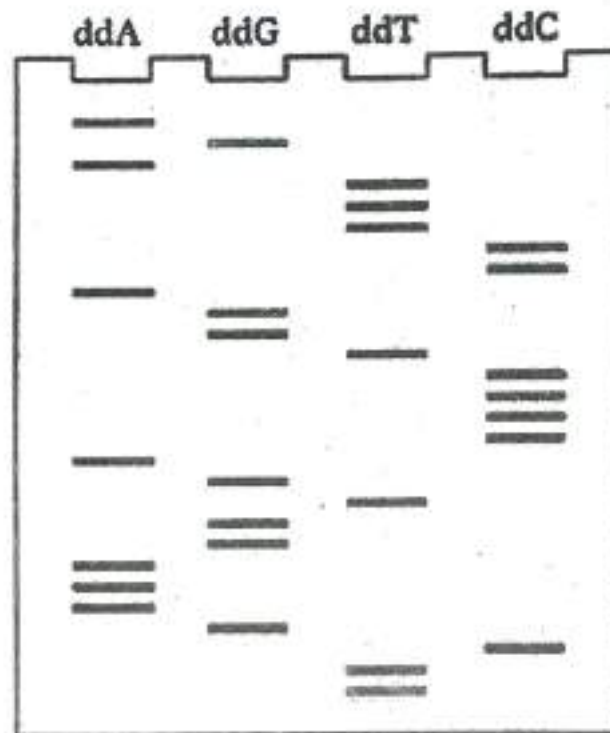
Eco-RI+Bam-HI =50 bp, 100 bp, 200 bp, 250 bp, 400 bp

P.T.O.

Construct a restriction map from above data.

- (C) A cloned fragment of DNA was sequenced by using the dideoxy method. A part of the autoradiogram of the sequencing gel is represented here. Answer the following questions based on this autoradiogram.

$$2+2+(\frac{1}{2}+\frac{1}{2})=5$$



- Write out the nucleotide sequence of the DNA molecule synthesized from the primer. Label the polarities of the strand.
- Write out the nucleotide sequence of the DNA molecule used as the template strand. Label the polarities of the strand.
- What is the other name of this technique?
Who discovered this technique?

(3)

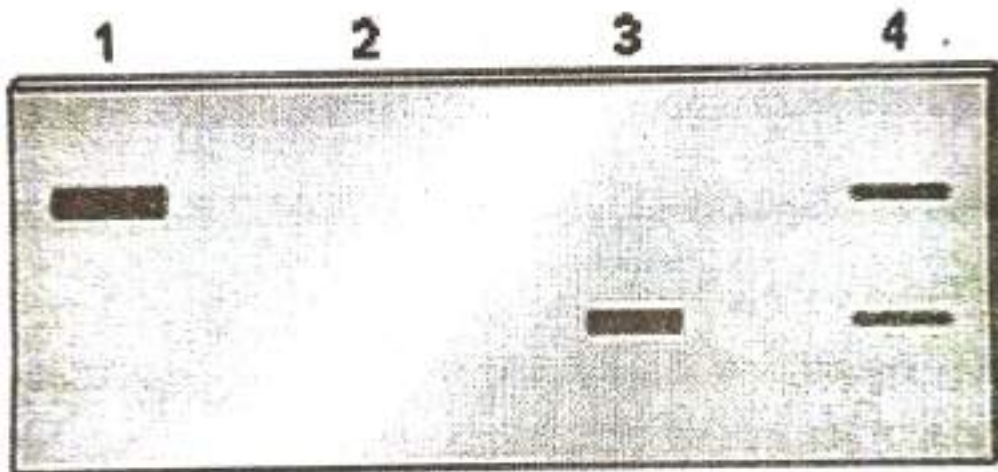
- (D) (i) The Northern blot shown here was made using a DNA probe that is complementary to the mRNA coded by a particular gene. The mRNA in lanes 1 through 4 was isolated from different cell types, and equal amounts of total cellular mRNA were loaded onto all four lanes.

Lane 1 : mRNA isolated from nerve cells

Lane 2 : mRNA isolated from kidney cells

Lane 3 : mRNA isolated from spleen cells

Lane 4 : mRNA isolated from muscle cells



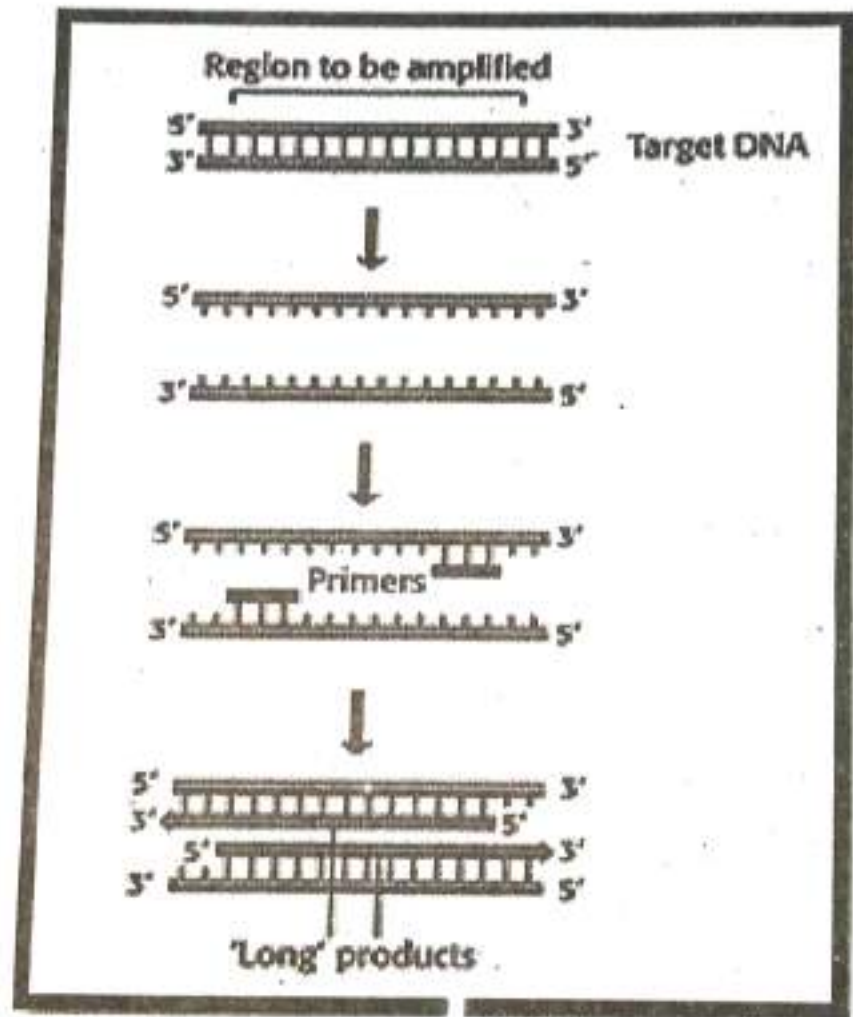
Explain the result of the above Northern blot.

- (ii) Which technique employs identifying differences in repetitive DNA among individuals? State one application of the technique. $3+(1+1)=5$

P.T.O.

(4)

- (E) Name the technique shown in the figure alongside. Who discovered this technique? Label the steps in the process and give the temperatures for each step. How the bacterium *Thermus aquaticus* is related to this process? $\frac{1}{2} + \frac{1}{2} + 3 + 1 = 5$



- (F) Submission of a report on any topic pertaining to tools and techniques of biotechnology combined with a presentation/talk. $2 + 3 = 5$

4. Laboratory Notebook. 2
5. Viva-voce. 3

UG/6th Sem (H)/24/(CBCS)

2024

ZOOLOGY (Honours)

Paper Code : ZOOH DC-13

(Parasitology and Immunology)

Full Marks : 25

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

1. Answer any *eight* questions taking *four* from each group : $\frac{1}{2} \times 8 = 4$

Group - A

(Parasitology)

- (a) State the intermediate host of *Schistosoma haematobium*.
- (b) *Xenopsylla* sp. is the vector of plague disease.
(True/False)
- (c) The vector of leishmaniasis is Tse-tse fly.
(True/False)
- (d) Give an example of intestinal hookworm.
- (e) Name a disease transmitted by mites.
- (f) Amoebiasis is caused by _____. (Fill in the blank)

P.T.O.

(2)

Group - B

(Immunology)

- (g) Expand ADCC.
 - (h) Maternal antibody is an example of natural active immunity. (True/False)
 - (i) Give one example of secondary lymphoid organ.
 - (j) Name an antibody a baby receives from mother in the intra-uterine life.
 - (k) Which class of MHC molecule is found only on antigen presenting cells?
 - (l) Allergies to food is an example of _____ hypersensitivity. (Fill in the blank)
2. Answer *two* questions taking *one* from each group :
 $2\frac{1}{2} \times 2 = 5$

Group - A

(Parasitology)

- (a) Differentiate between parasite and parasitoid.
- (b) Write the pathogenicity of *Brugia malayi*.

Group - B

(Immunology)

- (c) Discuss HAT selection.
- (d) How innate immunity is different from acquired immunity?

(3)

3. Answer *four* questions taking *two* from each group :

$4 \times 4 = 16$

Group - A

(Parasitology)

- (a) Briefly describe the life cycle of *Trypanosoma gambiense*.
- (b) Explain the role of ticks as vectors.
- (c) Which stage of *Giardia intestinalis* is infective to humans? Write about the pathogenicity of this parasite. $1+3=4$
- (d) Write about the diagnosis and treatment of *Taenia saginata*. $2+2=4$

Group - B

(Immunology)

- (e) Discuss the process of inflammation with a diagram. $3+1=4$
- (f) Give an outline on different class of immunoglobulin molecules along with their functions.

2023

ZOOLOGY (Honours)

Paper Code : ZOOH DC-13

(Parasitology and Immunology)

Full Marks : 25

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

1. Answer *eight* questions taking *four* from each group :

$$\frac{1}{2} \times 8 = 4$$

Group - A

[Parasitology]

- (a) Give an example of blood fluke causing urinary bladder cancer.
- (b) Housefly is an example of biological vector. (True/False)
- (c) Name a disease transmitted by hard tick.
- (d) Name the infective stage of *Schistosoma haematobium* to humans.
- (e) State an example of intestinal parasite in humans.

P.T.O.

(2)

- (f) *Giardia* sp. is an example of haemoflagellate. (True/False)

Group - B

[Immunology]

- (g) Expand ELISA.
- (h) Vaccination is an example of artificial active immunity. (True/ False)
- (i) Name an antibody, a baby receives from mother immediately after birth.
- (j) Give one example of antigen presenting cell.
- (k) Which granulocyte plays a role in allergic reactions?
- (l) Name the class of MHC molecule recognized by CD4 T-helper cell.

2. Answer *two* questions taking *one* from *each* group :

$$2\frac{1}{2} \times 2 = 5$$

Group - A

[Parasitology]

- (a) Differentiate between definitive host and intermediate host with example.
- (b) Discuss on the laboratory diagnosis of *Schistosoma haematobium* infection.

(3)

Group - B

[Immunology]

(c) Differentiate primary and secondary immune response.

(d) Write a short note on adjuvants.

3. Answer *four* questions taking *two* from *each* group :
 $4 \times 4 = 16$

Group - A

[Parasitology]

(a) Briefly describe the life cycle of *Leishmania donovani*. What is PKDL? $3+1=4$

(b) Write the diagnosis and treatment of *Giardia intestinalis*. $2+2=4$

(c) Which stage of *Trypanosoma gambiense* is infective to human? Write about the pathogenecity of this parasite. $1+3=4$

(d) Explain the role of any mite as a vector studied by you. Mention some control measures of mites. $2+2=4$

Group - B

[Immunology]

(e) Discuss the process of monoclonal antibody production using hybridoma technology.

P.T.O.

UG/6th Sem (H)/25/(CBCS)

2025

ZOOLOGY (Honours)

Paper Code : ZOOH DC-13

(Parasitology and Immunology)

Full Marks : 25

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

1. Answer *eight* questions taking *four* from each group :

$$\frac{1}{2} \times 8 = 4$$

Group - A

[Parasitology]

- (a) Name a nematode parasite that infects the lymphatic system.
- (b) Name the infective stage causing malaria.
- (c) Ticks are vectors of Lyme disease. (True/False)
- (d) Name the stage of *Trypanosoma gambiense* infective to humans.
- (e) Expand PKDL.
- (f) *Giardia* is an example of haemoflagellate. (True/False)

P.T.O.

(2)

Group - B

[Immunology]

(g) Immunoglobulin _____ is primarily found in secretions like saliva and tears. (Fill in the blank)

(h) Name one antigen-presenting cell.

(i) Name the hypersensitivity type involved in autoimmune diseases.

(j) Which antibody is involved in allergic reactions?

(k) Vaccination is an example of artificially acquired active immunity. (True/False)

(l) Which MHC class is recognized by CD8⁺ T cells?

2. Answer *two* questions taking *one* from *each* group :

$$2\frac{1}{2} \times 2 = 5$$

Group - A

[Parasitology]

(a) Describe the biological and medical importance of mites.

(b) Write the pathogenecity of *Trypanosoma gambiense*.

(3)

Group - B
[Immunology]

- (c) What is Type I hypersensitivity reaction? Explain with example.
- (d) What is difference between cell mediated and humoral immunity?
3. Answer *four* questions taking *two* from *each* group :
4×4=16

Group - A
[Parasitology]

- (a) Describe the phases of life cycle of *Plasmodium vivax* in human host.
- (b) Differentiate between mechanical and biological vectors with examples.
- (c) Briefly describe the life cycle of *Leishmania donovani*.
- (d) Which stage of *Schistosoma* is infective to humans and snails? Write the mode of this parasitic infection to humans. Mention its treatment.

$$(\frac{1}{2} + \frac{1}{2}) + 1\frac{1}{2} + 1\frac{1}{2}$$

P.T.O.

UG/6th Sem/H/Pr./23/(CBCS)

2023

ZOOLOGY (Honours)

Paper Code : ZOOH DC-13

(Parasitology and Immunology)

(Practical)

Full Marks : 15

Time : Two Hours ,

The figures in the margin indicate full marks.

Question no. 1, 3 and 4 are compulsory for all

Question no. 2 will be selected by Lottery

1. Identify the following specimens with reasons :

$2\frac{1}{2} \times 2 = 5$

Specimen A

Specimen B

2. Determine your own blood group with the kit supplied.
Write down principle for determining the blood group.
Comment on your result.

$2+2+1=5$

P.T.O.

Write the principle and prepare a smear of differential identification of WBC. Identify one WBC and draw a labelled diagram of it.

1+2+1+1=5

Or,

Dissect out the gut and identify one rectal parasite of cockroach. Draw a labelled diagram and write its characteristics features.

1+1+1½+1½=5

3. Laboratory Notebook.

2

4. Viva voce.

3

UG/6th Sem/H/Pr./24/(CBCS)

2024

ZOOLOGY (Honours)

Paper Code : ZOOH DC-13

(Parasitology and Immunology)

(Practical)

Full Marks : 15

Time : Two Hours

The figures in the margin indicate full marks.

Question no. 1, 3 and 4 are compulsory for all

Question no. 2 will be selected by Lottery

1. Identify the following specimens with reasons : $2\frac{1}{2} \times 2 = 5$

Specimen A

Specimen B

(2)

5

2. Answer any *one* question :

(A) Dissect out the gut of cockroach and identify one rectal parasite from it. Draw a labelled diagram and write its identifying features. $1+1+1\frac{1}{2}+1\frac{1}{2}=5$

(B) Determine your own blood group with the supplied kit. Write down the principle and comment on your result. $2+2+1=5$

(C) Prepare a smear of differential identification of WBC. Write the principle, identify one WBC and draw a labelled diagram of it. $2+1+1+1=5$

3. Laboratory Notebook.

2

4. Viva-voce.

3

UG/6th Sem (H)/26/(CBCS)

2026

ZOOLOGY (Honours)

Paper Code : ZOOH DC-13

(Parasitology and Immunology)

Full Marks : 25

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

1. Answer eight questions taking four from each Group :

$$\frac{1}{2} \times 8 = 4$$

Group - A

[Parasitology]

- (a) Name the precise microhabitat or organ occupied by adult *Wuchereria bancrofti* inside human hosts.
- (b) Name the specific larval stage of *Fasciola hepatica* that emerges from the miracidium within the snail tissue.
- (c) *Entamoeba histolytica* uses flagella as its primary means of locomotion. (True/False)
- (d) The vector of Chagas disease is _____.
(Fill in the blank)
- (e) Give an example of haemoflagellate.

P.T.O.

(2)

- (f) Name the infective stage of *Giardia* sp. to human.

Group - B

[Immunology]

- (g) Name one secondary lymphoid organ in humans where adaptive immune responses are actively initiated.
- (h) Name the distinct category of hypersensitivity reaction that is driven primarily by IgE-mediated mast cell degranulation.
- (i) Autoimmune hemolytic anemia is fundamentally a manifestation of a Type III hypersensitivity reaction.
(True/False)
- (j) Expand ADCC.
- (k) ELISA detects both antigen and antibody.
(True/False)
- (l) Transfer of IgG from mother to fetus is an example of _____ immunity. (Fill in the blank)

2. Answer any *two* questions taking *one* from each Group :

$$2\frac{1}{2} \times 2 = 5$$

Group - A

[Parasitology]

- (a) Elaborate on the structural and physiological parasitic adaptations observed in adult intestinal roundworms.

(3)

- (b) State the difference between parasite and parasitoid.

Group - B

[Immunology]

- (c) Differentiate between primary immune response and secondary immune response.

- (d) What is epitope and paratope?

3. Answer any *four* questions taking *two* from each Group : 4×4=16

Group - A

[Parasitology]

- (a) Describe the life cycle of *Wuchereria bancrofti*.
- (b) Describe the structural morphology, intra-cellular transmissin phase, and pathogenic consequences of *Entamoeba histolytica*.
- (c) Which stage of *Trypanosoma gambiense* is infective to human? Write the pathogenicity of this parasite. 1+3
- (d) Briefly explain the life cycle and pathogenicity of *Taenia saginata*. 3+1

P.T.O.

UG/5th Sem (H)/23/(CBCS)

2023

ZOOLOGY (Honours)

Paper Code : ZOOH DSE-2

(Biostatistics / Bioinformatics)

Full Marks : 25

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
(by selecting either DSE-2A : Biostatistics Or
DSE-2B : Bioinformatics) with their own words
as far as practicable.*

DSE-2A : (Biostatistics)

1. Answer any *eight* questions as directed : $\frac{1}{2} \times 8 = 4$

(a) Find the class boundary of class interval 20-24.

(b) Find the mode of the following series :

3, 6, 1, 3, 2, 7, 2, 5, 8, 3.

(c) Height of student is an example of qualitative data.
(True/False)

(d) Give one example of non-parametric test.

P.T.O.

- (e) What will be the degrees of freedom when number of observation is 4?
- (f) Yates' correction is applied in monohybrid cross.
(True/False)
- (g) Give one example of discrete variable.
- (h) The root mean square deviation is commonly known as _____.
(Fill in the blank)
- (i) Primary data are collected directly from the field.
(True/False)
- (j) Arrangement of values in a serial order is needed to determine mean.
(True/False)
- (k) Sampling represents subset of the whole population.
(True/False)
- (l) When correlation between height and weight is very strong, what will be the correlation coefficient?

2. Answer any *two* questions :

$2\frac{1}{2} \times 2 = 5$

- (a) Explain standard deviation and standard error.
- (b) Define median. Find the mean of the following series of data :

42, 48, 43, 65, 57, 31, 60, 37, 48, 59, 78.

$1 + 1\frac{1}{2}$

- (c) Write a note on frequency distribution.
- (d) What do you mean by class limit and class mark?

3. Answer any *four* questions :

4×4=16

- (a) Mendel self-fertilized pea plants with round and yellow peas. In the next generation, he recovered the following numbers of peas plants :

Round and yellow peas - 330

Round and green peas - 112

Wrinkled and yellow peas - 106

Wrinkled and green peas - 38

Use a χ^2 test to determine whether this experiment fits expected Mendelian ratio at 5% level of significance.

(Given : critical χ^2 value at 0.05 for $df=3$ is 7.82, $df=4$ is 9.49)

- (b) The fasting glucose level of seven persons were 4, 6, 8, 5, 9, 3 and 7 mmol/L. After intake of oral glucose, the blood sugar level was 8, 10, 13, 9, 8, 12 and 14 mmol/L respectively. Use appropriate statistical test whether oral glucose has significantly increased the blood sugar level or not? (Given : critical t value at 0.05 for $df=6$ is 2.45)

P.T.O.

- (c) Erythrocyte Sedimentation Rate (ESR) of 12 subjects have been given in mm as 10, 8, 9, 6, 17, 8, 11, 14, 18, 8, 11, 11. Calculate the variance and standard error. $2\frac{1}{2}+1\frac{1}{2}$
- (d) Briefly discuss regression analysis.
- (e) State the assumptions of ANOVA. What do you mean by one-way and two-way ANOVA? $2+2$
- (f) What is correlation? State its characteristic features. Name the types of correlation. $1+2+1$
- (g) What do you mean by paired and unpaired 't' test? State the application of 't' test. $3+1$
-

DSE-2B : (Bioinformatics)

1. Answer any *eight* questions as directed : $\frac{1}{2} \times 8 = 4$

(a) The first computer was invented by _____.
(Fill in the blank)

(b) Which memory unit is bigger : 1MB or 1GB?

(c) Write the full form of CPU.

(d) NCBI stands for _____.
(Fill in the blank)

(e) Give an example of nucleotide sequence database.

(f) When a sequence is submitted to GenBank, a number is assigned to it known as _____.
(Fill in the blank)

(g) Which numbers are used in binary number system?

(h) Expand WWW.

(i) TelNet is used to study genes that are involved in telomere maintenance mechanisms. (True/False)

(j) Today we are using third generation of computers.
(True/False)

(k) Give one example of hardware of computer.

(l) Expand PHYLIP.

P.T.O.

2. Answer any *two* questions :

$2\frac{1}{2} \times 2 = 5$

- (a) Write a short note on BLAST.
- (b) What is input and output unit of computer? Give one example of each.
- (c) Give an account of PAM250.
- (d) What is FTP? State its utility.

$1\frac{1}{2} + 1$

3. Answer any *four* questions :

$4 \times 4 = 16$

- (a) Explain multiple sequence alignment and its type in details.
- (b) Discuss the goals, scopes, and applications of bioinformatics.
- (c) Mention the different elements of phylogeny. Add a note on PHYLIP software.
- (d) Write an explanatory note on protein sequence database.
- (e) Explain gap penalty scoring matrix.
- (f) How Octal number system is different from Hexadecimal number system?
- (g) Diagrammatically represent the components of a typical digital computer along with their functions.

2024

ZOOLOGY (Honours)

Paper Code : ZOOH DSE - 2A/2B

[Biostatistics / Bioinformatics]

Full Marks : 25

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers (by
selecting either DSE-2A : Biostatistics Or DSE-2B :
Bioinformatics) in their own words as far as practicable.
Use of Calculator is allowed.*

DSE 2A : Biostatistics

1. Answer any *eight* questions :

$$\frac{1}{2} \times 8 = 4$$

- (a) Give one example of qualitative data.
- (b) Find the class mark of class interval 15-19.
- (c) Find the mode of the provided series : 7, 9, 2, 2, 2, 7, 2, 3, 4, 9, 9, 2.
- (d) Name the scientist who introduced the concept of standard deviation.
- (e) Give one example of parametric test.
- (f) Name the type of chi-square where attributes are classified into a two-way table.

P.T.O.

- (g) When two independent variables are involved, this is called _____ ANOVA. (Fill in the blank)
- (h) Write the relation between mean, median and mode.
- (i) The range of coefficient of correlation is _____. (Fill in the blank)
- (j) Probability of an event may range from 1 to 2. (True/ False)
- (k) To perform t-test the number of samples should be less than _____. (Fill in the blank)
- (l) When standard deviation is high, variance should also be high. (True/False)

2. Answer any *two* questions :

$$2\frac{1}{2} \times 2 = 5$$

- (a) Define variance and standard deviation. State their relation.

$$2 + \frac{1}{2}$$

- (b) Find the mean and median of the following series of data :

50, 53, 76, 64, 68, 59, 71, 70, 65

$$1 + 1\frac{1}{2}$$

- (c) Define class width. What do you mean by primary data? Give one example.

$$1 + 1\frac{1}{2}$$

- (d) Write a brief note on different types of variables.

3. Answer any *four* questions :

4×4=16

- (a) The height of 9 students have been given in cm as 152, 165, 155, 161, 168, 160, 155, 154, 152. Calculate the standard deviation and standard error.

$$2\frac{1}{2} + 1\frac{1}{2}$$

- (b) Two flies heterozygous for curly wing when mated, produce 787 curly and 277 straight winged progenies. Use a chi square test to determine whether this experiment fits expected Mendelian ratio at 5% level of significance. (Given : critical χ^2 value at 0.05 for $df = 1$ is 3.84, $df = 2$ is 5.99)

- (c) Albino rats were administered with an Ayurvedic medicine at the rate of 10mg/10kg/day for 7 days. Initial and final body weights of the rats were recorded as provided in the table below. Determine whether the drug has any effect on the gain or loss of body weight of the rat. (Given : critical 't' value at 0.05 for $df = 9$ is 2.26, $df = 18$ is 2.10)

Rat No.	1	2	3	4	5	6	7	8	9	10
Initial body weight	110	115	102	98	112	110	97	120	102	110
Final body weight	109	116	100	95	108	112	98	115	98	111

(4)

- (d) What is probability? State the characteristic features of probability. What is the probability of drawing a black ball from a bag containing 6 white balls and 9 black balls? 1+2+1
- (e) Give a brief account on ANOVA.
- (f) Write a note on measures of Central Tendency.
- (g) Calculate the correlation coefficient between A and B for the following data set :

A	1	2	3	4	5	6	7	8	9
B	10	11	12	13	14	15	16	17	18

DSE - 2B : Bioinformatics

1. Answer any *eight* questions : $\frac{1}{2} \times 8 = 4$

- (a) GenBank is maintained by _____.
(Fill in the blank)
- (b) Expand EMBL.
- (c) Name a commonly used multiple sequence alignment tool.
- (d) How many bits are in a byte?
- (e) Which generation of computer introduced very large-scale integration technology?
- (f) Name a commonly used phylogenetic analysis software package.
- (g) Which unit controls the working of all units of a computer?
- (h) Expand ALU.
- (i) BLAST is used for _____.
(Fill in the blank)
- (j) Expand UPGMA.
- (k) Give an example of an operating system.
- (l) Name a tool for studying protein sequences.

P.T.O.

(6)

$$2\frac{1}{2} \times 2 = 5$$

2. Answer any *two* questions :

- (a) Write a short note on ClustalW.
- (b) What is Central unit and Memory unit?
- (c) Differentiate between primary and secondary storage devices.
- (d) Write a brief note on octal number system.

$$4 \times 4 = 16$$

3. Answer any *four* questions :

- (a) Explain briefly local and global sequence alignment.
- (b) Differentiate between HTML and HTTP.
- (c) Give an account of phylogenetic analysis and its application.
- (d) Write a note on binary number system.
- (e) State the characteristics of first-generation and fifth-generation computers.
- (f) Briefly discuss BLOSUM62.
- (g) Differentiate between RAM and ROM.

$$2+2$$

UG/5th Sem (H)/22/(CBCS)

2022

ZOOLOGY (Honours)

Paper Code : ZOOH DSE-2A

(Biostatistics)

Full Marks : 25

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

1. Answer any *eight* questions from the following : $\frac{1}{2} \times 8 = 4$

(a) What is the mode of the following data set: 22, 42, 24, 22, 25, 32, 30, 24, 28? 22- 42

(b) When a data is in perfect correlation, it lies exactly on straight line. (True / False)

(c) Find the degrees of freedom, when the number of observation is 2.

(d) Give one example of software used for statistical calculation.

(e) The value of correlation coefficient lies between _____. (Fill in the blank)

(f) Write the relation between mean, median and mode.

P.T.O.

- (g) Pie-chart is constructed on the basis of percentage.
(True / False)
- (h) Statistical sample represents the total population.
(True / False)
- (i) Give an example of continuous variable.
- (j) Who coined the term student 't' test?
- (k) Eye color is an example of _____
variable. (Fill in the blank)
- (l) Give an example of parametric test.

2. Answer any *two* questions from the following :

$2\frac{1}{2} \times 2 = 5$

- (a) What is frequency distribution table? What is a class interval?
 $1 + 1\frac{1}{2}$
- (b) Find the median of the following data: 11, 12, 19, 17, 18, 26, 15, 21, 26, 20
- (c) Write a note on Data.
- (d) What is Probability? State its characteristic features.
 $1 + 1\frac{1}{2}$

3. Answer any *four* questions from the following : $4 \times 4 = 16$

- (a) What is t test? Write about its types. $2 + 2$
- (b) Write a short note on central tendency.

(3)

(c) Calculate standard deviation for the following data :

28, 32, 55, 27, 41, 30, 27, 38, 29, 38

(d) Two curly winged flies when mated produce 71 curly and 41 straight winged progenies. Use a chi square test to determine whether this experiment fits 3:1 ratio at 5% level of significance. (critical χ^2 value at 0.05 for df =1 is 3.84, df =2 is 5.99)

(e) What is Regression? Mention its application. 2+2

(f) Calculate the mean and variance for the following data : 2+2

Weight	45-55	55-65	65-75	75-85	85-95
Number of students	15	39	61	15	2

(g) Give an account of ANOVA.

$$\frac{\sum x}{n}$$

mid

$$s.d = \sqrt{\frac{\sum d^2}{n} - \left(\frac{\sum d}{n}\right)^2}$$

$$(x-a):d$$

$$\frac{m-a}{i} \quad i=10$$

$$d^2 + d$$