Chhatrapati Shahu Ji Maharaj University, Kanpur

Answer Script Details
Barcode 11564164

Roll No. 24080022030
Total Mark 53.50/75.00

Exam M.SC-III_ODD_EXAM_NOV_2025
Subject B050903T - Waste Management and Sustainable Develop

Question wise Mark Summary

Q.No	Mark	Q.No	Mark	Q.No	Mark	Q.No	Mark
1A	3/5						
1B	4/5						
1C	3/5						
1D	3.5/5						
1E	3/5						
1F	3.5/5						
1G	3/5						
1H	3.5/5						
1I	4/5						
2	0/15						
3	11/15						
4	0/15						
5	0/15						
6	0/15						
7	12/15						
8	0/15						
9	0/15						

Chhatrapati Shahu Ji Maharaj University
Kanpur, Uttar Pradesh

PART-II

Date of Exam: 08/12/2025 Shift: 3rd Room No.: 12
Paper Code: B050903T Subject: Zoology PaperIII Year/Sem.: 3rd
Name of Candidate: ALSHIFA ALAM
Roll No.: 2 4 0 8 0 0 2 2 0 3 0
Signature of Candidate: Alshifa Alam
Signature of Invigilator:
COE Facsimile:

MARKS OBTAINED											
Q.	1	2	3	4	5	6	7	8	9	10	
(a)											
(b)											
(c)											
(d)											
(e)											
(f)											
(g)											
(h)											
(i)											
(j)											
Total											
Total Marks in Figures											Max. Marks
Total Marks in Words											

B050903T
Paper Code

Signature of Evaluator

PART-III

Course: M.Sc. Final Zoology
Session: 2025-26 Year/Semester: 3rd
Subject: Zoology Paper III

Paper Code: B 0 5 0 9 0 3 T
Exam Date: 0 8 1 2 2 0 2 5
Name of Candidate: ALSHIFA ALAM
Father's Name: MOHD ALAM

महाविद्यालय का कोड College Code: K N 0 4
परीक्षा केन्द्र का कोड Exam Centre Code: K N 0 4

परीक्षा का प्रकार Type of Exam
Regular ● Ex. Student ○
Private ○ Re-Exa. Other Back paper Exam ○

ANSWER BOOKLET NO.: 11564164
B050903T
Paper Code

PART-IV

नामांकन संख्या Enrollment Number: C S J M A 2 4 0 0 0 0 1 3 7 8 9

परीक्षार्थी अनुक्रमांक संख्या Candidate's Roll Number: 2 4 0 8 0 0 2 2 0 3 0

पेपर कोड Paper Code: B 0 5 0 9 0 3 T

Alshifa Alam
Signature of Candidate

Signature of Invigilator

C S Facsimile

COE Facsimile

नोट : 1. परीक्षार्थी को निर्देशित किया जाता है कि आंसर पत्रों के मुख्य भाग पर अंकित सभी जिन्दगी को सावधानी पूर्वक भरें।
2. बॉक्स में सभी जगह सभी प्रविष्टियां काली गोल से मुख की जायें। 3. गोलों को काले या नीले बॉलपेन से भरा जायें।

INSTRUCTIONS TO THE CANDIDATE FOR FILLING PART-I

1. Read the instructions carefully given on the answer script and admit card.
2. Write Date of Exam, Shift, Paper Code & Name of Subject Correctly.
3. Write Name & Roll No. Correctly.
4. Write Semester & Branch Correctly.

INSTRUCTIONS TO THE CANDIDATE FOR FILLING PART-III

1. Use blue or black ball point pen for writing alphabets & numerals in ☐ Boxes.
2. Carefully study the example before you start marking.
3. As shown in the example below blacken the circles completely.

4. Make no Stray marks on this sheet.
5. **DO NOT WRITE OR MARK ON THE BAR CODE.**

परीक्षार्थी के लिए निर्देश

1. प्रवेश पत्र एवं उत्तर पुस्तिका पर दिये गये निर्देशों को ध्यान से पढ़ें।
2. कवर पृष्ठ के दूसरी तरफ कुछ न लिखें।
3. उत्तर पुस्तिका के पृष्ठों पर दोनों तरफ लिखें।
4. प्रश्न पत्र पर अपने अनुक्रमांक के अतिरिक्त कुछ न लिखें।
5. प्रश्न पत्र कोड एवं प्रश्न पत्र कोड सावधानी पूर्वक लिखें।
6. अपनी स्थिति स्पष्ट लिखें।
7. उत्तर पुस्तिका के पृष्ठों की संख्या देखें। अगर उत्तर पुस्तिका में पृ (1–24) से कम है या फटे हुए है, तो परीक्षा शुरू होने के पूर्व दूसरी उ पुस्तिका ले लें।
8. प्रश्नपत्र को देख, यदि प्रश्नपत्र के विषय कोड, विषय का नाम तथा प्र में कोई त्रुटि है तो उसके परीक्षा शुरू होने के 30 मिनट के अन्दर व निरीक्षक को तत्काल सूचित करें, उसके बाद विश्वविद्यालय द्वारा क कार्यवाही नहीं की जायेगी।
9. प्रश्नों के उत्तर लिखने के लिये पेंसिल का प्रयोग न करें।
10. B कोपी या अतिरिक्त शीट नहीं दिया जायेगा।

IN ORDER TO AVOID UFM (UNFAIR MEANS) :

1. The Roll No. and Answer Book no. found elsewhere or any other symbol found in the answer book will be treated as unfair means.
2. Any tempering of Bar Code and Booklet no shall be treated as Unfair Means.
3. Do Not bring the materials like slip of paper/mobile/digital diaries/ study material/ revision notes in examination hall. Possession of the mobiles/ digital diaries/ electronic watch and any other electronic gadget except memory less scientific calculator shall be considered as UFM case.
4. Do not keep or paste currency note in answer script it shall be consider as UFM.

INSTRUCTIONS TO THE CANDIDATE

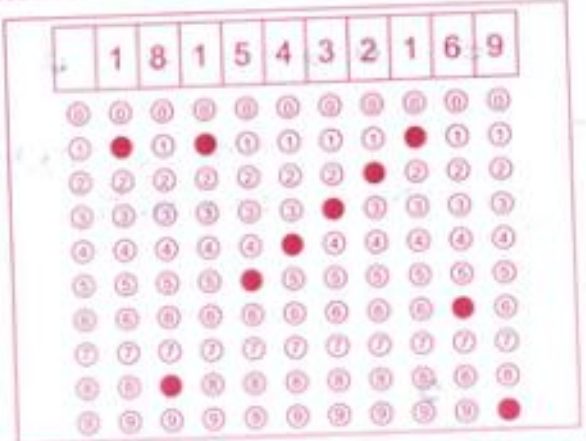
1. Read the instructions carefully given on the Question Pape Admit Card & Answer Script.
2. Do not write anything on back side of the cover page.
3. Write on both sides of pages of answer book.
4. Do not write anything on question paper except Roll Number.
5. Write Paper Code & Question Paper Id carefully.
6. CHECK the number of pages (1-32) or any other kind of damag in your answer script, if found than change the answer scri impediately before the commencement of examination.
7. CHECK the Question Paper for any kind of discrepancy e.g Subject Code, Subject Name and Question of the Questio Paper during first THIRTY MINUTES of the commencement the exam, so that it can be corrected in TIME. After that n corrections shall be entertained by the university.
8. Do not use pencil for answering the question.
9. Write status correctly e.g. those appearing in carry over paper should fill in status as Carry Over. Those appearing as Ex Students should fill in status as ex.
10. No supplementary answer book & graph paper will be provided.

अनुचित साधन से बचने हेतु:

1. उत्तर पुस्तिका के निर्दिष्ट स्थान को छोड़कर अनुक्रमांक एवं उत्तरपुस्तिका का क्रमांक कहीं और न लिखे तथा कोई भी चिन्ह न बनाये क्योंकि यह अनुचित साधन प्रयोग की परिधि में आता है।
2. उत्तर पुस्तिका के बारकोड अथवा उत्तर पुस्तिका संख्या पर छेड़ करने पर अनुचित साधन प्रयोग माना जायेगा।
3. परीक्षा कक्ष में निम्न वस्तुएं साथ न लायें, जैसे लिखे हुए कागज के टुकड़े, मोबाईल, डिजिटल डायरी, कोपी, पुस्तक यह सभी वस्तुएं जो अनुचित साधन के अन्तर्गत आती है। केवल सक्षिप्त प्रश्नपत्र में ही मेमोरी लैस साइंटफिक कैल्कुलेटर ले जाने की अनुमन्यता होगी।
4. उत्तर पुस्तिकाओं में कटपे न रखें न ही उत्तर पुस्तिका में चिपकायें। ऐसा करना अनुचित साधन प्रयोग की परिधि में आता है।

INSTRUCTIONS TO THE CANDIDATE FOR FILLING PART-IV

1. Use blue or black ball point pen for writing alphabets & numberals in ☐ Boxes.
2. Use blue or black ball point pen for filling the circles.



Note - If your Roll No. is of 10 digits. Please leave first three columns.

Paper Code
B 0 5 0 9 0 3 T

01

(SEC-A)

Short Answers

Ans. 1 (A)

Electronic waste

- Electronic waste or E-waste is the discarded electronic devices such as Computers, TV, mobile phones, refrigerators etc.
- If not managed properly E-waste can cause severe environmental damage.

E-waste recycling process.

① Collection :- E-waste is gathered from households, business etc.

② Dismanting :- Devices are broken down into components.

③ Material Recovery :- Precious metals are extracted by chemical or thermal methods.

④ Refurbishing :- Usable parts are repaired and resold.

(b) Safe disposal :- Non recylable parts are then send to authorized disposal facilites.

Ans. 1(b)

Ecological footprint

- Ecological footprint measures how much land/ water we use to support our lifestyle.
- It is usually measured in global hectares.
- Components of ecological footprint :-

① Carbon footprint :- Land needed to absorb CO_2 from the atmosphere.

② Food footprint :- Land used for growing crops and grazing animals.

③ Housing footprint :- Space used for buildings and infrastructure.

Importance

① Shows whether our lifestyle

is sustainable or not.

When it is unsustainable ?

If country's or individual's ecological footprint is more than Earth's biocapacity, then we are in ecological defiat.

Ecological deficiet ; when
Ecological footprint > Earth's biocapacity.

Ecological reserved , when
Ecological footprint < Earth's biocapacity

Ans. 1(C)

Wind Energy

- Wind energy is a renewable form of energy that uses turbine to convert Kinetic energy of wind into electricity

- Importance of wind energy

1. It is renewable.
2. Produces no green house emissions.
3. Minimal ecological disturbance.
4. Reduces dependency of on fossil

fuels.

(5) It is cost-effective over time.

(6) It generates employment in
- Manufacturing of turbines.
- Installation and maintaince.
- Research and development in energy technology.

(7) It has public health benefits because
- By reducing dependency on fossil fuels, it reduces air pollution
- Fewer cases of respiratory and cardiovascular diseases.
- Reduces health cost.

(8) It helps in rural development because most of the wind turbines are established in rural or semi-rural areas.

(9) It leads to community involvement.

Disadvantages

(1) Wind is not always consistent.
(2) Can also interfere with birds migration.

Paper Code
T B0509033T 05

Ans. 1 (d)

Crop rotation

- Crop rotation is the method of growing different crops in a sequence on a same field over several years.
- Typical Rotation Example :-

Year 1 :- Maize (Requires large amount of nitrogen)
Year 2 :- Legumes such as beans and peas (Nitrogen fixation)
Year 3 :- Rooted crops like carrot
Year 4 :- Leafy greens or cereals.

Significance of Crop rotation in Sustainable Development

① Improves soil fertility

When the nitrogen depleting crop (Maize) is followed by nitrogen fixing crop such as legumes, then soil naturally regains its nutrients without the needs of chemical fertilizers.

② Reduces soil erosion.

Crop rotation usually includes crop cover crops that reduces soil erosion during dry- seasons.

③ Control pest and disease.

When a same crop is grown repeadtly then it the pest and disease specific to that crop can establish in the soil. By rotating crops, we interfere with the life cycle of pest and pathogen, reducing their number and minimizing the use of chemical pesticides.

④ Enhance biodiversity.
⑤ Increase farm productivity and profitability.

Ans. 1(E)

Decomposable waste.

- Decomposable waste are organic wastes that can be decomposed by the microorganisms. such as bacteria, fungi, actinomycetes.
- Decomposable waste include — crop waste, manure, animal

waste, sewage waste, food waste etc.

- Decomposable waste can be composted
- Composting is a natural process in which organic waste is biologically decomposed into nutrient rich material known as compost.

Composting are of three types -

(1) Aerobic composting :- It depends on aerobic microorganisms to decompose the organic waste into compost. It occurs in the presence of O_2

(2) Anerobic Composting :- It depends on anerobic microorganisms to decompose the organic waste into compost. It occurs in the absence of Oxygen. It releases methane, Co_2 and H_2S (Hydrogen sulphide).

(3) Mechanical composting :- It is a industrial method of composting waste in a controlled closed equipment. In this temperature and oxygen are carefully maintained.
The method automates aeration and mixing.
It is a rapid method of composting.

Paper Code
B 0 5 0 9 0 3 T

08

Ans. 1 (f)

Chipko movement

- Chipko movement is a environmental movement
- It began in 1970s in Garhwal Himalayas
- In 1973, in Uttarakhand — When the workers come to cut down the trees, the villagers hugged the trees and prevent the workers from cutting them.
- It is also known as Tree-hugging movement.
- Sundarlal Bahuguna later took the message of Chipko Movement to the national and international level.

Bahuguna's slogan was —

"Ecology is permanent economy."

- This act inspired other Villages of Uttarkhand to protect the trees from felling down.

Importance of the movement

① Prevent deforestation:- The movement help to protect the

Do Not Write anything in this Portion

trees from falling down.

(2) Women's participation:- Women's take active part in Chipko Movement because they are directly affected by deforestation.

(3) Changes in Government policies

Ans. 4 (G)

Renewable energy

Renewable energy comes from naturally replenishing sources such as wind, sun, rain, tides, waves, geothermal heat.

Types of Renewable energy:

(1) Solar energy :- Captured using photo-voltaic cells and solar thermal systems.

(2) Wind energy :- Generate clean energy using wind turbines.

(3) Hydropower generation:- Uses flowing water to generate electricity.

(4) Biomass energy:- Produced from organic waste.

(5) Geothermal energy :- Uses earth's core heat.

Importance of Renewable energy

(1) Clean and sustainable

Produces little to no greenhouse emissions.

(2) Energy security

Reduces dependence on fossil fuels.

(3) Ecomic benefits and job creation

Creates jobs in manufacturing, installation, maintance and R&D.

(4) Cost effective over-time.

Low operational and maintainance cost.

(5) Combat climate change

Essential in reducing carbon emission and slowing global warming.

Ans. 1(H)

Biomedical waste

Biomedical waste is any waste that is generated during diagnosis, treatment and immunization of humans and animals.

If not managed properly it causes injuries, infections or environmental damage

Types of Biomedical waste:-

1. Infectious Waste :- Waste / materials contaminated with blood.
2. Pathogenic waste :- Humans. tissues, organs or body parts.
3. Sharps :- Needles, syringes or blades.
4. Pharmaceutical waste :- Expired or unused drugs or vaccines.
5. Radioactive waste :- Waste generated during ~~carbon~~ cancer radio-therapy.
6. Non-hazardous waste :- General trash from hospitals such as food, plastic etc

Paper Code
B D 5 0 9 0 3 T

12

Ans. 1 (I)

Role of NGOs'

Non-Government organizations are non-profit, Independent organisation that work at local, national and internation level to address social, environmental and development issues.

Role of NGOs' in sustainable developme

① Public Awareness :- Local NGOs often organize tree planting and clean up drives.

② Policy Advocacy :- Push for stronger policy changes of environm

③ Implementation of Developmental project Ex. Water conservation, waste reduction, organic farming etc.

④ Monitoring

Act as watch dogs, monitor the implementation of government schema environmental laws, etc

⑤ Research

Carry out research in sustainable practi

Do Not Write anything in this Portion

(SEC - B)

(Ans. 3)

Disposal of municipal solid waste :-

The last step in the solid waste management is the safe disposal of residue waste.

Methods :-

① **Composting :-** Composting is the biological breakdown of organic waste using microorganism into a nutrient such material known as compost.

Types of composting :-

(1) **Aerobic composting :-** Aerobic composting occurs in the presence of oxygen. The aerobic microorganisms consume Carbon from the waste and generate CO_2, water vapour and heat.

(2) **Anaerobic composting :-** Occurs in the absence of oxygen. The anaerobic microorganisms breat down waste and produce CO_2, Methane and Hydrogen Sulphide. It is slower than aerobic.

(3) **Mechanical composting :-** It is a controlled

Industrial method. occurs in a closed equipm

(3) ~~Beau~~ Incineration :- It is a method of waste treatment in which solid waste is burnt at high temperature. It reduces the volume of waste by 90%.

Advantages :- • Reduces landfill use.
• Reduces volume of waste by 90%

Disadvantages :- • Causes air pollution
• Fly ash is toxic and requir special care.

Steps :-

① Collection :- Waste and collected and bring to incineration facility

② Pre-treatment (optional).

③ Burni... :- Waste is burned at high temperature (800 - 1500°C)

④ Energy recovery :- Heat produced is used to produce steam. Steam drives turbines to generate electricity.

⑤ Emission control :- Exhaust gases are treated with filters and scrubbe

⑥ Ash handling.
• Bottom Ash is collected and landfille
• Fly ash is toxic, require special care.

③ Landfilling

- It is a method of waste disposal where waste is buried in a designated land area.
- Components

- Liner System :- Plastic or clay at the bottom to prevent leachate flow into groundwater.
- Leachate collection system:- Collects the leachate and direct it to treatment plant.
- Waste covering and compaction: Waste is compacted to reduce waste and covered to avoid odour, litter and pest-
- Gas collection system:- Decomposition of waste produce methane gas, which can be collected.

Advantages

① Better than open dumping.
② Reduces spread of diseases.

Disadvantages

① Requires vast area.
② Can still pollute environment if not managed properly.

④ Recycling

- It is a process in which waste is collected, processeed and transformed into a new product.
- It reduces landfill pressure.
- Contribut to circular economy.

⑤ Waste-to-energy process

- The non-recyclable waste is converted into heat, electricity, steam. by chemical, thermal or biological process.
- Reduces lanfill use and produce energy.

Three categories of Municipal solid waste —

① Biodegradable waste :- Organic waste such as food scraps, garden waste etc. These can be composted or used to produce biogas.

② Non-Biodegradable waste :- Inorganic waste that can not be composted such as metals, plastic, glass etc. They can recycled.

③ Hazardous waste :- These waste possess some threat to the environment or human health.
Ex- batteries, pesticides, chemicals etc.

Paper Code B 0 5 0 9 0 3 T 17

(SEC-C)

(Ans. 7)

Introduction :-

- Recycling involves collection, processing and transforming of waste into new products.
- Recycling is the fundamental pillar of solid waste management.
- More than just a method to reduce the landfill use, recycling helps to conserve natural resources, save energy and foster sustainable development

Significance Of Recycling of solid wastes?

① Reduction in landfill pressure and environmental impact.

The most immediate benefit of recycling of solid waste is reduction in landfill use. When the recyclable materials such as glass, plastic, metals etc are diverted from landfill, they not only increase the life of existing landfills but also reduces the ecological footprint of waste disposal.

Recycling also reduces the

Volume of waste that require incerination Thus by recycling community can reduce the need for both recycling landfilling and incerination, leading to a cleaner and more sustainable environment.

② Conservation of natural resources.

Recycling helps to conserve limited natural resources. For example, recycling aluminium reduces/saves 95% of its energy required to make it from its raw materials.
In the same way, recycling paper helps to reduce need for deforestation, protecting the forests which are vital for carbon absorption and biodiversity. Moreover, extraction and processing of raw materials require high environmental and economic cost.

③ Economic growth and job creation

Recyling industry contributes significantly to National income. It creates job worldwide in collection, storage, processing and, manufacturing and selling of recyclable materials. In addition, recycled materials also serve as cheaper alternative to raw materials;

making cost - effective to manufacturers. Governments and municipalities are financially benefited by reducing the landfill operation cost and generating revenues through the sale of ~~recyclable~~ recycled materials.
As nation moves through greener technologies recycling become the essential part of economic development strategies.

④ Encourage sustainable behaviour and public engagement:

Recycling fosters sustainability and responsibility among citizens and communities. It serve as a entry point for broader sustainable behaviour, encouraging people to think about their consumption pattern and waste generation. Citizens become active stakeholders in environment protection, helping to drive collective efforts towards sustainable development.

⑤ Support various national and global sustainability or environmental targets :-

Recycling aligns with several global sustainability targets.
It align with UN 17 sustainability targets.

especially the target no. 12.

SDG 12 :- Responsible consumption and production.

Countries that implement effective recycling strategies are better positioned to meet international committments related to -

- climate ~~chan~~ action
- Resource recovery
- Pollution reduction.

Recycling is a fundamental pillar of waste management. Everyday tons of waste are produced from businesses, households, industries etc. Only a little percentage of waste is managed safely.

Poor waste disposal can harbour the vector of many diseases such as flies, rodents and mosquitoes.

To mitigate these issues recycling of solid is done.

Thus, these are significances of recycling of solid wastes.

Paper Code

21

Do not write anything in this portion

Paper Code

22

Do Not Write anything in this Portion

Paper Code

23

Do not write anything in this area.

Paper Code

24

Do Not Write anything in this Portion