**Chattogram Veterinary and Animal Sciences University, Chattogram**
**Faculty of Fisheries**
**B. Sc. Fisheries (Hons.) Year -01, Semester-02, Final Examination' 2022**
**Course No: EME-102 (T), Course Title: Estuarine and Marine Ecology (Theory)**
**Total Marks: 70, Time: 3 hours**

*Answer any **05 (five)** questions from each sections. Figures in the right margin indicate full mark. Use separate answer script for each section.*

## Section A

| | | | |
|---|---|---|---|
| 1. | a) | Draw the typical morphological features of an estuary. | 2.0 |
| | b) | What are the major characteristics of an estuary? | 3.0 |
| | c) | 'Estuarine ecosystem act as a nursery ground for aquatic organisms'- explain the statement. | 2.0 |
| 2. | a) | Classify estuary based on geomorphology. | 4.0 |
| | b) | 'Estuary is a nutrient flux'- explain. | 3.0 |
| 3. | a) | Illustrate typical marine bottom topography. | 3.0 |
| | b) | Illustrate marine province including its major features. | 4.0 |
| 4. | a) | Define population, community and ecology. | 3.0 |
| | b) | Draw and describe the typical estuarine ecosystem. | 4.0 |
| 5. | a) | Write down the role of biogeochemical cycles in coastal nutrient cycling. | 2.0 |
| | b) | Discuss nitrogen and phosphorus cycling in marine ecosystem. | 5.0 |
| 6. | a) | Classify earth surface zones on the basis of latitude circle with diagram. | 3.0 |
| | c) | Describe the geographical distribution and migration of hilsha fish. | 4.0 |
| 7. | Write short notes on **any 02 (two)** of the following: a) ENSO; b) Marine communities and c) Adaptations in marine fishes | | 3.5×2= 7.0 |

## Section B

| | | | |
|---|---|---|---|
| 8. | a) | Define food web and food chain. | 2.0 |
| | b) | Compare estuarine ecosystem with marine ecosystem. | 2.0 |
| | c) | How positive estuary and negative estuary forms? | 3.0 |
| 9. | a) | Divide estuarine region based on tidal influence. | 3.0 |
| | b) | "Intertidal zone support an extensive number of habitats that assist a wide range of biodiversity"- explain | 4.0 |
| 10. | a) | What are the types of evolution? | 3.0 |
| | b) | Explain Darwin's theory on natural selection. | 2.0 |
| | c) | Give some examples of natural selection in fish. | 2.0 |
| 11. | a) | Explain the symbiotic relationship observed in coral. | 2.0 |
| | b) | Briefly discuss the Darwin's subsidence theory. | 3.0 |
| | c) | What is coral bleaching? | 2.0 |
| 12. | a) | What is salt marsh and seagrass? | 1.0 |
| | b) | Classify marine pelagic zone. | 3.0 |
| | c) | 'Deep sea fishes need special types of adaptation'-justify. | 3.0 |
| 13. | a) | Sketch intertidal and subtidal zones. | 3.0 |
| | b) | Differentiate between habitat and niche. | 2.0 |
| | c) | Define stenohaline and euryhaline organisms. | 2.0 |
| 14. | Write short notes on **any 02 (two)** of the following: a) ENSO; b) Estuarine biodiversity and c) Sandy beach. | | 3.5×2= 7.0 |

**Chattogram Veterinary and Animal Sciences University, Chattogram**
**Faculty of Fisheries**
**B. Sc. Fisheries (Hons.), Year-01, Semester-02 (July-December), Final Examination' 2022**
**Course No.: 0831WQM102T, Course Title: Water Quality Management (Theory)**
**Total Marks: 70, Time: 3 hours**

*Answer any **5 (five)** questions from each section. Use separate answer script for each section. Figures in the right margin indicate full mark.*

## Section-A

| | | | |
|---|---|---|---|
| 1. | a) | Mention the ideal level of water quality parameters for aquaculture. | 4 |
| | b) | Write down the significance of water quality management in aquaculture. | 3 |
| 2. | a) | What do you mean by water quality deterioration? | 1 |
| | b) | How you will measure the water quality deterioration? | 3 |
| | c) | How pond water quality can be deteriorated? | 3 |
| 3. | a) | What is eutrophication? | 2 |
| | b) | What are the primary symptoms of eutrophic water? | 2 |
| | c) | Why eutrophication is harmful for culture species? | 3 |
| 4. | a) | Explain the effects of pH and temperature on ammonia toxicity. | 3 |
| | b) | Write down the forms and toxicity of Total Ammonia Nitrogen (TAN). | 2 |
| | c) | What are sources of ammonia in fish pond? | 2 |
| 5. | a) | Write down the characteristics of POPs? | 3 |
| | b) | How does polluted water disrupt food chains? | 2 |
| | c) | What are the differences between bioaccumulation and biomagnifications? | 2 |
| 6. | a) | Define dissolved oxygen (DO). | 2 |
| | b) | What are the possible sources of DO in a culture pond? | 2 |
| | c) | Why anoxic condition is harmful for culture species? | 3 |
| 7. | Write short note on **any 02 (two)** of the following: | | 3.5x2=7 |

a) Causes of water pollution; b) Feeding management to maintain water quality; c) Carbon buffer system.

## Section-B

| | | | |
|---|---|---|---|
| 8. | a) | Write down the relationship of DO, $CO_2$, pH and photosynthesis in a pond. | 3 |
| | b) | What are the significances of temperature to produce fish? | 2 |
| | c) | How will you identify and solve $H_2S$ gas problem in pond? | 2 |
| 9. | a) | Why does dissolve oxygen deplete in aquatic waterbody? | 3 |
| | b) | How does oxygen dissolve in water? | 2 |
| | c) | How can you enrich dissolve oxygen in pond? | 2 |
| 10. | a) | What are the effects of clay turbidity on other water quality parameters? | 3 |
| | b) | Explain flocculation and coagulation. | 2 |
| | c) | "Alum is the most effective coagulant" – justify. | 2 |
| 11. | a) | How will you manage ammonia problem in fish pond? | 4 |
| | b) | "Ammonia concentration tends to be greater during winter than during summer" – justify. | 3 |
| 12. | a) | Briefly describe different water pollution. | 3 |
| | b) | "Among liming materials limestone is recommended for aquaculture" – justify. | 2 |
| | c) | "Lime is considered more than fertilizer in aquaculture" – explain. | 2 |
| 13. | a) | How does overfeeding create water quality problem in aquaculture? | 3 |
| | b) | "Nitrogen fertilizers are less important than phosphorus fertilizers" – justify. | 2 |
| | c) | Write down the effects of aquatic vascular plants related to water quality in fish pond. | 2 |
| 14. | Write short note on **any 02 (two)** of the following: | | 3.5x2=7 |

a) Fertilization management; b) Water pollutants; c) Control of aquatic vascular plants

**Chattogram Veterinary and Animal Sciences University, Chattogram**
**Faculty of Fisheries**
**B. Sc. Fisheries (Hons.) Year-1, Semester-2, Final Examination' 2022**
**Course Code: 0831MBI102T, Course Title: Marine Biology (Theory)**
**Full Marks: 70; Time: 3 hours**

*Answer any **05 (five)** questions from each section. Figures in the right margin indicate full mark. Use separate answer script for each section*

## Section-A

| | | | |
|---|---|---|---|
| 1. | a) | Relate marine biology with biological oceanography. | 2 |
| | b) | How the 'Voyage of Challenger' contributed in the development of marine biology? | 3 |
| | c) | Classify marine creatures with examples. | 2 |
| 2. | a) | Differentiate archaea and bacteria. | 2 |
| | b) | Compare 'Lytic' from 'Lysogenic' life cycle. Which one is beneficial for virus and why? | 3 |
| | c) | How virus play role in nutrient transportation in marine environment? | 2 |
| 3. | a) | Illustrate your idea on seagrass, salt marsh, seaweed and mangroves. | 4 |
| | b) | Write down the adaptations and succession of salt marsh. | 3 |
| 4. | a) | Draw and describe the developmental stages of ichthyoplankton. | 4 |
| | b) | Describe the methods of ichthyoplankton collection. | 3 |
| 5. | a) | Explain the larval nutrition modes in marine organisms. | ~~4~~ 3 |
| | b) | What do you know about shark reproduction? | ~~3~~ 2 |
| | c) | Sharks have a variety of tail patterns- explain. | 2 |
| 6. | a) | What is tidal pool? Differentiate between soft and rocky bottom communities. | 3 |
| | b) | 'Marine benthic habitats are diversified' - explain with appropriate diagram. | 4 |
| 7. | Write short notes on **any 02 (two)** of the following: a) HNLC b) Protozoan feeding habits and c) Hermaphroditism. | | 3.5 x 2 = 7 |

## Section-B

| | | | |
|---|---|---|---|
| 8. | a) | Discuss how bacteria help in nutrient cycling with special focus on nitrogen. | 3 |
| | b) | What is diel vertical migration? | 2 |
| | c) | Briefly explain seasonal succession of planktons. | 2 |
| 9. | a) | Explain 'Alteration of generation' in seaweeds. | 2 |
| | b) | Enlist three examples of each: seaweed, seagrass and salt marsh. | 3 |
| | c) | How do seagrasses reproduce? | 2 |
| 10. | a) | Draw the external and internal morphology of a barnacle. | 3 |
| | b) | Compare among the larval stages of clam, mussel and oyster. | 4 |
| 11. | a) | Explain how 'Marine snow' act as the base of food chain in deep ocean. | 2 |
| | b) | Draw the life cycle of Pallas's gull found in the coastal vicinity of Bangladesh. | 2 |
| | c) | How do the sea snakes reproduce in the marine territory of Bangladesh? | 3 |
| 12. | a) | Discuss the reproductive strategies of marine fishes based on parity. | 4 |
| | b) | What is osmoregulation? Compare osmoregulators with osmoconformers. | 3 |
| 13. | a) | Differentiate between horseshoe crab and mud crab. | 2 |
| | b) | Why horseshoe crab blood is important for human health? | 2 |
| | c) | Write down the life cycle of a horseshoe crab. | 3 |
| 14. | Write short notes on **any 02 (two)** of the following: a) Cyclomorphosis b) The Voyage of Beagle and c) Marine mammals. | | 3.5 x 2 = 7 |

# Chattogram Veterinary and Animal Sciences University, Chattogram

## Faculty of Fisheries

**B. Sc. Fisheries (Hons.) Year -01, Semester-02 (July-December), Final Examination' 2022**

**Course No:0831ICH102T, Course Title: Ichthyology (Theory)**

**Total Marks: 70 Time: 3 hours**

*Answer any **5 (five)** questions from each section. Illustrate your answer wherever necessary. Figures in the right margin indicate full mark. Use separate answer script for each section.*

## Section-A

1. a) What do you understand by fish and fishes? 1
   b) Differentiate between Agnatha and Gnathostomata. 3
   c) Describe external morphology of any six marine fish species available in Chattogram region. 3
2. a) Compare and contrast between (i) Chondrostei and Holostei, (ii) sharks and rays 4
   b) "Siluriform fishes have multiplicity in their appendages and body structure" – justify. 3
3. a) Diagrammatically show the digestive tract in Chondrichthyes and Actinopterygii. 3
   b) Briefly describe the variations and adaptations in fish teeth. 4
4. a) What do you know about the structure of a teleostean gill? 3
   b) Give details of the accessory air breathing organs of snakehead and climbing perch. 4
5. a) Enlist the location of light organs in fish body with example. 2
   b) How light is produced in fish body? 2
   c) Compare and contrast between physostomous and physoclistous swim bladder of fishes. 3
6. a) Draw and label a typical fish brain. 2
   b) Write down and locate five cranial nerves in the fish brain with their central connection and functions. 5
7. Write short note on **any 02 (two)** of the following: $3.5 \times 2 = 7$

   a) Derivatives of skin, b) Arterial system in bony fish, c) Ostracoderm, and d) Electric eel

## Section-B

8. a) Draw and label a typical bony fish. 2
   b) Explain principal types of fish body shapes with examples. 5
9. a) Differentiate between open and closed circulatory system. 2
   b) Illustrates and describe various components of fish heart. 5
10. a) What do you mean by white-, dark- and pink muscle of a fish? 2
    b) Illustrates the pelvic fin supports in bony fish. 2
    c) Illustrate the "vertebral column & ribs" and intermuscular bones found in fishes. 3
11. a) Differentiate between the kidney of freshwater and marine fishes. 3
    b) Classify kidney on the basis of configuration with example. 4
12. a) Differentiate between lobular and tubular testes. 2
    b) Draw the urinogenital system of male Selechian and Teleost. 2
    c) What do you know about ovarian follicle? 3
13. a) Enlist different types of cells/organs involved in the sense of vision in fish. 2
    b) "Different fish have different mechanisms of smell"- explain. 2
    c) Diagrammatically show the comparison of various sensory epithelia of the acoustic-lateralis system. 3
14. Write short note on **any 02 (two)** of the following: $3.5 \times 2 = 7$

    a) Feeding adaptations, b) Fish gill, c) Spinal cord, and d) Diencephalon

**Chattogram Veterinary and Animal Sciences University, Chattogram**
**Faculty of Fisheries**
**B. Sc. Fisheries (Hons.), Year-01, Semester-02 (July-December), Final Examination' 2022**
**Course No.: 0831ASS102T, Course Title: Aquatic Soil Science (Theory)**
**Total Marks: 70, Time: 3 hours**

*Answer any **5 (five)** questions from each section. Use separate answer script for each section. Figures in the right margin indicate full mark.*

## Section-A

| | | | |
|---|---|---|---|
| 1. | a) | Define aquatic soil science. | 2 |
| | b) | Briefly describe the importance of studying aquatic soil science as a fisheries student. | 5 |
| 2. | a) | "Two different soils having same pH can have different liming requirement."-Justify | 2 |
| | b) | Draw and label a typical humus compound. | 2 |
| | c) | How does soil-water interaction affect the properties of a water body? | 3 |
| 3. | a) | What is 'Soil Organic Matter (SOM)'? What are the sources of soil organic matter? | 3 |
| | b) | How do you classify SOM? Write about the significance of soil organic matter. | 4 |
| 4. | a) | Define bioturbators. | 2 |
| | b) | "The chemical effects of bioturbation are highly interlinked with each other"-explain. | 2 |
| | c) | How bio-turbators affect the overlying water and surrounding aquatic ecosystem? | 3 |
| 5. | a) | Mention two major problems of sandy soil for aquaculture. | 2 |
| | b) | Develop an aquaculture model on very sandy soils. | 5 |
| 6. | a) | Classify salt-affected soils with appropriate chart. | 2 |
| | b) | Write down the mechanism of development of salt-affected soils. | 2 |
| | c) | Recommend your suggestions to reclaim sodic and saline-sodic soils. | 3 |
| 7. | a) | What types of characteristics of soil should be considered in site selection for aquaculture? | 3 |
| | b) | What are the standard practices of pond bottom soil management during grow-out period of fish? | 4 |

## Section-B

| | | | |
|---|---|---|---|
| 8. | a) | Draw and label a schematic diagram of a soil profile. | 2 |
| | b) | Enlist the soil forming processes. | 2 |
| | c) | Illustrate the mechanism of soil formation. | 3 |
| 9. | a) | Define Cation Exchange Capacity (CEC). | 2 |
| | b) | "CEC of a soil is generally higher than that of its AEC"- Explain. | 2 |
| | c) | A 25g sample of soil is leached with 1N $CaCl_2$. The adsorbed $Ca^{2+}$ is displaced in 600mL of 2N NaCl solution. The Ca concentration in the leachate is 90mg/L. Now calculate the CEC. | 3 |
| 10. | a) | Define 'Soil profile' and 'Soil horizons' by illustrating them in a cross-sectional diagram. | 4 |
| | b) | Give a brief description of soil components. | 3 |
| 11. | a) | Differentiate between "Soil Clay" and "Humus". | 2 |
| | b) | Why clay particle has a net negative charge? Explain with proper justification. | 2 |
| | c) | Illustrate the cation and anion exchange by plant root hair. | 3 |
| 12. | a) | Why acid sulphate soils are generally concentrated in the coastal area? | 2 |
| | b) | Write down the chemistry of Acid Sulphate Soils. | 2 |
| | c) | Recommend your suggestions to manage acid sulphate soil. | 3 |
| 13. | a) | Write down the drawbacks of clay soils in constructing a fish pond. | 2 |
| | b) | Discuss the appropriate management techniques of clay soils for aquaculture. | 5 |
| 14. | Write short note on **any 02 (two)** of the following: | | 3.5x2=7 |

a) Soil texture; b) Soil pH and c) Soil temperature

**Chattogram Veterinary and Animal Sciences University, Chattogram**
**Faculty of Fisheries**
**B. Sc. Fisheries (Hons.), Year-01, Semester-02 (July-December), Final Examination' 2022**
**Course No. 0831HPF102T, Course Title: Handling and Preservation of Fish (Theory)**
**Total Marks: 70, Time: 3 hours**

*Answer any **05 (five)** questions from each section. Use separate answer script for each section. Figures in the right margin indicate full mark.*

## Section-A

| | | | |
|---|---|---|---|
| 1. | a) | Define commercial handling of fish and shellfish. Why the course Handling and Preservation is important for Fisheries graduates? | 3 |
| | b) | Describe with diagram the physical structure of fish muscle. | 4 |
| 2. | a) | Explain briefly how to avoid or minimize cross contamination during handling of fish. | 2 |
| | b) | Outline briefly about good handling practices of harvested fish on the deck of a fishing vessel. | 3 |
| | c) | Discuss briefly the maintenance of raw material quality in a fish processing industry. | 2 |
| 3. | a) | Write down the characteristics need to be considered in organoleptic quality evaluation of fish. | 3 |
| | b) | What is rigor mortis? Draw a flow diagram on post mortem quality changes in fish. | 4 |
| 4. | a) | Explain briefly about personal hygiene and sanitation practices in a fish processing establishment. | 2 |
| | b) | Draw and layout of a typical shrimp processing plant. | 5 |
| 5. | a) | How lipid content contributes to palatability and perishability of fish? | 2 |
| | b) | Every 1-hour delay in fish chilling reduces 1-day shelf-life of fish-justify with example. | 2 |
| | c) | Define thermal arrest point. Explain briefly about fish freezing curve. | 3 |
| 6. | a) | Define fish packaging. Packaging is important for fish and fishery products-justify. | 3 |
| | b) | Describe briefly different types of packaging materials used during fish preservation and transportation. | 4 |
| 7. | a) | Write down the principles of fish preservation. | 2 |
| | b) | Discuss briefly the principal methods of fish preservation. | 5 |

## Section-B

| | | | |
|---|---|---|---|
| 8. | a) | What do you know about the proximate composition of fish? Why the knowledge on proximate composition of fish is important? | 3 |
| | b) | Explain briefly what kind of quality problems occur in fish during freezing and subsequent storage. | 4 |
| 9. | a) | Proper washing and sorting increase the quality of fish and fishery products-Explain. | 3 |
| | b) | Write down the function of protein. Classify fish protein based on their solubility. | 4 |
| 10. | a) | Stressed fish undergoes to rigor mortis more quickly than unstressed fish-justify your answer. | 3 |
| | b) | Why quick freezing is better than slow freezing ensuring the quality of fish? Why fish is frozen at -40 °C but stored at -18 °C? | 4 |
| 11. | a) | What chilling? Write down the factors influencing quality of fish during chilling. | 3 |
| | b) | Draw a flow diagram of marketing channel of commercially important marine fishes in Bangladesh. How the value chain influences the quality of fish at different stages of handling? | 4 |
| 12. | a) | Discuss briefly the advantages and disadvantages of MAP and vacuum packaging. | 3 |
| | b) | What is conditioning of live fish? Discuss the factors affecting the live transportation of fish. | 4 |
| 13. | a) | Explain briefly the cleaning steps in a fish working premise after finishing the work. | 3 |
| | b) | Differentiate between chilling and freezing? Which method of freezing do you consider the best in achieving the quality of fish for a long term preservation? Explain. | 4 |
| 14. | | Write down short notes any TWO of the following:<br>a) Gapping & drip-loss; b) Sous-vide technology and c) IQF freezing | 3.5x2=7 |

**Chattogram Veterinary and Animal Sciences University, Chattogram**
**Faculty of Fisheries**
**B. Sc. Fisheries (Hons.), Year-01, Semester-02 (July-December), Final Examination' 2022**
**Course No. 0831FWA102T, Course Title: Freshwater Aquaculture (Theory)**
**Total Marks: 70, Time: 3 hours**

*Answer any **5 (five)** questions from each section. Figures in the right margin indicate full mark. Use separate answer script for each section.*

## Section-A

| | | | |
|---|---|---|---|
| 1. | a) | How do you determine the size of pond for fish farming? | 2 |
| | b) | Differentiate among extensive, semi-intensive and intensive aquaculture system with illustration. | 5 |
| 2. | a) | What do you mean by water quality? | 1 |
| | b) | Name physical, chemical and biological water quality parameters those are measured in a aquaculture pond. | 6 |
| 3. | a) | Mention the characteristics of pond soil influencing fish production. | 2 |
| | b) | Discuss the processes of soil treatments and pond preparation after harvesting the previous crop. | 5 |
| 4. | a) | What is fertilization? | 1 |
| | b) | Why a pond bottom is dried before fertilization? | 2 |
| | c) | Give a flowchart of the fate of applied organic fertilizer in a pond. | 4 |
| 5. | a) | Define water filtration process in a hatchery. | 2 |
| | b) | Discuss the function and uses of water filtration in shrimp hatchery. | 5 |
| 6. | a) | What are the major benefits of induce breeding? | 2 |
| | b) | Write down the three principles of hatchery operation. | 5 |
| 7. | | Write short notes on any two of the following:<br>a) Organic aquaculture; b) Integrated fish farming and c) Biosafety | 3.5×2=7 |

## Section B

| | | | |
|---|---|---|---|
| 8. | a) | Differentiate between composite and integrated fish farming. | 2 |
| | b) | Write down the advantages and disadvantages of organic aquaculture. | 3 |
| | c) | What are the causes of harmful algal blooms in fish pond? | 2 |
| 9. | a) | Differentiate between cage and pen culture. | 2 |
| | b) | Write down the construction materials used in cage culture. | 2 |
| | c) | Describe the production process of fish in cage culture. | 3 |
| 10. | a) | What do you know about pre and post stocking pond management? | 5 |
| | b) | Prepare a generalized feeding schedule for aquaculture. | 2 |
| 11. | a) | What are the impacts of natural fish and shrimp seed collection in context of Bangladesh? | 4 |
| | b) | Write down the principle of Integrated Multi-Trophic Aquaculture (IMTA). | 3 |
| 12. | a) | What do you mean by biofouling in aquaculture? | 2 |
| | b) | Give an account on the impacts of pollutants on aquaculture farm. | 5 |
| 13. | a) | List down 10 indigenous ornamental fish of Bangladesh with their common and scientific name. | 2 |
| | b) | Illustrate the marketing channels of ornamental fish in Bangladesh. | 2 |
| | c) | What are the general considerations for ornamental fish breeding? | 3 |
| 14. | | Write short notes on any two of the following:<br>a) Aquatic weeds; b) Biofertilizer and c) Suspension culture | 3.5×2=7 |

**Chattogram Veterinary and Animal Sciences University, Chattogram**
**Faculty of Fisheries**
**B. Sc. Fisheries (Hons.), Year-01, Semester-02, Final Examination' 2022**
**Course No: LAN - 102 (T), Course Title: Communicative English (Theory)**
**Total Marks: 35, Time: 2 hours**

*Answer all the questions from each section. Figures in the right margin indicate full marks. Use separate answer script for each section.*

## Section-A

1. Correct the following sentences if they are incorrect. If a sentence is correct, just copy it. 5.0
   a) The man behaves as if he knows everything in the world.
   b) If I knew he would be coming, I would have waited for him.
   c) Many students are used to use Facebook these days.
   d) The man is comparatively better today.
   e) He informed the matter to the police.

2. Complete the following sentences. 5.0
   a) When you don't do exercise regularly, _____ .
   b) If I had been you_____.
   c) It was ten years since_____.
   d) Though money cannot buy happiness, _____.
   e) Only a few people read books nowadays as _____.

3. Fisheries and aquaculture play a vital role in nutrition, employment and foreign exchange earnings in Bangladesh. **Now, write a letter to the editor of an English daily stating what extensive measures are to be taken to enhance the contribution of fisheries to our economy.** 7.0

## Section-B

4. Change the following sentences as directed: 5.0
   a) I made him understand the poem. (Change the voice)
   b) We encourage students to speak English regularly. (Change the voice)
   c) Father said, "I will see the doctor tomorrow." (Change the speech)
   d) The girl wondered that it was a very exciting idea. (Change the speech)
   e) He has done it. It seems. (Join the sentences to make a simple sentence)

5. Write a paragraph of about 150 words on " The book you have recently read". 5.0

6. Read the passage carefully and answer the questions that follow. 8.0

### The potential to sniff out disease

**The fact diseases have a smell comes as no surprise - but finding someone or something that can detect them at an early stage could hold huge potential for medicine.**

Breath, bodily odours and urine are all amazingly revealing about general health. Even the humble cold can give off an odour, thanks to the thick bacteria-ridden mucus that ends up in the back of the throat. The signs are not apparent to everyone - but some super-smellers are very sensitive to the odours. Joy Milne, for example, noticed her husband's smell had changed shortly before he was diagnosed with Parkinson's disease.

Humans can detect nearly 10,000 different smells. Formed by chemicals in the air, they are absorbed by little hairs, made of extremely sensitive nerve fibres, hanging from the nose's

olfactory receptors. And the human sense of smell is 10,000 times more sensitive than the sense of taste. But dogs, as the old joke might have had it, smell even better.

Their ability to detect four times as many odours as humans makes them a potential early warning system for a range of diseases. Research suggesting dogs could sniff out cancers, for example, was first published about 10 years ago. And there have been many tales of dogs repeatedly sniffing an area of their owner's body, only for it to turn out to be hiding a tumour.

What they are smelling are the "volatile molecules" given off by cells when they become cancerous. Some studies suggest dogs can be 93% accurate. Others suggest they can detect very small tumours before clinical tests can. And yet more studies have produced mixed results.

## Does cancer smell?

At Milton Keynes University Hospital, a small team has recently begun to collect human urine samples to test dogs' ability to detect the smell of prostate cancer. The patients had symptoms such as difficulty urinating or a change in flow, which could turn out to be prostate, bladder or liver cancer.

Rowena Fletcher, head of research and development at the hospital, says the role of the dogs - which have been trained by Medical Detection Dogs - is to pick out samples that smell of cancer. Further down the line, a clinical test will show if the dogs' diagnosis is correct. She says the potential for using dogs in this way is far-reaching - even if it is not practical to have a dog in every surgery.

"We hope one day that there could be an electronic machine on every GP's desk which could test a urine sample for diseases by smelling it," she says. "But first we need to pick up the pattern of what the dogs are smelling."

And that's the key. Dogs can't tell us what their noses are detecting, but scientists believe that different cancers could produce different smells, although some might also be very similar.

## Electronic noses

Lab tests to understand what these highly-trained dogs are smelling could then inform the development of 'electronic noses' to detect the same molecules. These might then give rise to better diagnostic tests in the future. The potential for using smell to test for a wide range of diseases is huge, Ms Fletcher says.

Bacteria, cancers and chronic diseases could all have their own odour - which may be imperceptible to only the most sensitive humans, but obvious to dogs. It may be possible in the future to use disease odours as the basis for a national screening programme or to test everybody at risk of a certain cancer in a particular age group.

However, there are fewer than 20 dogs in the UK trained to detect cancer at present. Training more will take more funding and time. On the positive side, all dogs are eligible to be trained provided they are keen on searching and hunting. Whatever their breed or size, it's our four-legged friend's astounding sense of smell which could unlock a whole new way of detecting human diseases.

Do the following statements agree with the information in the reading text?

On your answer sheet, write

**TRUE** if the statement agrees with the information

**FALSE** if the statement contradicts the information

**NOT GIVEN** if there is no information on this

a) You can have a specific smell even due to simple cold.

b) Human sense of taste is 10,000 less sensitive than human sense of smell.

c) Dogs and cats can sniff out different diseases.

d) Doctors believe that different cancers might have the same specific smell.

Choose the correct letter, A, B, C or D.

Write ***only the correct letter*** on your answer sheet. Do not copy words from the question.

e) All the studies suggest that dogs:

A. Can be 93% accurate

B. Can detect very small tumours

C. Can't detect tumours at all

D. Different studies have shown different results

f) What scientists give dogs to detect cancer?

A. Urine samples

B. Bacterias

C. Different odours

D. Nothing

g) What's an electronic nose?

A. A specific tool for dogs

B. A gadget to diagnose diseases

C. A recovery tool for ill patients

D. An artificial nose

h) The main objective of this passage is to:

A. Bring awareness to the cancer problem

B. Show us how good dogs are at detecting cancer

C. Show us how important it can be to be able to diagnose a disease by an odour

D. Tell us about new technologies