Environment and Public Health

Total marks: 10
Parts: a) 4 marks, b) 3 marks, c) 3 marks

Q2(a) Discuss how environmental factors affect public health. (4 marks)

Answer (exam-style, structured):

Overview: The environment comprises physical, chemical, biological and social components that interact with human populations. Environmental factors influence public health through direct exposures (inhalation, ingestion, dermal contact), vector ecology, contamination of food/water, and by shaping social determinants (housing, livelihoods, access to services).

Key pathways and mechanisms:

- **Air quality:** Outdoor (ambient) and indoor air pollutants (PM2.5, NO_2, SO_2, ozone, household smoke) cause respiratory and cardiovascular disease, aggravate asthma, and increase premature mortality.
- **Water & sanitation:** Contaminated drinking water and poor sanitation promote diarrhoeal diseases, parasitic infections and heavy-metal exposure (e.g., arsenic), affecting child survival and long-term health.
- **Soil & food contamination:** Pesticides, heavy metals and persistent organic pollutants enter the food chain causing neurodevelopmental disorders, cancers, and endocrine disruption.
- **Vector ecology & land use:** Changes in land use, water management and climate affect breeding habitats of vectors (mosquitoes, ticks), influencing malaria, dengue, chikungunya and other vector-borne diseases.
- **Climate change & extreme events:** Heatwaves, floods, droughts, and storms increase injuries, mental health stresses, food insecurity and spread of disease.
- **Built environment & occupational exposures:** Poor housing, crowding, unsafe workplaces, noise and ergonomic hazards increase infectious disease transmission, injuries, chronic diseases and occupational illnesses.

Vulnerable groups & modifiers: Children, pregnant women, elderly, low-income communities and outdoor workers have higher vulnerability due to physiological sensitivity and greater exposure. Social determinants (poverty, education, access to health care) modify the health impacts of environmental exposures.

Exam tip: Provide 3–4 clear pathways with one sentence on health impacts and mention vulnerable groups to secure full marks.

Diagram 1 — How environment affects public health (schematic)

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[Environment: Air / Water / Soil / Climate / Built / Occupational]
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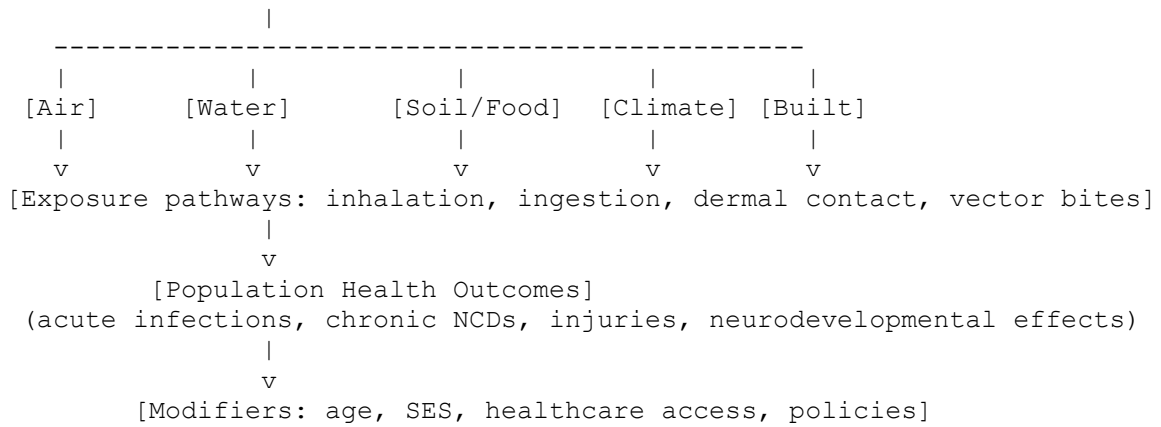


Q2(b) Describe two examples of diseases linked to environmental pollution. (3 marks)

Answer (concise examples with cause, effects and prevention):

Example 1 — Air pollution → Cardiovascular & respiratory disease

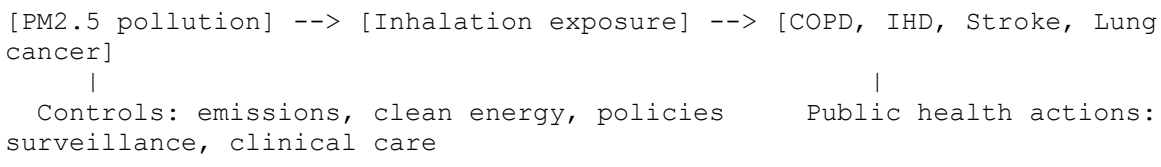
- **Causal agent:** Fine particulate matter (PM2.5), NO_2, ozone, and other pollutants.
- **Health effects:** Short-term exposures cause asthma exacerbations and acute respiratory events; long-term exposure increases risk of chronic obstructive pulmonary disease (COPD), lung cancer, ischemic heart disease, stroke and premature death.
- **Prevention & control:** Emission controls, clean fuels and technologies, urban planning to reduce traffic exposure, indoor smoke reduction (clean cook stoves), and public health surveillance.

Example 2 — Contaminated water & poor sanitation → Diarrhoeal diseases (e.g., cholera, diarrhoea of young children)

- **Causal agent:** Faecal contamination of drinking water by bacteria (*Vibrio cholerae*), viruses, protozoa and enteric bacteria due to inadequate sanitation and water treatment.
- **Health effects:** Acute watery diarrhoea, dehydration, high child morbidity and mortality, outbreaks and long-term growth/ development impacts in children.
- **Prevention & control:** Safe water supply, sanitation and hygiene (WASH) interventions, vaccination where available (e.g., oral cholera vaccine), rapid outbreak response and community education.

Exam tip: Give one chemical/physical example (air) and one infectious example (water) with brief prevention measures to cover the range of environmental links.

Diagram 2 — Two disease examples (schematic)



```
[Faecal contamination] --> [Ingestion exposure] --> [Diarrhoeal disease
outbreaks]
     |                                                    |
  Controls: sanitation, safe water, WASH              Public health actions:
ORS, vaccines, outbreak control
```

Q2(c) Suggest strategies to improve environmental health. (3 marks)

Answer (practical, multi-level strategies):

1. **Policy, governance & standards:** Enact and enforce air and water quality standards, chemical safety regulations, waste management laws, and environmental impact assessment (EIA) requirements.
2. **Infrastructure & services:** Expand safe drinking water, sewage treatment, solid waste management, clean energy and resilient housing; invest in green urban planning and public transport to reduce exposures.
3. **Surveillance, monitoring & research:** Establish integrated environmental and health surveillance (air/water monitoring, disease registries), early warning for outbreaks, and support research on exposure–response relationships.
4. **Health-system actions & community measures:** Strengthen primary care for environmental disease detection, provide vaccination and ORS for diarrhoeal disease, occupational health services, public education on hygiene and pollution reduction, and empower communities to participate in local decision-making.
5. **Cross-sectoral & preventive approaches:** Apply One Health and Health in All Policies (HiAP) principles; coordinate between health, environment, agriculture, urban planning and industry; invest in climate mitigation and adaptation.

Exam tip: Mention one policy-level action, one infrastructure/service action and one surveillance/health-system action to demonstrate multi-sectoral thinking for full marks.

Diagram 3 — Strategies to improve environmental health (schematic)

```
[Governance & Policy]
       /
[Infrastructure & Services] --- [Monitoring & Surveillance]
       \                              /
        [Health Systems & Community Action]
                |
        [Reduced exposures & improved health outcomes]
```

Concluding summary

- Environmental factors shape disease patterns through multiple exposure pathways and indirect social effects.
- Practical action requires a mix of regulatory measures, infrastructure, surveillance, health services and community participation under a multi-sectoral framework.