

(Part II) Section I 30 July 25

Q:3(a) Structure and function of human heart:

→ Structure of human heart:

- Muscular fist sized organ located slightly left of chest centre.

- 4 Chambers:

→ 2 Atria: Upper chamber (Receive blood)

→ 2 ventricles: Lower chamber (pump blood)

- Valves: Tricuspid, Bicuspid (Mitral), pulmonary, Aortic.

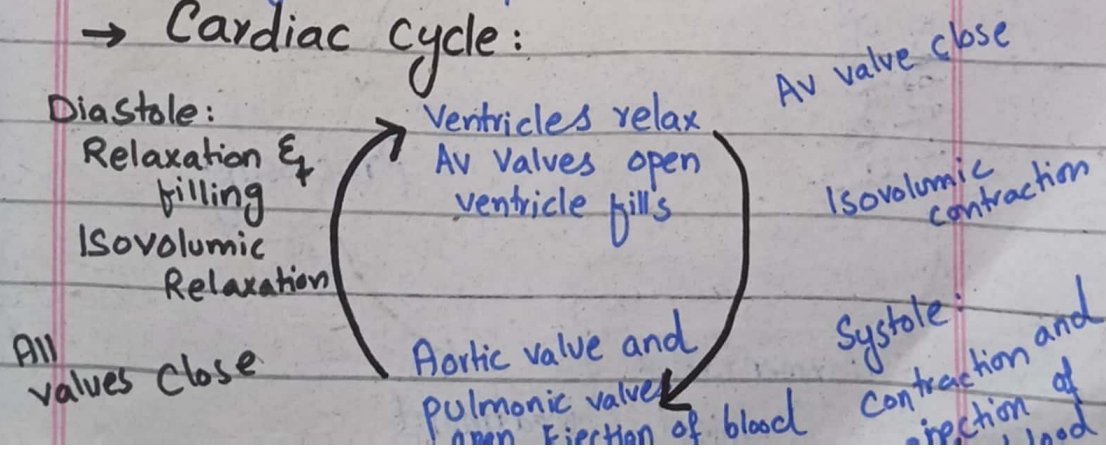
- Double circulatory system:

pulmonary (lungs), systemic (body)

→ Function of heart:

The primary function of heart is to pump blood throughout the body, delivering O_2 and nutrients to cells while removing waste products like CO_2 .

→ Cardiac cycle:



→ Role in blood circulation:

- Maintain double circulation (pulmonary + systemic)
- Ensure continuous oxygen supply and waste removal.

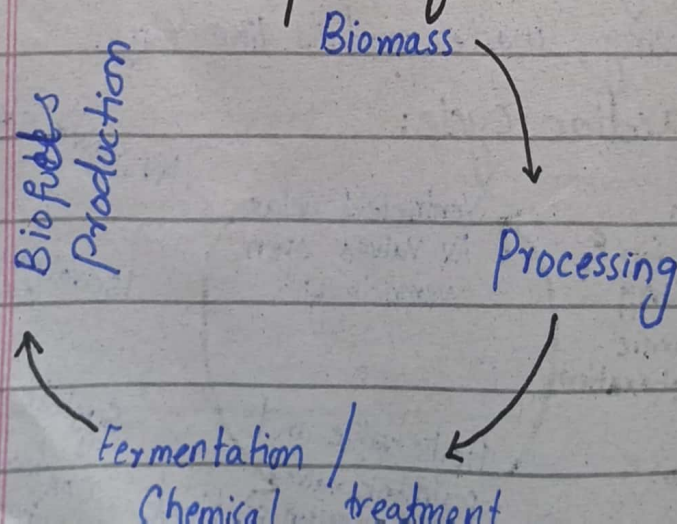
→ Blood pressure Regulation:

- Baroreceptors detect pressure → signal brain
- Autonomic nervous system adjusts heart rate and vessel diameter.
- Hormones (e.g. adrenaline, renin-angiotensin) assist.

(b) Biofuels:

“Renewable fuels from biological materials (plant, waste)”

Production of Biofuels:



- **Bioethanol**: from sugar cane, corn (fermentation).
- **Biodiesel**: from vegetable oils/fats (transesterification)
- **Biogas**: from animal/organic waste (anaerobic digestion)

Advantages:

- Renewable and biodegradable.
- Reduces dependence on fossil fuels.
- Lower CO_2 emissions.

Disadvantages:

- Competes with food crops.
- Require large land/water crops resources.
- Lower energy content.

Emission Reduction:

- Plants absorb CO_2 during growth
- Net carbon emissions are lower than fossil fuels.

C Key factors determining food quality:

- Nutritional content
- Taste, aroma, texture
- Freshness and appearance

- Absence of contaminants

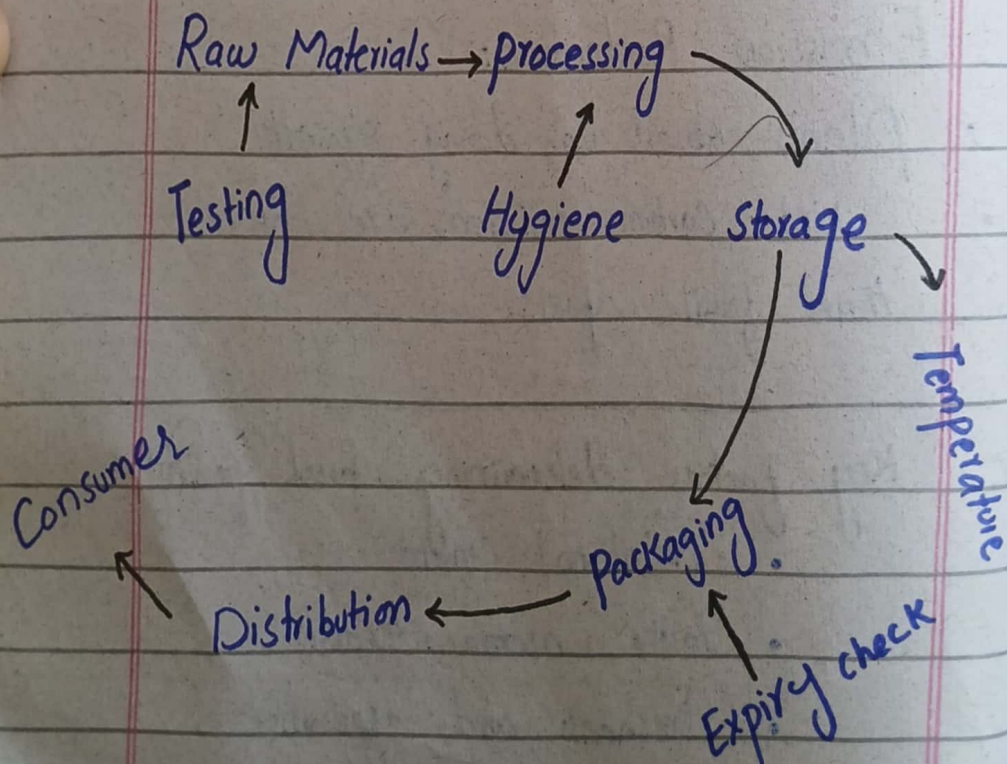
Importance of food safety:

- prevents foodborne disease
- protects public health
- Ensure consumer trust.

Food Quality Control measures:

- HACCP (Hazard Analysis and critical control points)
- ISO standards, lab testing.
- Expiry date monitoring and proper storage.

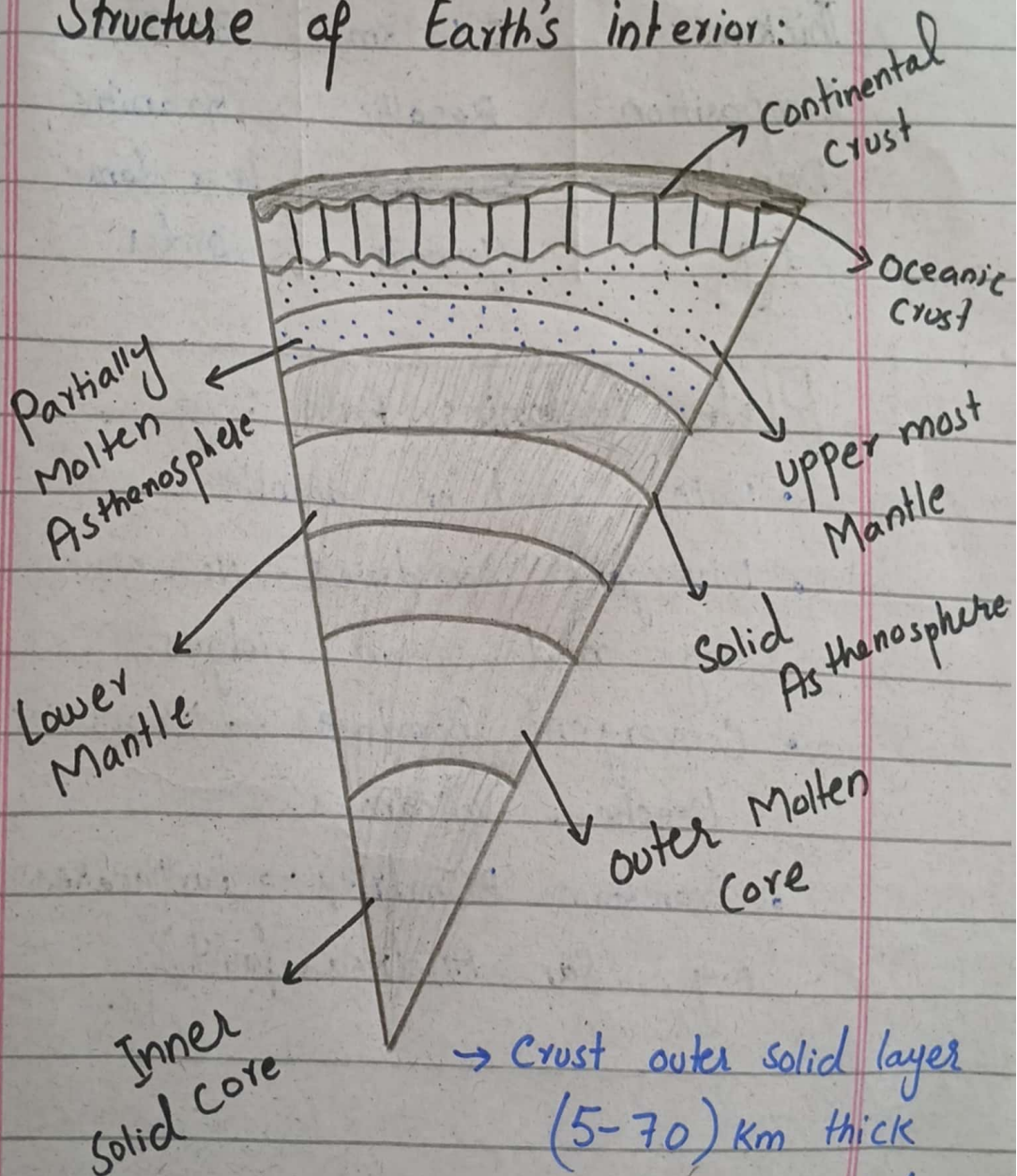
Food Safety Control:



How Consumers Ensure Safety:

- Read labels / Expiry dates.
- Buy from reputable sources.
- Cook food thoroughly
- Store food properly

d Structure of Earth's interior:



→ Crust outer solid layer
(5-70) km thick

→ Mantle Semi Solid,
Convection current (2900 km)

Core :

- Outer core : Liquid (iron, Nickel)
- Inner core : Solid (dense, iron)

Difference b/w Oceanic vs
Continental Crust :

Feature	Oceanic	Continental
Thickness	5-10 km	30-70 km
Composition	Basaltic	Granitic
Density	More dense	Less dense
Age	Younger	Older

Plate tectonics Role :

- plate float on mantle.
- Divergent boundaries → New crust
e.g mid-ocean ridges.
- Convergent Boundaries → Mountains,
trenches, Volcanoes.
- Transform Boundaries → Earthquakes
e.g San Andreas fault)

Q: No 4

(a) Characteristics of a tropical cyclone:

- Low-pressure system with organized thunderstorms.
- Strong winds rotating counter-clockwise (Northern hemisphere) or clockwise (Southern hemisphere)
- Eye (calm centre), eye wall (strongest winds), rainbands
- Wind speed exceed 119 km/h (74 mph)
- Heavy rainfall and storm surges

Formation Process:

- Warm ocean water ($> 26.5^{\circ}\text{C}$)
- Moist air rising and creating low pressure.
- Coriolis effect cause rotation.
- Continuous heat release from condensation fuels storm.
- Organized into cyclonic system.

Intensity factors:

- Sea surface temp.
- Atmospheric moisture content.

- Wind Shear (less shear = stronger storm)

- Upper-level divergence.

Impacts on Coastal Communities:

- Flooding from Storm.

- High winds damaging.

- Salinization of fresh water supplies.

- Displacement of populations.

- Disruption to agriculture and fisheries.

(b) Remote Sensing:

The use of satellite or aerial sensor technologies to collect data about earth's surface.

Uses:

- Tracking land / use land cover change.

- Monitoring deforestation.

- Assessing vegetation health

- Observing climate change

- Disaster response (floods, fires etc)

Advantages:

- Wide area coverage.
- Frequent repetitive data collection.
- Access to remote or dangerous area.
- Multispectral and temporal data.

Limitations:

- High cost of satellites and data processing.
- Cloud cover interferes with optical sensors.
- Limited ground truthing.

(c) Types of vitamins and their role in health:

→ Fat-Soluble vitamins:

- Vit A, vision, immune function, skin health.
- Vit D, Bone, Calcium absorption.
- Vit E, Antioxidant, skin protection.
- Vit K, Blood clotting.

→ Water-soluble vitamins:

- B-complex (B_1 to B_{12}) Energy metabolism, nerve function,

red blood cell formation.

- vit C (Ascorbic acid), collagen production, antioxidant, immune support.

Importance for Skin, Hair, eyes:

- vit A:

Prevents dry eyes, maintains vision

- vit C:

Support collagen for skin

- Biotin (B₇):

Healthy hair and nails

- vit E:

prevent skin aging.

Consequences of Deficiencies:

vit A: Night blindness

vit C: Scurvy

vit B₁: Beriberi

vit D: Rickets

Biotin: Hair loss

(d) Poliomyelitis (polio):

- A viral disease caused by polio virus.
- Attacks nervous system, can cause paralysis.

Transmission:

Fecal-oral route → Contaminated water / food)

Person to person via → oral secretions.

Global Eradication efforts:

- led by WHO, UNICEF, CDC, Rotary, Gavi and GPEI.
- use of oral polio vaccine and inactivated polio vaccine.
- Mass immunization campaigns.

Challenges:

- Inaccessibility in conflict zones.
- Vaccine misinformation and hesitancy.
- Incomplete surveillance.
- Vaccine derived polio strains.

Importance of Vaccination:

- prevents infection and transmission.
- Builds herd immunity.
- Essential for global eradication.

Section II

Q. No 6 (a)

Original selling price = x
Then

$$\text{Original profit} = x - 100$$

$$\text{New sp} = 2x$$

$$\text{New profit} = 2x - 100$$

$$\text{New profit} = 3 \times \text{original profit}$$

So,

$$2x - 100 = 3(x - 100)$$

$$2x - 100 = 3x - 300$$

$$-100 + 300 = 3x - 2x$$

$$200 = x$$

So,

$$\text{sp} = \text{Rs } 200 \text{ and}$$

$$\text{cp} = \text{Rs } 100$$

$$\text{profit} = 200 - 100 =$$

100.

profit % :

$$\frac{100}{100} \times 100 = 100\%$$

b Let y's pay = y
Then x's pay = 120% of y =
1.2y

Total pay:

$$y + 1.2y = 2.2y = 550$$

Solving

$$y = \frac{550}{2.2} = 250$$

So,

y is paid Rs. 250, and x
is paid Rs 300.

c Let breadth = b

then perimeter = 5b

$$\text{perimeter of rectangle} = 2(1+b) = 5b$$

$$2(1+b) = 5b \Rightarrow 1+b = \frac{5b}{2} \Rightarrow 1 = \frac{5b}{2} - b = \frac{3b}{2}$$

$$\text{Area} = l \times b = 216$$

$$\frac{3b}{2} \cdot b = 216 \Rightarrow \frac{3b^2}{2} = 216 \Rightarrow$$

$$3b^2 = 432 \Rightarrow b^2 = 144$$

$$b = 12$$

Then

$$l = \frac{3 \cdot 12}{2} = 18$$

$$\text{Length} = \boxed{18 \text{ cm}}$$

d List of tickets : 1 to 20

Multiples of 3 : 3, 6, 9, 12, 15, 18 $\rightarrow 6$ nos

Multiples of 5 : 5, 10, 15, 20 $\rightarrow 4$ nos

Common multiple of both (3, 5) =

15 counted twice

So total,

$$6 + 4 - 1 = 9$$

$$= \frac{9}{20}$$

Q No: 7

(a) $5\% \text{ of } A + 4\% \text{ of } B = \left(\frac{2}{3}\right) \times$

$6\% \text{ of } A + 8\% \text{ of } B.$

Convert % to decimal.

$$0.05A + 0.04B = \frac{2}{3} (0.06A + 0.08B)$$

multiply both sides by 3,

$$3(0.05A + 0.04B) = 2(0.06A + 0.08B)$$

$$0.15A + 0.12B = 0.12A + 0.16B$$

So,

$$0.15A - 0.12A = 0.16B - 0.12B \Rightarrow$$

$$0.03A = 0.04B \Rightarrow \frac{A}{B} = \frac{0.04}{0.03} =$$

$$\frac{4}{3}$$

$$A:B = 4:3$$

C Let Common multiplier = x

Then :

$$A = 5x$$

$$B = 2x$$

$$C = 4x$$

$$D = 3x$$

Given

$$4x - 3x = 1000$$

$$x = 1000$$

$$\text{Now } B's \text{ share} = 2x = 2 \times 1000$$

$$= 2000$$

d Son's present age = x

father's age at son's birth = $38 - x$

At Son's birth, father's age =
Son's current age so,

$$38 - x = x \Rightarrow 2x = 38 \Rightarrow x = 19$$

Son's current age = 19

$$\text{Son's age five years ago} = 19 - 5$$
$$= 14$$
