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38407
PART-"
Section-1

Q.No 3

a) Describe the Structure and function of the human heart. Explain the cardiac cycle and the role of the heart in maintaining blood circulation. How does the heart regulate blood pressure.

Ans

Human heart

The human heart is a muscular organ located in the thoracic cavity slightly tilted to the left. It functions as a pump that circulates blood

Dos and Don'ts for the General Science & Ability Paper

Hi there — you've prepared well! Remember, knowing the content is one thing, but presenting it in the paper exactly as required is another. Here are a few key points to keep in mind:

1. For a 5-mark part, aim to write at least 2 and at most 3 sides of the answer sheet. Often, a question has two or three parts, and the marks are divided accordingly — so address each part fairly.

2. Manage your time wisely — you have about 35 minutes per full question, which comes down to around 8 minutes for each 5-mark part. Stick to this to avoid rushing later.

3. Make your answers look scientific, not just theoretical. Use flowcharts and diagrams wherever they add clarity.

4. Neatness matters — keep your handwriting clean, avoid cutting or overwriting.

5. Mind your spelling and grammar — while GSA doesn't deduct marks for these, your expression leaves an impression.

6. In the ability portion, explain analytical ability questions thoroughly. For a 5-mark part, show all steps and provide clear explanations.

Good luck for CSS 2026 — you're going to ace it, in sha Allah! 🌟

throughout the body via the circulatory system. Heart is composed of special muscles called cardiac muscles.

» Structure of heart.

Add diagrams in order to explain structure in an apt manner

There are four chambers of human heart. Two upper chambers, right and left are called atria which are thin walled. Two lower chambers, right and left are called ventricles which are thick walled. Right atrium and right ventricles are completely seperated from left atrium and ventricles. valves are present at the junction of atria and ventricles.

3 Cardia cycle (one complete Heartbeat)

The cardiac cycle consists of systole (contraction) and diastole (relaxation) phases.

1) Atrial Systole.
Atria contract, pushing blood into ventricles.

2) "Lub Sound (Closing of AV valves).

3) Ventricular systole.
Ventricles contract, pumping blood out (Semilunar valves open.
"Dub" Sound. (Closing of semilunar valves)

4) Diastole:
Heart relaxes, chambers refill with blood.

Total cycle = 08 sec at 72 beats/min).

4) Role of heart in blood circulation:

The heart maintains double circulation:

i) Pulmonary circulation:
Right side Pumps deoxygenated blood in lungs (For oxygenated).

2) systemic circulation:

Left side pumps oxygenated blood in body tissues (delivers o2 & nutrients.

5) Regulation of blood pressure by the heart:

The heart helps regulate blood pressure (BP) through:

i) Cardiac output (CO = Heart Rate x Stroke volume.)

- Increased CO in Higher BP.
- Decreased CO in Lower B.P.

2) Autonomic Nervous System:

i) Sympathetic Nerves (↑ Heart rate and force in ↑BP).

ii) Parasympathetic Nerves (Heart rate in BP.)

3) Hormonal control.

- Adrenaline increase heart rate and BP.
- Antidiuretic Hormone Retains water, Blood and BP volume.

The heart is a vital organ that ensures continuous blood circulation through coordinated contractions. It regulates blood pressure via neural, hormonal, and mechanical mechanisms, maintaining homeostasis in the body.

b) what are biofuels and how are they produced?

Ans

i) what are Biofuels?

Biofuels are renewable energy sources derived from organic material (biomass) such as crops, algae, and waste. They are used as alternatives to fossil fules (petrol, diesel) in vehicles, industries, and power generation.

ii) How are poduced?

Biofules are produced through different methods:

- **First-Generation:**
  made from food crops (Sugarcane corn, Soybeans).

  Ethanol: => Sugarcane / corn starch.

- Biodiesel:
  ~~veg~~ vegetable oils (Soybeen, plam, oil)

- **Second-Generation:**
  made from non-food biomass (agricultural waste, wood.
  Cellulotic Ethanol:
  Produced from crop residues (corn, stover, wheat straw.)

- **Third-Generation:**
  made from algae, which grows fast and absorbs CO_2.

- **Fourth-Generation:**
  Genetically modified algea / bacteria for higher efficiency.

3

Advantages of Biofuels:

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1. **Renewable & sustainable:**
unlike fossil fuels, biofules can be replenished.
2. **Reduces Greenhouse Gas Emission:**
Burning biofuels releases CO_2, but plants absorb it back. (carbon-neutral cycle).
3. **Reduces Air Polution:**
Lower Sulfur and particulate emissions than fossil fuels.
4. **Energy Security** - Reduces dependence on imported oil.
5. **Supports farmers:**
creates demand for agricultural products.

4) **Disadvantages:** —

1. **Land use competition** -
crops for fuels may replace food crops, raising food prices.
2. **Deforestation:** Expanding biofuel crops (. plm. oil) destroys forests.
3. **High water usage:**
Large amounts of water needed for crop irrigation.

Lower Energy Efficiency:

Some Biofuels (for example corn ethanol) give less energy than fossil fuels.

5. **Biofuels vs Alternative Energy**

	Advantages.
Biofuels	Renewable, reduces CO_2.
Solar power	Clean, abundant
Wind energy	Zero emissions, low cost
Hydrogen fuel	High energy, zero pollution
Nuclear Energy	High efficiency, low CO_2

Disadvantages.

i) Land/water intensive.
ii) High initial cost, weather dependent
iii) Needs large space, noisy.
iv) Expensive storage & production.
v) Radioactive waste risks.

6. **Green house Gas Emissions**

- **Carbon Recycling:**
  - Plants absorb CO_2 while growing, balancing emissions when burned.
- **Replaces fossil fuels:**
  Reduces dependency on coal/oil, which release ancient carbon.
- **Waste utilization:**

using agricultural waste prevents methane emissions from decomposition.

Biofuels offer a sustainable alternative to fossil fuels, helping reduce greenhouse gases. However challenges like land and use and production costs must be addressed. Combining biofuels with other renewable (solar, wind) can create a cleaner energy future.

c) **Key Factor of Food Quality Expanded:**

- **Nutritional values:**
  Presence of essential macronutrients (proteins, carbs, fats) and micronutrients (vitamins, minerals).
- **Freshness:**
  Indicated by color, smell, and texture; affects shelf life and safety.
- **Taste & Palatability:**
  Influences consumer preference and

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and satisfaction.

- **Appearance:** Includes color, shape and absence of physical objects.
- **Safety:** Free from pathogens, chemical contaminants, (heavy metals) and physical hazards (eg dust, metal fragments.

Importance of food safety.

- **Disease prevention.** Foodborne illnesses (eg norovirus listeria) cause symptoms like diarrhea, vomiting, and even death in vulnerable groups.
- **Public Health Protection.** outbreaks can overwhelm healthcare systems: Safe food reduces morbidity/mortality.
- **Economic Benefits:** Prevents costly recalls, lawsuits and loss of productivity due to illness.

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- **Regulatory compliance:**
  Meets standards set by agencies (FDA, EFSA, FSSAI) to avoid legal penalties.
- **Consumer confidence:**
  Build trust in brands and encourages repeat purchases.

3 **Food Quality control Measures**

- **HACCP:**
  Identifies critical points in production (cooking, cooling) where hazards can be controlled.
- **Inspections and testing:**
  Microbial testing (E. coli, Salmonella), chemical analysis (pesticides), and allergen screening.
- **temperature control:**
  Cold chain maintenance to inhibit bacterial growth.
- **Sanitation Protocals.**
  Regular cleaning of equipment, worker hygiene (handwashing, gloves) and pest control.

4) **How consumers Ensure safe food**

1. **check Expiry dates:**
Avoid spoiled or expired products.
2. **Proper washing:** Rinse fruits/vegetables under running water to remove dirt and pesticides.
3. **Cooking thoroughly:**
Heat meat to safe internal temperatures 74°c/165°F
4. **Stroage Practices:**
Refrigerate perishables (≤4°c) Separate raw/ cooked food, to prevent cross-contamination.
5. **Trusted Sources:**
choose certified organic/Fair Trade products; buy from reputable retailers.

5. Impact of Poor Food Safety.

There are many impact of poor food such as; Health Risks, Economic losses, food waste, Brand Damage, Legal consequences.

D) Stroture of the Earth's interior:

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The Earth's interior is divided into three main layers; the crust mantle, and core, each with distinct properities.

1) **Crust:**

The outermost solid layer, ranging from 5-70 km thick. it is divided into,

- **Oceanic crust** (5-10) km thick)
- Denser, composed mainly of
- **basalt**, and younger in age.

Add diagrams

- **Continental crust:**

(30-70) km thick. Less dense, made of granite, and older.

2) **Mantle:**

Extends to 2900 km depth, composed of silicates. The upper mantal is rigid while the lower mantle is semi-fluid (asthenosphere), enableing plate movement.

Core => Divided into:

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1) **outer core:** 2,900 - 5,150 km)
Liquid iron and nickel generating Earth's magnetic field.

1) **inner core:**
(5,180 - 6,371 km) Solid due to extreme pressure, despite high temperatures,

Difference between oceanic and continental crust

Feature	Oceanic	continental
Thickness	5-10 km (thinner)	30-70 km (thicker)
Density	Higher (~3.0 g/cm³)	Lower (~2.7 g/cm³)
Composition	Basalt (mafic)	Granite (felsic)
Age	Younger (<200 million yrs)	older (up to 4 billion yrs)
location.	under oceans	forms continents

How Plate Tectonic shape Earth's Surface

Plate tectonics drive geological activity through,

1) **Divergent Boundaries:-**
Plates move apart (eg. mid ocean ridges), creating new crust or rift valleys.

c) Convergent Boundaries. Add diagrams

Plates collide, causing:

. Subduction (oceanic crust sinks, forming trenches & volcanoes)

. Mountain building. (Continental collision eg. Himalayas)

3 Transform Boundaries:

Plates slide past each other (San Andreas Fault), causing earth quakes.

These movement shape mountains, volcanoes, earthquakes, and ocean basins, continuously reshaping Earth's surface.

Earth's layered structure and crustal difference influence tectonic activity, driving the dynamic processes that form landscapes over millions of years.

Q.No. 4.

A): Characteristics of a Tropical cyclone:

A tropical cyclone is a

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Powerful, rotating storm system that forms over warm ocean waters.
Key characteristics include

- **Low-pressure center.**
  Calm and clear area surrounded by intense winds.
- **High-speed winds:**
  Exceeding 119 km/h (74 mph).
  Classified as hurricanes, typhoons, or cyclones depending on the region.
- **Heavy rainfall & storm surge**
  Causes flooding and coastal damage.
- **Spiral rainbands.**
  Dense clouds and thunderstorms rotating around the eye.

2 **Formation process of a Tropical Cyclone:**

Add diagrams

- **Warm ocean waters**
  (≥ 26.5°C up to 50m depth) - provides energy through evaporation.
- **Low wind shear.**
  Allows the storm to grow vertically without disruption.

- **Coriolis Effect.**
  Causes rotating (absent near the equator) cyclones from 5°-30° latitude)
- **Moisture & Rising Air.**
  warm, humid air rises, condenses and releases latent heat, fueling the cyclone.
- **organization into a Storm.**
  A tropical depression' tropical storm cyclone as wind speeds increase

Factors influencing intensity

- **Sea Surface Temperature.**
  warmer water = stronger cyclone.
- Atmospheric humidity.
  more moisture enhance storm development.
- wind shear.
  High shear disrupt cyclone structure, weakening it.
- Ocean Heat content.
  Deep warm water sustain intensity longer.
- Interaction with Land.

Impact on coastal communities

1) **Destructive winds.**
Damage infrastructure, uproot trees and cause power outages.

2. **Storm Surges**
Rising sea levels flood coastal areas, erode beaches. and submerge homes.

3 **Torrential Rains.**
Trigger landslides and inland flooding.

4 **Economic losses:**
Destruction of agriculture Fisheries, and property.

5 **Human casualties:**
Drowning, injuries and displacement of populations.

Conclusion;
Tropical cyclones from over warm oceans, fueled by heat and moisture. These intensity depends on environmental conditions, and the devastate coastal regions through winds, flood

and surges, preparedness and early warning systems are crucial to minimizing damage.

B)

What is Remote Sensing?

Remote sensing is the process of collecting data about Earth's surface from a distance using satellites, aircraft, drones, or other sensors. it captures visible infrared, microwave and other wavelengths to monitor environmental changes over time.

1. **Environment monitoring:**
   - **Land cover & vegetation Tracking:**
     - Detects deforestation, urban sprawl, and agricultural changes.
     - uses NDVI (Normalized [illegible] vegetation index) to assess plant health.
2. **Climate change Analysis.**

- monitors ice melt, sea-level rise, and temperature shifts.
- Tracking greenhouse gas emissions via thermal imaging.

Disaster management

Predicts droughts, wildfires, and floods using real-time imagery.

Advantages –

- Wide coverage monitors large inaccessible areas.
- Time-Efficient
  Provides frequent updates (daily satellite passes)
- multi-spectral data.
  captures beyond visible light.
- Historical comparision.
  Archives decades of data for trend analysis.
- Cost-Effective.
  Reduces fieldwork expenses.

Limitations of Remote Sensing

- Atmospheric interference.
  clouds and pollution distort

Spatial & Temporal Resolution Trade-offs.

High detail = less frequent coverage.

data complexity.

Require specialized software and expertise.

* Limited Ground Truthing.

Field verification is still necessary.

High initial costs.

Satellites and advanced sensors are expensive.

Remote Sensing is a powerful tool for tracking land use, vegetation and climate trends.

Focus on your handwriting and presentation
You have got potential
Good luck!!