

GEOGRAPHY

Time Allowed: 3 hr.

Max. Marks: 250

Instructions to Candidate

- There are EIGHT question divided in Two Sections.
- Candidate has to attempt FIVE questions in all
- Question No. 1 and 5 are compulsory and out of the remaining, three are to be attempted choosing at least one question from each section.
- The number of marks carried by a question/part is indicated against it.
- Answers must be written in the medium authorized in the Admission Certificate which must be stated clearly on the cover of this Question-cum-Answer (QCA) Booklet in the space provided. No marks will be given for answers written in medium other than the authorized one.
- Word limit in questions, wherever specified, should be adhered to.
- Attempts of questions shall be counted in chronological order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the Question-Cum-Answer booklet must be clearly struck off.

Answers should cover all aspects of the question and conclude with all the answers

87

250

1. Invigilator's Signature _____

2. Invigilator's Signature _____

Name Hemant Singh

Mobile No. _____

Date _____

Signature Hemant

REMARKS

GS SCORE

SECTION-A

Attempt all questions:

1. Answer the following questions in about 150 words each: (10 * 5 = 50)
- (a) Write a short note on the contribution of Ancient period historians and philosophers in the evolution of geomorphological thought.
 - (b) Write a short note on Bowen's Reaction Series.
 - (c) Describe the terms in detail,
 - 1. Podzolization
 - 2. Gleying
 - (d) Discuss the continental drift theory of Taylor.
 - (e) Write a short note on Misfit meandering.

(a) Geomorphology is the science of study of landforms on earth - their origin and evolution, features and distribution pattern around the world.

→ origin dates back to Greek period where foundation was laid by scholars like Herodotus & described the geography of areas around Mediterranean. Ptolemy (gave description of Tiber), Anaximander (father of mathematical geography).

→ Arabs also contributed through description of various mountains - Hindu Kush, Himalayas (eg: Ibn-Batuta, Al-Masudi), flow pattern of rivers and how they cut water (al-Biruni)

→ Real foundation was laid by Wm Davis in late 19th century through his concept of cycle of erosion.

provide complete answer

Answer is too short. Cover whole answer

4
15

Explain more

Remarks

Ancient contribution to geomorphology was largely descriptive in nature though few accounts for explanation of earthquakes, mountains and ~~valleys~~ were given but were devoid of empirical studies. ✓

(b)

Remarks

(c) Soil is the basis for human life or almost all life processes occur over it. It is a very precious natural resource, and it takes a long period of time to form.

Claying and podzolization are the 2 of the most important soil forming processes (pedogenesis) as envisaged by W DeBorchaer

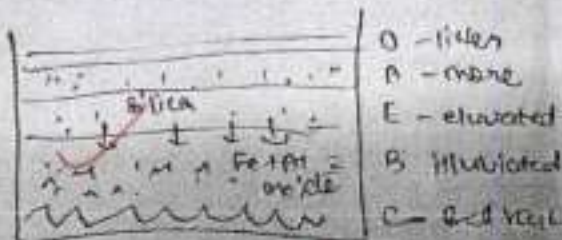
Podzolization:-

There is translocation of silica from upper eluvial horizon (E) to lower illuvial B horizon. Thus, silica get leached from top soil layers which leads to abundance of iron and aluminium oxides in lower layers.

It gives soil a reddish-brown colour.

A greyish silica pan may be formed below this process and soil type usually occurs in medium rainfall taiga regions.

promote examples



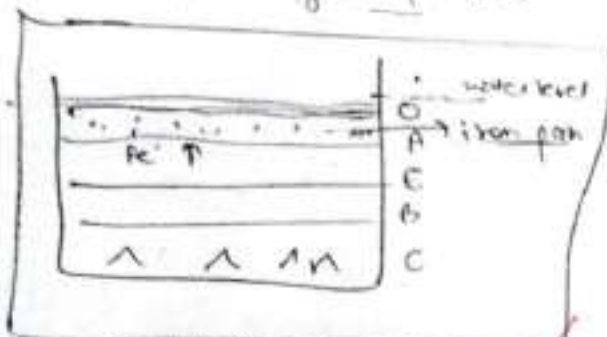
Remarks

explain in process

Explain with Example

GS SCORE

⇒ Gleying - It is usually formed in waterlogged areas where soil iron ferric oxide gets reduced to ferric oxide giving it a reddish greyish colour. The ferric oxide (ferric) forms a hard pan layer in upper layers of soil.



⇒ Soil profile illustrating

Whenever soil gets exposed to surface, soil again gets oxidized and ~~forms~~ (ferric oxide) to show a reddish colour.

6/10

Conclude your answer properly.

(Q1) FB Taylor propounded a continental drift theory in early 20th century. before Wegner

He noticed that continents were moving based on certain assumptions :-

- 1) Noted stark similarity among opposite coasts of South America and Africa
- 2) Evidence of records of past climate in present day regions

Remarks

3) He too saw fit of world's continents as if they were once joined.

Diagram
 Answer is
 does not
 cover all
 aspects

However, Taylor didn't give any evidence of forces to support his theory unlike Wegner.

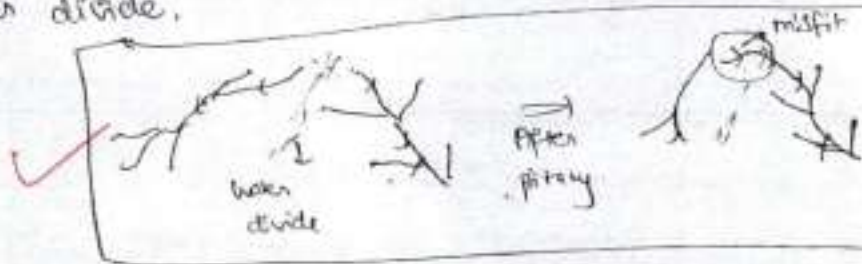
As a result, his theory wasn't based on evidence and thus not much popularized and was neglected.

only after coming of Wegner, who in turn was inspired by Taylor's theory formulated his own theory with some modifications and evidence, was continental drift as an idea emerged on a scale that geographers started paying attention to it.

4
70

Remarks

(c) Misfit are usually small rivers which get pirated in upper courses of river basin across river divide.



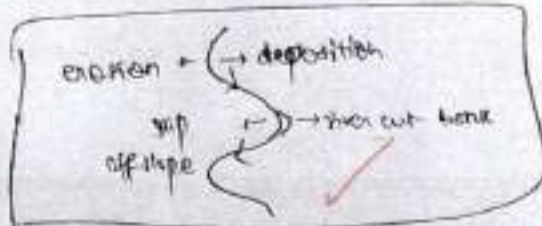
Misfit meandering is the meandering pattern - noticed in such rivers.

It is rare to notice meanders in upper courses of rivers. However, according to geologists, such patterns can occur anywhere in river course.

5
1/2

Need to explain the process of mid-fil meandering with the river channel

Rivers over time get pirated, and due to increased vertical gradient to the head stream, the erosion rate of



misfit meandering

misfit also increases and lateral erosion. It also starts both vertical and lateral erosion. Due to abundance of sediment load due to rainwater and weathering, it starts cutting its bank laterally causing it to meander.

Remarks

GS SCORE

Remarks

2. Answer the following questions:

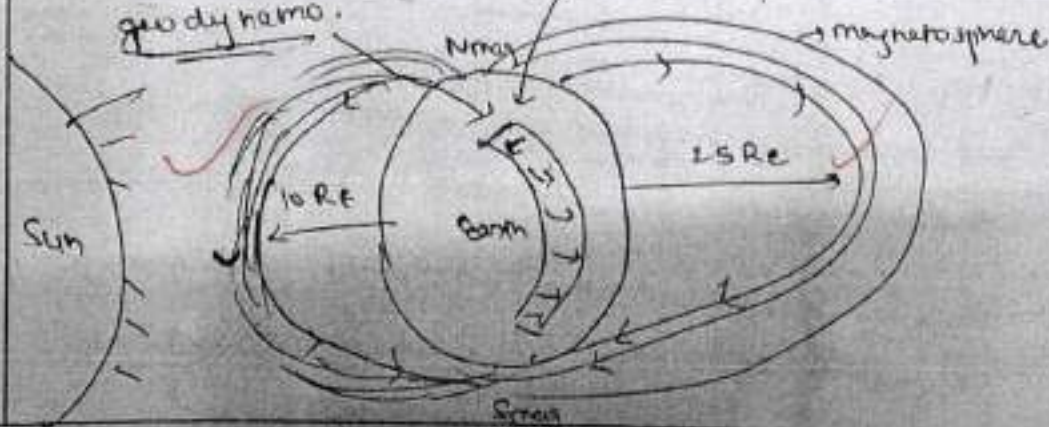
- (a) What is geomagnetism? Explain and discuss the causes of geomagnetism & also explain how geomagnetism & its application help us understand some aspects of the earth's crust? (250 Words) (20)
- (b) It is said that the Holocene epoch which started at the end of the ice age has given rise to Anthropocene epoch. In light of the above statement discuss the significance of Anthropocene epoch. (200 Words) (15)
- (c) What do you understand by Social Forestry? Describe its role in sustainable rural development. (200 Words) (15)

(a) Geomagnetism is the phenomena in which the whole earth behaved as if a large bar magnet is placed inside it. magnetic field of earth is 0.25-0.65 Gauss - much less than a normal refrigerator (100 Gauss)

appears geomagnetic near crust

Cause :-

1) It is caused primarily by heat escape from core (5370°C) to mantle-core boundary (5700°C) produced by heavy metal sinking and radioactivity which causes convection currents to form (circulating) to ampere's circuit (A.C) through process called geodynamo.




Remarks

2) Around 8 to geomagnetism occurs due to charged particles of ionosphere ✓

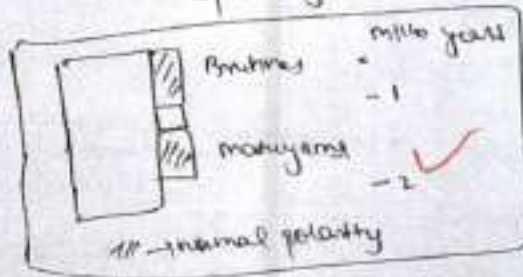
Relevance to study of earth :-

→ 1) Palaeomagnetism :- magnetic records of past magnetic fields in igneous rocks (magnetic) help

in reconstruction of  give insight into presence of convection currents in the mantle

- confirm sea floor spreading
- age of ocean floor

7. Examples of paleomagnetism
 → examples of paleomagnetism should be discussed



|| magnetic reversal and superheating

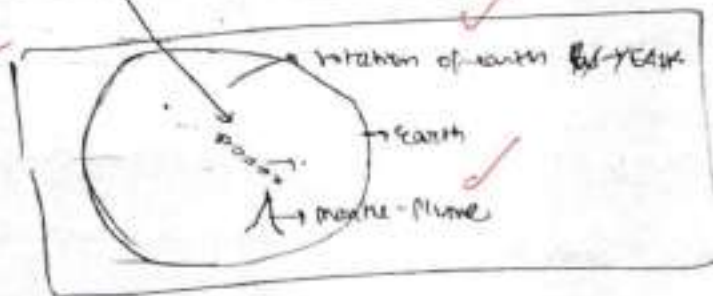
2) help in ascertain / predict reversal and rate of migration of magnetic poles by studying paleomagnetic records. ✓

3) Provide insight into temperature and mineral composition in core :- eg. geomagnetism confirms presence of iron in core ✓

Remarks

4) It helps predict convectional currents are active inside ~~the~~ ~~outer~~ ~~core~~ thus, give credence to Arthur Holmes (1960) convectional current theory as a mechanism for plate movement

5) It confirms validity of mantle-plume relations e.g. Hawaiian-Emperor chain of islands.



10/20
 → more analysis is needed in summer
 → give examples

more research is needed to elucidate other aspects and link many phenomena on earth to mantle-core convection currents.

(b) Earth's geological time period has been divided into eon, era, epoch, period, epoch.

Miocene epoch began 11,000 years ago when Plastocene Epoch ended.

Period		
Quaternary	Anthropocene	8,000
	Holocene	
Tertiary	Pleistocene	11,000
	Miocene	
	Epoch	

Remarks

Recently, many scientists are of view that a new age has started within Holocene called Anthropocene

↳ In which large scale human activities have significantly altered the earth and its weather, geological and ecological patterns.

Give some
few diagram
to
strengthen
your
argument

Significance :-

1) Human activities bring massive changes in land use -> over 50% of forests have been cut down since 1880's, Industrial Revolution has caused large scale pollution of soil, water and air.

2) Over 60% of biodiversity has become extinct since end of ice-age, mostly post 1500 A.D. by human actions

3) Loss of genetic resources, diversity and gene pool.

4) Humans have exceeded carrying capacity of earth by 1.7 times -> leading to unsustainability

In ecosystem services

5) over 50% coral reefs have been lost, more

6) more than 1.2 billion people depend on forest ecosystem and fishing for livelihood.

7
15

Give suitable
examples

Remarks

7) Large scale waste, plastic, hazardous (pesticides, POPs), heavy metals, have toxicated environment

On the other hand, - many sustainable techniques have been developed by humanity for saving our planet:-

1) Use of technology like renewables, carbon capture and storage

2) Commitments for halting climate change under Paris agreement.

3) Deforestation has reduced by 12.5% over 2005-2015 period.

4) Billions have been lifted out of poverty

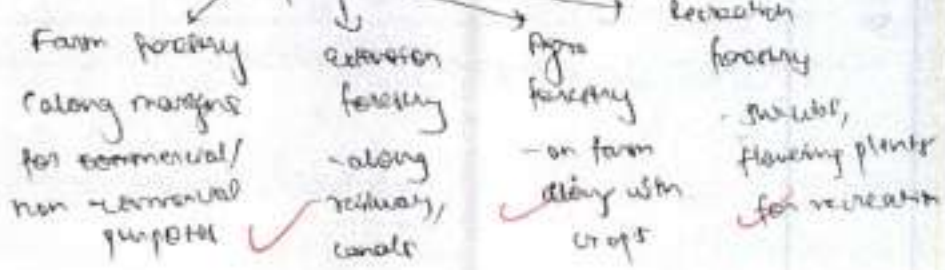
Thus, Anthropocene need not be thought only in negative sunlight, in fact steps should be made to promote a sustainable lifestyle.

Conclude your answer properly

(c) Social forestry is the practice of using sustainable land use practices like planting of trees on degraded wasteland, fallowlands and afforestation on common lands to promote individual and community needs as well as reduce pressure on conventional forests.

Remarks

Components



diminish the points given in flow diagram

It mentioned in

Importance in sustainable rural development :-

- 1) It help provide employment - especially to rural poor, disabled, landless - eg. in Rishan after need to social forestry by local administration → generated lacks of jobs ✓
- 2) Increase farmer income through selling of timber, fruits, flowers etc ✓
- 3) Reduce pressure on degraded / reserved forests eg: Valmiki Reserve, Rishan → reforestation increased by 30% over 2005-15. ✓
- 4) Diversify production pattern and reduce sudden effect of crop failure - due to droughts, floods. ✓
- 5) Reduce soil erosion → increase crop yield
- 6) Help in integrated nutrient management

7
15

Example should be given to strengthen your answer

Remarks

eg:- mahua and green-grain - in Chattisgarh ² recycle
 nutrients (Ca, Mg) faster.

✓ Social forestry is a sustainable way of rural
 development, however its success is limited
 by lack of people participation, unscientific
 tree selection which needs to be corrected.

make
 proper
 conclusion to
 your answer

Remarks

SECTION-B

Attempt all questions

5. Comment on the following into 150 words:

(10 × 5 = 50)

- (a) Explain various theories put forward by various geomorphologists regarding the formation of limestone caves.
- (b) Explain the process of Nivation and Frost Heaving.
- (c) Write a short note on the tectonic-geomorphic model of M. Morisawa.
- (d) Write a short note on Cymatogenic Movements suggested by L.C. King.
- (e) Why Continental Drift theory is also called as an impossible hypothesis?

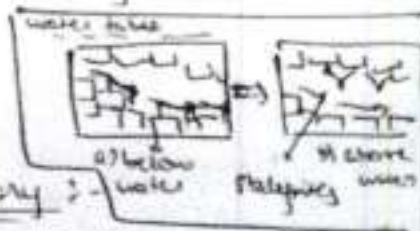
(a) Limestone caves are typical feature of karst landforms which have formed. Geomorphologists have been divided over their origin mainly into 2 schools - whether they form above water table or below water table.

Various theories:-

→ Forces assumed may well be formed by corrosion and above water table.

Swireston challenged it :-

Swireston's water table theory :-



→) believe they are formed there if no water table in karst regions, thus they are formed by both corrosion (external pluviation) and corrosion through underground water.

6
10

Remarks

2) Davis 2 cycle theory

- major part is formed below water (vadose zone) through solution action.

Uplift causes water to drain and rest of it is formed above water through solution of phosphate water majorly the depositional features (stalagmites).

Evidences he put : 1) 3D network cannot be formed by river action

2) presence of blind galleries

Thus, today it's largely accepted that caves are formed both above and below water and majorly by solution action.

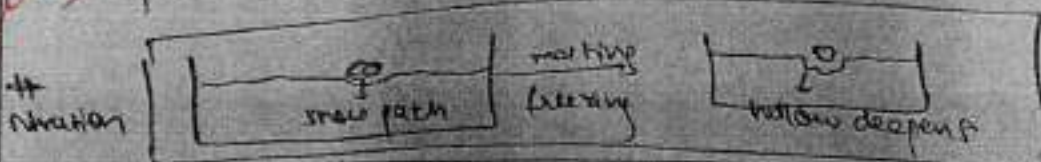
(b) Abraction and Frost-heaving are 2

geomorphological process active in periglacial regions

→ abraction → small patches of snow and ice

on rock surface cause local erosion through

repeated freeze-thaw action



Remarks

Need to explain means in more details give more examples

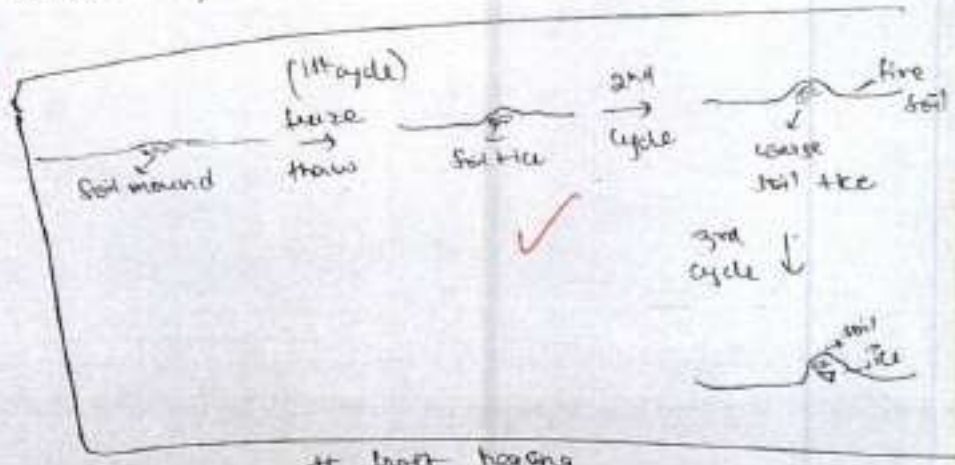
Give definition of geomorphological process active in periglacial regions

they help in formation of alluviation terraces from highland erosion thus, reducing relief in periglacial areas. ✓

→ frost heaving :- It refers to repeated freeze-thaw of soil colloids and water present in their interstitial pores which causes segregation of large soil particles / pebbles which are regularly thrown upwards through such action.

Explain the process briefly clearly

5/10



→ frost heaving

It helps in formation of patterned ground where repeated freeze-thaw causes fine kaolinitic to settle along the margins forming circles, polygons etc. ✓

Remarks

7"

GS SCORE

(c)

(d)

Remarks

(e) Continental Drift ~~not~~ Theory was propounded by Alfred Wegner in 1912 suggesting continents of world are in motion. He envisaged a united landmass Pangea which broke up 200 million years ago in tertiary period. ✓

Various ~~scholar~~ scholars criticized the theory as they saw it impractical for such huge continents to move. ✓

Their arguments against evidences put out by Wegner-

1) Jig saw fit of East America with West Africa was not so perfect. ✓

2) Tidal force was not strong enough to displace continents over huge distances - If it were earth would stop rotating altogether.

3) Pole fleeing force for latitudinal movement

Remarks

couldn't explain why Africa and India crossed equator and reaching northern hemisphere.

4) It envisaged ocean as passive which is not the case (evident by sea floor spreading)

5) Fossil similarity may be a coincidence because of similar climates.

6) Couldn't explain why continents started moving only in Cretaceous period. Later the Plate tectonics completely refuted this

~~principle theory~~ - It stated plates comprising of continents was moving over molten asthenosphere

Thus, continents don't move but asthenosphere plates move, and however the basic idea that landmass is moving was a great contribution of continental drift theory.

5/10
 Do not abruptly end the answer
 conclude properly

Remarks

6. Answer the following questions:

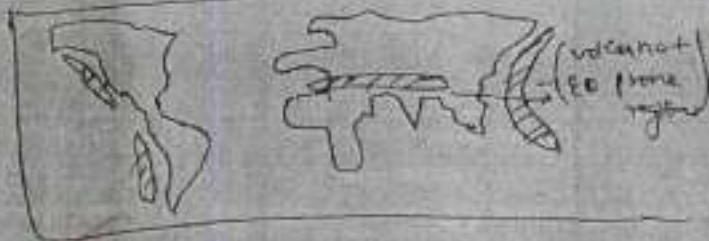
- (a) Discuss the role of the geomorphology in hazard management and the urbanization. (250 Words) (20)
- (b) Explain the concept of the cycle of erosion put forward by Beede and Cvijic. (200 Words) (15)
- (c) How are minerals formed in Igneous and metamorphic rocks? Also Explain various types of sedimentary rocks. (200 Words) (15)

(a) Geomorphology has various application in many fields like economics, engineering, politics etc. It refers to application of geomorphological knowledge of landforms to better use and plan for certain goals. *man related background needed*

Hazard Management :- ✓

- 1) Prepare a zonation map for earthquake prone and volcano prone regions ✓
 e.g. areas of intense folding (Himalayas - zone III)
 , faulting (Dhanu lift valley, near Guj India).

Added to explanation



- 2) describe area liable to flooding - e.g. near

Remarks

alluvial fans, flood plain areas, deltas

3) creation of dyke walls in suitable artesian wells, soft alluvial river areas like Ganga plain to mitigate drought.

4) identify coastal areas prone to tsunami waves.
eg: Indonesia coasts located near Sunda bench

5) downstream areas - liable to glacial lake flooding

6) Arrestain - strength of glacial moraine bound lava blinded glacial lakes, dams etc - which can cause floods if downstream.

Can give
few more
examples
to
prove

Urbanization

1) city master plans have to account for local geological conditions - like type of rocks.
eg: porous rock like limestone - ample water resources.

2) land-use type is dependent on geology

eg- agriculture → on fertile black lava soil
(eg: Deccan trap, Snake Plateau Idaho)

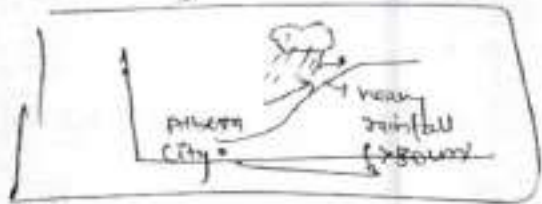
building construction → on hard infertile rock
outcrops / wastelands eg: basalt.

Remarks

- 3) need to have idea of pattern of air flow through nearby mountain ranges, valleys etc to plan for reducing of urban-heat island effect.
- 4) Account for manage^{orographic} precipitation / flash floods if site for city located on mountain base

Analysis and precaution need to be improved

9/20



- 5) waste dumping site → should be on impermeable hard rock like - granite, gabbro.

But, many cities like housing, water for reservoirs, mining etc.

Conclude your answer properly

Remarks

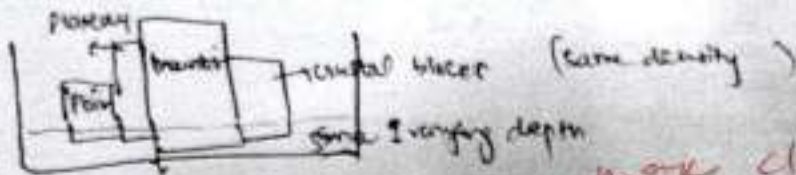
7. Answer the following questions:

- (a) Discuss the view of Airy and Pratt regarding the concept of Isostasy. Also, give the interpretation of the theory of plate tectonics. (250 Words) (20)
- (b) What is a Zoogeographic region? Provide a classification of major Faunal regions of the world and discuss Ethiopian Faunal Region and Oriental Faunal Region in detail. (200 Words) (15)
- (c) Write a short note on various factors causing rejuvenation in landforms and thus describe the consequent landforms. (200 Words) (15)

(a) Constance Dutton defined isostasy as "gravitational equilibrium of landforms caused by rotation of planetary bodies & other words it is how various topographical landscapes balance each other on earth."

views of Sir George Henry :-

- landforms on earth are viewed as blocks of atmosphere having equal density
- These blocks float over the SiMa (mantle) upto varying depths.
- All crustal features have roots of varying length going deep into SiMa.
- gave analogy of wooden block floating over water.



more clear
diagm

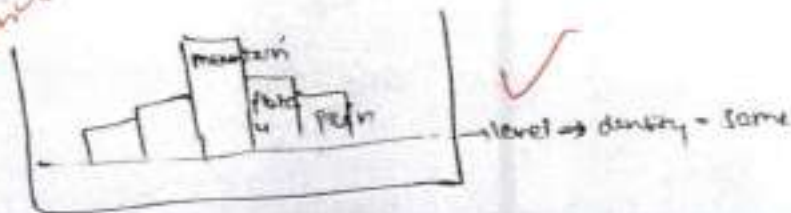
more
detail
analysis
of
boom
meanings
will help to
improve
answers

Remarks

View of John Pratt:-

- though of crustal blocks having varying density from bottom to top as well as with other blocks. eg: mountains are less dense, ~~down~~ floors are more dense
- defined a level below crust where mass above the block is compensated in such a way that density is same for all blocks below the level (similar to a level of compensation)
- believed mountains rise higher above this level because they were lighter

*Mass compensation
Analysis
summary*



Evaluation: both theories - single-handedly don't explain all features on earth but their selective application on regional level is well documented

- Heiskanen

Remarks

⇒ Plate Tectonics is a comprehensive geological theory propounded in 1960 by Taylor and Scot which comprehensively explains all major geomorphological features on earth.

Evaluation in favour of theory :-

- Explains through phenomena of plate movement that continents were in motion at present as well as in the past
- Explains origin of mid-oceanic ridges in middle of oceans
- Accounts for pattern of distribution of major earthquake and volcanic zones around the world as a result of interaction of plate boundaries
- Explains formation of sea basin, island-arc, subduction zones, oceanic trenches
- Account for formation of African rift valley, fault valleys.

Make your answer better by adding just facts



+ Distribution of plates and volcanoes

Remarks

Argument against:-

- 1) failure to predict rate of movements of various plates
- 2) failure to account for unequal rate of plate formation and plate melting
- 3) Doesn't explain origin of triple junction points (eg. San Andreas, California)
- 4) Doesn't explain some mountain like Himalaying (S. Africa), ✓

These shortcomings are not because of fault in the theory but because of inadequate knowledge of interior which must be supplemented to improve our understanding of earth's processes.

conclude you answer properly

(b) Zoogeography refers to study of pattern and distribution of fauna on the earth

→ more detailed information

Zoogeographic region is a part / province geographical in nature which represents a unique assemblage of fauna distinct from other regions.

Remarks

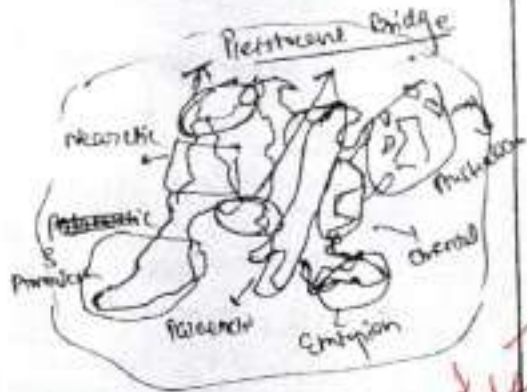
World can be classified into 5-6 major zoogeographic regions on the basis of endemism and unique traits of fauna found in these regions. Various scholars have attempted to classify faunal regions, but majority have classified it into 5 regions.

Explain characteristics of these regions

1) Palaearctic Region

consists of Europe till north of Himalayas.
157 families of vertebrates,
40 unique-mammal, 20 families of unique birds

Some ~~are~~ faunal: - Tibetan argali, Lemming, Siberian tiger, 2 humped camel



clean map

2) Neartic Region

Whole of North America till Mexico.

148 family-vertebrates

eg:- polar bear, bison, mountain lion

3) South American Region

4) Oriental Region

one of the richest; 148 family-vertebrates

36-unique family-mammal, 18-family-bird (unique)

1
15

Characteristics

Remarks

eg: Rhinoceros, macaque, tigers, leopard, hyena

covers Indian subcontinent and South East Asia and West Asia

5) African Region

covers area south of Sahara

- dominance of mammals

- Savanna and forest region

eg: cheetah, hippopotamus, elephant, giraffe, oryx

- deforestation has occurred on large scale due to human encroachment.

consider your answer

(c) Rejuvenation refers to sudden increase in erosive capacity of river in its course. It causes increase in its slope, increase in velocity and more downcutting.

It causes a shift from graded equilibrium profile of river.

subsidance to be noted

Various causes :-

Remarks

- 1) Eustatic changes in sea level :- due to freezing / melting of glaciers and climate change. It causes change in base level of erosion.
- 2) Tectonic changes : due to local uplift, subsidence or warping along mountain or in upstream area.
- 3) Faulting along river course may create sharp fall of water around knickpoint.
- 4) Increase in river flow due to river capturing.
- 5) Reduction of in sediment load causing increased capacity of river to erode.

Analysis at the process of rejuvenation need to be through

River rejuvenation causes formation of knickpoints and features like incised / ingrown meanders, 2 cycle valleys, waterfalls etc.

1) Knickpoints :- these are sharp break ~~over~~ long profile over which river water falls off as rapids or waterfalls.



Clean diagram

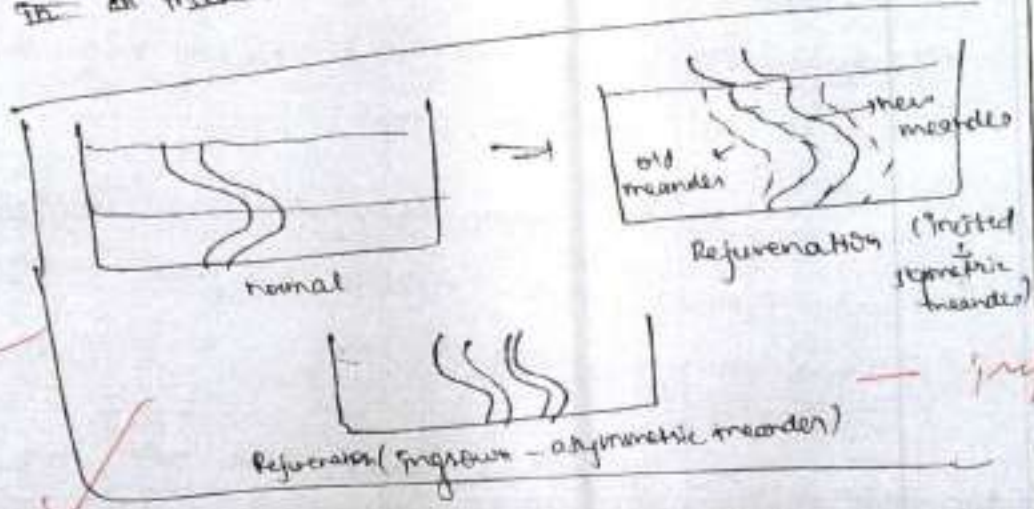
Explain the above two diagrams

Remarks

2) waterfall and rapids - they are temporary features formed due to elevation ~~in~~ in river bed topography

at confluence

3) incised / ingrown meanders :- meanders start cutting deep into their valley bed resulting in ~~an incised~~ ~~incised~~ ~~meander~~



incised as the deep

8
15

4) 2 cycle valleys : where valley within a valley it formed. It is different from neck-cut because as it is etiological in origin.

poorly exposed
exposed remains of
dip force

Rejuvenation is a natural response of river to change in its profile -> it again attempts to achieve a graded profile

Remarks