For TDC Part – I (Geography Hon's)

Paper –I (Physical Geography)

PLATE TECTONIC THEORY

¼lysV foorZfudh fl|kUr½

By

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- ***The term 'tectone' derived from Greek word = 'builder' that build up or form the features of the crust.***
- ***Plate is the -- Top crustal part of the earth.***

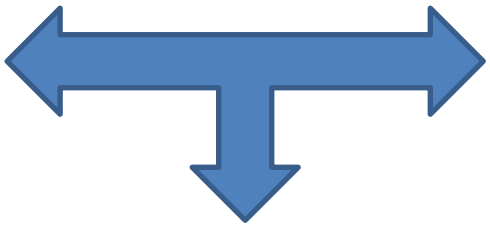
  -- Broken shells of granite & basalt.

  --- A mosaic of several rigid segments.

  Tectone (a Greek word) -- To construct.

  Theory is the -- postulation or hypothesis by Scientists

  i`Foh dk LFkyeaMy VsDVkWfud lysVksa esa cWVk gS tks nqcZy eaMy ds mij izokfgr gksrk gSA (The theory that the earth's lithosphere is divided into tectonic plates that drifts on the asthenosphere is considered as the theory of Plate Tectonics.)

- ***Divided into 7 major plates and 22 or several minor plates.***
- ***The plates move by convection currents that either push the plates apart or together or make them slide against one another.***
- ***PLATE***  ***THEORY***

TECTONE–

- ***The term 'tectonic' derived from Greek word = 'builder' that build up or form the features of the crust.***
- ***<u>Plate is the</u> -- Top crustal part of the earth.***

-- Broken shells of granite & basalt.

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<u>Tectone (a Greek word)</u> -- To construct.

<u>Theory is the</u> -- postulation by Scientists

-- hypothesis

-- Doctrine

-- Concept

- ***Top crustal layer of the earth is simply called a plate. (<u>Hkwry dh mijh ijr dks lk/kkj.kr% lysV dgk tkrk gSA</u>)***
- Broken shells of Granite and basalt on the earth's surface is called Plate. (<u>xzsukbV o cSlkYV ds VwVs gq, [k.M dks lysV dgrs gSaA</u>)

- Rigid lithospheric slab or landmass is called Plate. (n`<+ LFkyh; Hkw[k.M dks lysV dgrs gSaA)
- Rigid lithospheric slabs are technically called plate. (n`<+ LFkyh; VqdM+k rduhfd :i ls lysV dgykrk gSA)
- Rigid and solid crustal layers are technically called plate.
- Rigid crustal mass that includes Crustal and upper Mantle portion having 100 km. as its average thickness is called Plate.
- A.N. Strahler & A.H. Strahler (1978) stated that a Plate is-------
- Moving over a weak Asthenosphere.
- Individual lithospheric plates glide slowly over the surface of the globe
- It glides just like a pack of ice of the Arctic Ocean
- Drifts under the dragging force of current and winds

  is known as the plate tectonics.

- (lysV og gS tks vkUrfjd nqczy eaMy ds mij Hkze.k djrk gS] Xyksc ds lrg ij ,d Lora= LFkyh; lysV ds :i esa /khjs&/khjs fopj.k djrk gS] tks vkdZfVd egklkxj ds oQZ ds Fkksd dh HkkWfr ljdrk gS]] vkSj ,sls izokfgr gksrk gS] tSls yxrk gS fd <ky dh fn”kk esa iou o leqnzh /kkjk ds }kjk [khapdj yk;k tk jgk gS] lysV dgykrk gSA)
- ***The study of----***

  ----the whole mechanism of evolution plate concept

  ---- nature and motions of plates

  ----deformations of plates

---- interactions of plate margins with each other

is collectively called plate tectonics.

- ***Lithosphere is completely made up of rigid plates.***
- ***The whole process of plate motions and resultant deformations is referred as Plate tectonics.***
- ***Plate tectonic theory ---***

  -----a <u>significant scientific advancement of the decade 1960</u>'s or a new concept is based on -----

  (i) <u>Continental Drift theory (egkns"kh; izokg fl|kUr)</u>

  (ii) <u>Sea Floor Spreading</u> <u>(leqnzh fury izlkj)</u>

  (iii) <u>Paleo-magnetism (iqjkpqEcdRo)</u>

- ***<u>Plate tectonics is a valuable theory</u> in the field of <u>Geology</u>, <u>Geography</u> particularly in <u>Geomorphology</u> and in <u>Geophysics.</u>***
- ***According to size, the plates have been divided into two categories:***
- ***Major plates- (7)–***

  (1) Eurasian Plate (2) Indo-Austrelian Plate (3) North American Plate (4) South American Plate (5) Pacific Plate (6) African Plate

  (7) Pacific Plate

  B) Minor Plates (22)-<u>Arabian</u> plate, <u>Phillipine</u> plate, <u>Cocos</u> plate, <u>Caribean</u> plate, <u>Nasca</u> or <u>east Pacific</u> plate, <u>Scotia</u> plate et.c.

¼IysV foorZfudh fl|kUr dk fodkl½

- 1960 -- Concept of Sea Floor Spreading propounded by Hary Hess of Princeton Univ., U.S.A.
- 1965 -- The term 'Plate' was at first, coined by Canadian Geophysicist J. Tuzo Wilson.
- 1967 -- Makenzie & Parker discussed the mechanism of plate motions on the basis of Euler's Geometrical theorem.
- 1967 -- He also postulated 'Paving Stone hypothesis' where in oceanic crust was considered to be newly formed at mid-oceanic ridges and destroy at trenches.
- 1967 -- Isacks & Sykes confirmed the Paving stone hypothesis.
- 1967 -- Euler's Geometric theorem and Paving Stone hypothesis wherein the oceanic crust was considered to be newly formed at mid-oceanic ridges and destroyed at the trenches.
- 1968 -- W.J. Morgan & Le Pichon elaborated the various aspects of Plate Tectonics

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1) Continental Drift Theory -- Alfred Wegner---1912 To 1924
2) Sea Floor Spreading -- Hary Hess ---1960
3) Palaeo-magnetism --- William Gilbert--1600 AD

- ***Plate Boundary (IysV lhek) –***

The zone between two plates is called plate boundary. Or it represents the zone of motion between two plates. (nks IysVksa ds e/;orhZ Hkkx dks fdukjk dgk tkrk gSA)

- ***Plate Margin (IysV fdukjk) –***

The marginal part or end part of a plate is called margin of that plate. (IysVksa ds vfUre Hkkx dks fdukjk dgk tkrk gSA)

- ***Plate boundaries & Plate margins are the most significant because all the tectonic activities occur along the plate margins. E.g. Seismic events, vulcancity, mt. building, faulting etc.***

- ***Constructive Plate Boundaries or Divergent Plate Boundaries or Accreting Plate Boundaries.***

- ***2) Destructive Plate Boundaries or Consuming Plate Boundaries or Convergent Plate Boundaries.***

- ***3) Conservative Plate Boundaries or Shear Plate Boundaries or Accreting Plate Boundaries.***

- ***Constructive Plate Margin (lajpukRed IysV fdukjk) or Divergent or Accreting plate boundaries. The results of divergent movement of plate is as follows:***

- ***Volcanic activity.***
- ***Fissure flow of basaltic magma.***
- ***Continuous formation/Creation of new oceanic crust.***
- ***Formation of submarine mt. ridge mt. ridge / submarine canyon.***
- ***Creation of transform fault***
- ***Drifting of continental oceanic plate***
- ***Occurrence of shallow focus earthquake.***
- ***Drifting of oceanic plates or crust.***

1) Constructive Plate Margin (lajpukRed lysV fdukjk) or Divergent (vilkjh) or Accreting (lao/khZ) plate boundaries. The results of divergent movement of plate is as follows:

- ***ubZ lkxjh; dzLV dk fuekZ.kA***
- ***Tokykeq[kh fdz;kA***
- ***cSlkfYVd eSxek dk njkjh mn~HksnuA***
- ***lysV lhekUr Hkkx dk fo:i.kA***
- ***vUr% lkxjh; ioZr Jsf.k;ksa o mHkkjksa dk fuekZ.kA***
- ***lkxjh; lysVksa dk izokgA***
- ***de xgjkbZ okys HkwdEi dk vkukA***
- ***:ikUrj Hkza"k dk fuekZ.kA***
- ***lkxjh; lysV dk izokgA***

2) Destructive Plate Margin (fouk"kkRed lysV fdukjk) or Convergent or Consuming plate boundaries. The results of convergent movement of plate is as follows:

- ***Occurrence of explosive volcanic activity.***
- ***Deep focii (focus) earthquake.***
- ***Formation of fold mountain.***
- ***Formation of oceanic trench.***
- ***Formation of oceanic festoons / Island arcs.***
- ***Formation of collision zone/sub-duction zone or Benioff zone***

2) Destructive Plate Margin (fouk"kRed IysV fdukjk) or Convergent(vfHklkjh IysV fdukjk) or Consuming(IysV fdukjk) plate boundaries. The results of convergent movement of plate is as follows:

- ***Hk;adj foLQksV okys Tokykeq[kh; mn~xkjA***
- ***xgjkbZ esa dsUnz okys HkwdEi dh mRifrA***
- ***ofyr ioZrksa dk fuekZ.kA***
- ***leqnzh [kkbZ dk fuekZ.kA***
- ***leqnzh pki o QsLVwu dk fuekZ.kA***
- ***IysV ds lhekUr dk fo:i.kA***

- ***Plate Collision are of three types —***

1) ***Collision between Oceanic and Oceanic plates (egklkxjh; IysV dk egklkxjh; IysV ls Vdjko)--***
2) ***Collision between Continental and Continental plates (egkns"kh; IysV dk egkns"kh; IysV ls Vdjko)--***
3) ***- Collision between Continental plate and Oceanic plate (egkns"kh; IysV dk egklkxjh; IysV ls Vdjko).***

THREE TYPES OF PLATE ¼lysV ds rhu izdkj ½

- Continental Plate: Made of continental parts only.
- Oceanic Plate : Made of Oceanic parts only.
- Continental-Oceanic Plate: Made of continental and Oceanic parts both.

- Three classes of plates (lysV ds rhu oxZ) —

1) Continental plates (egkns"kh; lysV)

2) Oceanic plate (egklkxjh; lysV)

3) Oceanic-continental plate (egklkxjh;& egklkxjh; lysV)

- The plate fully made up of continental part is called continental plate. (iq.kZ:is.k egkns"kh; Hkkx ls fufeZr lysV)
- The plate fully made up of oceanic part is called Oceanic plate. (iq.kZ:is.k egklkxjh; Hkkx ls fufeZr lysV)
- The plate made up of partially continental part and partially oceanic part is called Oceanic-continental plate. (vkaf"kd :i egkns"kh; lysV vkSj vkaf"kd :i egklkxjh; lysV vFkkZr ftl lysV ds fuekZ.k esa egkns"k ,oa egklkxj vkaf"kd :i esa gksrs gSaA)

PLATE MOTION ¼lysV&xfr)----

- All the lithospheric plates constantly move. (lHkh lysV yxkrkja xfr djrs gSa o Hkze.k djrs gSaA)

- Each plate constantly move as a single unit. (izR;sd lysV yxkrkja ,d bdkbZ ds :i esa xfr djrs gSa o Hkze.k djrs gSaA)
- All the lithospheric plates constantly move with respect to each other. (lHkh lysV yxkrkja ,d nwljs ds lkis{k esa xfr djrs gSa o Hkze.k djrs gSaA)
- Plate motion is relative with respect to each other. (lysV ,d nwljs ds lkis{k esa xfr djrs gSaA)
- Plate margin goes under changes due to motion but little change is seen in the middle part of a plate. (lysV xfr ds dkj.k lysV fdukjk esa ifjorZu rks gksrk gS ysfdu blds e/;orhZ Hkkx esa ux.; ifjorZu gksrs gSaA)
- The rate of movement of plates vary with each other. (lysVksa dh xfr ,d nwljs ls fHkUu gksrh gSA)
- The velocity vary continuously along all constructive and destructive boundaries. (lajpukRed ,oa fouk"kkRed lysV dh xfr yxkrkj cnyrh jgrh gSA)
- Plates motions are currently measured and monitored with the help of satellites & Lasers. (lysV xfr dk ekiu ,oa vuqJo.k lsVsykbZV o yslj dh lgk;rk ls dh tkrh gSA)
- Any change in rate or direction of motionin one plate causes corresponding change in the motion of other plates. (fdlh ,d

IysV dha xfr o fn”kk esa ifjorZu gksus ls nwljs IysVksa dh xfr o fn”kk Hkh cnyrh gSA)

- Plate’s motion may be explained in terms of Euler’s Geometrical theorem. (IysVksa dh xfr dks vk;yj T;kferh; fl|kUr ds vk/kkj ij O;k[;k dh tk ldrh gSA)

- Every displacement of a plate from one position to another on the surface is a simple rotation of a plate. (lrg ij ,d LFkku ls nwljs LFkku rd IysV dk izR;sd izokg o LFkkukUrj.k ,d ?kq.kZu dh HkkWafr gksrk gSA)

- The rotation axis of plates passes through the centre of the globe.(IysV dh ?kw.kZu /kwjh Xyksc ds dsUnz ls gksdj xqtjrh gSA)

- All points on the plate travel along small circle path of rotation while passing from initial to final position.(IysV dk lHkh foUnq ?kw.kZu ds NksVs o`r iFk ds lgkjs izkjEHk ds LFkku ls vfUre LFkku rd ?kwerk gS)