

Plates are given ~~no~~ name at 3 margins.

1) The junction :- Breaking sea.

where boundary are not known we called it as conservative boundary.

Kinematic Part of Plate Tectonic Theory :- The

plate tectonic theory is based upon plate motion, their interaction & their geological events.

Divergent Boundary :- It is also called constructive boundary because crust is being created.

Origin :- When the hot plumes enters the lithosphere, it melts the rock & gradually the lithosphere becomes weak. The process is called intra plate thinning.

As the lateral plumes develop, (the) keened outplate ^{of plate occur} divergence due to drifting & the tensional force.

Through the rift valley the magma outpours on the surface & assists the plate divergence. More magma comes out & get deposited ^{at} the ridge. Below the ridges new oceanic crust is being created.

The height of the ridge remains constant, because of the spreading of the plate & the central rift valley signify that plate tensional tears are at none.

④ If convective current flow upward & down then surface will tear apart & oceanic crust will be created.
Lithosphere → Basalt
gabbro
granite, rest denser

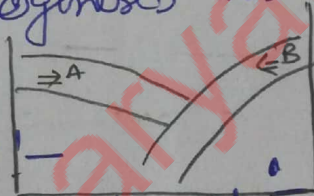
Along such boundary volcanism is slow & seismic events are very regular, but they are non-catastrophic.

Converging Boundary also called destructive boundary!
Such boundaries are symbolic of compressional forces. There are 3 types of convergences -

1) Ocean-Ocean Conv., also called Island arc Orogenesis!

As the oceanic plate collide, the denser plate or one with greater velocity, must subside. The island arc orogenesis has four stages - e.g → Japan

Stage:- 1 :- ~~then~~



V Shape, Trench Formation

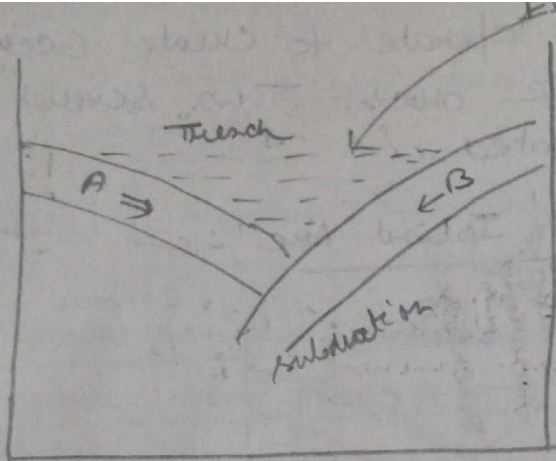
Sedimentation in the trench

Ocean-crust
→ ocean will go downward, due to high density
Ocean-Ocean - depend on velocity & size, one plate will go down

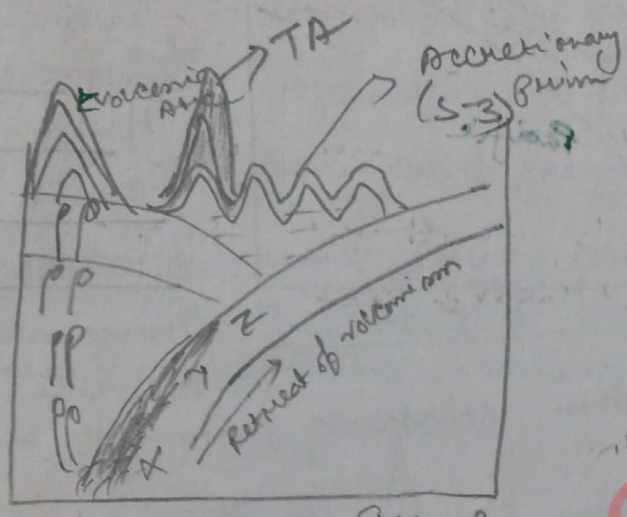
Stage:- 2 ✓

Formation of Volcanic Arc

∴ due to subduction of oceanic crust & the partial melting of basalt. The differentiated basalt produces andesytic magma & since basalt is saturated, it can produce granite & due to presence of water vapour, the explosive type volcanism takes place, since the andesytic magma has more silica & greater viscosity; the conical shape volcanic arc is produced. e.g - Alentian Islands



Stage-1



Stage-2

Basalt :- Less remain in water is saturated basalt, once it gets down & melt, water vapour is created & volcano will be explosive. Saturated basalt will have more pressure & water vapour can directly produce granite.

When Basalt at x exhausted, creating retreat of volcano.

Stage-3

In the trench, due to compressional forces accretionary prism are produced. If the compressional forces further exceeds, the accretionary prism are further uplifted & folded into tectonic arcs (TA). TAs are further uplifted & magnified by intrusion of granitic magma; which forms their core after consolidation.

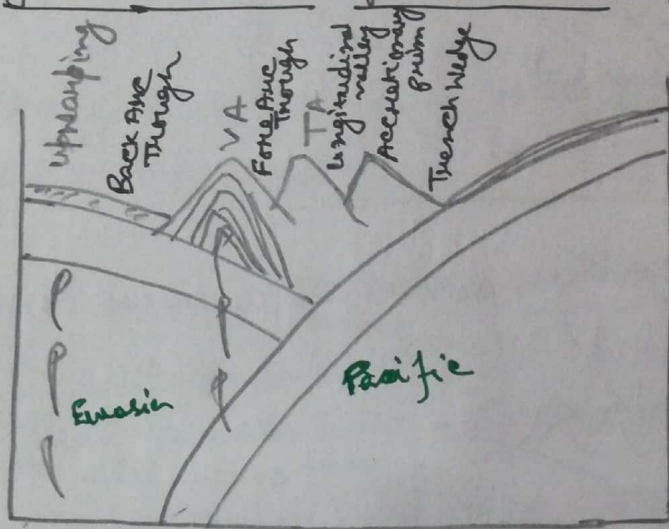
Due to retreat of vol. it able to force out in Andese, in Japan, but not in Himalaya.

intrusive - granitic
 extrusive - andesite

Ocean -> Basalt
 Conti -> granitic

Similar processes operate to create accretionary prism & the tectonic arcs, Thus several parallel ranges can be created.

Geological Structure of Island Arc!



Eurasia ← Pacific
 Pacific will go down
 western part west of
 Japan will have
upwarping (shallow sea)
 VA will develop
 when VA is lifted

Though will be dev. in
 one side.

TA. then accretionary prism. It will dev. in

Eastern part of Japan will dev. Trench wedge, remaining
 of Trench. So continental shelf will be less developed
 & deep fishing will developed.

Acc. Prism (sedimentary being in nature) can easily
 be eroded & pediplained. So cities are located in Eastern
 part of accretionary prism.

then VA. then shallow basin & then China.
 Acc. Prism → Marine Sediment

TA → granite at core. due to thermal metamorphic
 it will be metamorphic rock.

↓ Eurasia

↑ India

From South.

- Trench
- Trench sedimentation (Trench gypsiferous)
- Shallow sea.
- Tethys sea.

Dress (Kashmir) is a volcanic arc. will form
 first. more compression TA → then Greater Himalaya,
 then lesser (A-P) then trench wedge (gangaik plain)

TA → Lesser Himalaya

VA + TA → Tecto volcanic Arc → Greater Himalaya

Sensitic → Acc. Plism.

Upper part of Himalaya metamorphic rock
↳ Non fossiliferous.

Due to very limited oceanic arc → NO VA ✓

Deep inside Himalaya → granitic rock ✓

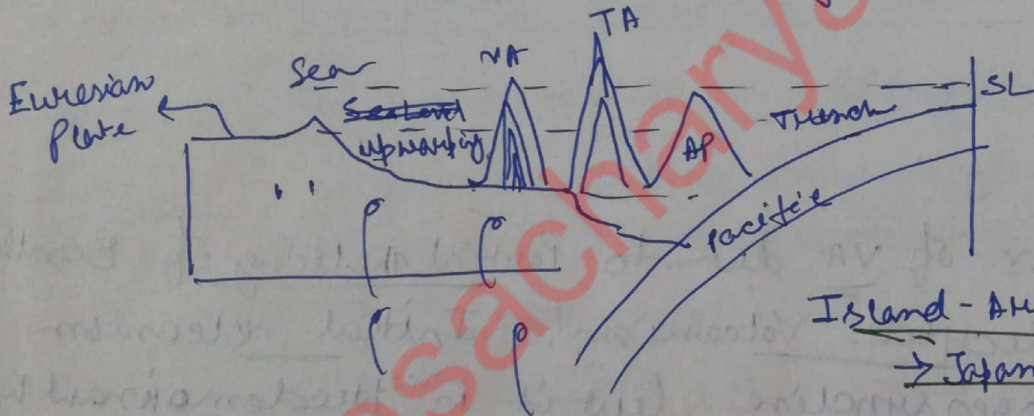
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i) geosyncline → Shallow water ldy over trench ✓

ii) Accretion ^{Plism} ~~arc~~ → Accumulation TA ✓

iii) Batholith → ~~Core~~ intrusion of granitic magma (⊗ beneath the volcano)

iv) At the east of oceanic crust, continental mass is formed.
↳ Japan is growing & pacific is destructing → ✓ e.g.
Continent → granite, andesite & sedimentary rock



Island-Arc Orogenesis
→ Japan

Mountain Orogenesis → Himalay.

Two Arc different

2) Ocean ~~A~~ - Island Arc Collision! - It is only a variant of ocean-ocean interaction, where the frontal margin have oceanic crust & island arcs. For e.g. → New guinea

~~It~~ It is also called Indonesian Type.

↓
e.g of Island arc-ocean interaction

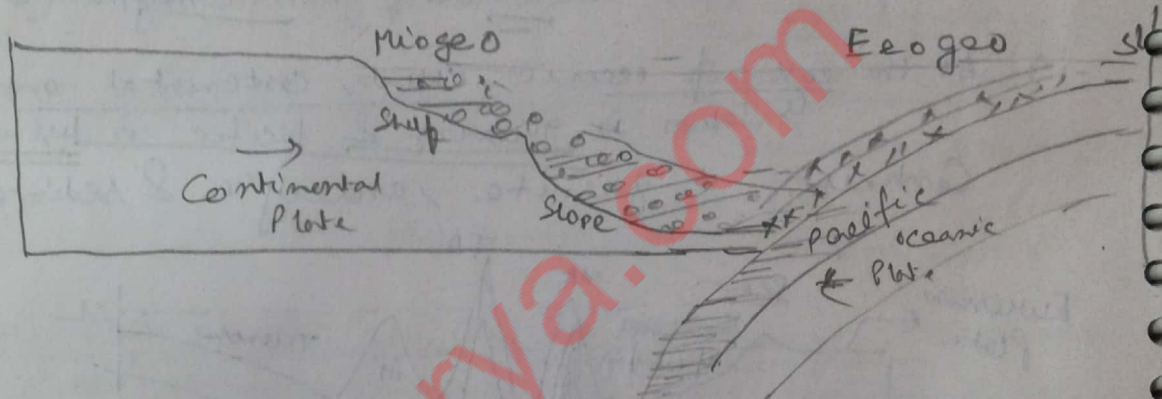
3) Ocean Continent Interaction :- When the oceanic plate, collide with continental plate, as a rule oceanic plate will subduct.

Stage 1 :- Formation of Geosyncline in the Trench!

Geosyncline has two parts -

a) Mio geosyncline :- Where the terrestrial sediment is deposited

2) Eo geosyncline :- Where oceanic sediment is deposited



Stage 2 :- Dev. of VA due to partial melting of Basalt, Andesitic Volcanism! - Initial volcanism is in mio geosyncline but it is predominantly found in Eo geo.

Stage 3 :- Formation of Accretionary Prism & TA by exceeding compressional forces. This type of orogenesis is called cordilleran type orogenesis.
cordilleran
e.g. → Andes & Rockies

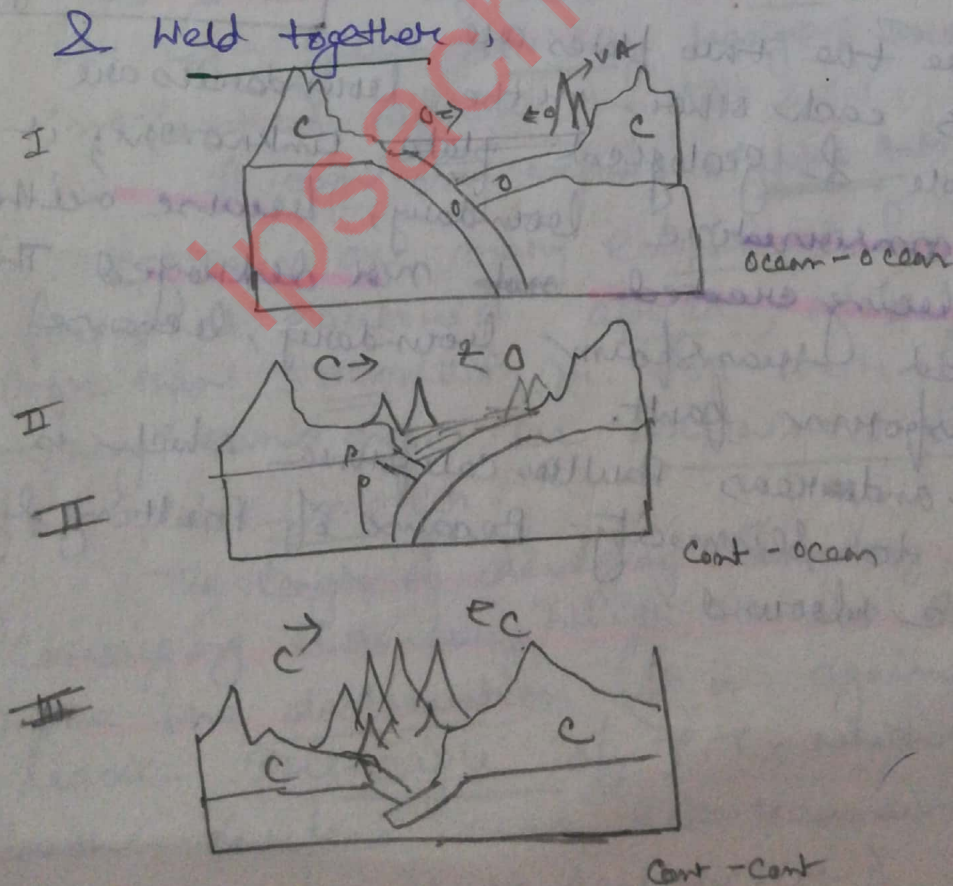
4) Continent-Continent Collision / Alpine Orogenesis (87)
Ural Type / Himalayan Type:-

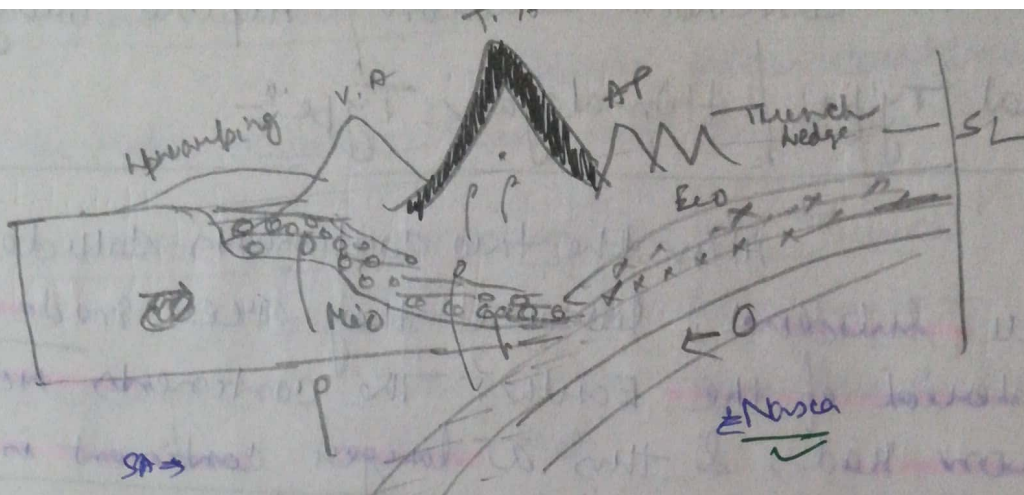
When the two continents collide, none will subduct, because they are made of lighter material of the Earth. The continents weld like iron rod, & thus a larger continent is formed. This mechanism led to the formation of the pangeaea.

Himalayan type is in fact the 3rd stage of ocean-ocean interaction. Stage 1:- denser oceanic plate subduct & finally consume or destroyed. Stage 2:- The 2nd oceanic crust begin to subduct.

Stage 3:- When the entire oceanic crust has been consumed, the two continents come closer & weld together.

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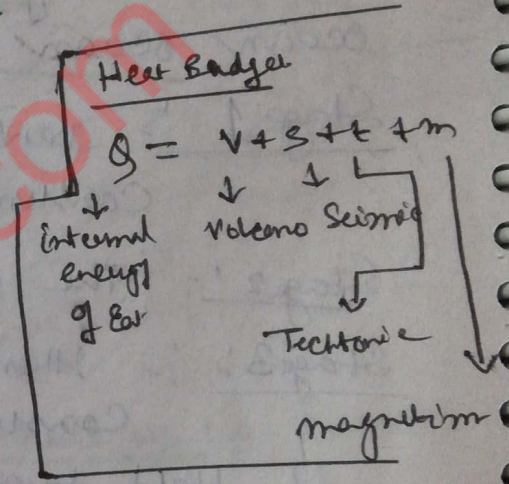




Case Study of Andes Mts.

Nasca vs South America, So like volcano in Andes.
Ocean vs continent

Imp
 e.g. of
 ocean-continent interaction



III Conservative Boundary:

Where the two plates are sliding past each other, on the boundaries are unidentifiable & geological plate unknown, it is called conservative boundary, because neither crust is being created ~~not~~ not destroyed. They are also called transform boundary, because of the transform fault.

e.g → San-andreas Faults, California which is prone to seismicity. Because of faulting & elastic rebound.

IV) Gliding Boundary: Where the subduction of oceanic plate is passed & uninterrupted & highly prone to seismic event.
For e.g. → Plate boundary along Indonesia, near Java & Sumatra is a gliding boundary.
It is the focus of Tsunami & Earthquakes.

Conclusive Remark!

- !- Plate Tec. Theory is incomplete without
- ① describing the forces which drives the plate. Convictional current theory is the most plausible mechanism, but why they originate & why they die, is not known.
 - ② P-T Theory reveals the history of Earth after Carboniferous. However Earth has a long history of 4.5 billion years.
 - ③ P.T. cannot explain the intra plate mts. & some of hercynian, caledonian mts. For e.g. - great dividing range, Drakensberg mts. located within the plate.
It can only explain Alpine mts.
 - ④ There are many evaporites & spacious placers found at equatorial africa; which we need more than 500 million yr. for their formation. They can not be explained if we assume the plate motion.
 - ⑤ The length of diverging boundary is more than converging boundary which means creation is more the destruction. (It is against the basic principle of P.T, which says Earth surface area will remain const., as creation is equal to destruction.)

⑥ This is against the basic premise of P-T theory. The total surface acc to P.T is constant. But, ~~the~~ it have been challenged by Russian scientist & theory of expanding Earth of J. K. F. Halm has been revived.

⑦ P.T. Theory cannot explain why suddenly the divergence in great African rift valley stopped.

⑧ It has not been able to establish the boundaries & the no. of plates.

Geotumors
↳ in Earth.
dev. in many parts
of crust. It may
be found in
Europe

⑨ New Evidences. / Post facto Evi.

i) Through Satellite LASER ranging (SLR), It has been established that plates are in motion.

ii) Joides expedition [Joint Investigation Oceanographer for deep Earth Sampling] | SLR → method to identify motion of plate

Following result came

a) central rift valley has high heat flow, which signify existence of hot plumes.

b) Along the trenches the heat flow was absent, which means existence of cold plumes.

c) The red clay was absent near the ridge & thickest along the trench.

d) The innumerable earthquakes along the ridge suggest push of magma on the rising limb of convictional current.

Include Benioff Zone Also