Gupta Empire

Chandragupta I

- Founder of Gupta Empire

Samudragupta

- Expanded Gupta Empire 10 times
- Gave Patronage to Buddhist Scholars like Vasubandhu and Asanga
- His court poet was Harishena
- Details About him in Allahabad Pillar Inscription

Chandragupta II

- He married his daughter Prabhavati Gupta to Vakataka King Rudrasena II
- Conquered Western India Shakas
- Ports: Broach, Sopara, Cambay and other sea ports
- Fa Hien visited India during his reign
    i. Fa Hien came to India through land route but went back through sea route.
    ii. According to him, Buddhism was flourishing in North-West India and Gangetic Valley had become the land of Brahamanism

Gupta Empire

Chandragupta II

- He had Nine Gems in his court:
    i. Kalidasa - Poet
    ii. Shapanaka - Astrologist
    iii. Amarnatha - Wrote Amarkosh (Sanskrit Grammar)
    iv. Dhanvantri - Doctor
    v. Varuchii - Grammar Expert
    vi. Varahamihira - Astrologist | Wrote Brihatsamhita, Brihadjataka and Panch Siddhantika
    vii. Ghatakpara - Architect
    viii. Shanku - Geologist
    ix. Vetalabhadra - Expert in Black Magic and Tantric Science | Also known as Mega Brahmin | Wrote 16 stanza poem Niti Pradipa (Lamp of Conduct)

Kumargupta

- Founder of Nalanda University
- Threat of Hunas Invasion started during his time

Gupta Empire

Skandagupta

- Large scale Huna Invasion ultimately leading to weakening of Gupta Empire
- 2 Famous Huna Rulers - Toramana and Mihirakula

Kingdom after the Fall of Gupta Empire

1. Pushyabhutis of Thanesar
2. Maukharies of Kannuaj
3. Maitrakas of Vallabhi
4. Late Guptas
5. Yashodharma of Malwa

Administration under Guptas

- Sabha : Council of Ministers
- Amatyas and Sachivas : Executive Officers
- Mahanandanayaka : Chief Justice
- Vinayasitishpataka : Morale and Social Discipline
- Dutakas : Espionage or Spies Network
- Sandhi Vigrahika : Minister of Peace and War
- Ranabhandagarika : Look after day to day needs of the army

Gupta Empire

Administration under Guptas

- Vishaya : Provice
- Vishayapati : Head of Province
- Grama : Village
- Gramadhyaksha : Head of Village
- Nagara Sresthis : City Administration
- Vishti : Forced Labour (PYQ Question)
- Taxes : Uparikara, Udranga and Hiranya
- Dinaras : Gold Coins
- Atavirajyas : Forest Kingdoms
- Kulyavapa : 12 to 16 acres of land
- Dronavapa : 0.5 to 2 acres of land
- Adhavapa :0.375 to 0.5 acres of land
- Important Ports: Ghantasala, Kadura,Chaul, Lothal, Muziris

Gupta Literature

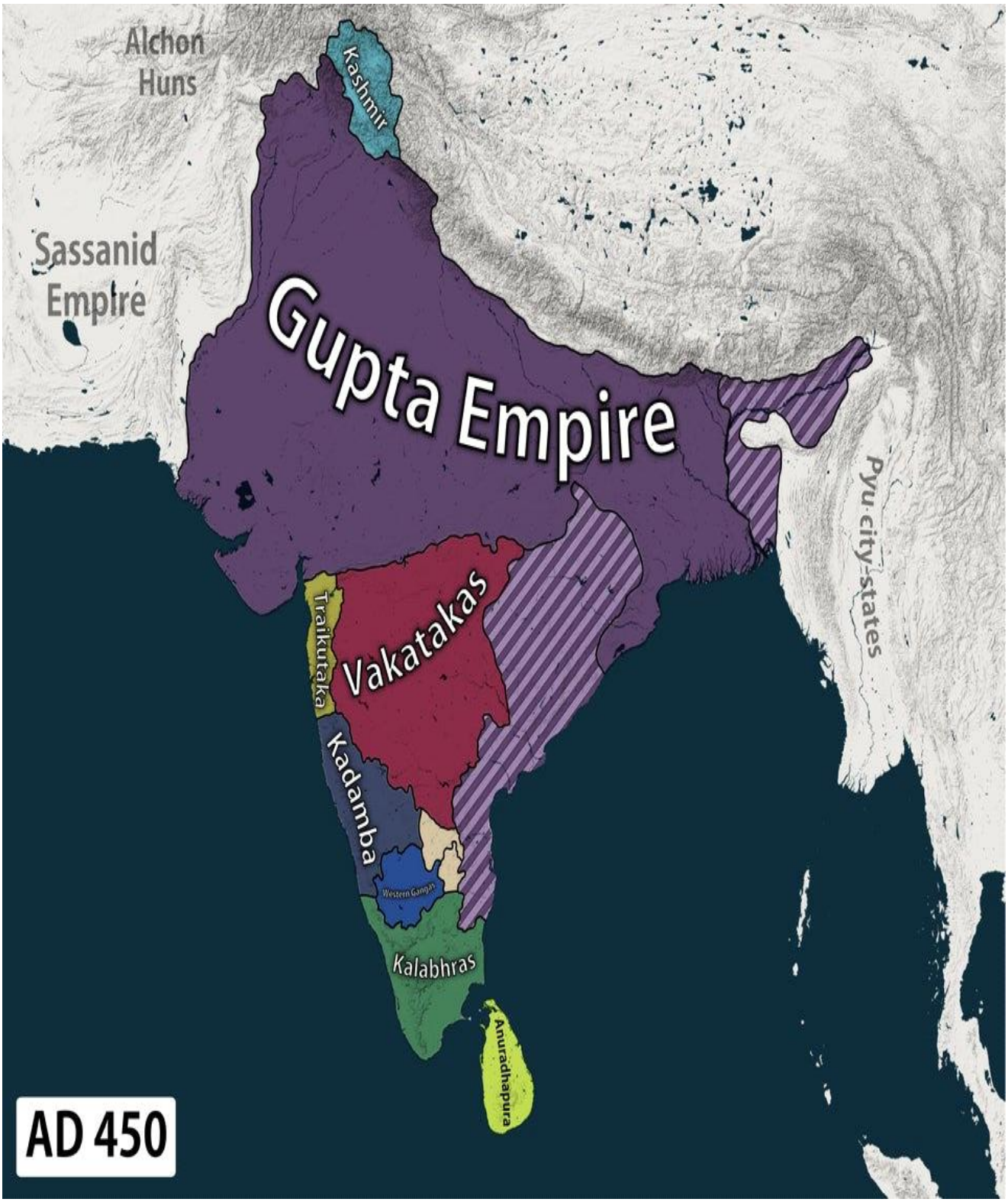
1. Kalidasa
   a. Plays: Abhigyan Shakuntalam, Malvikagnimitra and Vikramorvasiya
   b. Epics: Raghuvamsa and Kumarsambhava
   c. Lyrics: Ritusamhara and Meghaduta

Gupta Empire

Gupta Literature

2. Vishakadutta - Mudrarakshasha and Devichandraguptam
3. Sudraka - Mrichhatkatika (Rich in Humour)
4. Bharvi - Kritarjuniya (Story of Conflict between Arjun and Shiva)
5. Dandin - Kavyadassa and Dasakumaracharita
6. Subandhu - Vasavadutta
7. Vishnu Sharma - Panchtantra stories
8. Amarsimha - Amarkosha
9. Aryabhatta - Aryabhatiya
10. Vagbhatta - Astangasamhita or Astanga Samagraha (Summary of 8 branches of medicine)
11. Kamandaka - Nitisara
12. Manjushri Mulakalpa (Mahayana Buddhist Text)
13. Harivamsha Purana (Jain Text)
14. Tiloya Pannati (Jain Text)
15. Kathasaritsgara (Storehouse of popular folklore)
16. Vatsayana - Kamasutra
17. Faxian - A record of Buddhist Kingdoms

Gupta Empire



Gupta Empire

Prelims PYQ

With reference to forced labour (Vishti) in India during the Gupta period, which one of the following statements is correct?

(a) It was considered a source of income for the State, a sort of tax paid by the people.

(b) It was totally absent in the Madhya Pradesh and Kathiawar regions of the Gupta Empire.

(c) The forced labourer was entitled to weekly wages.

(d) The eldest son of the labourer was sent as the forced labourer.

Solution: Option C

Gupta Empire

Prelims PYQ

With reference to the period of the Gupta dynasty in ancient India, the towns Ghantasala, Kadura and Chaul were well known as

(a) ports handling foreign trade

(b) capitals of powerful kingdoms

(c) places of exquisite stone art and architecture

(d) important Buddhist pilgrimage centres

Solution: Option A

Gupta Empire

Prelims PYQ

With reference to the history of India, the terms "kulyavapa" and "dronavapa" denote

(a) measurement of land

(b) coins of different monetary value

(c) classification of urban land

(d) religious rituals

Solution: Option A

Note: This question is covered in our notes. If you are not able to recall, then you need to revise again. Do not just move pages unless you are sure that you know each and every word of the previous page.

Gupta Empire

Prelims PYQ

With reference to the Scholars/literatures of ancient India, consider the following statements:

1. Panini is associated with Pushyamitra
2. Amarsimha is associated with Harshavardhana
3. Kalidasa is associated with chandragupta-II

Which of the above given statements is/are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 3 only
(d) 1, 2 and 3

Solution: Option C

Note: All are among the nine gems of Chandragupta II of Gupta Empire.

Important Legislations

Wildlife Protection Act, 1972

- Establishment of National Parks, Wildlife Sanctuaries, Conservation Reserves, Community Reserves, Tiger Reserves, etc.
- Appointment of Wildlife Advisory Board and Wildlife Warden
- Gives license for trade and commerce in some wildlife species
- Bodies:
  a. NTCA
  b. National Board for Wildlife
  c. Central Zoo Authority
  d. Wildlife Crime Control Bureau

Schedule I and part II of schedule II	Animals which are in the category of **endangered species. These are given absolute protection from hunting. Eg Tiger**
Schedule III and IV	These also have roughly the same provisions of Section I and II, but cover animals that are not in danger of becoming extinct.
Schedule V	Delineates animals that can be hunted **like ducks and deers** with the prior permission of **chief wildlife warden**. (**Vermins**)
Schedule VI	Concerns cultivation and plant life and gives teeth to setting up more protected animal parks.

Important Legislations

Environment Protection Act, 1986

- Enacted to protect environment
- Provides procedures for setting standards of emission or discharge of environmental pollutants.
- Based on pollutor pays principle.
- Eco Sensitive Zones are declared under EPA, 1986
- Bodies:
  a. Genetic Engineering Appraisal Committee
  b. National Coastal Zone Management Authority
  c. Central Ground Water Authority

Indian Forest Act, 1927

- Classifies Forest into:
  a. Reserved Forest
  b. Protected Forest
  c. Village Forest
- Defines forest offence i.e. acts which are prohibited in forest area.
- Implementing Agencies
  a. Centre: Directorate General of Forests under Moefcc
  b. State: State Forest Department
  c. Local: Subordinate Agencies

Forest Conservation Act, 1980

- Central Government prior approval was made mandatory for diversion of forest land for non-forestry purposes.
- Diversion of forest land is made subject to
  a. Stringent scrutiny
  b. Recovery of Net Present Value and compensatory afforestation equal to the area diverted.

Important Legislations

Forest Rights Act, 2006

- Ministry of Tribal Affairs
- Objective is to restore the deprived rights of STs and other traditional forest dwellers across India.
- Acts defines Critical Wildlife Habitats as areas of national parks and wildlife sanctuaries that are kept aloof for wildlife conservation.
- Rights Recognised:
  a. Title Rights
  b. Use Rights
  c. Community Forest Resource Rights
- Eligibility Criteria:
  a. Must be a Scheduled Tribe in the area whose right is claimed.
  b. Primarily resided in forest or forest land for 3 generations before 13th December 2005
  c. Depends on the forest for livelihood needs.
- Process of Recognition of Rights:
  a. Gram Sabha would pass a resolution recommending whose rights to which rights should be recognised.
  b. Screening Committees: Resolution is screened and approved at sub division and district levels by a committee comprising 3 government officials and 3 elected members from local bodies.

National Wildlife Action Plan (2017-2031)

- Integrating actions for climate change mitigation and adaptation.
- Adopt landscape approach in conservation of all wildlife.
- Address rising human- animal conflict.
- Underscores increasing need for people's support for conservation of wildlife.
- Underlines increasing role of private sector through CSR.

Important Legislations

Biological Diversity Act, 2002

- To conserve and promote sustainable use of biological diversity and ensure fair and equitable sharing of benefits
- Act was enacted to meet the obligations under Convention on Biological Diversity.
- Prohibits transfer of Indian genetic material out of the country without specific approval.
- Prior permission is mandatory to claim IPR over biodiversity and its derivatives.
- Establishes:
  a. National Biodiversity Authority
  b. State Biodiversity Authority
  c. Biodiversity Management Committees
- Biodiversity Management Committees helps in implmentation of Convention on Biological Diversity, Nagoya and Cartegana Protocol on ground level. Its main function is to maintain People's Biodiversity Register. Apart from this, it has other functions also like determining access and sharing benefits with local population, etc.

Compensatory Afforestation Fund Act, 2016

- Setup CAMPA authority at Centre and State Level
- Provides an appropriate institutional mechanism to utilize afforestation funds
- Establishes National Compensatory Afforestation Fund under Public Account of India and similarly for states.
- National Fund receives 10% and State Fund gets 90% of funds collected.
- The CAMPA Act mitigates the impact of diverting forest land for non-forest purposes.

Important Legislations

Protection of Plant Varieties and Farmers Rights Act, 2001

- Aims to protect plant varieties, rights of farmers, plant breeders and to encourage the development of new varieties of plants.
- Farmers Rights:
  a. Farmer who has developed a new variety is entitled to registration and protection.
  b. Compensation to farmers for non-performance for variety developed
- Breeder Rights:
  a. Exclusive rights to produce and sell the protected variety.
- Researcher Rights:
  a. Researchers can use any registered variety for experiments or research.
  b. It would facilitate the growth of seed industry and ensure availability of high quality seeds.

National Green Tribunal Act, 2010

- All cases before NGT needs to be disposed-off within 6 months of appeal.
- It has jurisdiction over all cases involving substantial questions relating to environment.
- NGT orders are binding. But orders can be challenged before Supreme Court within 90 days.
- NGT draws inspiration from Article 48A
- NGT deals with the following Acts:
  a. Water Act, 1974
  b. Water Cess Act, 1977
  c. Forest Conservation Act, 1980
  d. Air Act, 1981
  e. EPA, 1986
  f. Public Liability Insurance Act, 1991
  g. Biological Diversity Act, 2002
- NGT does not deal with following Acts:
  a. WPA, 1972
  b. Indian Forest Act, 1927
  c. Forest Rights Act, 2006

Important Legislations

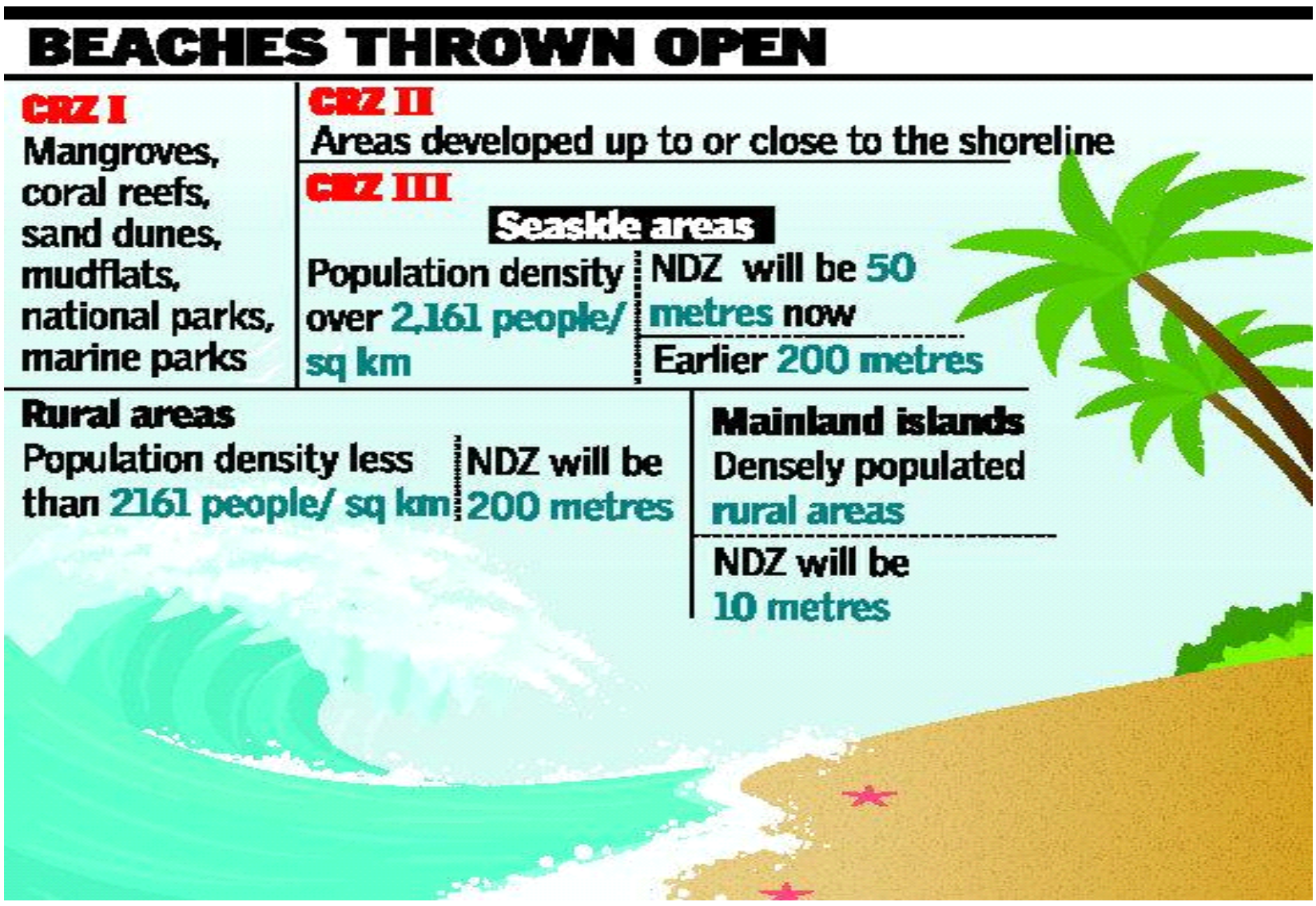
Coastal Regulation Zones

- CRZ-I: CRZ 1 is made up of environmentally delicate places such mangrove swamps, coral reefs, sand dunes, maritime parks, sanctuaries, reserve forests, and wildlife habitats. Between high tide and low tide lines are where the coastal regulatory zone regions of CRZ 1 are located.

- CRZ-II: It consists of the built-up regions that are inside the current municipal boundaries and extend up to the shoreline. This zone prohibits the construction of unauthorised constructions.

- CRZ-III: This zone includes places like rural areas that are generally undeveloped and do not fit into the categories listed above. In accordance with this coastal management zone, only particular activities relating to agriculture or designated public utilities are allowed.

- CRZ-IV: This zone includes regions of the tidally-influenced water bodies as well as water areas from the low tide line up to the territorial borders.



Important Conventions

Basel Convention

- Convention aims towards restricting transboundary movements of hazardous wastes that are explosive, flammable, poisonous, infectious, corrosive, toxic, or eco-toxic.

- Awakening environmental awareness and corresponding tightening of environmental regulations in the industrialised world in the 1970s and 1980s resulted in increased public opposition to hazardous waste dumping - known as the NIMBY (Not In My Back Yard) syndrome - and an increase in disposal costs.

- Basel Convention does not cover radioactive waste.

- Basel Ban Amendment is an agreement made by Basel Convention Parties that forbids the Organization for Economic Cooperation and Development (OECD), the European Union (EU), and Liechtenstein from exporting hazardous wastes as defined by the Convention to other nations, mainly developing or transitional economies.

Rotterdam Convention

- The Rotterdam Convention on the prior informed consent procedure for certain hazardous chemicals.

Stockholm Convention

- It covers Persistent Organic Pollutants also known as forever chemicals.
- 12 Persistent Organic Pollutants covered in this (popularly known as Dirty Dozen:
  a. Pesticides: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, and toxaphene
  b. Industrial chemicals: hexachlorobenzene and PCBs
  c. Unintentionally produced POPs: dioxins and furans

Minamata Convention

- It takes care of Mercury pollution.

Important Conventions

Convention on Biological Diversity

- Legally Binding Agreement open for signature in Rio Convention in 1992

- 3 Goals
  a. Conservation of Biological Diversity
  b. Sustainable use of its components
  c. Fair and Equitable sharing of benefits arising from genetic resources.

- Cartegena Protocol
  a. Also known as Biosafety Protocol
  b. It seeks to protect biodiversity from Living Modified Organisms (LMOs)
  c. Established Advance Information Agreement (AIA) so that countries can make informed decisions before actually importing such organisms.
  d. Also establishes Biosafety Clearing Houses to facilitate exchange of information on LMOs.

- Nagoya Protocol
  a. It deals with access to genetic resources and fair and equitable sharing of benefits arising from utilisation of biodiversity.
  b. It also consists of 5 strategic goals and 20 new biodiversity targets famously called Aichi Biodiversity Targets.

- 15th COP to CBD
  a. Held in Kunming, China and Montreal, Canada
  b. Also called Kunming-Montreal Global Biodiversity Framework
  c. 30 x 30 Targets: To conserve atleast 30% of land and sea areas by 2030.

Important Conventions

United Nations Convention to Combat Desertification (UNCCD)

- It is the sole legally binding international agreement linking environment and development to sustainable land management.

- The UNCCD is particularly committed to a bottom-up approach, encouraging the participation of local people in combating desertification and land degradation.

- Land Degradation Neutrality Fund (LDN Fund) was launched at COP13 to the UNCCD in China.

- What is/are the importance/importances of the ' United Nations Convention to Combat Desertification' ? (2016)
  1. It aims to promote effective action through innovative national programmes and supportive international partnerships.
  2. It has a special/particular focus on South Asia and North Africa regions, and its Secretariat facilitates the allocation of major portion of financial resources to these regions.
  3. It is committed to bottom-up approach, encouraging the participation of local people in combating the desertification.

  Select the correct answer using the code given below:

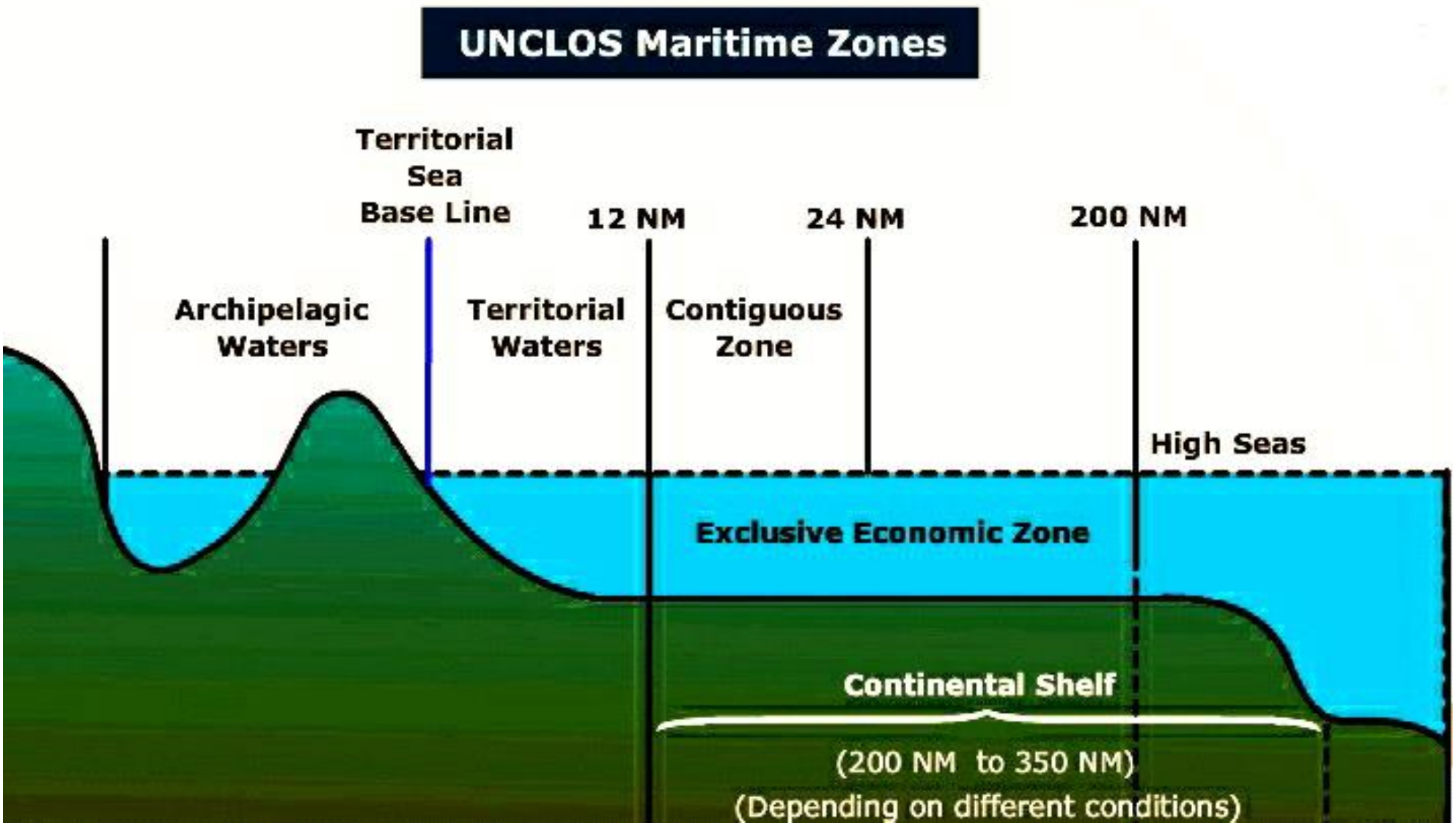
  (a) 1 only
  (b) 2 and 3 only
  (c) 1 and 3 only
  (d) 1, 2 and 3

Important Conventions

UN CITES

- Convention on International Trade in Endangered Species of Wild Flora and Fauna.
- Also known as Washington Convention.
- 3 Appendixes:
  a. Appendix 1: Animal Threatened with Extinction and hence, trade in these species is allowed only for scientific and educational purposes.
  b. Appendix 2: Animals on the verge of extinction and hence, trade in these species is regulated through permits.
  c. Appendix 3: Animals that are protected in atleast 1 country that is a CITES member and that country has requested for help in controlling international trade of that species.

UN Convention on Law of Sea (UNCLOS)



Important Conventions

Convention on Conservation of Migratory Species (CMS)

- It is the only global convention specialising in conservation of migratory species, their habitats and migratory routes.

- 2 Appendixes:
  a. Appendix 1: Species facing a very high risk of extinction in near future.
  b. Appendix 2: Species with less risk of extinction.

- CoP 13 of CMS
  a. Gandhinagar declaration was adopted to highlight the importance of migratory species for a new global biodiversity strategy.
  b. Its mascot was Great Indian Bustard.

- 3 Flyways of India
  a. Central Asian Flyway
  b. East Asia- Australasian Flyway
  c. West Asia- East African Flyway

International Treaty of Plant Genetic Resources for Food and Agriculture

- By FAO
- Comprehensive international agreement for ensuring food security through conservation and sustainable use of plant genetic resources for food and agriculture.

Indian Peninsula

Features

- The Peninsular Plateau is a one of the oldest and the most stable landmass of India composed mostly of the Archaean gneisses and schists.
- Roughly triangular in shape and lie in the south of the great plain of North India.
- It is bordered on all sides by the hill ranges:
  - North-west (extension of Aravalis) = Delhi ridge
  - East = Rajmahal hills
  - West = Gir range
  - South = Cardamom hills (constitute the outer extent of the peninsular plateau)
  - Outlier = Shillong and Karbi-Anglong plateau
- It covers a total area of about 16 lakh square kilometer (India as a whole is 32 lakh sq km).
- The average height of the plateau is 600-900 meter above sea level
- Most of the peninsular rivers flow from west to east indicating the general elevation of the plateau is from the west to the east.
- Narmada-Tapti are the exceptions which flow from east to west in a rift (rift is caused by divergent boundary).

Hill Ranges

1. Aravalli Hills

- The length of the Aravalis is 1100 km which extends from Delhi to Ahmedabad.
- They are one of the oldest fold mountains of the world and the oldest in India.
- Only a few peaks reach an elevation of above 1000m.
- Its highest peak is Guru Shikhar. It is on the 'Abu hills'. Mt. Abu is a famous hill station.
- Rivers Banas, Luni, Sabarmati are initiates from Aravallis.
- It contain several lakes such as Lake Sambhar (largest inland saline water body in India), Lake Dhebar, Lake Jaisamand, etc.

Indian Peninsula

2. **Satpura Range**
   - Satpura hills are tectonic mountains formed as a result of folding and structural uplift
   - With peaks more than 1,200m high, the Satpura Range includes the Mahadeo Hills to the north, the Maikala Range to the east, and the Rajpipla Hills to the west.
   - The Satpura range is a block mountain which has Narmada river valley on its northern side and that of the Tapi on the western side.
   - It stretches for a distance of about 900 km.
   - Dhupgarh on Mahadev Hills (near Pachmarhi) is the highest peak of the Satpura range.
   - Amarkantak is another important peak, highest of the Maikal hills, from where two prominent rivers, the Narmada and the Son originate.
   - It is noteworthy that three rivers do originate from the three sides of the Maikal hills but only two rivers, the Narmada and the Son originate from Amarkantak and not the Mahanadi.
   - Due to the presence of Gondwana rocks, these hills are rich in bauxite.
   - The rivers in the Satpura range make several waterfalls like Dhuandhar waterfall on the Narmada river.

3. **Vindhyan Range**
   - It runs parallel to the Narmada Valley in an east-west direction from Bharuch in Gujarat to Sasaram in Bihar for a distance of over 1,200 km.
   - The general elevation of the Vindhyan Range is in between of 300 to 650 meters.
   - Most parts of the Vindhayan Range are comprised of horizontally bedded sedimentary rocks of ancient age.
   - They locally named as Panna, Kaimur, Rewa etc.
   - This range acts as a divide between the Ganga system and the river systems of south India.

Indian Peninsula

4. Western Ghats (Sahyadris)
   - The Western present a stepped topography facing the Arabian Sea coast due to the horizontally bedded lavas.
   - From the Deccan plateau, they have a gentle slope towards their eastern edge and don't appear to be a tall range of hills.
   - Northern Section:
     - This section of the Western Ghats is located in Maharashtra and also known as the Sahyadris.
     - The average height of Sahyadris is about 1200 meter
     - Sahyadris are made of volcanic igneous rocks (Deccan lavas or Deccan Traps).
     - Godavari, Bhima, and Krishna are the main rivers of this section.
     - Some of the prominent peaks of the Sahyadris are - Kalasubai peak (the tallest peak of the Sahyadris), Salher peak, Harischandragarh peak etc.
   - Middle Section:
     - This section runs through Karnataka and Goa and terminates in the Nilgiris, where it joins the Eastern Ghats.
     - They are made of igneous and metamorphic rocks like the granite and gneiss.
     - Their average height is around 1200 meters and some of the prominent peaks such as Vavulmala, Kudremukh, Pushpagiri etc.
   - Southern Section:
     - This section comprising the Annamalai and Cardamom hill ranges.
     - Palghat gap is the largest gap in the Western Ghats (about 24 km wide) which separates the Nilgiris from the Annamalai hills.
     - Anaimudi peak is the highest point of peninsular India lying in the Annamalai hills.
     - The southernmost section of the Western Ghats is Agasthyamalai hills situated in Kerala and Tamil Nadu. The southernmost peak of peninsular India is Agasthamalai peak.

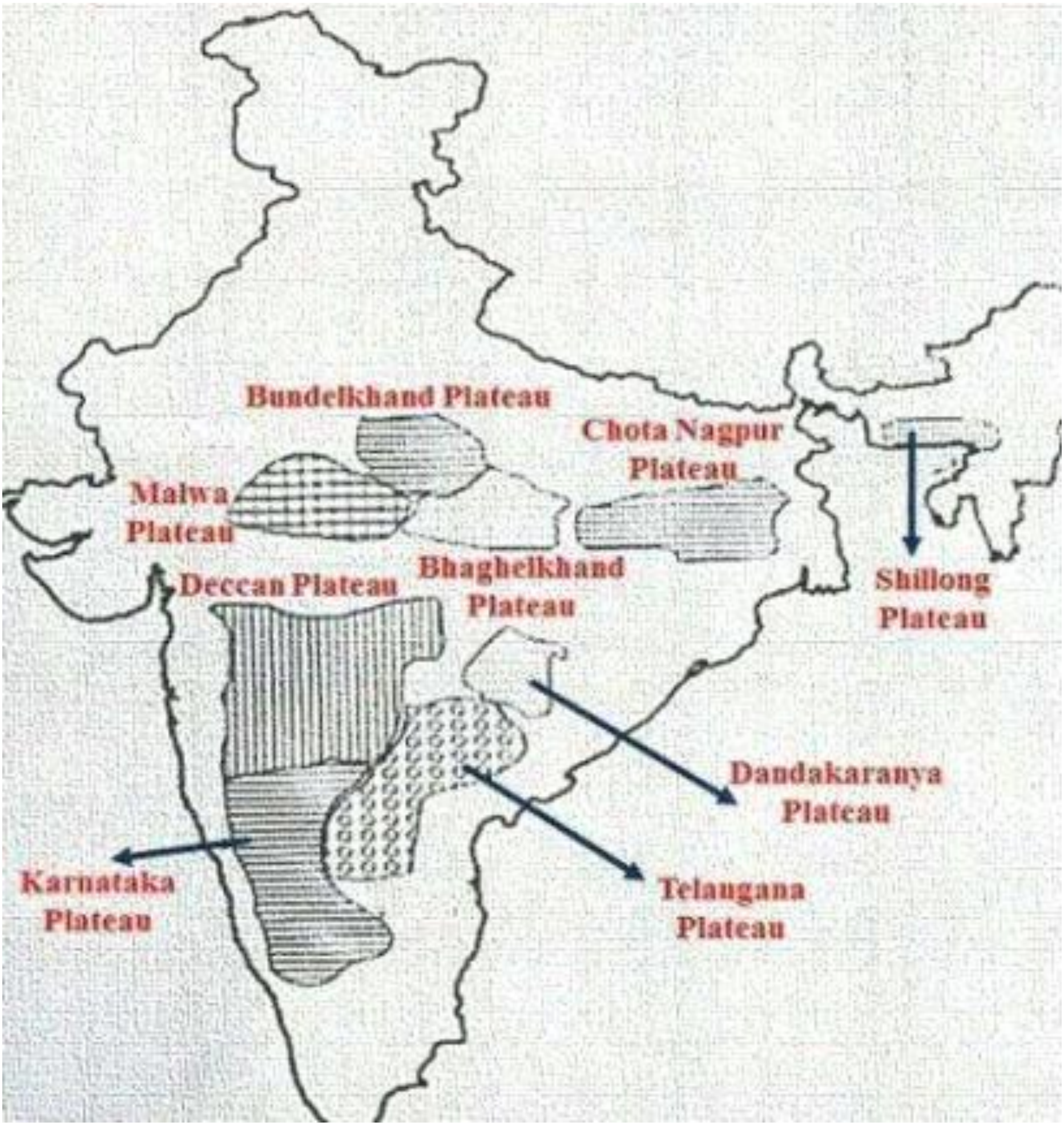
Indian Peninsula

5. Eastern Ghats
   - Eastern Ghats run almost parallel to the eastern coast of India leaving broad plains between their base and the coast.
   - It has been eroded than the Western Ghats. Therefore, it is of less height.
   - They are mainly comprising of Dharwar igneous and metamorphic rocks.
   - These hills lack structural and physiographic continuity unlike Western Ghats
   - Some prominent hills:
     - Andhra Pradesh = Velikonda hills, Palakonda hills, and the Seshachalam
     - Tamil Nadu = Javadi hills and Shevaroy hills
   - Eastern Ghats merge with the Western Ghats at the Nilgiris.

The Western Ghats	The Eastern Ghats
The Western Ghats lie on the western margin of the Deccan Plateau.	The Eastern Ghats lie on the eastern margin of the Deccan Plateau.
The Western Ghats are higher in elevation. Their average elevation is from 900 to 1600 metres.	The Eastern Ghats are lower in elevation. Their average elevation is 600 metres.
They have a continuous chain of mountains and can be crossed through passes only.	The mountain chains are not continuous and are denuded by the rivers which flow into the Bay of Bengal.
No major river has cut across them.	They have been cut across by major rivers like the Godavari, Mahanadi, Krishna and Kaveri.

Indian Peninsula

Plateaus



Indian Peninsula

Plateaus

1. **Marwar or Mewar Plateau**
   - It is the plateau in eastern Rajasthan. (Marwar plain lie in the west of Aravalis whereas Marwar plateau lie in the east).
   - The height is in between 250-500 meters above sea level and it slopes down eastwards.
   - It contains sandstone, shales and limestones of the Vindhayan period.

2. **Central Highlands**
   - Also known as Madhya Bharat Pathar
   - It is a rolling plateau with sandstone containing rounded hills.
   - Thick forests grow here
   - Ravines or badlands of the Chambal river found in the north

3. **Bundelkhand Plateau**
   - Yamuna river to the north, Malwa Plateau to the south, Vindhyan Ranges to the east and south-east and Madhya Bharat Pathar to the west.
   - It is the old dissected (divided by a number of deep valleys) upland of the 'Bundelkhand gneiss' made up of granite and gneiss rocks.
   - The height of the plateau is in the range of 300-600 meters.
   - It has a drainage system into the Bay of Bengal.
   - Streams like Betwa, Dhasan and Ken flow through the plateau.

4. **Baghelkhand**
   - It is situated east of Maikala range and is made of limestone and sandstone on the west and granite in the east.
   - The plateau has a general elevation of 150 meters to 1200 meters and has uneven relief.
   - The main elements of Physiography are scarps of the Vindhyan sandstones between the Ganga plain and the Narmada-Son trough.

Indian Peninsula

5. **Malwa Plateau**
   - The Malwa Plateau roughly forms a triangle based on the Vindhyan Hills, bounded by the Aravali Range from the west and Madhya Bharat Pathar from the north and Bundelkhand from the east.
   - This plateau has two systems of drainage
     - Towards the Arabian sea (Narmada, Tapi and Mahi)
     - Towards the Bay of Bengal (Chambal and Betwa by joining the Yamuna)
   - The average elevation of the plateau is 500 meter

6. **Chotanagpur Plateau**
   - It's a continental plateau with an average elevation of the plateau is 700 meter above sea level.
   - It is spread in Jharkhand, northern part of Chattisgarh and Purulia district of West Bengal and parts of Odisha.
   - Damodar rift valley (DRV) is the most prominent structure of this plateau which possess Gondwana rocks making it one of the richest coal deposits of India viz., the Damodar Valley Coal Fields.

7. **Meghalaya or Shillong Plateau**
   - The peninsular plateau extends further east beyond the Rajmahal hills to from Meghalaya or the Shillong plateau.
   - An extension of the peninsular plateau is also visible in the northeast, locally known as the Meghalaya or the Shillong plateau, Karbi-Anglong Plateau and North Cachar Hills.
   - It is separated by a fault from the Chotanagpur Plateau and its western boundary more or less coincides with the Bangladesh border.
   - Three prominent hill ranges from the west to the east are the Garo, the Khasi and the Jaintia Hills.
   - Its average height is about 1500 meters above the mean sea level.
   - Cherrapunji and Mawsynram are the wettest places in India and are a part of the plateau located in the Khasi hills

Indian Peninsula

8. Kathiawar Plateau
   - Located in the Kathiawar region of Gujarat having many pipe-like volcanic openings which gave rise to many hill ranges such as the Girnar range, Junagarh range, Pavagarh range etc.
   - Lake Nalsarovar (a bird sanctuary) forms the Northeast boundary of the plateau.
   - To the north of Kathiwar plateau, Little Rann is situated.
   - It has some volcanic rocks in the form of Mandav hills and Balda hills.
   - Mt.Girnar = Highest point of Kathiawar plateau

9. Deccan Plateau
   - This is the largest unit of Peninsular Plateau of India covering an area of about 5 lakh sq km.
   - It is triangular in shape and is bordered by
     - the Satpura and the Vindhya in the north-west
     - the Mahadev and the Maikal in the north
     - the Western Ghats in the west
     - the Eastern Ghats in the east
   - Its average elevation is 600 m.
   - It rises upto 1000 meter in the south but dips to 500 meter in the north.
   - Its general slope is from west to east which is indicated by the flow of its major rivers like the Mahanadi, Godavari, the Krishna and the Cauvery. These rivers have further subdivided this plateau into a number smaller plateaus described as under:
     - The Maharashtra Plateau – it has typical deccan trap topography underlain by basaltic rock, the regur.
     - The Karnataka Plateau (also known as Mysore plateau) – divided into western hilly country region of 'Malnad' and plain 'Maidan'
     - Telangana Plateau

Indian Peninsula

Himalayan Region Vs Peninsular Plateau

The Himalayan Region	The Peninsular Plateau
Having a comparatively recent origin, it is made up of young fold mountains.	It is the oldest landmass of the Indian subcontinent; was part of the Gondwana land.
Consists of the loftiest mountains and deep valleys.	Consists of broad and shallow valleys, and rounded hills.
Formed due to the collision of the Indo-Australian and Eurasian plates.	Formed due to the breaking and drifting of the Gondwana land.
Composed of sedimentary rocks.	Composed of igneous and metamorphic rocks.
From the point of view of geology, this region forms an unstable zone.	This region forms a stable zone.
Major rivers like – the Indus, the Ganges and the Brahmaputra originate from the Himalayas.	Major rivers like – the Narmada and the Tapti, Godavari, Krishna and Kaveri originate from these hills.
Important hill stations like – Shimla, Mussoorie, Darjeeling, Nainital , etc. are found on the Himalayas.	Important hill stations like - Khandala, Panchgani, Ooty, Kodaikanal, etc. are found on the Peninsular Plateau.

Delhi Sultanate

Mamluk or Slave Dynasty (1206 to 1290)

1. Qutub-ud-din Aibak

- Md. Ghori died in 1206 after which Qutub-d-din Aibak became the Sultan of Delhi
- He was known as Lakh Baksh
- He patronised great scholars like Hasan Nizami who wrote books like Tajul Maasir (Crown of Exploits). It deals with Qutub-ud-din-Aibak's history
- He started construction of Qutub Minar in memory of Sufi saint Khwaja Qutubuddin Bhaktiyar Kaki. The construction was completed by Iltutmish.
- He built Quwwat-ul-Islam mosque in Delhi (Triumph of Islam). This mosque was built from stones of 36 Jain and Hindu temples
- He also built a mosque named Adhai din ka jhopda in Ajmer
- He died while playing Chaugan (horse polo) in 1210

Delhi Sultanate

Mamluk or Slave Dynasty

2. Iltutmish

- He received mansur (letter of recognition) from Abassid Caliphate.
- He introduce silver coins (known as Tanka and copper coins (known as Jital)
- He gave patronage to scholars like Minhaj-ul-siraj (Author of famous book Tabaqquat-i-Nasiri)
- He is also known as father of Tomb Building in India. He built Sultan Garhi in Delhi.
- He had an army of 40 powerful military leaders (known as Chalisa or Chihalgani)
- When Khwarism was attacked by Mongols, its ruler Jalauddin Mangbarni seeked help from Iltutmish but he refused to help him. This is the reason why Chengez Khan did not invade India.
- 2 Important Officers:
    a. Wazir (Deputy or Prime Minister)
    b. Ariz-i-Mamalik (Defence Minister)

Delhi Sultanate

Mamluk or Slave Dynasty

2. Iltutmish

- 2 Important Systems:
    a. Naquib (Audit System)
    b. Iqta (Revenue Assignment)
- Shaikh-ul-Islam was the highest religious position in his court. This position was conferred to Suhrawardi Sufi Saint Bahauddin Zakaria
- Iltutmish divided his empire into Iqtas:
    a. Iqtas were assignment in lieu of salary
    b. Every Iqtadar has to maintain law and order and collect revenue.
    c. After deducting salary and expenses of Iqtadar, the surplus revenue was sent to the Central Government.
    d. Iqtas were transferable property.
- He followed Policy of Aloofness with Mongols.

Delhi Sultanate

Mamluk or Slave Dynasty

3. Raziya Sultana

- She introduced African Slaves from Abyssinia (Ethiopia). One such slave was Yakut.
- She followed the Policy of Appeasement with Mongols.

4. Ghiyasuddin Balban or Ulugh Khan

- He abolished the post of Naib (Chief Secretary)
- He followed the Policy of Blood and Iron.
- He introduced Nauraz (Iranian Festival) in India.
- He called himself Zil-i-Ilahi means 'Shadow of God on Earth'
- He introduced court etiquettes:
    a. Paibos: Kissing the feet of the king
    b. Sijda: Prostration in a court of law
- The longest serving historian of Delhi Sultanate, Barani was present in his court. He wrote books like Fatwa-i-Jahandari and Tarikh-i-Ferozshahi

Delhi Sultanate

Mamluk or Slave Dynasty

4. Ghiyasuddin Balban or Ulugh Khan

- Administration:
    a. Diwan-i-Wizarat: PM
    b. Diwan-i-insha: Correspondence
    c. Diwan-i-ariz: Defence
    d. Diwan-i-risalat: External Affairs
    e. Sadar-us-Sudur: Education and Religion
    f. Qazi-ul-Quzat: Chief Justice
- Palam Baoli Well Inscription
    a. This inscription is commissioned at Baoli well at Pala, Delhi
    b. It was written in Sanskrit by Pandit Yogeshwara
    c. In this inscription, Balban is referred to as the 11th re-incarnation of Vishnu.

Delhi Sultanate

Khalji Dynasty (1290 to 1320)

1. Jalauddin Khalji

- He appointed Alauddin Khalji as the Governor of Kara
- According to Barani, he believed in the policy of 'not harming even an ant'

2. Alauddin Khalji

- He patronised poets like Amir Khusrau and Amir Hassan.
- He built a famous gateway known as Alai Darwaza
- Capital at Siri.
- He introduced 4 important Ordinances:
    a. He confiscated the property of nobles
    b. Intelligence system was re-organised and all the secret activities of nobles were immediately reported to Sultan
    c. Public sale of liquor and drugs were totally stopped.
    d. Social Gathering and festivities without the permission of Sultan were forbidden.
- Mongols sent their army 6 times during Alauddin Khalji's rule.

Delhi Sultanate

Khalji Dynasty (1290 to 1320)

2. Alauddin Khalji

- Reforms:
    a. Revocation of all grants to Inam, Waquif, etc.
    b. Creation of network of spies
    c. Wine Drinking was forbidden
    d. Nobles were forbidden to associate with each other. Even for marriage alliances, they had to seek the permission of Sultan.
- Military Reforms:
    a. He introduced the system of dagh (branding of horses) and huliya (description of face of soldiers)
    b. He paid salaries in cash as Iqta system was abolished.
    c. Ariz-i-Mumalik: Officer in charge of appointment of soldiers.
- Agrarian Reforms:
    a. Taxes: Kharaj, Jazia, Karai-Gharia-Charain
    b. 50% Land Revenue Tax : Highest in the entire history of India.

Delhi Sultanate

Khalji Dynasty (1290 to 1320)

2. Alauddin Khalji

- Conquests and Territorial Expansion
    a. Areas not far from Delhi. Ex- Gujarat, Rajasthan, Malwa
    b. Modern Maharashtra and Deccan. These areas were not under the direct control of Sultan
    c. During Ghiyasuddin Tughlaq's reign, the control over Deccan was made centralised.
- Market Reforms:
    a. Alauddin set up 3 markets at Delhi:
        i. Food Market
        ii. Cloth Market or Sarai-i-Adl
        iii. Market for horses, cattle and slaves
        iv. Intermediary Commodities
    b. Food Market:
        i. Focussed on supply, transportation and distribution of foodgrains.
        ii. Officer in charge: Shuhna-i-Mandi
        iii. Transportation of foodgrains was done by Karwanas or Banjaras.

Delhi Sultanate

Khalji Dynasty (1290 to 1320)

2. Alauddin Khalji

- Some Important Terminologies:
    a. Mutsarrif: Accountants
    b. Amils: Collectors
    c. Gumasthas: Agents
    d. Barids: Intelligence Officer
    e. Munhiyan: Secret Spies or Espionage
    f. Zawabit: Detailed regulations to control and administer 3 markets.

Delhi Sultanate

Tughlaq Dynasty (1320 to 1413)

1. Ghiyasuddin Tughlaq

- Founder of Tughlaq Dnasty
- He built Tughlaqabad city

2. Mohammad Bin Tughlaq

- He adopted the policy of annexation and took Deccan area under his direct control.
- 4 Blunders:
    a. He transferred capital to Devagiri (Daulatabad)
    b. His Expeditions in North-West like Qarachi Campaign and Ambitious project of Khurasan. This led to huge financial losses
    c. He introduced Token currency. Copper coins were issued at par with the value of Silver coins.
    d. Taxation in Doab region leading to famine situation for 7 years (1332 to 1342)

Delhi Sultanate

Tughlaq Dynasty (1320 to 1413)

2. Mohammad Bin Tughlaq

- He gave Takkavi loans or Sandhar Loans to farmers
- Separate Department for Agriculture: Diwan-i-Kohi
- During his time, Ibn Batuta (from Morocco) visited India. He wrote a book by the name Rihla (Social and Cultural life). Md Bin Tughlaq appointed him as the qazi of Delhi.

3. Feroz Shah Tughlaq

- He revived Iqta system and made it hereditary.
- He followed the advice of Ulemmas. He did not believe in Secularism
- Sharb: Irrigation Tax
- Diwan-i-Khairat or Yatimkhana: To take care of orphans and widows
- Dar-ul-shifa: Hospitals
- Book: Tarikh-i-Ferozshahi (Written by Barani and Shams-i-Siraj Afif)

Delhi Sultanate

Tughlaq Dynasty (1320 to 1413)

3. Feroz Shah Tughlaq

- He introduced a new valuation Jama for land revenue.
- He abolished all taxes not sanctioned by shara (Abwabs)
- He built a canal by the name: Hissar Firuza

1398 ----> Timur invaded India and ransacked entire Delhi

Sayyid Dynasty (1414 to 1451)

- Founder: Khizr Khan
- Last Ruler: Alauddin Shah (He left his throne voluntarily for Bahlul Lodhi)

Delhi Sultanate

Lodhi Dynasty (1451 to 1526)

1. Bahlul Lodhi
    - He started Jirza tradition
    - He annexed Jaunpur (Sharqui Dynasty). Its founder was Malik Sarwar.

2. Sikandar Lodhi
    - He shifted capital to Agra
    - He introduced new measurement of land: Gazz-i-sikandari
    - He destroyed many Hindu temples. He was anti-Hindu just like Feroz Shah Tughlaq.

3. Ibrahim Lodhi
    - He was the only sultan to die in a battle field
    - He died in 1st Battle of Panipat with Babur in 1526. In this battle, Gun powder was used in India for the very first time.

Delhi Sultanate

Local Administration

- **Iqta Land**: Land assigned to officials as Iqtas
- **Khalisa Land**: Land under the direct control of Sultans
- **Inam Land**: Land assigned or granted to religious leader or religious institutions.
- **Muqtis or Walis**: Governor of Provinces
- **Patwari**: Village Accountant
- Provinces were divided into
  a. **Shiqs** (District) (Headed by Shiqdar)
  b. **Pargana** (Group of Village) (Headed by Amils)
  c. **Village** (Headed by Muqaddam or Chaudhari)

Taxes

- **Kharaj**: Tax on Land (Usually 10% of produce)
- **Zakat**: Wealth Tax (On the basis of flocks, herds, gold, silver, etc. a person has)
- **Khams**: It represents one-fifth of the booty acquired in war or mine or treasure trove to be handed over to the state

Delhi Sultanate

Some Important Miscellaneous Terms:

1. Diwani-i-Risalat: Religious Affairs
2. Diwan-i-Insha: Correspondence
3. Diwan-i-Wizarat: PM Office
4. Diwan-i-Ariz: Military Department
5. Qazi: Head of Judicial Department
6. Amir-i-Akhur: Superintendent of Horses
7. Amir-i-Tuzuk: Master of ceremonies
8. Amir-i-Mumalik: Minister of War
9. Diwan-i-amir-kohi: Department of Agriculture
10. Diwan-i-Khairat: Charity
11. Diwan-i-Bandagan: Slaves Department
12. Kismat-i-Khuti: Headman's Cess
13. Chari: Pasture Tax
14. Rahat: Water lifting device for irrigation

Hindu Reform Movements

Brahmo Samaj

- Established in 1828
- The 'Society of God'
- Founded by - Raja Ram Mohan Roy (1772-1833)

Raja Rammohan Roy

- RMR was born in an Orthodox Brahmin family in Bengal
- Given title of 'Raja' by Mughal Badshah Akbar Shah II due to his social work
- He knew many languages (polyglot) – Sanskrit, Greek, Latin, Arabic, Persian
- In 1815, he established the ATMIYA SABHA.
- Book – 'Tuhfat-ul-Muwahiddin' – A gift to Monotheist
- 1820 –Published the 'Precepts of Jesus' where he analysed moral teachings of Christ
- He extensively studied and analysed all major religious texts and wrote about their teachings
- Translated Vedas in Bengali

Hindu Reform Movements

Raja Rammohan Roy

- 1821- Started a Bengali weekly Newspaper – Samwad Kaumudi – The moon of intelligence
  - It was the first newspaper to be published, edited and managed by an Indian.
  - In some places he has been termed as Pioneer of Journalism.
- 1822- another weekly in Persian - 'Mirat ul Akbar' – Mirror of intelligence
- 1830 - Went to England to plead for the Mughal emperor Akbar Shah II in the court of King William IV
  - King increased the pension of Emperor on his request.
- Toured Europe for cultural exchange
- Died at Bristol, England in 1833
- First to ask political questions about the country
- 'Father of Indian Nationalism' – title given by Rabindranath Tagore

Hindu Reform Movements

Brahmo Samaj Criticized:

- Caste system
- Polygamy
- Child marriage
- Priests
- Idol Worship
- Polytheism
- Avatar worship
- Sati system
- Sacrifices
- Dogma against going abroad

Brahmo Samaj Emphasized:

- Human dignity for all – Humanism
- Spirituality based on Upanishads
    - Arya Samaj doesn't believe in Upanishads
- Worship of the Eternal, immutable and unsearchable – no image/idol
- Morality
- Women's rights
- Upliftment in conditions of widows
- Widow remarriage

Hindu Reform Movements

Debendranath Tagore

- After the death of RRM, Debendranath Tagore (father of Satyendranath and Rabindranath Tagore) took the reins of Brahmo Samaj in 1843
- He earlier headed the Tattvabodhini Sabha (1839 –a spiritual body). It was merged with Brahmo samaj
- He also founded Shantiniketan

Keshab Chandra Sen

- Keshab Chandra Sen joined Brahmo samaj in 1858 - he expanded the movement outside Bengal
- KCS's teachings and outlook was too radical – he brought teachings of other religions in the sabha.
- This led to a spilt in the Brahmo Samaj in 1866
  - Adi Brahmo Samaj – Debendranath Tagore
  - Brahmo Samaj of India – Keshab Chandra Sen
- Keshab Chandra Sen's Brahmo Samaj of India further split when he married his 13-year-old daughter to the minor king of Cooch Behar (near Siliguri) in 1878
  - Disgusted followers founded the 'Sadharan Brahmo Samaj'

Hindu Reform Movements

Prarthna Samaj

- Implemented Ideas of Brahmo Samaj in Maharashtra
- 1849 – Paramhansa sabha started
- This Sabha was reorganised as Prarthna Samaj by Dr. Atmaram Pandurang and Keshab Chandra Sen in 1867 at Bombay
- Famous leaders associated with the Samaj -
  - Mahadeo Govind Ranade
  - R.G. Bhandarker
  - N.G. Chandaverker
- Emphasised on 'works' rather than 'faith'
- Believed in 'love and worship of God' lay in service of needy people
- Education and persuasion - not confrontation with orthodox elements - for reforms
- Focus on – caste system, child marriage, widow remarriage and girl's education

Hindu Reform Movements

Arya Samaj

- Est. in 1875 at Bombay
- Arya Samaj means 'The Society of Noble people'
- Founder – Swami Dayanand Saraswati
- Later the headquarters and base shifted to Lahore and the society took deep roots in Northern India- Punjab, UP, Bihar, Haryana, Rajasthan.

Dayanand Saraswati

- Original name – Moolshanker
- Born in an orthodox Gujarati Brahmin family
- Age 21 - left home as an ascetic
- Age 36 – Studied Vedas at Mathura and translated them into Hindi
- Books written by him:
  - Satyarth Prakash (Hindi)
  - Ved Bhashya Bhoomika (Sanskrit)
  - Ved Bhashya (Sanskrit)

Hindu Reform Movements

Philosophy and Views of Arya Samaj

- Rejected the western ideas of reform
- Accepted Vedas as the ultimate authority.
  - He gave the slogan- "Go Back to Vedas"
- Believed in superiority of Hindu religion and culture
- Creation of a sense of pride in Indian culture and tradition
- Prayers, meetings, and religious lectures were held by Samaj every 8th day
- Believed in welfare of mankind
- Fatherhood of God and Brotherhood of man
- Gender equality
- Love and charity towards all
- 'Shuddhi' campaign for re-conversion
- 'India for Indians' – political slogan
- Arya Samaj did NOT oppose modernisation completely. It embraced modernity and accepted the utilitarian benefits of modern society.

Hindu Reform Movements

Arya Samaj Opposed:

- Sati practice
- Child marriage
- Idol worship
- Superstitions
- Priestly class dominance
- Caste system (But accepted 'Varna' system according to Vedas)
- Swami Dayanand believed that any scripture written after the Vedas (Puranas, Upanishads, etc.) were reason for redundant practices in Hinduism, like idol worship and opposed them.

Works in Field of Education:

- Gurukuls opened by Arya Samaj to spread Vedic knowledge in children
- Dayanand Anglo Vedic (DAV) school was established at Lahore in 1886 by Lala Hansraj and Lala Lajpat Rai (Liberal Faction)
- Gurukul University at Haridwar established in 1902 by Lala Munshiram (Orthodox faction)

Hindu Reform Movements

Ramakrishna Mission

- Established at Belur, Bengal in 1897
  - Today a Belur Math is there in Belur.
- By Swami Vivekananda (Narendranath Dutt)
- Named after his guru - Ramakrishna Paramhansa, a priest in Calcutta temple

Objective:

- It is a social service and charitable society.
- Providing humanitarian relief and social work through the establishment of schools, colleges, hospitals and orphanages.
- Swami Dayanand believed that any scripture written after the Vedas (Puranas, Upanishads, etc.) were reason for redundant practices in Hinduism, like idol worship and opposed them.

Views and Philosophy

- Teachings and philosophy rooted in Bhakti and Yoga traditions
- Krishna, Hari, Ram, Allah are all names of one god
- Did not reject image worship but laid stress on the worship of essential spirit and not the image

Hindu Reform Movements

Views and Philosophy

- Did not reject image worship but laid stress on the worship of essential spirit and not the image
- Selfless devotion to God – Bhakti movement
- The teachings of Ramakrishna Paramhansa appealed to the common man of Bengal.
    - Whereas, the Brahmo samaj appealed to elite, intellectual and educated class, since social evil was prevalent in upper class.
- Swami Vivekananda preached these philosophies of Ramakrishna Paramhansa in simple language
    - He attended the Parliament of World Religions at Chicago in 1893 and gave a famous speech on Hinduism.
    - He asked the Blend of Materialism of the west with the spiritualism of the east
- He said that, 'It is an insult to teach religion to a starving man'.
- Opposed caste system and untouchability
- Asked Youths to build Moral and physical strength
- He stressed on upliftment of the poor, the weak and the hungry by inspiring youth of the society

Hindu Reform Movements

Theosophical Society

- Did not reject image worship but laid stress on the worship of essential spirit and not the image
- Theosophy- Teaching about God and the world based on mystical insight
- Madam H.P. Blavatsky – a Russo- German woman by birth laid the foundations of the society in 1875 at New York, USA. Later Col. M.S. Olcott joined her.
- Headquarters shifted to ADYAR, near Madras in 1882. Since, they wanted to do research of Indian religion.

Views and Philosophy:

- Belief in Reincarnation, Karma
- Inspiration from Upanishads and Samkhya, Yoga, Vedanta school of philosophy
- Universal brotherhood of humanity
- No difference based on caste, creed, race, sex or colour of skin
- Investigate the unexplained laws of nature and latent powers of man
- Theosophy became a movement of Hindu Revival

Hindu Reform Movements

Annie Besant

- An Irish woman, was elected its president after death of Col. Olcott in 1907
  - She had come to India to work for the society in 1892.
- She became a Hindu in her views, dress, food and social manners
- Translated Bhagvat Gita (Not the 1st to do so)
  - Charles Wilkins of the Asiatic Society 1st translated Bhagvat Gita to English in 1785.
- She made the movement popular in India
- She later became a prominent national leader and even the 1st woman president of Congress
- She established Home Rule League movement with support of Bal Gangadhar Tilak
- Annie Besant laid foundation of Central Hindu College in Benares in 1898 where Hindu religion + western science was taught together
  - It became BHU -1916 – Madan Mohan Malviya

Hindu Reform Movements

Young Bengal Movement

- Henry Vivian Derozio was the founder of the Young Bengal Movement (~1826)
- He was born in Calcutta in 1809 and taught in the Hindu College (est. RMR and David Hare). He died of cholera in 1833.
- His followers were known as the Derozians and their movement the Young Bengal Movement.
- They attacked old traditions and decadent customs.
- They also advocated women's rights and their education.
- They founded associations and organized debates against idol worship, casteism and superstitions
- This movement gave quick start to Social Reform movement in Bengal.
    - Later, these Derozians joined other societies like, Brahmo Samaj, Arya Samaj etc.

Depressed Classes Mission

- Maharshi Vitthal Ramji Shinde

Hindu Reform Movements

Pandit Ishwar Chandra Vidyasagar

- A great educator, humanist and social reformer
- He was born in 1820 in a village in Midnapur, Bengal.
- He rose to be the Head Pandit of the Bengali Department of Fort William College.
- Vidyasagar founded many schools for girls
- He helped J.D. Bethune to establish the Bethune School.
- He founded the Metropolitan Institution in Calcutta
- He protested against child marriage and favoured widow Remarriage which was legalised by the Widow Remarriage Act (1856).
- It was due to his great support for the spread of education that he was given the title of Vidyasagar.

Deccan Education Society

- Vishnushastri Chiplunkar and Bal Gangadhar Tilak
- Established the Fergusson College, Pune in 1885

Hindu Reform Movements

Dayal Singh Majithia

- Dayal Singh College, Lahore (1902)
- Punjab National Bank

Year	Movement Name	Founder
1815	Atmiya Sabha	Raja Ram Mohan Roy
1828	Brahmo Samaj	Raja Ram Mohan Roy
1839	Tattvabodhini Sabha	Debendranath Tagore
1866	Adi Brahmo Samaj	Debendranath Tagore
1866	Brahmo Samaj of India	Keshab Chandra Sen
1878	Sadharan Brahmo Samaj	Followers of KCS
1867	Prarthna Samaj	Keshab Chandra Sen Dr. Atmaram Pandurang
1875	Arya Samaj	Swami Dayanand Saraswati
1897	Ramkrishna Mission	Swami Vivekanand
1875	Theosophical Society	Madam H.P. Blavatsky Col. M.S. Olcott
1826	Young Bengal Movement	Henery Vivian Derozio

DPSP

Basics about DPSPs

- The Directive Principles of State Policy are enumerated in Part IV of the Constitution from Articles 36 to 51
- The framers of the Constitution borrowed this idea from the Irish Constitution of 1937, which had copied it from the Spanish Constitution.
- The Directive Principles along with the Fundamental Rights contain the philosophy of the Constitution and is the soul of the Constitution.
- Dr B R Ambedkar described these principles as 'novel features' of the Indian Constitution.

Features of DPSPs

- DPSPs denotes the ideals that the State should keep in mind while formulating policies and enacting laws. These are the constitutional instructions or recommendations to the State in legislative, executive and administrative matters.
- The Directive Principles resemble the 'Instrument of Instructions' enumerated in the Government of India Act of 1935.

DPSP

- The Directive Principles constitute a very comprehensive economic, social and political programme for a modern democratic State. They aim at realising the high ideals of justice, liberty, equality and fraternity as outlined in the Preamble to the Constitution.
- The Directive Principles are non-justiciable in nature, that is, they are not legally enforceable by the courts for their violation. Therefore, the government (Central, state and local) cannot be compelled to implement them.
- The Directive Principles, though non-justiciable in nature, help the courts in examining and determining the constitutional validity of a law.

Article 38

- The State shall strive to promote the welfare of the people by securing and protecting as effectively as it may a social order in which justice, social, economic and political, shall inform all the institutions of the national life.

DPSP

- The State shall, in particular, strive to minimise the inequalities in income, and endeavour to eliminate inequalities in status, facilities and opportunities, not only amongst individuals but also amongst diverse groups of people.

Article 39

- The State shall, in particular, direct its policy towards securing
  - that the citizens, men and women equally, have the right to an adequate means of livelihood
  - that the ownership and control of the material resources of the community are so distributed as best to subserve the common good
  - that the operation of the economic system does not result in the concentration of wealth and means of production to the common detriment
  - that there is equal pay for equal work for both men and women
  - that the health and strength of workers, men and women, and the tender age of children are not abused and that citizens are not forced by economic necessity to enter avocations unsuited to their age or strength

- that children are given opportunities and facilities to develop in a healthy manner and in conditions of freedom and dignity and that childhood and youth are protected against exploitation and against moral and material abandonment.

Article 39A

- The State shall secure that the operation of the legal system promotes justice, on a basis of equal opportunity, and shall, in particular, provide free legal aid, by suitable legislation or schemes or in any other way, to ensure that opportunities for securing justice are not denied to any citizen by reason of economic or other disabilities.

Article 40

- The State shall take steps to organise village panchayats and endow them with such powers and authority as may be necessary to enable them to function as units of self-government.

DPSP

Article 41

- The State shall, within the limits of its economic capacity and development, make effective provision for securing the right to work, to education and to public assistance in cases of unemployment, old age, sickness and disablement, and in other cases of undeserved want.

Article 42

- The State shall make provision for securing just and humane conditions of work and for maternity relief.

Article 43

- The State shall endeavour to secure, by suitable legislation or economic organisation or in any other way, to all workers, agricultural, industrial or otherwise, work, a living wage, conditions of work ensuring a decent standard of life and full enjoyment of leisure and social and cultural opportunities and, in particular, the State shall endeavour to promote cottage industries on an individual or co-operative basis in rural areas.

DPSP

Article 43A

- The State shall take steps, by suitable legislation or in any other way, to secure the participation of workers in the management of undertakings, establishments or other organisations engaged in any industry

Article 43B

- The State shall endeavour to promote voluntary formation, autonomous functioning, democratic control and professional management of co-operative societies

Article 44

- The State shall endeavour to secure for the citizens a uniform civil code throughout the territory of India.

Article 45

- The State shall endeavour to provide early childhood care and education for all children until they complete the age of six years.

DPSP

Article 46

- The State shall promote with special care the educational and economic interests of the weaker sections of the people, and, in particular, of the Scheduled Castes and the Scheduled Tribes, and shall protect them from social injustice and all forms of exploitation.

Article 47

- The State shall regard the raising of the level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties and the State shall endeavour to bring about prohibition of the consumption except for medicinal purposes of intoxicating drinks and of drugs which are injurious to health.

Article 48

- The State shall endeavour to organise agriculture and animal husbandry on modern and scientific lines and shall, in particular, take steps for preserving and improving the breeds, and prohibiting the slaughter, of cows and calves and other milch and draught cattle.

DPSP

Article 48A

- The State shall endeavour to protect and improve the environment and to safeguard the forests and wild life of the country

Article 49

- It shall be the obligation of the State to protect every monument or place or object of artistic or historic interest, declared by or under law made by Parliament, to be of national importance, from spoliation, disfigurement, destruction, removal, disposal or export, as the case may be.

Article 50

- The State shall take steps to separate the judiciary from the executive in the public services of the State.

DPSP

Article 51

- The State shall endeavour to—
  - promote international peace and security
  - maintain just and honourable relations between nations
  - foster respect for international law and treaty obligations in the dealings of organised peoples with one another
  - encourage settlement of international disputes by arbitration

Conflict between Fundamental Rights and DPSPs

- The justiciability of Fundamental Rights and non-justiciability of Directive Principles on the one hand and the moral obligation of State to implement Directive Principles (Article 37) on the other hand have led to a conflict between the two since the commencement of the Constitution.
- Champakam Dorairajan Case: Supreme Court ruled that in case of conflict between Fundamental Rights and DPSPs, former would prevail.

DPSP

- **Golaknath Case**: Supreme Court ruled that the Parliament cannot take away or abridge any of the Fundamental Rights, which are 'sacrosanct' in nature. In other words, the Court held that the Fundamental Rights cannot be amended for the implementation of the Directive Principles.
- **24th Amendment Act (1971)**: Parliament has the power to abridge or take away any of the Fundamental Rights by enacting Constitutional Amendment Acts and inserted Article 31C in the constitution.
- **Article 31C**
  - No law which seeks to implement the socialistic Directive Principles specified in Article 39 (b) and (c) shall be void on the ground of contravention of the Fundamental Rights conferred by Article 14, 19 or 31
  - No law containing a declaration for giving effect to such policy shall be questioned in any court on the ground that it does not give effect to such a policy.

DPSP

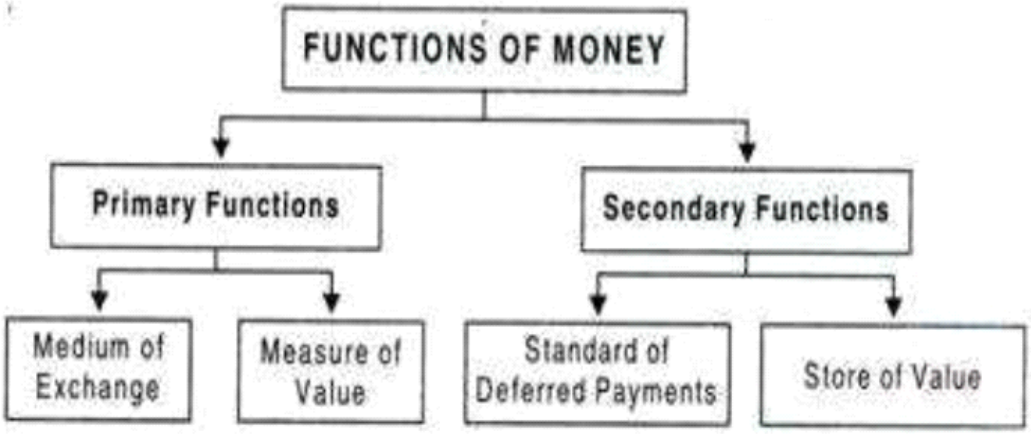
- Keshavananda Bharati Case: Supreme Court declared the above second provision of Article 31C as unconstitutional and invalid on the ground that judicial review is a basic feature of the Constitution
- 42nd Amendment Act (1976): It extended the scope of the above first provision of Article 31C by including within its protection any law to implement any of the Directive Principles and not merely those specified in Article 39(b) and (c)
- Minerva Mills Case (1980): This amendment was declared invalid and unconstitutional by Supreme Court. It means that the Directive Principles were once again made subordinate to the Fundamental Rights. Supreme Court also held that 'the Indian Constitution is founded on the bedrock of the balance between the Fundamental Rights and the Directive Principles.

Therefore, the present position is that the Fundamental Rights enjoy supremacy over the Directive Principles.

Money

Meaning of Money

- Money is a commonly accepted medium of exchange.
- Money is anything that can be generally accepted as payment for goods and services or settlement of debts.



Primary Functions of Money

- Measure of value: Money serves as a common measure of value or unit of account.
- Medium of exchange (transaction): people can easily exchange goods and services with money.

Money

Derivative Functions of Money:

- Deferred Payment: Money also serves as a standard mode of deferred payments.
- Transfer of Value: Money has the same value throughout the country and has its value is transferrable.
- Store of Value: It can be kept as savings (in bank account) and could be used for investment purpose e.g. Buying property.

Paper Money (Fiat Money)

- Paper money acted as money (Legal tender) because they are guaranteed by the national governments.
- Fiat money is legally recognized to settle all debts & payments within territorial jurisdiction.
- Fiat money gives central banks greater control over the economy because they can control how much money is printed.
- Examples: US dollar, Indian Rupee, Euro, etc.

Money

Liquidity of Money

- Money is the most liquid of all assets.
- Liquidity Order is as following:
  - Currency
  - Demand deposits in Banks
  - Savings deposits in Banks
  - Term (Time) deposits in Banks

Q. Consider the following liquid assets: (UPSC 2013)

1. Demand deposits with the banks
2. Time deposits with the banks
3. Savings deposits with the banks
4. Currency

The correct sequence of these assets in decreasing order of liquidity is

a) 1-4-3-2
b) 4-3-2-1
c) 2-3-1-4
d) 4-1-3-2

Money

Creation of Money

- Money supply: It is all the currency and other liquid instruments in a country's economy on the date measured.
- The money supply is roughly composed of both cash and deposits that can be used almost as easily as cash.

Currency Deposit Ratio (CDR)

- The currency deposit ratio (cdr) is the ratio of money held by the public in currency to that they hold in bank deposits
- It reflects people's preference for liquidity. It is a purely behavioural parameter which depends, among other things, on the seasonal pattern of expenditure.
- For example, cdr increases during the festive season as people convert deposits to cash balance for meeting extra expenditure during such periods.

Reserve Deposit Ratio

- Reserve deposit ratio (rdr) is the proportion of the total deposits commercial banks keeps as reserves.

Money

- Reserve money consists of two things:
  - Vault cash in banks and
  - Deposits of commercial banks with RBI.
- Banks hold a part of the money, that people keep in their bank deposits as reserve money and loan out the rest to various investment projects.
- RBI requires commercial banks to keep reserves in order to ensure that banks have a safe cushion of assets to draw on when account holders want to be paid.
- RBI uses various policy instruments to bring forth a healthy rdr in commercial banks. Example- Cash Reserve Ratio, Statutory Liquidity Ratio, Bank Rate, etc.

Q. When the Reserve Bank of India announces an increase of the Cash Reserve Rate, what does it mean? [CSE -2010]

a) The commercial banks will have less money to lend
b) The Reserve Bank of India will have less money to lend
c) The Union Government will have less money to lend
d) The commercial banks will have more money to lend

Money

Commercial Banks

- Commercial Banks accept deposits from the public and lend out this money to interest earning investment projects.
- The rate of interest offered by the bank to deposit holders is called the 'borrowing rate' and the rate at which banks lend out their reserves to investors is called the 'lending rate'
- The difference between the two rates, called 'spread', is the profit that is appropriated by the banks.
- Deposits are broadly of two types – demand deposits, payable by the banks on demand from the account holder, e.g. current and savings account deposits, and time deposits, which have a fixed period to maturity, e.g. fixed deposits.

Q. Which of the following is not included in the assets of a commercial bank in India?

(a) Advances

(b) Deposits

(c) Investments

(d) Money at call and short notice

Money

Function of Commercial Banks

- Primary Functions
  - Accepting deposit and Providing loans
- Secondary Functions
  - Collection and payment of various items e.g. Cheques, Bills
  - Purchase and sell of securities & remittance of money
  - Purchase and sell of foreign exchange
  - Acting as executors and trustees of wills & underwriting of shares
  - Lockers facility & Travellers' cheque and letter of credit

Q. The main functioning of the banking system is to_____ (CDS-2013)

a) Accept deposits and provide credit

b) Accept deposits and subsidies

c) provide credit and subsidies

d) accept deposits, provide credit and subsidies

Money

Value of Money

- By value of money, we mean the purchasing power of money.
- Purchasing Power is the amount of goods or services that can be purchased with a unit of currency.
- When the value of money rises i.e. its purchasing power increases, the general price level falls and vice versa. This means the value of money is inverse of the general price level.
- For instance, at a point of time, Rs. 10 were able to purchase 2 packets of biscuits, but on another times it can buy only one packet because of erosion of purchase power of that currency. This also results in increased purchase power of biscuit packet, it became Rs.7.

Demand For Money

- Money is the most liquid of all assets in the sense that it is universally acceptable and hence can be exchanged for other commodities very easily.
- On the other hand, it has an opportunity cost. If, instead of holding on to a certain cash balance, you put the money in a fixed deposits in some bank you can earn interest on that money.

Money

- Total demand for money in an economy is composed of transaction demand and speculative demand. Demand for money balance is thus often referred to as liquidity preference.
- People desire to hold money balance broadly for following motives:
  - Transaction Motive
    - The principal motive for holding money is to purchase goods and services in day to day life and carry out transactions
  - Speculative Motive
    - When people wish to hold money rather than buying assets/bonds/risky investment. An individual may hold her wealth in the form of landed property, bullion, bonds, money etc.
    - E.g. If interest rates are high, and people expect interest rates to fall, then there is likely to be greater demand for buying bonds and less demand for holding money. If interest rates fall, then the price of bonds will rise.

Money

- Precautionary Motive
  - The precautionary demand for money is the act of holding real balances of money for use in an emergency situation.
  - As receipts and payments cannot be perfectly foreseen, people hold precautionary balances to minimize the potential loss arising from a Contingency

Opportunity Cost of Money

- Opportunity cost refers to a benefit that a person could have received, but gave up, to take another course of action.

Determinants of Money Demand

- The prevalent price level
  - High interest rate or price level will reduce demand for money and vice versa.
- Inflation level in an economy
  - Inflation level reduces demand for money because people prefer to save instead of expenditure because of price rise.

Money

- Real income (Real GDP)
  - Real income is how much money an individual or entity makes after accounting for inflation.
- Disposable income
  - Higher the disposable income, there will be higher tendency to spend more.
- Innovation level in an economy.

Money Supply (Monetary Aggregates)

- The supply of money is a total stock of money in circulation among the public at a particular point of time.
- The measures of money supply in India are classified into four categories M1, M2, M3 and M4 along with M0.

Q. Which of the following measures would result in an increase in the money supply in the economy? [CSE -2012]

Money

1. Purchase of government securities from the public by the Central Bank
2. Deposit of currency in commercial banks by the public
3. Borrowing by the government from the Central Bank
4. Sale of government securities to the public by the Central Bank

Select the correct answer using the codes given below:

a) 1 only
b) 2 and 4 only
c) 1 and 3
d) 2, 3 and 4

Reserve Money (M0)

- It is also known as High Powered Money, monetary base, base money etc.
- Reserve Money is the monetary base of the economy.
- M0 = Currency in circulation + Bankers' Deposits with the RBI + 'Other' deposits with the RBI.

Money

Narrow Money (M1 and M2)

- In banking terminology, M1 and M2 is called narrow money as it is highly liquid and banks cannot run their lending programmes with this money.
- M1 = Currency with the Public + Demand Deposits with the Banking System + 'Other' deposits with the RBI.
- M2 = M1 + Savings Deposits of Post-office Savings Banks

Broad Money (M3 and M4)

- The money component M3 and M4 is called broad money. With this money (which lies with banks for a known period) banks run their lending programmes.
- M3 = M1 + Time Deposits with the Banking System.
- M4 = M3 + All deposits with Post Office Savings Banks (excluding National Savings Certificates).

Money

Ques. Consider the following:
1. Currency with the public
2. Demand deposits with banks
3. Time deposits with banks

Which of these are included in Broad Money (M3)
a) 1 and 2
b) 1 and 3
c) 2 and 3
d) 1, 2 and 3

Ques. Following are some components of money supply in India:
1. Currency with the public
2. Aggregate demand deposits with banks
3. Aggregate time deposits with banks
4. 'Other' deposits with the Reserve Bank of India

Which of the aforesaid items are components of narrow money (M1) in India?
a) 1, 2 and3
b) 2 and 4 only
c) 1, 2 and 4
d) 1and 4 only

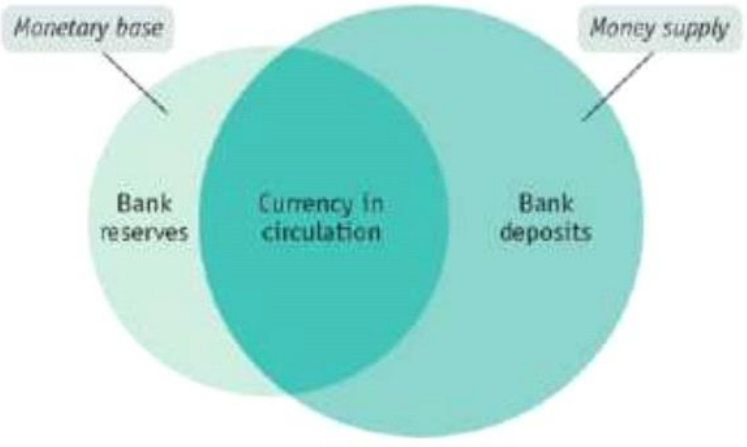
Money

Money Multiplier

- The money multiplier is maximum amount of broad money that could be created by commercial banks for a given fixed amount of base money and reserve ratio.
- Its value is determined in ratio of total money supply to the stock of the high-powered money in an economy.

$$\text{Money multiplier} = \frac{M}{H} = \frac{1 + cdr}{cdr + rdr} > 1$$

$$rdr < 1$$



Money Multiplier
=
Money Supply
÷
Monetary Base

Money

Q. The money multiplier in an economy increases with which one of the following?

a) Increase in the cash reserve ratio

b) Increase in the banking habit of the population

c) Increase in the statutory liquidity ratio

d) Increase in the population of the country

Monetary Policy Of RBI

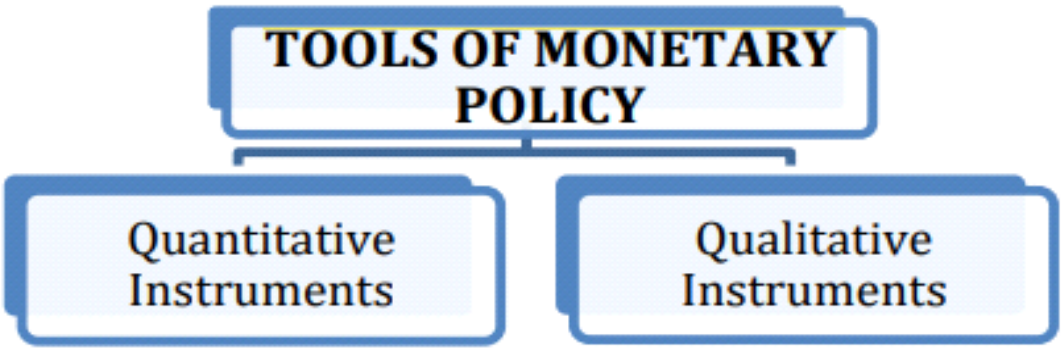
- Monetary policy refers to all those operations, which are used to control the money supply in the economy.
- The RBI implements the monetary policy through instruments like open market operations, bank rate policy, CRR, SLR, reserve system, credit control policy, moral suasion etc.

Objective of Monetary Policy

- To maintain economic and financial stability – by targeting healthy inflation range.
- To ensure adequate financial resources for the purpose of development
- Ensuring price stability in market by maintaining optimum inflation level.
- Adequate flow of credit to productive sectors.

Money

- Promotion of productive investments & trade by ensuring conducive monetary policy, E.g. by credit rationing tool.
- Promotion of exports and economic growth – by providing timely credit and favourable monetary stimulus through various monetary policy tools.



Quantitative Instruments	Basis	Qualitative Instruments
These are the instruments of monetary policy that affect overall supply of money/credit in the economy.	**Meaning**	These instruments are used to regulate the direction of credit.
Traditional methods of control	**Alternative Name**	Selective methods of control
(*i*) Bank rate (*ii*) Repo Rate (*iii*) Reverse Repo Rate (*iv*) Open market operation (*v*) Cash reserve ratio (*vi*) Statutory liquidity ratio	**Instruments**	(*i*) Marginal requirement (*ii*) Moral suasion (*iii*) Selective credit control

Money

Monetary Policy Committee (MPC)

- Monetary policy refers to the credit control measures adopted by the central bank of a country. RBI is the sole monetary authority which decides the supply of money in the economy.
- MPC is a statutory body created under Monetary Policy Framework Agreement 2015 between the RBI and Government in 2016.
- MPC is entrusted with the responsibility of fixing the benchmark repo rate (policy rate) required to contain inflation as defined in the Monetary Policy Framework Agreement.
- The meetings of the MPC are held at least 4 times a year and it publishes its decisions after each such meeting.
- MPC is 6-member body including 3 members from RBI and 3 members to be nominated by the Central Government.
- Chairperson of MPC – RBI Governor
- Quorum for meeting - 4 members
- Decisions are taken by majority with the Governor having the casting vote in case of a tie.
- To ensure transparency - Govt can send message only in writing.

Money

Inflation Targeting

- It is a monetary policy where a central bank follows an explicit target for the inflation rate for the medium-term and announces this inflation target to the public.
- The Government of India has notified a medium term inflation target of 4 %, with a band of +/-2%.
- If Target fail: If inflation not kept in 4% +/-2% zone for 3 consecutive quarters then the Committee must send report to Govt. with reasons and remedies.

Objective of MPC

- Price Stability for promoting economic development through ensuring optimum inflation level which will drive economic growth in long run.
- Controlled Expansion of Bank Credit with special attention to seasonal requirement (E.g. for agricultural purposes) for credit without affecting the output.
- Promotion of Fixed Investment to increase the productivity of investment by restraining nonessential fixed investment.

Money

- Promotion of Exports and Food Procurement Operations by paying special attention in order to boost exports and facilitate the trade. It is an independent objective of monetary policy.
- Desired Distribution of Credit: Monetary policy decides over the specified percentage of credit that is to be allocated to priority sector and small borrowers.
- Equitable Distribution of Credit to all sectors of the economy and all social and economic class of people.
- To promote economic efficiency in the financial system and tries to incorporate structural changes such as deregulating interest rates, ease operational constraints in the credit delivery system, to introduce new money market instruments etc.
- Reducing the Rigidity and encouraging more competitive environment and diversification.

Nano Technology

Nano Scale

- Nano scale is the size at which nano - technology operates.
- The Prefix nano is derived from a greek word nanos which means a very short man or dwarf.
- Name is used in scientific units to denote one-billionth (10^{-9}) of the base unit.
- Nano scale = 1nm to 100nm.
- A well accepted convention is that for something to exist on the nano scale, atleast 1 of its dimensions (L,B,H) must be in the range of 1nm to 100nm. This scale is smaller than the size of bacteria (10^{-6})or virus (100nm).

What is so special about nano scale?

- Material may exhibit significantly different properties and behaviour at nano-scale than what they show at macro/bulk scale.
- There may be a change in physical properties, chemical properties, magnetic properties, optical properties, electrical & heat conductivity etc.

Nano Technology

Some Examples

Gold

- It is a solid yellow metal, non-reactive at the macro scale. But at the nano scale, it becomes liquid.
- It shows different colours like red, yellow and purple depending upon the size it also becomes chemically very reactive.
- So, it can act like a catalyst.

Silver

- At nano scale silver also exhibits different colours i.e. blue, yellow, red depending upon size.
- There is also a change in biological properties as silver becomes bactericidal.

Copper

- At nano scale, it becomes transparent.

Nano Technology

Carbon

Graphene

- One atom thick honey-comb lattice of carbon atoms.
- It is a considered as the new wonder material because of its impressive collection of superlative properties.
- It was discovered in 2004 and the scientists won 2010 Nobel Prize in physics.

Properties

- It is harder than Diamond yet more elastic than rubber.
- It is tougher than steel yet lighter than aluminium.
- It is the strongest Known material (more than 100 times stronger than steel)
- It conducts heat 2 times better than diamond
- Its electrical conductivity is 13 times better than copper and sliver.
- It is impervious so that even Helium cannot pass through it.
- It has very high surface area.
- It is almost transparent.

Nano Technology

- It has very high tensile strength i.e. it can be stretched upto 20% without breaking.

Carbon Nano Tubes(CNT)

- CNT are cylindrical molecules that consist of rolled up sheets of single layer graphene sheet.
- Its properties are similar to that of graphene.

Fullerene(C-60)

- These are spherical molecules about 1nm in diameter comprising 60 carbon atoms arranged as 20 hexagons and 12 pentagons like a football.
- C-60 was named Buckminster fullerene in recognition of the architect Buckminster fuller who was well known for building geodesic domes and the term fullerene was than given to any closed carbon caged.
- Several applications of this are:-
  - Miniature ball bearing to lubricate surfaces.
  - Drug delivery vehicles.
  - Electronics Circuits.

Nano Technology

Quantum Dots (QDs)

- These are nano scale semi-conductor particles due to nano scale, their optical and electronic properties differ from those of large particles.
- Quantum dots emits lights of specific frequency if electricity or light is applied to them and these frequency can be precisely tuned by changing the dots size, shape and material giving use to many applications.
- Larger QDs emit longer wavelength like orange & red.
- Shorter QDs emit shorter wavelength like blue and green.
- QDs have wide applications in display technology like TVS, phones, laptops etc.

Nano Technology

Why do materials behave differently at nano scale?

- Vastly increased surface area to volume ratio at the nano scale. Thus, as particle size decreases, a greater portion of the atoms are found at the surface compared to those inside. Thus, all the surface related phenomenon become more pronounced at the nano-scale.
- For Example: Nano particles may become chemically more reactive as chemical reactions occur at the surface
- Quantum Mechanics plays a dominant role at nanoscale and classical laws of physics plays a very negligible role.
- At macro scale, we see that forces like gravity, friction, etc. plays a very dominant role in dictating the behaviour of materials but at Nano scale, other forces become more dominant like electromagnetic force. Thus, we can say that the game of science has different rules when you play it at nanoscale

Nano Technology

Nano Technology

- It refers to the technology which enables us to see, understand and manipulate the matter at nano scale.
- It enables us to exploit the novel properties at nano scale.
- It is not just one science or one technology, it is a platform that includes physics, chemistry, biology, electronics, medicines, etc.
- Thus, it is an inter-disciplinary field of study.

Historical Background of Nano Technology

- 1959: Richard Fynman gave a lecture on "There is plenty of room at bottom"
- 1974: Norio Taniguchi coined the term Nano Technology
- Dr Eric Drexler wrote a book "Engines of Creation: The Coming Era of Nano Technology"
- 1991: One of the landmark discovery in nano technology was discovery of carbon nanotubes by Sumio Jijimi
- 2004: Another landmark discovery was the discovery of Graphene by Andre Geim and Novoselo for which they were awarded 2010 Nobel Prize in Physics

Nano Technology

Applications of Nano Technology

Medicines

- Targetted Drug Delivery
  - Nano Technology helps in targetted drug delivery of drugs like anti-cancer drugs precisely to the cancer cells or infected cells using nano particles as drug cancer.
  - Benefits:
    - Bio Avaialability of drugs improves
    - Healthy cells are not damaged

- Targetted Heat Therapy
  - Gold Nano Particles are targetted to bind to cancer cells by attaching anti-bodies to the nano gold surface.
  - Then, irradiating the area of tumour with infrared lasers which passes through the body flesh without heating it.
  - But gold nano-particles is heated significantly leading to the death of cancer cells

Nano Technology

- Medical Nano Robots
  - Nano sized robots will navigate inside the human body, transport important molecules, manipulate microscopic objects and communicate with the physician by way of miniature censors.
  - They will help in early detection of disease.
  - These medical nano robots can also be made to work like artificial RBCs and WBCs

- Diagnosis (Lab on a Chip)
  - Nano scale diagnostic device helps to perform multiple lab test on a single platform
  - It is very fast and require very small fluid volume.

Electronics

- Miniaturization: Use of CNTs, Graphene and other nano materials will help in further miniaturization in electronics.
- Field Emission Display: Carbon Nanotubes can be used as electron emitters with extremely high efficiency and very less energy consumption.

Nano Technology

- **Increase in Data Storage Capacity:** Due to high surface are to volume ratio, nano materials like Graphene and CNT will help in increasing data storage capacities many times.

Agriculture: Precision Farming

- With the help of nano sensors dispersed in the field and smart delivery systems, efficient use of resources like water, fertilizers, etc. can be done.
- Nano Sensors detect what the plant requires and delivery systems will deliver what the plant requires in optimum quantity.

Cosmetics

- Nano particles like Titanium Oxide and Zinc Oxide are used in the production of sunscreeens to protect against UV rays

Textiles

- Nano Fibres are being developed which will make the clothes water and stain repellant and wrinkle free.
- Nano Silver helps in keeping the harmful becateria away from the body as nano-silver is bactericidal.

Nano Technology

Energy Applications

- Hydrogen Fuel Cells: Carbon Nanotubes with larger surface area to volume ratio allows larger amount of hydrogen to be stored.
- Solar Cells: Indiam Salanide nano particles will drastically increase the conversion efficiency of solar energy into electrical energy.

Purification of Water

- Nano Particles of ferrous oxide are extremely effective in binding and removing arsenic from the ground water.
- Silver nano coating in water filters acts as bactericidal and thus, will kill the bacteria present in water.

Nano Technology

Concerns or Risks associated with Nano Technology

1. Health
    - Nano Particles can be easily inhaled.
    - They can pass from lungs into the bloodstream and other organs.
    - Once they are inside the body, it is not clear how long they remain inside or what they do
    - Current Science has no way of testing for nano waste in air and water and no way of cleaning up such pollution
2. Environment
    - Nano Particles can be harmful for other organisms in the environment.
    - For example- Silver Nano Particles which are used in Textile Industry or other areas cannot make a distinction between good bacteria and bad bacteria. When these silver nano particles are released into the atmosphere, they would also kill the beneficial bacteria which helps in decomposition of the waste organic matter.

Nano Technology

Concerns or Risks associated with Nano Technology

3. Privacy
    - With the help of nano technology, spying devices can become invisible to the naked eye and more mobile. It can, thus, invade our privacy.
4. Military
    - Untraceable weapons of mass destruction can be made with the help of nanotechnology.
    - Such threats will be hard to detect and counter
5. Nano Divide
    - It will create a divide between rich and poor as rich will be able to take advantage of advancements in nanotechnology