

ONESHOT + 3 PYQ Solution

UNIT-4 [Science, Management & Indian Knowledge System]

TOPICS:-

- * **Astronomy in India** → [2021-22], [2022, 23]
- * **Chemistry in Ancient India** → [?]
- * **Mathematics in Ancient India** [2022-23] 5th sem
- * **Physics in Ancient India** [2022-23]
- * **Agriculture in Ancient India**
- * **Medicine in Ancient India** [2022-23]
- * **Metallurgy in Ancient India** [2022-23]
- * **Geography, Biology**
- * **Harrappan Technology**
- * **Water Management in Ancient India** [2021-22]
- * **Textile Technology in India** [2022-23] [2021-22]
- * **Writing Technology in India.**
- * **Pyro Techniques in India** [2022-23] [5th sem]
- * **Trade in Ancient India**
- * **India's Dominance up to Pre-colonial Times.**

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Page No.	
Date	

* Describe the concept of **Astronomy** in India.

- Indian astronomy has a rich history from prehistoric times to the Present
- The movement of planets came to be emphasized and closely observed.
- Rig Veda calendar → a year of 360 days divide into 12 parts & a five-year yug to align lunar and solar year
- Yajur Veda calendar → Considers a lunar year of 354 days and a solar year of 365 days, dividing the year into six two-month seasons.
- The first astronomical objects, like calendar sticks from the Andmans (12,000 years ago), noted lunar phases by a wooden stick.
- Rock Art in Kashmir: Depictions such as a double sun and concentric circles, dating back 7000 years, represent a supernova & meteor showers.
- Mohenjo-daro-Ring-stones: found b/w 2600 - 1900 BCE, these artifacts with drilled holes are interpreted as devices to track sunrise times throughout the year.

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- Explore the contribution of Aryabhata in Astronomy.
- Jyotish Vedanga text established systematic categories in astronomy, but the more basic problem was handled by Aryabhata.
- His Aryabhattiya, text is Concise, containing 121 verses
- It includes sections on astronomical definitions, methods for determining the true position of planets, descriptions of the sun & moon's movements & calculations of eclipses.
- Aryabhata deviated from Vedic astronomy, providing it with a scientific outlook that guided later astronomers.

* Indian Chemistry

- The Indus Valley civilization was the earliest society, which had developed & elaborate urban.
- The Early chemistry in India begins from here.
- Glass making, Pottery, Jewellery making, dyeing of clothes and tanning of leather etc. were the major chemical arts and crafts in the later periods
- the alchemical knowledge as per the activity expanded

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- ① Glass → main factory at Kopia (UP)
- ② Paper → main centre in medieval India.
- ③ Soap → Used plant like soap nuts (Ritha, Sikkai)
- ④ Dyeing → mentioned in Atharva Veda.
- ⑤ Perfumes → Mentioned in Brihatsamhita text.
- ⑥ Ink → recipes found in Rasaratnakara.
- ⑦ Alcoholic Liquors → Somasas in Vedas.

AKTU - 2022-23 (5th Sem)

Q. write short note on : mathematics in Ancient India.

- The town planning of Harappa shows that the people possessed a good knowledge of measurement & geometry.
- Mathematics originated from Sulvasutras;
- Apastamba introduced practical geometry in the 2nd Century BCE. (include acute angle, obtuse angle & right angle).
- Key Contribution → Notation System
 - Decimal System
 - Use of Zero.
- Aryabhata discovered algebra & formulated the area of a triangle, → development of trigonometry.
- Key works → Surya Siddhanta → for further research
Brihatsamhita

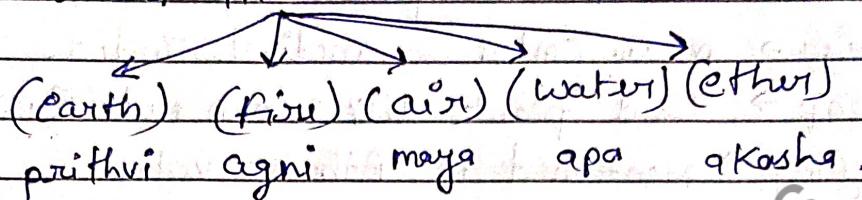
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India's Contribution to Physics

- From the Vedic times Indians has classified the material world into



→ Concept of parmanu :- Ancient Indian philosophers believed that except for ether, all elements comprised minuscule particles of matter. The smallest indivisible particle was termed parmanu.

→ Parmanu suggests Indian philosophers had an abstract understanding of atomic division.

→ Vaishika (Indian philosophical System) introduced the concept of parmanu.

→ Total Nine type of substance → five elements
 ↓
 Time (kaly)
 ↓
 Direction or Space (di)
 ↓
 The mind (manas)
 ↓
 The spirit (atman)

→ These substances had 24 quality → fluidity, viscosity, gravity, elasticity.

→ Characteristics of sound, heat, light also discussed.

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* Agriculture in India

- Agriculture in India dates back to the Indus Valley Civilization and even earlier in some parts of Southern India.
- India has one of the largest expanses of agricultural land globally.
- Good monsoon & extensive network of rivers.
- In Agriculture forming the backbone of Economy & civilization.
- Key Crops → wheat, rice, millets, oilseeds, cotton, Sugarcane & Indigo.
- Crops like tobacco, chillies, potato, guava, custard apple, cashew and pineapple were introduced in the 16th & 17th centuries.
- The system of land measurement & irrigation developed.

* Medicine in Ancient India

[AKTU - 2022-23]

- Diseases, cur & medicines were mentioned for the first time in the Atharva Veda.
- Fever, Cough, consumption, diarrhoea, dropsy, Sores, leprosy and seizure are the disease mentioned.
- The oldest medical system is ayurveda → Science of good health & longevity of life → using herbal medicine aims at removing the cause of disease by striking at the root. → which is highly developed.

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- Centre of medicine & learning at Takshila & Varanasi.
- In Charaka Samhita & Sushruta Samhita used Plant & herbs for medicine.
- In Sarangadhara Samhita - use of opium (Afum) for medicine.

* Metallurgy in Ancient India. [AKTU-2022-23]

- It can be defined as the extraction, purification, glowing & application of metals.
- For over 7000 years, India has had a high tradition of metallurgical skills.
- The pottery, bronze, and copper artifacts found in Indus valley civilization.
- By the 1st Century AD, mass production of metals like iron, copper, silver, gold and of alloys like brass & bronze were taking place.
- Harappan artifacts → arrowheads, axes, chisels, sickles, blades, needles, hooks & vessels.
- Recent excavations in central parts of the Ganges valley shown that iron was produced early in 1800 BC.
- Zinc, steel also used in ancient India.

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Page No.

Date

* Geography

- Constant interaction b/w humans & nature led to the study of geography.
- people understand their own physical geography & the western countries, they were unaware of their exact position on Earth & distances to other countries.
- Indians contributed in ship buildings.
- Lothal, a site in Gujarat proving that trade flourished in those day by sea.
- puranas also have info. about tirtha & tirthayatra.

* Biology

- Ayurvedic Medicines belong to the plant Kingdom.
- Ayurvedic text also deal with plants classification.
- many references to plant diseases and their treatment are also available in the vedic literature.
- Vinaya, the famous Buddhist text describes the blight & mildew diseases.
- Germination → The technical term used for seed is vija. Germination of seed is called anuviod bhudha.
- Acc. to Susruta → proper season
 - good soil
 - requisite supply of water
 - then germination will good.

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Page No.:	
Date:	/ /

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* Harappan Technology of Ancient India

- In early human stages, 'technology' refers to any modification of the natural environment, including Stone tools, clothing & construction.

Harappan Civilization:

- Agriculture was a mainstay.
- Ceramic technology also developed = pots, fire fired bricks.
- Pots: used for carrying water, storing seeds & grain and cooking.
 - wheel-turned, glazed or painted, covered with red slip.
- Bricks: fired bricks with a $1 \times 2 \times 3$ proportion for stronger walls.
 - Extensive use of baked / mud bricks & stone.
- Bread-Making: Perfected techniques for polishing, coloring, glazing, drilling & bleaching
 - fav stone → Carnelian, agate & Jasper.
- Other Crafts: Pottery → Stone & ivory Carving, Carpet making, inlaid wood work.
 - Bangles made from gold, bronze
 - Weaving with wheel-spun thread for cotton & Silk.

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AKTU - [2022-23, 2021-22]

* Textile technology in India.

→ Early References

- Vedas mention various garments and fabrics like wool & silk, along with weaving and looms.
- Buddhist literature provides insights into weaving skills.
- Ajanta paintings depict clothing & weaving techniques, including dying, from 2,000 years ago.

→ Trade & Export.

- the Roman Empire saw India as a major exporter of textiles, especially cotton & silk.
- India exported cotton to China & silk to Indonesia.

→ Textile Specialties:

- Muslin → A thin, loosely woven cotton fabric suitable for hot climates, introduced to Europe from Bengal.
- Calico → A plain-woven textile made from unbleached cotton, originally from (Calicut), Kerala.
- Chintz → A type of calico printed with floral and other colorful patterns.
- Other fabrics :- Included useful textiles from hemp, flax, linen and Jute.

→ Technology → weaving → Dev. of complex looms with regional variations. → Dyeing → mineral sources and vegetal.

- Blue from Indigo
- Red from plants like madder
- Yellow from turmeric, mango bark.
- Black from iron acetate.

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Page No.:

Date:



Writing Technology in India.

- Birch Bark : Used mainly in north India, with ink made from finely ground charcoal powder & gum or soot from oil lamp.
- Palm leaves : a sharp point was used to tear the leaf's surface film, use charcoal powder.
- In both the cases, considerable skills were developed to preserve manuscripts from insects and fungi.
- The paper introduced in the 11th century CE in India from China via Nepal.
- By the late 15th century, Kashmir produced high-quality paper from rags and hemp, with lime and soda added to whiten the pulp.
- Several European visitors from the 15th to 18th century testify that Indian paper was of high quality.

[AKTU - 2021-22]



Water Management in Ancient India.

- Ancient India showcased a variety of water structures for harvesting, conserving & distributing water efficiently.

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Page No.	/ /
Date	/ /

- Harappans used trapezoidal bricks to construct wells, preventing them from collapsing under ground pressure.
- Wells were built in various shapes (circular, square, vertical, horizontal) and materials (bricks, stone).
- Village ponds were crucial not just for ground water recharge but for being interconnected.
- These networks were maintained by village committees, ensuring equitable water distribution.

AKTU - 2022-23 [5th sum]

- * **Pyrotechnics in India**
- Pyrotechnics is the science of using materials capable of exothermic chemical reactions for the production of heat, light, gas, smoke and sound.
- Fireworks appeared in India during the 13th or 14th century.
- By the 16th century, gunpowder became a key element in warfare.
- Sanskrit texts describe the preparation of gunpowder using Sulphur and charcoal in various ratios. Salt peter,
- Rockets began to be used in Indian wars from the 16th century onwards.
- The British took some of these rockets to England for study, which advanced rocket technology in European warfare.

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Page No.:

Date: / /

Trade in ancient India

- The trade networks expanded significantly before and during Indus civilization.
- During the 1st millennium BCE, large cities such as Taxila, Ujjain, Mathura, Patna, Rajgir, Varanasi, Bharugh and Madurai emerged as major trade centers.
- These cities were generally situated on major trading routes, well structured states provided the necessary infrastructure and conductive env. for promoting trade.
- Kautilya's Arthashastra lists trade as one of the three major economic activities.
- The Harappans exported timber, semiprecious stone beads, shell bangles, ivory items & pearls to Oman, Bahrain and mesopotamia.

India's Dominance up to Pre-colonial times

- From the onset of the historical period, India enjoyed a favourable trade balance, accumulating significant stocks of gold.
- During Mughal times, India maintained trade dominance (Abu'l Faiz records 40,000 traders engaged in trade on the Indus & its Punjab tributaries).

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Page No.

Date / /

- Economic historians note India's high trade surplus with Europe, West Asia, & Africa in the centuries preceding British rule.
- Because of India's efficient production of low-cost products like cotton & spices, alongside well-organised trading communities.
- India & China controlled nearly 60% of the world's GDP 2,000 years ago, remaining premier economic & trade powers until the colonial era.
- Colonial rule coincided with a steep decline in India's overseas trade dominance & overall production as trade and industry rules were dictated by the colonial powers.

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