

**WRAP Exams · wrapexams.com**

Prelims PYQ, Mains model answers, and copy evaluation. Write to the desk for this paper, a doubt, or the AI waitlist.

**ask@wrapexams.com · +91 85951 84903 · wrapexams.com**

Q1(e)

**Thermoluminescence (TL) dating.**

UPSC Civil Services Mains 2021 · Anthropology GS 1 · 10 marks · Principles of Prehistoric Archaeology. Chronology

(a) Principles of Prehistoric Archaeology. Chronology: Relative and Absolute Dating methods.

**Core demand of the question**

- Write a note on Thermoluminescence (TL) dating
- Keep the note to a 10-mark length of about 150 words

**Revision summary**

TL measures light from trapped electrons when a mineral is heated.

The clock starts at the last firing or sunlight bleach.

Pottery, hearths, and burnt flint are the main archaeological samples.

The age is equivalent dose divided by annual **dose rate**.

Water, fading, and incomplete zeroing are the chief errors.

**Introduction**

Thermoluminescence dating ages fired clay, burnt flint, and some sediments by measuring trapped electrons released as light when the sample is heated.

**Body****Principle**

- Ionising radiation from uranium, thorium, and potassium fills traps in the crystal. Heat or strong light empties them. The last firing or bleaching is the clock's zero.
- In the laboratory the sample is heated, light is counted, and the equivalent dose is divided by the annual **dose rate**.
- **Range** is roughly a few hundred years to several hundred thousand years, useful where carbon is scarce.

**Use in anthropology**

- Pottery, hearths, and burnt flint at palaeolithic and Neolithic sites, including Near Eastern early farming contexts such as **Jericho** sequences when ceramics appear, can be dated.
- Indian applications include pottery and burnt clay at Harappan and later sites, and burnt flint in some palaeolithic debates.
- **Limits:** anomalous fading, incomplete zeroing, and water-content error. TL is a clock, not a culture name.

**Flow diagram**

Natural radiation -> Electron traps  
Firing or lab heat -> Luminescence  
Luminescence -> Equivalent dose / dose rate

## Conclusion

TL dates the last heating or bleaching of mineral grains. It is a workhorse for ceramics and burnt stone when the **zero event** is well understood.

## Facts & figures

### Zero event

Last heating of pottery or flint, or last sunlight on sediment grains, resets the TL clock.

### Dose rate

Annual radiation from the grain and its burial environment; water content changes it.

### OSL

Optically stimulated luminescence is a sibling method that uses light rather than heat to empty traps.

### Range

Typically centuries to some  $10^5$  years, bridging  $^{14}\text{C}$  limits for older burnt flint.

---

WRAP Exams · Write. Read. Analyse. Practice. ·

<https://wrapexams.com/upsc/mains-answers/anthropology-gs-1/2021/thermoluminescence-tl-dating/> ·

[ask@wrapexams.com](mailto:ask@wrapexams.com) · [wrapexams.com](https://wrapexams.com)