



PART 1

Read the text below and answer questions 1–13.

NEW TECHNOLOGIES IN ARCHAEOLOGY: SEEING BEYOND THE TROWEL

For generations, archaeology was imagined as a discipline of careful digging: slow layers, meticulous drawings, and the steady removal of soil to reveal what lay beneath. In recent decades, however, the most significant transformation has occurred before a single trench is opened. New detection and mapping tools allow researchers to identify sites, model landscapes, and test hypotheses with minimal physical intervention. This has shifted professional priorities. Excavation is still essential for dating evidence and fine-grained interpretation, but it is increasingly treated as a last resort, reserved for targeted questions rather than broad exploration. The change reflects both ethics and practicality: once a context is dug, it is altered forever, so better reconnaissance can reduce unnecessary destruction and focus limited resources where they matter most.

Remote sensing has expanded the archaeologist's field of view from individual sites to entire regions. Aerial photography and satellite imagery can reveal crop marks, soil discoloration, and subtle topographic variations that betray buried walls, ditches, roads, and building platforms. Because imagery can be compared across seasons and across years, patterns become visible that are difficult to recognise from the ground: vegetation stress in a dry summer, shadowed earthworks in low winter light, or slight changes in drainage after heavy rain. These datasets also make it possible to monitor threats. Development, intensive agriculture, and erosion can damage sites quickly, and repeat imagery can help identify vulnerability early enough for surveys, protective planning, or rescue investigation.

Among the most influential innovations is LiDAR (Light Detection and Ranging), which produces dense elevation models by firing laser pulses and measuring their return times. The resulting point clouds can be processed to remove vegetation mathematically, revealing micro-topography that is otherwise hidden. This is particularly valuable in heavily wooded regions, where terraces, embankments, and ancient trackways may be invisible at ground level. In several parts of the world, LiDAR has exposed extensive settlement systems—canals, causeways, field grids, and platform mounds—suggesting more intensive land use and more complex infrastructure than earlier surveys had inferred from sparse surface evidence. At the same time, interpretation remains cautious: a crisp hillshade image may suggest a feature, but it still requires archaeological judgement and, often, follow-up verification.



If remote sensing reads the landscape from above, geophysical survey reads it from below. Ground-penetrating radar can map reflections at different depths, allowing teams to outline buried walls, voids, graves, or building floors without turning a spade. Magnetometry detects variations in the soil's magnetic properties caused by fired materials, pits, hearths, or filled ditches. These methods can rapidly cover large areas and highlight subsurface anomalies that guide excavation strategy, but their performance depends on local conditions. Soil moisture, clay content, background geology, and modern interference can distort signals, and experienced interpretation is essential to distinguish archaeology from natural features or recent disturbance. When used well, geophysics reduces guesswork: it helps excavators place trenches precisely and avoid destroying contexts that are better left intact.

Once a site is identified, digital recording has reshaped how evidence is documented. Photogrammetry can convert overlapping photographs into accurate 3D models of trenches, stratigraphy, artefacts, and standing architecture, producing records that can be revisited long after excavation ends. Drones extend these techniques to wider areas, creating orthomosaics and terrain models quickly after storms, construction work, or seasonal vegetation change. Because excavation removes the very contexts it studies, high-resolution recording functions as a safeguard: it preserves spatial relationships, enables later re-analysis, and supports more transparent publication. This does not eliminate the need for drawings and notes, but it changes their role, integrating them into a broader digital archive that can be shared, checked, and compared across projects.

Laboratory science has likewise expanded what can be inferred from the past. Ancient DNA can illuminate biological relationships, population movements, and sometimes the presence of pathogens. Isotopic analysis of teeth and bones can suggest diet and indicate where individuals spent their childhood, revealing mobility that is invisible in artefacts alone. Microarchaeology pushes interpretation further by studying microscopic residues, phytoliths, and sediment chemistry; traces of fats, ash, or dung can indicate food processing, craft activities, or animal stalling even when no obvious structures remain. These methods widen the questions archaeologists can ask, but they also impose strict requirements: sampling must be planned carefully, contamination must be controlled, and results must be interpreted alongside context rather than treated as standalone truths.

As archaeological datasets grow, computational tools are increasingly used to sort, detect, and model patterns. Machine learning can help classify pottery fragments, flag potential features in satellite imagery, and explore how settlement choices correlate with water, soils, or elevation. Yet such systems do not replace field expertise. Their outputs depend on training data, assumptions, and the quality of the underlying records;



automated detection can miss subtle contexts or over-interpret noise. For that reason, many researchers treat AI as decision support: it can prioritise areas for survey, suggest classifications, or speed up initial screening, but conclusions still require field verification and critical review. Technology also introduces new ethical and practical obligations. Publishing precise site coordinates can increase the risk of looting, especially where artefacts are valuable and enforcement is weak. Meanwhile, long-term digital preservation is itself fragile: formats become obsolete, servers fail, and poorly documented files can be unusable. The most effective projects therefore plan for open standards, robust metadata, and controlled access from the outset, recognising that the modern archaeological archive is both physical and digital.

Questions 1–6

Choose the correct heading for each paragraph.

List of Headings

- i Remote sensing as a way to find and monitor sites
- ii Why excavation is increasingly selective
- iii Subsurface mapping without excavation
- iv Digital recording as a safeguard against loss
- v Scientific analyses that expand interpretation
- vi Using laser mapping to reveal hidden landscapes
- vii Computers as the new field assistant
- viii Funding problems for traditional fieldwork

1 Paragraph 1

2 Paragraph 2

3 Paragraph 3

4 Paragraph 4

5 Paragraph 5

6 Paragraph 6

Questions 7–10

Choose **TRUE** if the statement agrees with the information given in the text, choose **FALSE** if the statement contradicts the information, or choose **NOT GIVEN** if there is no information on this.

7 LiDAR is described as particularly useful in heavily wooded regions.



8 Magnetometry is said to be unaffected by soil conditions.

9 The passage states that machine learning can fully replace field verification.

10 The passage gives an exact cost estimate for long-term digital storage of archaeological records.

Questions 11–13

Complete the summary below. Choose **ONE WORD ONLY** from the text for each answer.

How technology supports archaeological investigation

The growing use of non-invasive methods reflects practical concerns and **11** because excavation permanently alters its context. Geophysical surveys can highlight unusual subsurface signals known as **12**, helping researchers position trenches precisely. Publishing exact site coordinates can increase the risk of **13**

Answer Key

1. ii
2. i
3. vi
4. iii
5. iv
6. v
7. TRUE
8. FALSE
9. FALSE
10. NOT GIVEN
11. ethics
12. anomalies
13. looting