

1.1 Explain how evidence changes scientific models

Name: _____ Class: _____ Date: _____

Total: 24 marks

KEY WORDS model 模型 • evidence 证据 • provisional 暂定的

Objective

Explain how evidence changes scientific models. This is original GAC013-aligned practice, not an official assessment. All supplied case data and review records are fictional; explicitly cited historical context is factual. The case data are invented for learning; they are not findings about a real school, country or population. Use the supplied evidence and do not invent missing observations.

1 Key knowledge and worked examples

■ Key knowledge: a model makes an explanation open to observation and revision

A scientific **model** 模型 represents selected features of a system and helps explain observations or make predictions. **Evidence** 证据 can support, challenge or limit it. Scientific explanations are **provisional** 暂定的: they remain open to justified revision, without implying that every well-tested result is equally doubtful. Physics studies matter and energy; chemistry studies substances and their changes; biology studies living systems. Their questions can overlap.

■ Source A: text or task brief

Historical context, paraphrased from Nobel sources checked 2 October 2026: J. J. Thomson identified the electron in 1897. In 1911, Rutherford published an atomic-structure analysis using scattering measurements, including work by Geiger and Marsden. Chadwick established evidence for the neutron in 1932. These are selected developments, not a complete history of science. Sources: Nobel atomic-history timeline, electron discovery, and Chadwick facts.

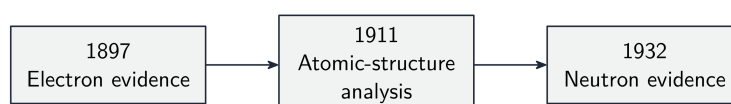
Three fictional student investigations ask: how does a ball's measured speed change on a ramp; how does a substance change when it reacts with another; and how does a plant's measured growth vary under permitted light conditions? Each requires a question-specific method and appropriate safety review.

■ Source B: response or review record

Draft revision note: “Chadwick discovered the electron in 1911. Each scientist’s award date must be the discovery date. A scientific model becomes an unquestionable fact once published. Chemistry and biology cannot use ideas from physics, so a plant’s growth question is answered only by naming its field.”

The teacher asks for corrected chronology, a distinction between a model and an observation, and an explanation of why naming a field does not supply an investigation result.

■ Worked example: use a source for the date it actually establishes



Known: the supplied timeline distinguishes 1897, 1911 and 1932 developments. Why check the event attached to each year? A publication or prize date is not automatically a discovery date. The history shows explanations changing with evidence and contributions from several researchers. It does not show that every later claim is correct merely because it is newer.

2 Practice

2.1 Match Thomson and Chadwick to their supplied discoveries and years. [2]

2.2 Identify the main field of the ball-speed question and the plant-growth question. [2]

2.3 Explain THREE corrections needed in the first two sentences of the draft note. [3]

2.4 Distinguish a model from an observation and explain why publication does not make the model unquestionable. [3]

3 Exam-style questions

3.1 Evaluate the draft's claims about scientific fields and progress using six distinct points. [6]

[8]

Solutions

2.1

: Thomson, electron, 1897.: Chadwick, neutron, 1932.

2.2

: physics for the speed question.: biology for plant growth. Fields can overlap; naming them supplies no experimental result.

2.3

each: electron is attributed to Thomson, not Chadwick; 1911 refers to Rutherford's atomic-structure publication, not Chadwick's electron discovery; award dates and discovery/publication dates must not be assumed identical.

2.4

: model is a representation/explanation.: observation is a recorded measurement or event used as evidence.: publication does not remove the need to test predictions, check methods or revise explanations.

3.1

each: plant growth is primarily a biological question; physical light measurement can inform it; chemical processes can also matter; a field label is not a measured result; newer ideas need evidence rather than automatic acceptance; models can change when evidence challenges their explanations while retaining useful tested predictions.

3.2

Local analytic rubric, 8 ×: correct electron attribution and year; correct 1911 event; correct neutron year; separate awards from discoveries; distinguish model from observation; explain evidence-led revision; recognise overlapping fields; avoid treating a field label as a result; coherent truthful 80–110 word response. Example: “Thomson identified the electron in 1897. Rutherford's 1911 analysis concerned atomic structure and drew on scattering measurements, including other researchers' work. Chadwick established evidence for the neutron in 1932. These event dates should not be replaced with prize dates. A model represents a system and helps explain or predict observations; publication does not make it immune to testing. New evidence can justify revision, while useful tested ideas may remain valuable. Scientific fields also overlap. A plant-growth investigation is biological, but measuring its light conditions may use physics. Naming a field does not answer the investigation.”