

1.4 Explain how scientific work is organised and checked

Name: _____ Class: _____ Date: _____

Total: 24 marks

KEY WORDS peer review 同行评审 • replication 可重复性 • institutions 机构

Objective

Explain how scientific work is organised and checked. 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: expert review, transparent methods and independent checks serve different roles**

Peer review 同行评审 asks relevant specialists to examine a study's methods and reasoning. It can detect problems but is not a guarantee that a result is correct. **Replication** 可重复性 involves a new attempt to investigate a finding with an appropriately comparable method. A fresh analysis of the same data is useful but not an independent new experiment. Research **institutions** 机构 provide people, equipment, rules and resources; funding interests should be disclosed and examined, not treated as automatic proof of dishonesty.

■ **Source A: text or task brief**

Fictional laboratory study: a school team tests an insulating sleeve on one cup design using a teacher-supervised approved procedure. The report says the sleeved cup cooled more slowly in its recorded comparisons. A specialist reviewer notices that the unsleeved cup began at a different temperature. The team retains this record, revises the comparison and reports its limit. A second school has not yet conducted its planned new experiment.

The sleeve supplier donated materials. The report discloses this. One member measured temperatures, another checked calculations, and a third documented materials and timing. No independent data are supplied here and no numerical performance claim should be invented.

■ Source B: response or review record

Draft publicity: “Peer review certifies the product works. Our team’s second calculation of the same readings is an independent replication. Supplier funding proves that either the study is false or the product is best. Since no second school has tested it, the original work is useless. The physics team should exclude everyone studying chemistry or materials.”

■ Worked example: give each kind of check its proper role



Known: a reviewer identified unequal starting temperatures. Why does this matter? That condition may explain cooling differences alongside the sleeve. A calculation check can catch arithmetic mistakes but cannot remove the unequal condition. A new school experiment can test a comparable design after approval; until performed, it is planned replication, not confirming evidence.

2 Practice

2.1 State ONE role of peer review and ONE limit.

[2]

2.2 Identify the uncontrolled condition and explain its effect on the comparison.

[2]

2.3 Distinguish recalculating the original data from the proposed independent experiment.

[3]

2.4 Explain THREE appropriate responses to the donated materials. [3]

3 Exam-style questions

3.1 Evaluate the publicity using six distinct evidence-based points. [6]

3.2 Write an 80–110-word public summary that describes the study and checks honestly. [8]

Solutions

2.1

: specialists examine methods, reasoning or reporting and can identify problems.: review does not guarantee the claim is correct or certify every product use.

2.2

: different starting temperatures.: this can affect cooling alongside the sleeve, so the comparison does not isolate the sleeve effect.

2.3

: recalculation uses the same recorded evidence.: replication obtains new observations under an appropriately comparable procedure.: the second school's experiment remains planned, so it supplies no result yet.

2.4

each: disclose the donation; scrutinise methods/data and possible incentives; seek independent checking without assuming funding proves truth or falsity. Accept retaining access to full records or preventing donor control over reporting as a distinct appropriate safeguard.

3.1

each: review is not certification; recalculation is not a new independent experiment; donation is neither proof of falsity nor proof of superiority; incomplete replication must not be called confirmation; original data may remain useful if its limits are stated; material/chemical expertise can inform insulation research alongside physics.

3.2

Local analytic rubric, 8 ×: identify original study; name unequal starting temperatures; keep peer-review limit; distinguish recalculation; state independent test is pending; disclose donation; avoid automatic funding verdict; recognise useful collaboration; coherent truthful 80–110 word response. Example: “The school team investigated an insulating sleeve using a recorded cup comparison. A specialist reviewer identified different starting temperatures, which could affect cooling alongside the sleeve. The report should retain that limitation rather than describe review as product certification. Checking calculations uses the original readings; it is not a new independent experiment. The second school's proposed test remains unperformed and supplies no confirming result. Donated materials should be disclosed, with methods and reporting open to scrutiny. Funding alone proves neither truth nor falsity. Relevant expertise from physics and materials research can help improve the next approved comparison.”