M5–M8 Mixed Quiz 4 (15 MC)

2025-08-26

1 Questions

1) M5 — The dependent variable is best described as the variable that:

- A. Is manipulated by the investigator
- B. Is kept constant throughout
- C. Responds to changes in the independent variable and is measured
- D. Is a nuisance factor

2) M6 — You need to measure rapidly changing accelerations. The most important specification is:

- A. Sensor housing colour
- B. ADC bit-depth only
- C. Bandwidth/response time and sampling rate fulfilling Nyquist
- D. Supply voltage

3) M7 — A press release claims "scientists prove X works" based on a preprint. Most appropriate stance?

- A. Accept result; it's scientific
- B. Treat cautiously; preprints are not peer-reviewed and context matters
- C. Dismiss entirely
- D. Assume bias

4) M8 — Which best describes stakeholder analysis?

- A. Statistical test selection
- B. Identifying groups affected, their interests, influence, and concerns
- C. Budget planning
- D. Media strategy only

5) M5 — Systematic error can often be detected by:

- A. Repeating trials and averaging
- B. Comparing with an independent, calibrated method or reference
- C. Increasing sample size
- D. Using more decimals

6) M6 — A sensor–amplifier chain clips on peaks. A remedy is to:

- A. Reduce gain or increase headroom so peaks stay within linear range
- B. Increase sampling rate only
- C. Smooth with moving average
- D. Remove offset

7) M7 — The "file drawer problem" results in:

- A. More null results published
- B. Underreporting of null results and overestimation of effects in literature
- C. Better meta-analyses
- D. Improved statistical power

8) M8 — When engaging communities in citizen science, best practice includes:

- A. Ignore co-design to avoid complexity
- B. Co-design questions, provide training, ensure data quality and feedback
- C. Limit involvement to data collection only
- D. Avoid publishing results

9) M5 — A result is precise but inaccurate. This suggests:

- A. High random error
- B. Low random error, high systematic error
- C. Low systematic error only
- D. Valid and reliable

10) M6 — If an infrared thermometer is highly emissivity-dependent, you should:

- A. Ignore emissivity; it's a constant
- B. Set emissivity appropriate to the surface or use emissivity tape
- C. Increase sampling rate
- D. Use ambient correction only

11) M7 — Which best describes a double-blind trial?

- A. Only participants are unaware of group allocation
- B. Participants and assessors are unaware of group allocation
- C. Everyone including statisticians is blinded
- D. Only analysts are blinded

12) M8 — "Science literacy" in society chiefly involves:

- A. Memorising facts
- B. Understanding processes, evaluating claims, interpreting data, and using evidence for decisions
- C. Agreeing with scientists
- D. Following rules

13) M5 — The purpose of a depth study (Stage 6) includes:

- A. Memorisation of content only
- B. Developing Working Scientifically skills through extended investigation
- C. Practising multiple-choice only
- D. Preparing lab reports only

14) M6 — A DAQ chain has 1 kHz anti-alias filter and samples at 2 kHz. Highest reliable frequency is roughly:

- A. 1000 Hz
- B. 500 Hz
- C. 2000 Hz
- D. 250 Hz

15) M7/M8 — A "science–policy interface" aims to:

- A. Ensure politicians run experiments
- B. Translate robust evidence into policy options while acknowledging uncertainty and values
- C. Remove public consultation
- D. Replace peer review

2 Answer key

Q	Ans	Rationale
1	C	Dependent responds; measured outcome.
2	C	Bandwidth/response time + sampling rate matter most.
3	B	Preprints not peer-reviewed; be cautious.
4	B	Stakeholders: who's affected, interests, influence.
5	B	Compare with reference to detect bias.
6	A	Avoid clipping: adjust gain/headroom.
7	B	File drawer inflated published effects.
8	B	Co-design, training, feedback.
9	B	Tight cluster off-target systematic error.
10	B	Set emissivity or use tape.
11	B	Participants and assessors blinded.
12	B	Evaluate claims and evidence use.
13	B	Depth study builds WS skills.
14	B	Nyquist 1 kHz sampling Nyquist 1 kHz? Here fs=2 kHz f_N=1 kHz; filter at 1 kHz, highest reliable 500 Hz passband.
15	B	Bridge between science and policy.