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OCR GCSE (9-1) PHYSICS B J259

TWENTY FIRST CENTURY SCIENCE | FOUNDATION + HIGHER

COMMON MISTAKES & DIAGNOSTIC REPAIR HANDBOOK

Examiner-evidenced Physics B weaknesses + specification-derived diagnostic risks

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Evidence key

ER = directly supported by public OCR J259 examiner-report commentary. SPEC = independently authored diagnostic risk grounded in the J259 specification. No frequency percentages are invented.

01. Vague explanations

Tier	Evidence
Both	[ER25F1, ER25F2]

Typical error: Responses name a fact but do not link cause to effect.

Repair routine: Use a chain: physical cause -> mechanism/model -> observed consequence.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

02. Energy vs force

Tier	Evidence
Both	[ER25F1]

Typical error: Energy and force are used as if they are interchangeable physical quantities.

Repair routine: State the quantity, unit and model before writing an explanation or equation.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

03. Equation without physics

Tier	Evidence
Both	[ER25F1]

Typical error: Values are substituted mechanically without explaining why the relationship applies.

Repair routine: Write the target quantity and physical relationship before substituting.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

04. kW and kWh

Tier	Evidence
Both	[ER25F1]

Typical error: W is not converted to kW or time is not kept in hours for kWh calculations.

Repair routine: Match the required unit: for kWh use kW × h; for joules use W × s.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

05. Wave feature labels

Tier	Evidence
Both	[ER25F1]

Typical error: Wavelength, amplitude and frequency are confused on diagrams.

Repair routine: Define each before measuring: wavelength is same-phase-point spacing; amplitude is maximum displacement.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

06. Reflection practical

Tier	Evidence
Both	[ER25F1, ER25F2]

Typical error: Method lacks a normal, angle measurement or repeat/alignment control.

Repair routine: Draw normal at incidence; measure i/r from normal; repeat and consider ray thickness/parallax.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

07. Radioactive decay explanations

Tier	Evidence
Both	[ER25F1]

Typical error: Random decay or half-life is described vaguely or deterministically.

Repair routine: State decay is random for individual nuclei but statistically predictable for a large sample.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

08. Newton III

Tier	Evidence
Both	[ER25F1]

Typical error: Action/reaction forces are put on the same object or confused with balanced forces.

Repair routine: Pair forces are equal/opposite, same interaction type, and act on different objects.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

09. Terminology in depth responses

Tier	Evidence
Both	[ER25F2]

Typical error: Definitions are recalled but scientific terms are used inaccurately in new contexts.

Repair routine: Practise applying each definition in an unfamiliar scenario and use the exact physical quantity names.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

10. Partial working

Tier	Evidence

Both	[ER25F2]

Typical error: Calculations show only substituted numbers or omit rearrangement.

Repair routine: Write equation -> rearrange -> substitute -> answer/unit.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

11. Rearranging equations

Tier	Evidence
Both	[ER25F2]

Typical error: Correct relationship chosen but algebraic rearrangement fails.

Repair routine: Rearrange symbolically before numbers; check dimensions/units.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

12. Variable identification

Tier	Evidence
Both	[ER25F2]

Typical error: Independent/dependent/control variables are mixed up.

Repair routine: Ask: what is changed, what is measured, what must be kept constant for a fair comparison?

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

13. Practical improvements

Tier	Evidence
Both	[ER25F2]

Typical error: Suggestions are generic and not linked to a limitation.

Repair routine: Name the specific limitation and explain how the improvement reduces it.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

14. Radiation vs radioactivity

Tier	Evidence
Both	[SPEC]

Typical error: Radiation is treated as material or confused with radioactivity.

Repair routine: Radioactivity is nuclear decay; radiation is emitted energy/particles.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

15. Climate correlation vs causation

Tier	Evidence

Both	[SPEC]

Typical error: A correlation in climate data is stated as proof of cause without mechanism/evidence chain.

Repair routine: Separate correlation from causation; cite mechanism and converging evidence.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

16. Efficiency

Tier	Evidence
Both	[SPEC]

Typical error: Useful output is divided by wasted output or percentages exceed 100%.

Repair routine: Useful/total; multiply by 100 only if percentage required.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

17. Current being used up

Tier	Evidence
Both	[SPEC]

Typical error: Current is said to decrease because components consume charge.

Repair routine: Charge is conserved; energy is transferred. Current rules depend on series/parallel topology.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

18. Meter placement

Tier	Evidence
Both	[SPEC]

Typical error: Ammeter in parallel or voltmeter in series.

Repair routine: Ammeter measures current through component -> series. Voltmeter compares p.d. -> parallel.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

19. Conventional current vs electron flow

Tier	Evidence
Higher	[SPEC]

Typical error: Directions are reversed without stating convention.

Repair routine: State whether answer refers to electron flow or conventional current.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

20. Transformer induction

Tier	Evidence
Higher	[SPEC]

Typical error: A changing field/flux is omitted from generator/transformer explanations.

Repair routine: Link changing current/field -> changing flux -> induced p.d.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

21. Distance vs displacement

Tier	Evidence
Both	[SPEC]

Typical error: Vector/scalar distinction is lost in motion questions.

Repair routine: Distance has magnitude only; displacement includes direction.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

22. Motion graphs

Tier	Evidence
Both	[SPEC]

Typical error: Area and gradient meanings are transferred to the wrong graph.

Repair routine: Write axis units then derive gradient/area units before interpreting.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

23. Zero resultant force

Tier	Evidence
Both	[SPEC]

Typical error: Zero resultant force is taken to mean stationary.

Repair routine: Zero resultant force means zero acceleration; velocity can be constant and non-zero.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

24. Momentum sign

Tier	Evidence
Higher	[SPEC]

Typical error: Directions are ignored in collision calculations.

Repair routine: Choose a positive direction and keep signs throughout.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

25. Thinking vs braking distance

Tier	Evidence
Both	[SPEC]

Typical error: Human factors and vehicle/road factors are mixed.

Repair routine: Thinking: reaction time factors. Braking: speed, road, tyres/brakes, mass and forces.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

26. Irradiation vs contamination

Tier	Evidence
Both	[SPEC]

Typical error: Exposure is treated as radioactive material being transferred.

Repair routine: Contamination = radioactive material present; irradiation = exposure to radiation.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

27. Fission vs fusion

Tier	Evidence
Separate Physics	[SPEC]

Typical error: Processes are reversed or described without nuclear change.

Repair routine: Fission splits heavy nucleus; fusion joins light nuclei; connect to energy release.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

28. Density unit conversion

Tier	Evidence
Both	[SPEC]

Typical error: cm^3/mm^3 converted linearly.

Repair routine: Cube the length conversion factor before density substitution.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

29. SHC vs latent heat

Tier	Evidence
Both	[SPEC]

Typical error: Temperature-change and state-change equations are swapped.

Repair routine: Temperature changes -> $mc\Delta\theta$; state changes at constant temperature -> mL.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

30. Extension vs total length

Tier	Evidence
Both	[SPEC]

Typical error: Spring length used directly as x.

Repair routine: extension = loaded length - original length.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

31. Repeat-and-average as universal fix

Tier	Evidence
Both	[SPEC]

Typical error: Repeats are proposed to correct systematic errors.

Repair routine: Repeats reduce random uncertainty; recalibration/method changes address systematic errors.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

32. Risk vs hazard

Tier	Evidence
Both	[SPEC]

Typical error: A hazard is described without probability/exposure when asked about risk.

Repair routine: Hazard = potential source of harm; risk includes likelihood and consequence/exposure.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

33. Model limitations

Tier	Evidence
Both	[SPEC]

Typical error: Models are described as exact copies of reality.

Repair routine: State what the model represents, what it predicts, and what it omits/assumes.

Retest rule: Attempt two fresh questions in different contexts. Explain the mechanism or calculation steps before checking the answer; mark secure only after both are correct.

2025 examiner-report themes to build into revision

- Foundation Breadth: candidates were stronger when they understood the physical concepts behind equations and practical apparatus; weaker responses were often vague, confused physical quantities such as energy and force, or substituted without understanding.
- Foundation Depth: stronger candidates used comparative language, full calculation working, correct terminology, variables and experimental improvements; weaker candidates showed partial working, incomplete substitution and equation-rearrangement difficulty.
- Higher Breadth: approximately 30% of marks involved calculations and the paper mixed practical skills and Ideas about Science with content across all six science chapters.
- Higher Depth: around 30% of the paper involved mathematical skills and at least 15% practical skills; extended-response and synoptic application demanded links across teaching chapters.

Diagnostic log

ID	Issue	Found	Repaired	Retested
01	Vague explanations	☐	☐	☐
02	Energy vs force	☐	☐	☐
03	Equation without physics	☐	☐	☐
04	kW and kWh	☐	☐	☐
05	Wave feature labels	☐	☐	☐
06	Reflection practical	☐	☐	☐
07	Radioactive decay explanations	☐	☐	☐
08	Newton III	☐	☐	☐
09	Terminology in depth responses	☐	☐	☐
10	Partial working	☐	☐	☐
11	Rearranging equations	☐	☐	☐
12	Variable identification	☐	☐	☐
13	Practical improvements	☐	☐	☐
14	Radiation vs radioactivity	☐	☐	☐
15	Climate correlation vs causation	☐	☐	☐
16	Efficiency	☐	☐	☐
17	Current being used up	☐	☐	☐
18	Meter placement	☐	☐	☐
19	Conventional current vs electron flow	☐	☐	☐
20	Transformer induction	☐	☐	☐
21	Distance vs displacement	☐	☐	☐
22	Motion graphs	☐	☐	☐
23	Zero resultant force	☐	☐	☐
24	Momentum sign	☐	☐	☐
25	Thinking vs braking distance	☐	☐	☐
26	Irradiation vs contamination	☐	☐	☐
27	Fission vs fusion	☐	☐	☐
28	Density unit conversion	☐	☐	☐
29	SHC vs latent heat	☐	☐	☐
30	Extension vs total length	☐	☐	☐
31	Repeat-and-average as universal fix	☐	☐	☐
32	Risk vs hazard	☐	☐	☐
33	Model limitations	☐	☐	☐

References and evidence base

Accessed 12 November 2026. Specification mappings, boundaries, results statistics, equation-sheet policy and examiner-evidence labels were checked against the sources below. Diagnostic entries do not claim frequency percentages unless OCR has published them.

[SPEC] OCR GCSE (9-1) Twenty First Century Science Physics B J259 Specification, Version 4.2 (February 2024)
https://www.ocr.org.uk/Images/234601-specification-accredited-gcse-twenty-first-century-science-suite-physics-b-j259.pdf

[ER25F1] OCR J259/01 Examiners Report, Summer 2025
https://www.ocr.org.uk/Images/753126-examiners-report-breadth-in-physics.pdf

[ER25F2] OCR J259/02 Examiners Report, Summer 2025
https://www.ocr.org.uk/Images/753125-examiners-report-depth-in-physics.pdf

[ER25H3] OCR J259/03 Examiners Report, Summer 2025
https://www.ocr.org.uk/Images/753124-examiners-report-breadth-in-physics.pdf

[ER25H4] OCR J259/04 Examiners Report, Summer 2025
https://www.ocr.org.uk/Images/753123-examiners-report-depth-in-physics.pdf