Captivate
EDUCATION

Given name/s	
Family name	
Teacher	

Trial 1 external assessment 2027

Question and response book

Physics

Paper 1

SAMPLE

Time allowed

- Perusal time — 10 minutes
- Working time — 90 minutes

General instructions

- Answer all questions in this question and response book.
- QCAA-approved calculator permitted.
- QCAA formula and data book provided.
- Planning paper will not be marked.

Section 1 (20 marks)

- 20 multiple choice questions

Section 2 (31 marks)

- 5 short response questions

Practice material in the layout of the 2025 QCAA external assessment. Not a QCAA assessment.

Sample pages only. Full paper and marking guide: captivateeducation.com.au/trial-exams/qce/physics

Section 1

Instructions

- This section has 20 questions and is worth 20 marks.
- Use a 2B pencil to fill in the A, B, C or D answer bubble completely.
- Choose the best answer for Questions 1–20.
- If you change your mind or make a mistake, use an eraser to remove your response and fill in the new answer bubble completely.

	A	B	C	D
Example:	●	○	○	○

	A	B	C	D
1.	○	○	○	○
2.	○	○	○	○
3.	○	○	○	○
4.	○	○	○	○
5.	○	○	○	○
6.	○	○	○	○
7.	○	○	○	○
8.	○	○	○	○
9.	○	○	○	○
10.	○	○	○	○
11.	○	○	○	○
12.	○	○	○	○
13.	○	○	○	○
14.	○	○	○	○
15.	○	○	○	○
16.	○	○	○	○
17.	○	○	○	○
18.	○	○	○	○
19.	○	○	○	○
20.	○	○	○	○

Ensure you have filled an answer bubble for each question.

SAMPLE

Do not write outside this box.

Section 2

Instructions

- Write using black or blue pen.
- Marks will not be deducted for correct answers that use different units or a different number of significant figures/decimal places than those indicated in the question.
- If you need more space for a response, use the additional pages at the back of this book.
  - On the additional pages, write the question number you are responding to.
  - Cancel any incorrect response by ruling a single diagonal line through your work.
  - Write the page number of your alternative/additional response, i.e. See page …
  - If you do not do this, your original response will be marked.
- This section has five questions and is worth 31 marks.

DO NOT WRITE ON THIS PAGE
THIS PAGE WILL NOT BE MARKED

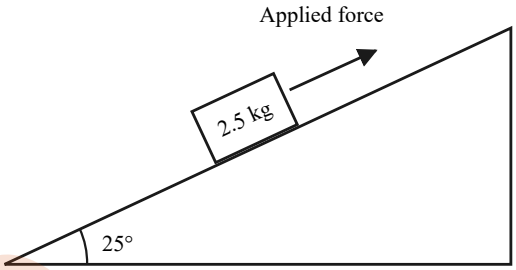
SAMPLE

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QUESTION 21 (3 marks)

A 2.5 kg trolley is held stationary on a frictionless ramp inclined at 25° by a force applied parallel to the ramp, as shown.

Not to scale



Calculate the magnitude of the applied force required to hold the trolley stationary. Show your working.

Magnitude of applied force = _____ N

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Do not write outside this box.

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Physics marking guide and response

Trial 1 external assessment 2027 · Paper 1 · 51 marks

Teacher copy – not for distribution to students.

Where a response does not meet any of the descriptors for a question or a criterion, a mark of '0' will be recorded.

Allow FT mark/s — refers to 'follow through', where an error in the prior section of working is used later in the response, a mark (or marks) for the rest of the response can still be awarded so long as it still demonstrates the correct conceptual understanding or skill in the rest of the response.

For any calculation question, do not penalise for incorrect decimal places/significant figures/units/rounding except where specified.

SAMPLE

Marking guide

Multiple choice

Question	Response	Explanation
1	**B**	Centripetal acceleration points toward the centre (direction of the net force). (A) and (D) confuse acceleration with velocity/tangential directions; (C) is the fictitious "centrifugal" intuition.
2	**C**	Kepler's third law relates T^2 to r^3. (A) is the Law of Universal Gravitation, (B) is orbital speed, (D) is gravitational field strength — all formula-book neighbours.
3	**A**	$F = qv \times B$: with v to the right and B out of the page, $v \times B$ points down the page; the negative charge reverses this to up the page. (B) forgets the negative charge; (C)/(D) apply the rule to the wrong axis pair.
4	**A**	Threshold frequency is the minimum frequency for photoemission ($W = hf_0$). (B) inverts the concept; (C) is a fabricated one-photon-many-electrons idea; (D) confuses frequency with intensity — the classic wave-model misconception.

5	**D**	$F \propto Mm/r^2$: tripling one mass ×3, halving r ×4 → 12F. (A) treats r as linear (3 ÷ 2); (B) ignores the separation change; (C) uses ×2 for the separation instead of ×4 (forgotten square).
6	**B**	Proper time is measured in the frame where both events occur at the same position (one clock). (A) confuses with simultaneity; (C) misses that frames disagree; (D) inverts the definition — a moving observer measures the dilated time.
7	**C**	Electrons, muons and neutrinos are leptons. (A)/(B) are composite quark particles; (D) are the force mediators.
8	**B**	$B = \mu_0 I/(2\pi r) = (4\pi \times 10^{-7} \times 15)/(2\pi \times 0.030) = 1.0 \times 10^{-4}$ T. (A) uses r = 3.0 (cm not converted); (C) drops the π (uses $\mu_0 I/2r$); (D) multiplies by 2π instead of dividing.
9	**B**	$\lambda_{max} = b/T = 2.898 \times 10^{-3} / 5800 = 5.0 \times 10^{-7}$ m. (A) is a calculator slip; (C) drops the 10^{-3} in b; (D) inverts the ratio (T/b).
10	**D**	Quarks experience all three forces; charged leptons experience the weak and electromagnetic forces but not the strong force. The other rows swap or omit forces — most commonly giving leptons the strong force.
11	**C**	$W = mg = 12 \times 3.7 = 44$ N. (A) divides m/g; (B) restates the mass; (D) uses g = 9.8 N kg^{-1} — ignoring the Mars value given.
12	**A**	Lenz's Law: the induced current's field opposes the change in flux. (B) would violate conservation of energy; (C) confuses force and field directions; (D) is only true while flux is decreasing.
13	**B**	$u_y = 12 \sin 35° = 6.9$ m s^{-1}. (C) is the sin/cos swap (12 cos 35° = 9.8); (D) forgets to resolve; (A) is a rounding/slip value.
14	**A**	$t = u_y/g = 6.9/9.8 = 0.70$ s. (D) is the full time of flight (2t); (B) uses the horizontal component; (C) uses 12/9.8.
15	**D**	$\gamma = 1/\sqrt{(1 - 0.95^2)} = 3.2$, so $t = 3.2 \times 2.2$ μs = 7.0 μs. (A) divides instead of multiplying; (B) applies no dilation; (C) uses $\gamma \approx 2$ (a $1/(1 - v^2/c^2)$ error without the square root).
16	**D**	$E_k = hf - W$ is linear in f with gradient h. (A) is the y-intercept magnitude; (B) is the x-intercept; (C) grows with f — not a constant gradient.
17	**A**	The field around a straight conductor forms concentric circles centred on the wire. (B) is the electric-field pattern of a point charge; (C) is a uniform field; (D) is a bar-magnet-style loop pattern.
18	**B**	$V_p/V_s = N_p/N_s$: stepping up voltage needs more secondary turns. (A) is a step-down transformer; (C) changes nothing; (D) would induce no emf at all — transformers need AC.
19	**D**	The second postulate: c in a vacuum is invariant for all observers. (A) and (B) are the classical assumptions relativity discards; (C) misstates the first postulate.

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20	**C**	Longest wavelength = smallest energy gap: n = 4 → n = 3 is 5.6 − 4.9 = 0.7 eV. (A) is the largest gap (shortest wavelength) — the inverse E–λ relationship missed; (B) and (D) are intermediate gaps.

Short response

Question 21 (3 marks)

Sample response	The response:
Since the trolley is stationary, $F_{net} = 0$, so the applied force balances the component of the weight parallel to the ramp: $F = mg \sin \theta$ $= 2.5 \times 9.8 \times \sin 25°$ $= 10.35$ Magnitude of applied force = 10 N	• recognises that the applied force is equal in magnitude to the component of the weight parallel to the ramp **[1 mark]** • recognises that $F = mg \sin \theta$ **[1 mark]** • calculates the magnitude of the applied force **[1 mark]**

Question 22 (4 marks)

Sample response	The response:
$A = \pi r^2 = \pi \times 0.040^2 = 5.03 \times 10^{-3}$ m² $\Delta\Phi = \Delta B \times A = (0.60 - 0.20) \times 5.03 \times 10^{-3} = 2.01 \times 10^{-3}$ Wb $\text{emf} = N \frac{\Delta\Phi}{\Delta t} = 50 \times \frac{2.01 \times 10^{-3}}{0.25} = 0.402$ Magnitude of emf = 0.40 V	• recognises that the scenario relates to electromagnetic induction from a changing magnetic flux **[1 mark]** • calculates the area of the coil **[1 mark]** • provides appropriate mathematical reasoning **[1 mark]** • calculates the magnitude of the emf **[1 mark]**

SAMPLE