2226 – 4717M

Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

May 2026

Physics

Higher level

Paper 1b

7 pages

Subject Details: Physics HL/SL Paper 1B Markscheme

Mark Allocation

Candidates are required to answer ALL questions. Maximum total = [20 marks].

1. Each row in the "Question" column relates to the smallest subpart of the question.

2. The maximum mark for each question subpart is indicated in the "Total" column.

3. Each marking point in the "Answers" column is shown by means of a tick (✓) at the end of the marking point.

4. A question subpart may have more marking points than the total allows. This will be indicated by "max" written after the mark in the "Total" column. The related rubric, if necessary, will be outlined in the "Notes" column.

5. An alternative wording is indicated in the "Answers" column by a slash (/). Either wording can be accepted.

6. An alternative answer is indicated in the "Answers" column by "***OR***" between the alternatives. Either answer can be accepted.

7. An alternative markscheme is indicated in the "Answers" column under the heading ***ALTERNATIVE* 1** *etc*. Any alternative can be accepted.

8. Words in angled brackets **« »** in the "Answers" column are not necessary to gain the mark.

9. Words that are underlined are essential for the mark.

10. The order of marking points does not have to be as in the "Answers" column, unless stated otherwise in the "Notes" column.

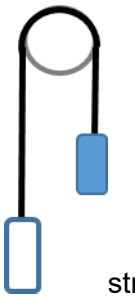
11. If the candidate's answer has the same "meaning" or can be clearly interpreted as being of equivalent significance, detail and validity as that in the "Answers" column then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by ***OWTTE*** (or words to that effect) in the "Notes" column.

12. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.

13. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking, indicate this by adding **ECF** (error carried forward) on the script. "Allow ECF" will be displayed in the "Notes" column.

14. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the "Notes" column.

15. Allow reasonable substitutions where in common usage, *eg* ^{c} for rad

Question			Answers	Notes	Total
1.	a	i	20.10 N ✓		[1]
1.	a	ii	«±» 0.12 N ✓ « $\frac{0.12}{20.10} \times 100 =$ » 0.6% ✓	*Allow ±0.1* N *and 0.5 %.* *Allow use of standard deviation to obtain ± 0.09 N and leading to 0.4% uncertainty.*	[2]
1.	b		« $\frac{20.10}{9.81} =$ » 2.05 kg ✓ relative uncertainties correctly summed « $\pm (2.05 \times (0.006 + 0.004)) =$ » ± 0.02 ✓ 2.05±0.02 kg ✓	*Watch for ECF from 1 a(i) and 1 a(ii).* ***MP3*** *can be awarded if seen in* ***MP1*** *and* ***MP2*** *Award* ***MP3*** *only if absolute uncertainty has 1SF and the mass value matches its precision.*	[3]
1.	c		 string drawn vertically down ✓		[1]
1.	d	i	« θ =0 so » y intercept ✓	*Accept 3.0*	[1]

1.	**d**	**ii**	***ALTERNATIVE 1*** indication that k can be determined by the gradient ✓ choice of points and are an appropriate distance apart $(\Delta x \geq 1.5\pi)$ ✓ final answer of the gradient ✓ ***ALTERNATIVE 2*** use of y-intercept (0,3) and equation of the line ✓ choice of point that is appropriate distance from y axis $(\Delta x \geq 1.5\pi)$ ✓ correct calculation of k ✓	*Accept CNA for values from 0.24 to 0.26 with a **max [2].*** *Select responses from one **ALT** only.* *Ignore if* k *value is positive or negative.*	**[3]**
1.	**e**		same «mass » block ✓ same rod ✓ same string ✓ coefficient of friction is held constant ✓	*Accept only references of the material of the string/rod and not dimensions such as length/radius*	**[2 max]**

Question			Answers	Notes	Total
2.	a		***ALTERNATIVE 1*** equation manipulated to the form $\frac{1}{P} = \frac{m_A}{Mk_BT} \times V$ ✓ each of M, T, m_A, k_B is constant ***OR*** direct proportionality as y = const × x is identified ✓ ***ALTERNATIVE 2*** PV = constant ✓ This shows P and V are inversely proportional which is the same as $1/P$ directly proportional to V ✓	*Select responses from one **ALT** only.*	**[2]**
2.	b		$\text{« Pa}^{-1} \times \text{m}^{-3} = \frac{\text{m}^2}{\text{kg} \times \text{m} \times \text{s}^{-2}} \times \text{m}^{-3} = \text{kg}^{-1} \times \text{m}^{-2} \times \text{s}^2 \text{ »}$ ***OR*** $\text{«} \frac{\text{kg}}{\text{kg}} \times \frac{1}{\text{J} \times \text{K}^{-1}} \times \frac{1}{\text{K}} = \text{kg}^{-1} \times \text{m}^{-2} \times \text{s}^2 \text{»}$ X = -1 ✓ Y = -2 ✓	*Allow CNA without working.* *Accept final answer in terms of units i.e.* $\text{kg}^{-1}\text{m}^{-2}\text{s}^2$	**[2]**
2.	c		from graph $\frac{1}{P} = 0.016\ \text{kPa}^{-1}$, so P = 63 kPa ✓	*Award the mark only for at least 2 significant figures **OR** working shown.* *Accept use of $0.0156 \leq y \leq 0.0160$ leading to values $62.5 \leq P \leq 64.1$*	**[1]**

2.	**d**	**i**	graph does not go through origin ***OR*** graph is shifted to the left ✓		**[1]**
2.	**d**	**ii**	air was also in the tube/sensor ***OR*** Total volume includes the volume of the tube/sensor ✓	*Explicit reference to the source is needed.*	**[1]**