

© International Baccalaureate Organization 2025

All rights reserved. No part of this product may be reproduced in any form or by any electronic or mechanical means, including information storage and retrieval systems, without the prior written permission from the IB. Additionally, the license tied with this product prohibits use of any selected files or extracts from this product. Use by third parties, including but not limited to publishers, private teachers, tutoring or study services, preparatory schools, vendors operating curriculum mapping services or teacher resource digital platforms and app developers, whether fee-covered or not, is prohibited and is a criminal offense.

More information on how to request written permission in the form of a license can be obtained from <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

© Organisation du Baccalauréat International 2025

Tous droits réservés. Aucune partie de ce produit ne peut être reproduite sous quelque forme ni par quelque moyen que ce soit, électronique ou mécanique, y compris des systèmes de stockage et de récupération d'informations, sans l'autorisation écrite préalable de l'IB. De plus, la licence associée à ce produit interdit toute utilisation de tout fichier ou extrait sélectionné dans ce produit. L'utilisation par des tiers, y compris, sans toutefois s'y limiter, des éditeurs, des professeurs particuliers, des services de tutorat ou d'aide aux études, des établissements de préparation à l'enseignement supérieur, des fournisseurs de services de planification des programmes d'études, des gestionnaires de plateformes pédagogiques en ligne, et des développeurs d'applications, moyennant paiement ou non, est interdite et constitue une infraction pénale.

Pour plus d'informations sur la procédure à suivre pour obtenir une autorisation écrite sous la forme d'une licence, rendez-vous à l'adresse <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

© Organización del Bachillerato Internacional, 2025

Todos los derechos reservados. No se podrá reproducir ninguna parte de este producto de ninguna forma ni por ningún medio electrónico o mecánico, incluidos los sistemas de almacenamiento y recuperación de información, sin la previa autorización por escrito del IB. Además, la licencia vinculada a este producto prohíbe el uso de todo archivo o fragmento seleccionado de este producto. El uso por parte de terceros —lo que incluye, a título enunciativo, editoriales, profesores particulares, servicios de apoyo académico o ayuda para el estudio, colegios preparatorios, desarrolladores de aplicaciones y entidades que presten servicios de planificación curricular u ofrezcan recursos para docentes mediante plataformas digitales—, ya sea incluido en tasas o no, está prohibido y constituye un delito.

En este enlace encontrará más información sobre cómo solicitar una autorización por escrito en forma de licencia: <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

Physics
Higher level
Paper 1B

29 April 2025

Zone A afternoon | **Zone B** afternoon | **Zone C** afternoon

Candidate session number

2 hours [Paper 1A and Paper 1B]

--	--	--	--	--	--	--	--	--	--

Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- A clean copy of the **physics data booklet** is required for this paper.
- The maximum mark for paper 1B is **[20 marks]**.
- The maximum mark for paper 1A and paper 1B is **[60 marks]**.



Answer **all** questions. Answers must be written within the answer boxes provided.

1. A student determines the resistivity ρ of a metal that is in the form of a cylindrical wire. The student makes the following measurements:

Length L of the wire = (462 ± 2) mm

Readings for the diameter d of the wire:

Reading	1	2	3	4	5	6
d / mm	0.18	0.20	0.21	0.22	0.26	0.18

Resistance R of the wire = $13.7 \Omega \pm 1.5\%$

- (a) Outline why the measurements of d were made at different places along the wire. [1]

.....

.....

.....

- (b) Suggest suitable instruments for the measurement of

- (i) L [1]

.....

.....

- (ii) d [1]

.....

.....

(This question continues on the following page)



(Question 1 continued)

- (c) (i) Show that the mean diameter of the wire is about 0.2 mm. [2]

.....

.....

.....

.....

- (ii) Calculate the fractional uncertainty in the diameter of the wire. [2]

.....

.....

.....

.....

- (iii) Calculate the fractional uncertainty in the length of the wire. [1]

.....

.....

- (d) The resistivity of the wire is given by $\rho = \frac{RA}{L}$ where A is the cross-sectional area of the wire. Calculate the value of ρ and its absolute uncertainty. State your answers to an appropriate number of significant figures. [3]

.....

.....

.....

.....

.....

.....



2. The equation $PV = Nk_{\text{B}}T$ describes the behaviour of an ideal gas.

A student tests a fixed mass of gas to confirm that, for a constant temperature,

$$PV = K$$

where K is a constant.

The student does this by making measurements of P and V .

Five sets of data for this experiment are shown in the table. Four processed values of $\frac{1}{V}$ are also shown.

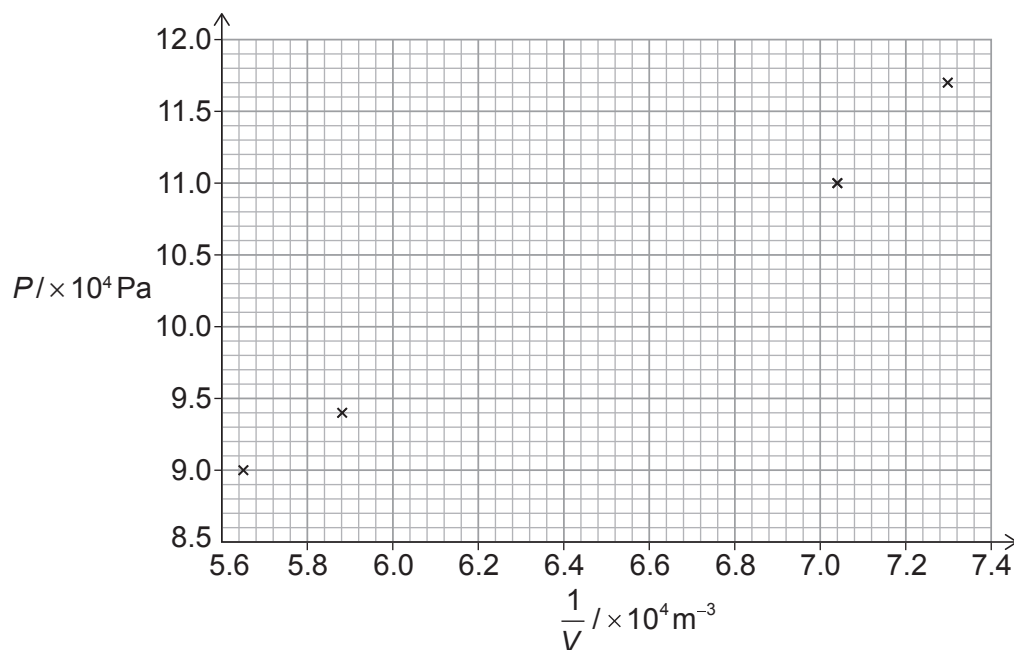
P / kPa	$V / 10^{-5} \text{m}^3$	$\frac{1}{V} / 10^4 \text{m}^{-3}$
117	1.37	7.30
110	1.42	7.04
103	1.54	
94	1.70	5.88
90	1.77	5.65

(This question continues on the following page)



(Question 2 continued)

The variation of P with $\frac{1}{V}$ is shown for four data points.



- (a) (i) Plot the missing data point on the graph. [1]
- (ii) Draw the best-fit line on the graph. [1]
- (iii) Explain how the student can use the graph to decide whether the data support the relationship $PV = K$. [3]

.....

.....

.....

.....

.....

.....

(This question continues on page 7)



Please **do not** write on this page.

Answers written on this page
will not be marked.



(Question 2 continued)

(b) (i) Determine K .

[2]

.....

.....

.....

.....

(ii) State an appropriate SI unit for K .

[1]

.....

(c) The laboratory is at a constant temperature of 291 K.

Determine the number of molecules in the fixed mass of gas.

[1]

.....

.....



Please **do not** write on this page.

Answers written on this page
will not be marked.



08EP08