



Diploma Programme
Programme du diplôme
Programa del Diploma

© 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/>.



International Baccalaureate®
Baccalauréat International
Bachillerato Internacional



Diploma Programme
Programme du diplôme
Programa del Diploma

Physics

Higher level

Paper 1B

29 April 2025

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

2 hours [Paper 1A and Paper 1B]

Candidate session number

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

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]**.

11 pages

2225–6708

© International Baccalaureate Organization 2025



12EP01



International Baccalaureate®
Baccalauréat International
Bachillerato Internacional

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

1. A student is analysing a sample of water. To determine its density, the student measures the volume with a measuring cylinder and the mass with an electronic balance.

- (a) Identify **one** way to ensure that the volume is read accurately.

[1]

.....
.....

The following data are collected:

$$\text{Volume} = (10.6 \pm 0.2) \text{cm}^3$$

$$\text{Mass} = (10.82 \pm 0.01) \text{g}$$

- (b) (i) Calculate the density of the sample and its absolute uncertainty.

[2]

.....
.....
.....
.....

- (ii) State your answers in kg m^{-3} and with correct precision.

[1]

.....
.....

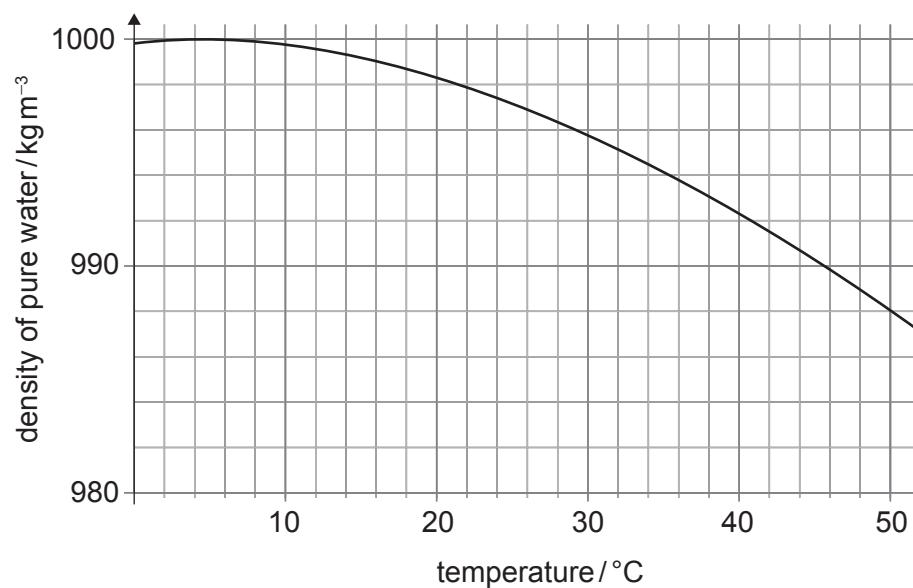
(This question continues on the following page)



12EP02

(Question 1 continued)

When the density was measured, the sample was at 35 °C. The student has a graph that shows the variation with temperature of the density of pure water.



- (c) Suggest whether the water sample can be considered pure.

[2]

.....
.....
.....
.....



12EP03

Turn over

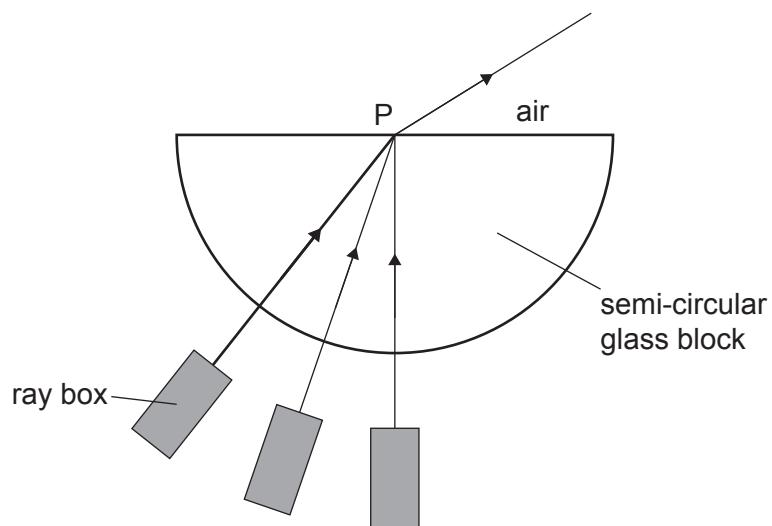
2. A group of students is investigating refraction in a semi-circular glass block.

Light from a ray box enters the curved side of the block. The light passes through the block and leaves, refracted, at P.

- (a) Outline how the students can ensure that the light is not deflected at the curved surface. [1]

.....
.....

The students vary the position of the ray box to obtain data to determine the refractive index of the glass. They use a protractor to collect values for the angles of incidence θ_i and refraction θ_r at P and record them on a table.



(This question continues on the following page)

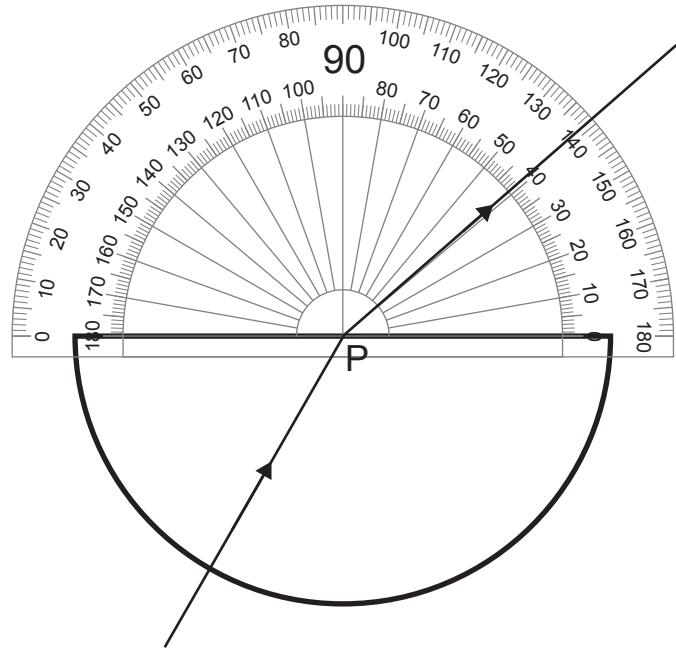


12EP04

(Question 2 continued)

- (b) (i) One of their measurements is shown. State θ_r for this measurement.

[1]



- (ii) Complete the table.

[1]

θ_i	θ_r	$\sin \theta_i$	$\sin \theta_r$
10	15	0.174	0.259
20	31	0.342	0.515
25	39	0.423	0.629
30	49	0.500	
35	60	0.574	0.866
40	75	0.643	0.966

(This question continues on page 7)



12EP05

Turn over

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

Answers written on this page
will not be marked.

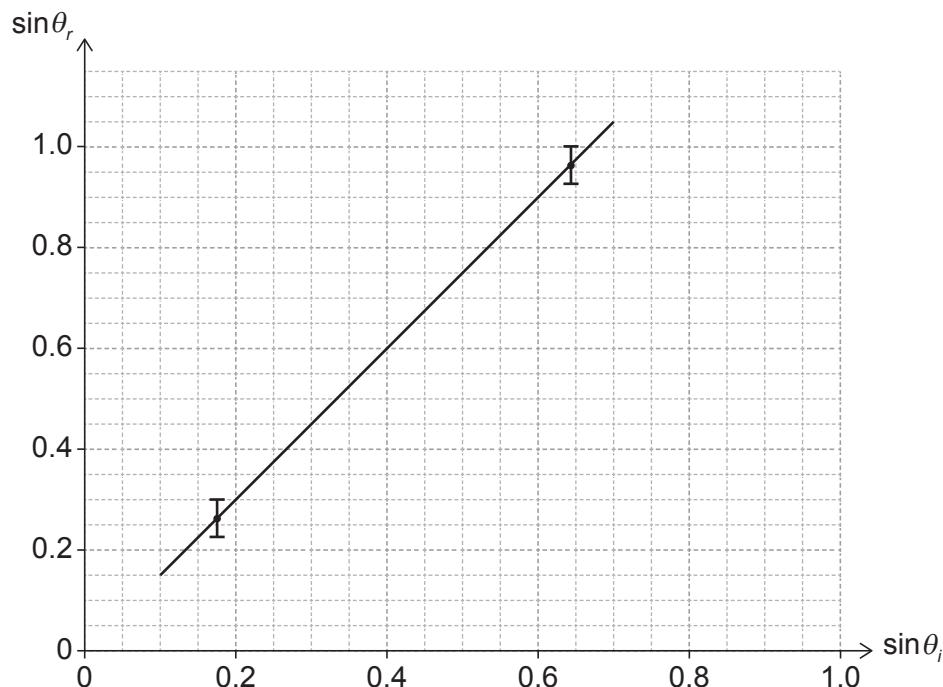


12EP06

(Question 2 continued)

They plot a graph of the variation with the sine of θ_i of the sine of θ_r .

They add uncertainty bars for $\sin \theta_r$ for the first and last data point and draw the best-fit line.



- (c) (i) Determine the gradient of the students' best-fit line. [2]

.....
.....
.....
.....

- (ii) Draw on the students' graph the line of maximum gradient. [1]

- (iii) Determine the value of the refractive index of the glass with its absolute uncertainty. [2]

.....
.....
.....
.....



12EP07

Turn over

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

Answers written on this page
will not be marked.



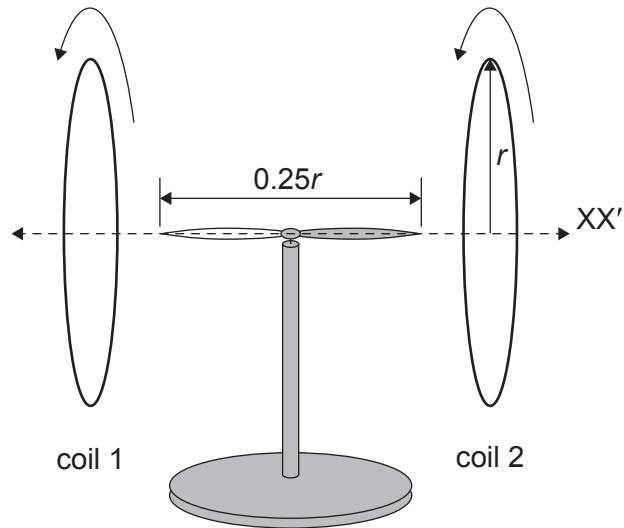
12EP08

3. A group of students wants to determine the horizontal component B_H of the Earth's magnetic field.

They place a magnet (in the form of a magnetic needle) midway between two coils.

When there is no current through the coils, the magnet aligns itself in the north-south direction. When there is an identical current established in the coils, the magnetic field produced deflects the magnet.

diagram not to scale



Each coil has a radius r . The length of the magnet is $0.25r$.

(This question continues on the following page)



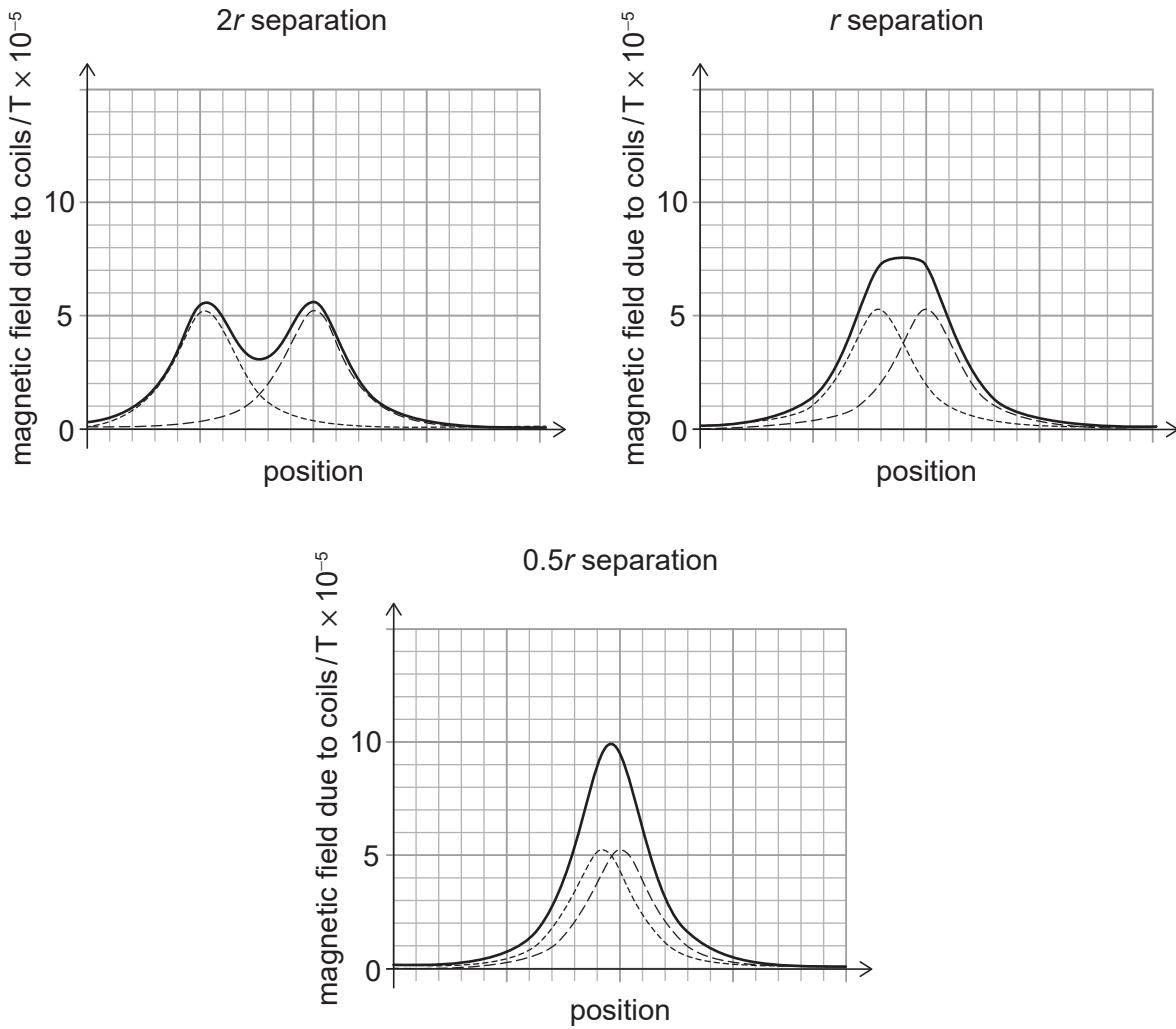
12EP09

Turn over

(Question 3 continued)

The students have to decide on the horizontal separation of the two coils. Their choices are separations of $2r$, r and $0.5r$.

The variation with distance of the magnetic field strength due to each coil and the resultant magnetic field strength for both coils are shown for each of these separations. The dotted line represents the magnetic field from each coil, while the solid line shows the resultant magnetic field.



- (a) State and explain which coil separation the students should choose for this experiment. [2]

.....
.....
.....
.....

(This question continues on the following page)



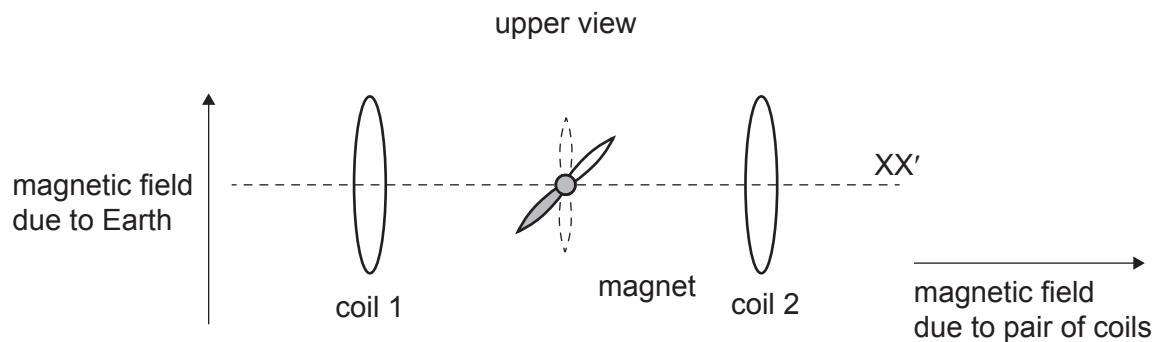
(Question 3 continued)

- (b) Explain why the students place axis XX' of the coils in the east-west direction. [2]

.....
.....
.....
.....

- (c) The deflection of the magnet is shown.

diagram not to scale



The magnet comes to rest when it makes an angle of 24° to XX'.

Determine, using the graphs, B_H .

[2]

.....
.....
.....
.....



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

Answers written on this page
will not be marked.



12EP12