

Dear Colleague,

Welcome to the British Physics Olympiad (BPhO) 2021/22. The BPhO provides a series of competition papers for Years 10 - 13 to stretch and challenge talented young physicists. In recent years the competitions have attracted entries from 20-30,000 students. We are supported by a number of sponsors, including the Universities of Oxford and Cambridge (for Training Camps), National Physical Laboratory, The Worshipful Company of Scientific Instrument Makers, Maplesoft, The Royal Astronomical Society and several academic book publishers.

This year due to Covid-19 the Oxford office is closed but we are working from home. In June and July, two teams of nine BPhO finalists represented the UK in the European and International Physics Olympiads (EuPhO and IPhO) which were held as competitions with our teams meeting in Cambridge. Our EuPhO team competed against 46 countries with 218 participants, and the IPhO hosted remotely from Lithuania included 370 students from 76 countries. The nine UK students each won either Silver or Bronze medals. Next year the IPhO is in Belarus in July 2022 and, for a chance to compete, students must enter BPhO Round 1 in November. If **teachers** are interested in participating or observing the students during training when the teams are assembled, or at the IPhO, please email bpho@physics.ox.ac.uk and express your interest. Each year we have teachers attending the training camps and the IPhO; it is a rewarding experience to see students gain confidence as they develop their understanding of the subject, and gives teachers the opportunity to develop their knowledge of school physics. But you do not have to be an expert. Few of us are, but we can still help the students on the teams.

Dates

We have two new competition papers, which follow on from this past year's encouraging participation in the Senior Physics Challenge online and the Intermediate Physics Challenge online. We are, however, returning the two traditional problem solving challenge papers, which had the two online substitutions in the past Covid year.

Competition	Year group	delivery	Length of "Paper"	Competition Date
Physics Challenge	Year 13 or below	paper emailed	1 hour	Sept - Dec 2021
BAAO Astro Challenge	Year 13 or below	paper emailed	1 hour	Sept - Dec 2021
BPhO Round 1	Year 13 or below	paper emailed	2 h 40m + 5m reading time	Fri 12 th Nov 2021
BAAO Junior Astro Challenge online	Year 10 & Year 11	online competition	2 x 25 min	Fri 5 th - Wed 24 th Nov 2021
Senior Physics Challenge online	Year 12	online competition	2 x 30 min	Mon 24 th – Fri 28 th Jan 2022
Intermediate Physics Challenge online	Year 11	online competition	2 x 30 min	Mon 31 st Jan – Friday 4 th Feb 2022
BAAO Astrophysics Olympiad	Year 13 or below	paper printed & posted	3 hour + 15m reading time	Mon 24 th Jan 2022
BPhO Round 2	Year 13 or below	paper printed & posted	3 hours	Mon 31 st Jan 2022
Senior Physics Challenge	Year 12	paper emailed	1 hour	Friday 4 th March 2022
Intermediate Physics Challenge	Year 11	paper emailed	1 hour	Friday 11 th March 2022
Junior Physics Challenge online	Year 10	online competition	2 x 25 min	Fri 29 th April - Wed 18 th May 2022
Experimental Project	Year 12/13 & Year 10/11	paper emailed		June - Dec 2022

We may not be able to send out book prizes this year. We hope to do so in the future.

It should be noted that papers are emailed to school email addresses for security. Please do not use Gmail, Hotmail, etc, for this. Students may not order papers. Please keep papers secure.

The competitions

The BPhO now runs twelve competitions for students in Key Stages 4 and 5. All the papers are free except BPhO Round 1 and the four online Challenges which require a school registration fee. A summary of the competitions is provided on the accompanying A3 sheet on our website. Further details, past papers and extension work can also be found there: <http://www.BPhO.org.uk>

The September **BPhO Physics Challenge** is used by some schools as a resource and by others as a selection process for BPhO Round 1 in November. **BPhO Round 1** was taken by 2000 students last year and is the initial competition paper for selecting a team for the IPhO and EuPhO. The top 100 Round 1 students are invited to take **BPhO Round 2** in January 2022, followed by invites to 28 students to attend the Oxford Training Camp over the Easter holiday. All competitions can be taken by younger age groups but not by older ones.

The **Intermediate Physics Challenge** (GCSE) is taken in March 2022. This paper provides thought provoking questions for strong students with an interest in physics and problems, to develop their skills. Similarly, the **Senior Physics Challenge** (AS), taken the week before, provides a competition environment for those students who want to raise their game and see where they stand amongst the top end of their age group.

The British Astronomy & Astrophysics Olympiad (BAAO)

The BAAO is run as part of the BPhO: the International Olympiad on Astronomy & Astrophysics (IOAA) will be run from Columbia this autumn with the UK team of four Y12 and one Y11 students gathered in Cambridge. An online competition is to take place instead. The team of five the previous year in Hungary won one Gold medal, three Silver and one Bronze. We are looking to offer places to Y13 students (or younger) who take Round 1 in November and the BAAO paper in January. Fourteen students will then be invited to a training camp in Oxford at Easter.

The sort of students who do well are good physics problem solvers who have an interest in astronomy and have developed their observational skills by going outside and looking at the night sky. They should be encouraged (but not required) to take the Astro Challenge Paper in September, but are required to take the BPhO Round 1 Paper in November. Good, keen physicists do very well. Few past team members would have considered themselves astronomers in any sense, but they are problem solvers and interested in new ideas. The majority are probably limited to knowing the names of the planets, and little more!

Studying the past papers, which are available online, would be strongly recommended for all of our problem competitions. All our competitions are about solving problems and this skill is learned by practising over a period of time.

How to enter

We have an online entry system **for teachers**, using the University of Oxford's online store. This system is used to order papers, mark schemes and certificates for the competitions. Further details and a link to the online shop can be found at www.bpho.org.uk, under the 'Enter Online' menu item.

How to prepare

Past papers are available online, together with the solutions. Students should attempt **at least two or three past papers minimum**, and be given the solutions after each one, in order to ensure that they know what to expect. Get a small group of your students to work together on a few problems themselves, to develop their skills and interest in a competitive but friendly atmosphere.

It is important that students realise that these competitions are taken by the top physics student problem solvers of their age in the country, and that gaining a modest mark still includes them in the very top rank of participants. They should not expect to think that because they are an A/A* candidate in their usual exams that they will gain a high mark in these challenging papers. A level papers are not about problem solving. Different skills are required but the physicist needs many skills to succeed. Nor should they think that because they have scored a low mark on a particularly challenging problem specific paper, that they are a weak physicist or that they will do poorly in the national exam system. These papers and questions are quite different. They require practice and determination.

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They should be told initially that one of the challenges is simply being willing to take the risk and have a go. Please encourage your students to do so.

Background

We want to provide opportunities for students to develop their physics and gain confidence in their subject. Finding a paper particularly challenging is not going to demoralise a student who expects to find it particularly challenging. The papers should contain some approachable questions, but also some designed to stretch the students until the elastic snaps. They are expected to be left to think and discuss one or two of the questions after the competition, or else it is merely more of the usual exam experience. They do not need to achieve 90-100% to be satisfied. The intellectual satisfaction of solving a problem that is worth solving, when the results do not affect the student's career, should be developed. In order to gain insight into the physics when it becomes difficult requires resilience or the student will never be able to stand the heat.

The way to understand a topic more deeply is (i) to try problems which are demanding in gathering the ideas together, (ii) to develop determination and perseverance particularly, (iii) having an approach (drawing diagrams, etc.), (iv) doing problems that are worded in a clear and unambiguous way but do not lead the student in to the answer, (v) are intellectually demanding.

Contacting Us

The BPhO is run by volunteers, all teachers, and we may struggle at times to provide a fully responsive service to every request. But we hope that we get the key things right. It is a struggle at busy times and emails get missed. Do not hesitate to email again. You can also email in to discuss the physics in a question. This is the part that we enjoy.

If you have any questions about the administration competitions or want any information, please contact the BPhO office at bpho@physics.ox.ac.uk

If you would like to be involved in any small way, or have a physics question, then send an email to Robin Hughes at rh584@cam.ac.uk. If you think that you have a good question idea for a paper, we would be delighted to hear from you. We do not expect polished questions.

Kind regards,

Lena Shams
Administration Secretary
British Physics Olympiad



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