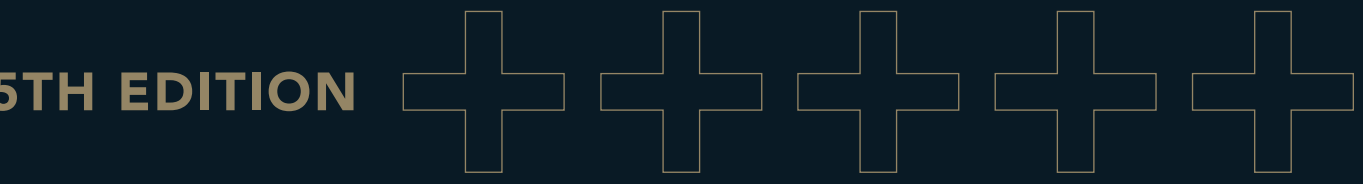
CAMBRIDGE CENTRE for INTERNATIONAL RESEARCH

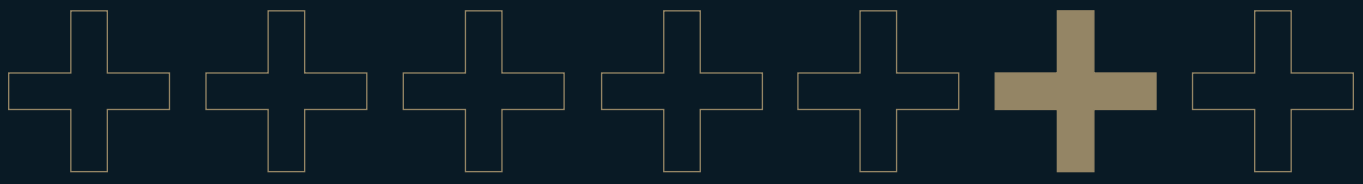
CCIR ACADEMY

APPLICATION AND INTERVIEW GUIDELINES

CAMBRIDGE FUTURE SCHOLAR PROGRAMME
1-ON-1 RESEARCH MENTORSHIP

5TH EDITION





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THE CCIR PROFESSOR-ADMISSION SYSTEM

Instead of CCIR Academy admission officers admitting and assigning students to each professor's group or mentorship, **PROFESSORS WILL MAKE FINAL ADMISSION DECISIONS IN EACH CASE.**

The CCIR Admissions Team only conducts preliminary review and assists with admission logistics. In the end, the professors will review, sometimes interview, and finally admit each student that they choose. Although this results often in smaller cohorts, this ensures that our professors are fully invested in each admitted student.

The CCIR Admissions Team will review and shortlist applications in the pre-application pool first, early admission pool second, and lastly, the regular admission pool. The professor will review and admit students on a rolling basis. Because of the limited group size and professor's availability, some research courses may close early before the deadline.

CHOOSING YOUR CCIR PROGRAMME

		Cambridge Future Scholar	1-on-1 Research Mentorship
Programme Overview		Choose from over 80 research courses mirroring freshmen-level courses from top universities in small 2 to 5 students group.	One student, One mentor, One project. Each mentorship is tailored to the specific needs and interests of each individual student.
Professor Mentors		Current faculty members at Ivy League, Oxbridge, and other top-tier universities with vast research and teaching experiences.	
Teaching Assistants		PhD candidates that are closer to students' age to provide support	N/A
Admissions	**Application Form**	**Required** • Personal and academic information • Transcript/report card for the most recent academic year • Personal Statement (no more than 500 words) ***Optional*** Standardised testing reports | CV/Resume | Writing Sample | Other supplementary materials	
	Academic Interview	Successful applicants will be invited to an 20 to 30 minutes interview with the a CCIR Academic Advisor (a PhD candidate in the same field) as part of the application for the research course's professors' final review .	
	Professor Introductory Meeting	N/A* *Professor will review applications and interview recordings.	The students and their mentors will get to know each other and finalise the direction of the student's research project. The professor will make the final admission decision after the meeting.
Students admitted through the Professor-Admission System: Each professor will receive all application materials and interview recordings of shortlisted students, before making final admission decisions.			
Programme	**Structure**	2 to 5 students (Oxbridge style small group mentorship)	One professor and one student throughout.
	Professor Sessions	**13 one-hour weekly sessions.** *Week 1 to 7: Foundation* *Week 8 to 13: Research*	**14 one-hour sessions** (flexible scheduling and meeting frequency) *Professor develops a custom curriculum for the student.*
	TA Sessions	**13 one-hour weekly sessions.**	N/A
	Office Hours	Additional weekly one-on-one office hours (30 minutes) with professor/TA upon avilability	
	Academic Support	• Unlimited Academics Team support to assist research, writing, journal publication, and journal submission guidance (by the mentor and Journal Publishing Team) • Writing Centre and Ethics Review Committee • Literature Request Portal with access of journals, papers, and e-books for free • Assigned Academic Coordinator to support each student • Access to all session recordings permanently	
After the Programme	**Outcome**	• 5000 to 10,000 words independent research paper • Option to request a Letter of Recommendation written and signed by the mentor • CCIR Certificate • An Academic Evaluation Report written and signed by the mentor	
	After Programme Support	• Letter of Recommendation delivery to universities' Admission Offices via the mentor's university email • Invitation to join CCIR's global alumni network • Continuous access to Literature Request portal and academic journal submission guidance (with the mentor and Journal Publishing Team) until successful paper publication/conferencing	

ADMISSION DEADLINES AND START DATES

		Spring 2025	Summer 2025
1-on-1 Research Mentorship (14 weeks)		**Available all year. Mentorships start on a rolling basis.**	
Cambridge Future Scholar (13 weeks)	**Official Admission Opens** (prospectus released) / Pre-Application Deadline	**Jan 15**	Apr 1
	Early Admission Deadline	**Mar 1**	May 1
	Regular Admission Deadline	**Mar 15**	May 15
	Programme Start Date*	**Mar/Apr**	Early Jun

Because of the small group size (no more than 5 students in each group), the schedule of the Future Scholar programme is usually flexible.

After each student is admitted, our dedicated Scheduling Team members will reach out individually and the final schedule will account for each admitted student's availability.

ADMISSION PROCESS OVERVIEW

CCIR's programmes can be challenging. The purpose of the application process is to help us discover the candidates who are ultimately up for a challenge. This is why we uphold rigorous academic standards and strive to ensure that each enrolled student meets our expectations.

The purpose of this guide is to help applicants understand why we ask for what we do in this process and how students should best approach the CCIR application process. We will be going over in detail all the information in the upcoming pages, but here is a quick overview of the entire process.

CCIR employs a meticulous two-round vetting system during the application process. Ultimately, our admissions are faculty-based, meaning that our faculty have full ultimate veto power on who gets into the research course. While there are minor differences between the application process for the 1-on-1 and Future Scholar programme, the two central components of your application process will be the same. They are:

1. Submit Application Form on the CCIR Admissions Portal

To start the admissions process, prospective applicants are expected to submit the application form and supplementary documents on the CCIR Admissions Portal.

The online application form collects essential information, including:

REQUIRED:

- Basic personal information
- Academic record and transcript
- A 500-word personal statement that allows applicants to express their motivation, goals, and suitability for the chosen programme

OPTIONAL:

- CV or resume
- Writing sample
- Standardised testing

2. Interview

Successful applicants will have the opportunity to participate in a 20 to 30-minute interview with a CCIR Academic Advisor, who is typically a Ph.D. candidate in the field of the student's interest. This interview is an integral part of the application process and serves as the final review for the research course's professors.

The interview aims to assess the applicant's genuine interest in the subjects and the research course they have chosen; evaluate any relevant experiences the applicant possesses that align with the research course's objectives; analyse the applicant's ability to engage in thoughtful discussions and demonstrate critical thinking skills; and provide applicants with an understanding of the nature of discussions and supervision they can expect during the programme.

By adhering to this comprehensive application process, we ensure that each admitted student is well-suited for the research-oriented academic experience offered at CCIR. Our goal is to foster a community of scholars who are passionate, dedicated, and ready to excel in their academic pursuits. In the following sections of this guide, we will delve into greater detail about the programme's curriculum, faculty, and the enriching experiences awaiting our future scholars.

ADMISSION PROCESS OVERVIEW

CAMBRIDGE FUTURE SCHOLAR (Early and Regular Admissions Pool)

1. Submit Application on CCIR Admissions Portal
Complete the application form and submit your supplemental materials.

Applications are evaluated by the Admissions Team on a rolling basis.

2. Interview with a CCIR Academic Advisor
Only shortlisted applicants will be invited for an academic interview. The interview recording will complete the applicant's profile and be passed on to the professors for final evaluation.

3. Official Offer
Your application will be considered by the professor of your top preference first. If your top preference has closed or declined your admission, you will be considered by the professor of your second choice, and so on.

Successful students will then be extended an Official Offer to the final research course.

The tuition is expected to be paid in full within five business days after receiving the official offer as a confirmation of enrollment.

CAMBRIDGE FUTURE SCHOLAR (Pre-Application Pool to Future Rounds)

1. Submit Application on CCIR Admissions Portal
Complete the application form and submit your supplemental materials.

Applications are evaluated by the Admissions Team on a rolling basis.

2. Interview with a CCIR Academic Advisor
Only shortlisted applicants will be invited for an academic interview. The interview recording will complete the applicant's profile and be passed on to the professors for final evaluation.

3. Conditional Offer and Priority Research Course Selection
Applicants who pass the interview round will receive Conditional Offers and an invite to priority research course selection when the Admission is officially open and the new prospectus is released.

A refundable deposit of 500 GBP / 600 USD is required to confirm the seat.

4. Official Offer
After research course selection is made, Conditional Offer holders will receive a final admissions evaluation from the professors teaching their selected courses. Successful students will then be extended an Official Offer.

ADMISSION PROCESS OVERVIEW

1-ON-1 RESEARCH MENTORSHIP

1. Intake Meeting
Please first schedule an Intake Meeting with a CCIR Academic Coordinator at https://calendly.com/ccir-talk-to-us/ccir-intake-meeting

2. Submit Application on CCIR Admissions Portal
Complete the application form and submit your supplemental materials.

Applications are evaluated by the Admissions Team on a rolling basis.

3. Academic Interview with the CCIR Academic Advisor
Only shortlisted students will be invited for an academic interview. The interview recording will complete the applicant's profile and be passed on to the professors for evaluation.

4. Professor Mentor Search
Applicant receives a Conditional Offer, with final tuition, if a professor is matched.

The final tuition is expected to be paid in full within ten business days after receiving the Conditional Offer in order to proceed to the Introductory Meeting.

5. Introductory Meeting with the Professor Mentor
Applicant receives an Official Offer after the professor's confirmation after the meeting.

If the professor rejects the student after the meeting, our team will endeavour to match the student with another professor and schedule an new Introductory Meeting, or arrange full tuition refund.

Each student has two opportunities to be paired with a professor. In the event that the second professor rejects the student after the Introductory Meeting, our team will proceed to automatically terminate the student's admission process to the 1-on-1 Research Mentorship and arrange full tuition refund.

STANDING OUT AS A STRONG CANDIDATE

At CCIR, we believe personalized attention and mentorship is key. **For the 1-on-1 Research Mentorship, most of our faculty only take on one or two students a year**, allowing each student to receive individualized guidance and support. Similarly, **in the Cambridge Future Scholar programme, we limit the number of students to maximum of five students per research course each round** to ensure an intimate and engaging learning environment.

Given these limited opportunities, we are searching for the best and brightest students who are inspired and highly motivated to join our research programme. We are seeking applicants who possess a genuine passion for the subject matter, as it is this passion that fuels the drive to excel and make significant contributions to their chosen field of study.

The reason for being so selective in our admissions process is twofold. Firstly, by accepting only the most talented and enthusiastic students, we aim to create a vibrant and intellectually stimulating community. Secondly, our small group teaching approach demands considerable time and effort from our professors and mentors. Thus, limiting the number of students ensures that we can provide the necessary attention and resources to each individual, fostering their growth and development as researchers and scholars.

To increase the chances of being selected for our research programme, applicants should focus on packaging themselves in a way that showcases their passion and dedication to the subject. Throughout your application, make sure:

(**1) Emphasize the reasons why you are genuinely enthusiastic about the subject.** Discuss any personal experiences, challenges, or inspirations that have sparked your interest and commitment to the field.

(2) Showcase your involvement in extracurricular activities related to the subject. This could include participating in relevant clubs, competitions, research projects, or community initiatives that demonstrate your dedication beyond the standard academic requirements.

(**3) Highlight any notable academic achievements**, such as awards, honors, high grades, or recognition in the subject area. Be sure to connect these achievements to your passion for the subject.

(4) Articulate your future goals and how the research programme at CCIR aligns with your long-term academic and career aspirations. Show that you have carefully considered how this opportunity will benefit you and your academic journey.

Remember, at CCIR, we are not just looking for students with impressive credentials; we are seeking young scholars who have the drive to make a meaningful impact in their chosen field. By presenting yourself as a bright, inspired, and committed individual, you increase your chances of being selected for our research programme and joining a community of like-minded, exceptional students from around the world.

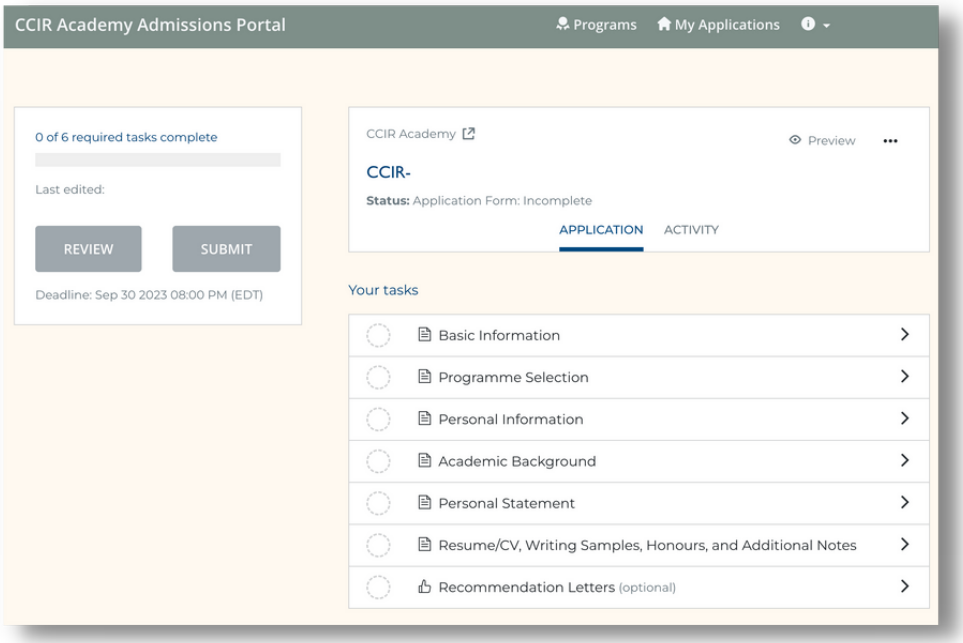
SUBMITTING YOUR APPLICATION ON THE CCIR ADMISSIONS PORTAL

OVERALL INFORMATION & REGISTRATION

The application process is a crucial step in the evaluation of your academic capabilities and potential as a student and researcher. It is designed to allow us to gain a deeper understanding of who you are, what drives you, and what you are capable of achieving. Our goal is to select the most promising candidates for an interview, and your application and supplementary materials will determine if you would be shortlisted for CCIR Academic Interview.

To start your application process, please go to the CCIR Admissions Portal and follow the steps to register your account:

CCIR Academy Admissions Portal



APPLICATION FORM

The application form will ask for your basic information and the programme you are applying to (CCIR Future Scholar or CCIR 1-on-1 Research Mentorship). Make sure to fill out all the information accurately; inaccuracies may cause delays in your application process.

PERSONAL STATEMENT

Why we ask for a personal statement?

CCIR aspires to be a platform to unlock your full potential as a budding researcher and scholar. Our application process goes beyond mere formality—it offers you a valuable opportunity to articulate your dreams, motivations, and aspirations towards academic excellence. The request for a compelling admissions essay stems from our belief in the profound impact of passion and conviction. This short admissions essay in your application is a place for you to showcase your intellectual passion, background, and ambition to your admissions officer in a vivid, qualitative way.

How to write a personal statement?

At CCIR, we're interested in learning about your background, motivations for applying, and why you would be a great fit for our programme. Keep in mind that space is limited, so be concise and focus on the key points that will make you stand out as a candidate.

Keep things academically focused. Your admissions essay should be a roadmap of your academic journey—a tool that aids us in setting you up for a research experience best suited to your interests and needs.

Think of your essay as having two key objectives:

(1) Demonstrating Purpose:

The essay should serve as a window into your mind—an authentic glimpse of what drives you, your scholarly interests, and your commitment to making a lasting contribution in your field. Tell us why you want to participate and what your ambitions and aspirations are. Articulate how participating in the programme aligns with your academic journey and contributes to your future aspirations.

(2) Demonstrating Background:

Your second focus should be your academic background. Frame things with honesty, relevance, and enthusiasm. Start by providing a clear and concise overview of your education, field of interest, and any notable coursework/experiences. Highlight your academic achievements, awards, and honors, using specific examples to demonstrate your dedication and excellence. Showcase your passion for your field of study and elaborate on specific areas of interest within it. Mention extracurricular activities that are relevant. Other things you might want to discuss might include any challenges you have encountered academically and how you have overcome them.

In sum, your objective should be to show us where you come from, intellectually, where you hope to go, and how you think CCIR can help you on that journey.

Personal Statement Example

My intellectual journey increasingly revolves around my longstanding interest in astrophysics —and since coming to learn about CCIR, I have come to believe that CCIR's research programme would offer me an unique opportunity to complement my academic pursuits and propel my scholarly growth.

Throughout high school, I consistently excelled in advanced mathematics and physics courses. By grade 10, I had exhausted my high school's mathematics courses, and started taking online courses at the college level in things like abstract algebra and number theory. This helped build a strong foundation for my fascination with the scientific principles governing the cosmos. As the president of my high school astronomy club, organizing the speaker workshop series last year also further ignited my passion, and reaffirmed my desire to contribute to astrophysics research. Participation in local science fairs has also been for me one of my favorite scientific extracurricular activities.

My academic aspirations lie in exploring topics such as dark matter, gravitational waves, and celestial body origins, seeking to contribute meaningfully to our understanding of the universe. This research programme's collaboration with accomplished researchers and like-minded peers excites me, offering the chance to engage in meaningful projects and apply theoretical knowledge to real-world challenges. I hope either to dive into the fields of computational astrophysics or quantum physics.

TRANSCRIPT SUBMISSION GUIDELINES

As part of the application process, we require all applicants to provide at least one year of unofficial transcript. (Official is of course fine!) This is a mandatory component of the application, as it allows our admissions team to assess your academic background and qualifications. If you do not have your current year's transcript available, you may submit the transcript from the previous year. Just as long as we have some transcript available from you, you will be golden.

There are four main things we are looking for in your transcript:

(1) Overall Academic Performance: We carefully review your overall marks to gauge your academic performance. While our average incoming students historically have a GPA of 3.9, we consider various factors beyond just GPA during the evaluation process.

(2) Course Level: We want to understand the level of courses you have taken throughout your high school years. This includes honors, advanced placement (AP), International Baccalaureate (IB), or any other challenging courses you may have pursued.

(3) Subject Proficiency: We are particularly interested in the subjects in which you excel. Whether you are applying for computer science or any other field, having strength in certain subjects demonstrates your academic potential and passion.

(4) Balanced Assessment: We believe in a holistic evaluation and understand that every student has their unique strengths and weaknesses. A lower mark in one subject, such as art history, will not disadvantage you if you are applying for a different field or if your overall academic performance remains strong.

Your transcript provides valuable insight into your academic journey and accomplishments, and it helps us identify the most suitable candidates for our research mentorship programme. We understand that each student has a unique academic profile, and we evaluate applications with a keen eye for potential and passion in the chosen field of study.

Remember, the transcript is just one aspect of your application. Our metric is holistic—although it is focused around your academic performance. We also carefully review your essays, recommendation letters, and other materials to get a comprehensive understanding of your qualifications and potential as a participant in our online research mentorship programme.

Two frequently asked questions:

What if my transcript is in another language?

- If your transcript is in a language other than English, there is no need to translate it before submission. You can send us the transcript directly, and our admission team will handle the translation process to ensure a fair evaluation of your academic achievements.

What if my school doesn't use GPA?

- Although the application form asks for your GPA, you do not need to convert your marks into the GPA scale. We will take care of the conversion process to maintain consistency and fairness across all applications.

THE WRITING SAMPLE (OPTIONAL)

What is a writing sample?

A writing sample is a piece of written work that applicants may submit to demonstrate their writing skills, critical thinking, and academic abilities. Typically, this is an existing piece of work, rather than something you produce on the spot. You may wish to edit the piece, but this isn't necessary per se.

CCIR does not require students to submit writing samples, but it is often a valuable thing to include in your application. A writing sample allows us to assess an applicant's writing proficiency, critical analysis, and research skills, while also providing an opportunity for applicants to showcase their perspectives and interests beyond test scores and transcripts. While it is not required, a good writing sample can strengthen an applicant's candidacy and highlight their preparedness for the academic rigor of CCIR's programme.

How should you pick a writing sample?

In selecting your writing sample, make sure that it is relevant to the area of study. Not everyone has done a research paper before—and that's fine—but make sure that even if you are submitting a school essay, it is relevant to the areas you hope to work in. If you are applying for a physics research course, don't send us an analysis of a poem. Beyond this, just pick something that showcases your interests and talents.

What is CCIR looking for in a writing sample?

(1) Writing Skills:
The main purpose of the writing sample is to allow CCIR's admissions committee to evaluate the applicant's writing abilities, including clarity, coherence, grammar, and style. So choose a piece of work that provides insights into your ability to convey complex ideas effectively.

(2) Critical Thinking:
CCIR's programmes emphasize critical thinking and analytical skills. A well-crafted writing sample provides evidence of the applicant's capacity to analyse information, form coherent arguments, and support their ideas with evidence.

(3) Academic Preparedness:
CCIR requires students to engage in extensive research and produce scholarly work. A writing sample helps assess whether an applicant is equipped for the academic rigor of the programme.

(4) Research Skills:
Again, not everyone will have done research before. But if you have, this might be a place for you to outshine the others. Choose a writing sample that can demonstrate your research prowess and your ability to articulate findings and insights.

RESUME/CV (OPTIONAL)

While it is not required, we encourage you to submit your resume as part of your application for our programme. Given the competition, this is a great way to show us a more complete picture of your profile. Your resume provides an opportunity for you to showcase your achievements, experiences, and skills beyond what can be captured in the traditional application form. Here's why we value the inclusion of a resume:

(1) **Comprehensive Overview:** While the application form covers essential information, your resume allows us to gain a more comprehensive understanding of your academic and extracurricular accomplishments. It helps us to assess your potential as a research mentee and your ability to contribute meaningfully to the programme.

(2) **Showcasing Your Experiences:** Your resume allows you to highlight various experiences, such as internships, research projects, leadership roles, volunteering, and any other activities that demonstrate initiative and dedication.

(3) **Unique Qualifications:** Every student has unique strengths, and a well-crafted resume can help us recognize your individual qualities that set you apart from other applicants.

Here are some general guidelines on how to construct a good resume:
You can include a range of relevant information in your resume to make it stand out:

1. Educational Background: Start with your academic qualifications, including your high school achievements, GPA, and any noteworthy awards or honors.

2. Internships and Research Experience: If you've participated in internships, work experiences, or previous research projects, be sure to highlight them, along with a brief description of your responsibilities and accomplishments.

3. Extracurricular Activities: Showcase your involvement in clubs, sports, community service, or any other activities that demonstrate your leadership, teamwork, and dedication.

4. Skills and Achievements: Mention any specific skills you possess, such as programming languages, laboratory techniques, or other relevant competencies. Also, include any notable achievements that demonstrate your abilities and dedication.

5. Recommendations and References: You may choose to include references or recommendations from teachers, mentors, or supervisors who can speak to your character, work ethic, and potential.

General Guidelines for a Well-Crafted CV:

Here are some general guidelines to ensure your CV looks professional and effectively showcases your qualifications:

1. Concise Format: Keep your CV well-organized and concise. Aim for a one-to-two-page document that highlights the most relevant information.

2. Clear and Readable Font: Use a clear and readable font (e.g., Arial, Times New Roman) with an appropriate font size (10-12 points).

3. Sections: Divide your CV into clear sections, such as Education, Work Experience, Extracurricular Activities, Skills, and Achievements.

4. Tailored Content: Customize your CV for the research mentorship programme, emphasizing experiences and skills relevant to the field of study.

5. Proofreading: Double-check your CV for any grammatical errors or typos. Attention to detail reflects positively on your application.

Remember, your resume is a valuable tool to make a strong first impression. Take the time to craft a thoughtful and well-organized document that effectively showcases your potential as an aspiring research mentee. Good luck with your application!

ACADEMIC INTERVIEW

THE PURPOSE OF CCIR ACADEMIC INTERVIEW

Each year, CCIR receives an overwhelming number of applications from talented individuals all over the globe, making the selection process highly competitive. As a result, only the most qualified candidates are shortlisted and invited for CCIR Academic Interview. This rigorous process ensures that CCIR can retain exceptional students who are prepared to conduct research and to contribute to the research community.

While it is important to have a solid base of knowledge about the field you are applying for, it is equally important to understand that we are not testing your ability to remember facts. Our goal is to gain insight into your approach to complex questions, and to get a sense of how you think through problems and challenges.

During the interview, CCIR will be interested in learning more about your problem-solving skills, and the ability to think independently and engage with complicated ideas or problems you may have never encountered before. We would like to see how you approach difficult questions, rather than simply evaluating your ability to regurgitate information.

With that in mind, we encourage you to approach the interview with an open mind and a willingness to engage in thoughtful discussion. Be prepared to share your insights and ideas, and to demonstrate your ability to think critically and creatively. Remember, the interview is an opportunity for us to get to know you better, and for you to showcase your strengths and abilities.

CCIR ACADEMIC INTERVIEW FORMAT

The CCIR Academic Interview is a 20-30 minute session that assesses your academic abilities. After the interview, the interviewer will write up a detailed report and give an interview score to each applicant.

The professor(s) responsible for making the final admission decision will receive not only the interview report and score but also the Zoom recording and other materials, such as application forms and transcripts. By combining the information provided in the interview and the application materials, the professors will be able to make an informed decision about whether to admit the applicant to the programme.

Interview Invite

At CCIR, we take great care in selecting suitable students. We meticulously review each application to create a shortlist of candidates for interviews. Please note that this process may take 1-2 weeks or more to complete. If you are unsure whether they have been invited for an interview, please feel free to email our admissions team at admissions@cambridge-research.org.

Interview Time & Zoom Links

If you are shortlisted for an interview, you will receive an email from CCIR which includes all the basic information about the interviewer and the proposed time. If the proposed time does not work, you can suggest three alternative time slots. The scheduling team will then coordinate with you to find a suitable time slot for the interview.

However, we kindly request that you accommodate if possible, as we often interview many students at the same time. Once you confirms the time, you will receive an email containing a Zoom link and a calendar invite.

The applicant is expected to join the Zoom link on time for the interview. To ensure that you don't miss the interview due to time zone differences, please make sure to calculate the time correctly. If you miss the interview without prior notification, you may be moved down on the interview list. This may also impact the admission decision. Therefore, we highly recommend that you inform us as soon as possible if you are unable to attend the scheduled interview so that we can reschedule it for a later time that works for both parties.

Interviewer (CCIR Academic Advisor)

The interview is normally conducted by a CCIR Academic Advisor, a PhD candidate from Oxford or Cambridge, who shares similar interests with the students' research area. They will not be the mentors who lead the Future Scholar research course or the 1-on-1 Research Mentorship, and they are only there to assess your academic ability. The length of the interview would take around 20-30 minutes.

PREPARATION FOR CCIR ACADEMIC INTERVIEW

In the past, we have received a considerable amount of inquiries from applicants who are eager to learn how they can prepare more effectively for the interview. We understand that the interview process can be daunting, and that it can be challenging to know where to begin when preparing for such an important opportunity. Therefore, we have compiled a list of tips and strategies that you can use to help you feel more confident and prepared on the day of your interview.

Technical Preparation

- Please add the interview time to your Google Calendar and confirm the scheduled time
- Make sure you have a good internet connection and download Zoom on your computer.

Academic Preparation

- Make sure that you take the time to thoroughly review all of the materials you submitted with your application, including your personal statement, writing sample, and resume.
- Remind yourself of the reasons why you chose this research area and why you want to conduct research at CCIR.
- Reviewing the material you have recently studied and conducting a broader exploration of the research area
- If you are interested in a topic but have not yet studied it at an advanced level, be prepared to demonstrate some background knowledge related to your research interests
- Continue to practice articulating your thoughts
- Read through the sample questions

WHAT WILL BE ASKED IN THE CCIR ACADEMIC INTERVIEW?

Introduction and Background

During the interview, the interviewer may ask you to give a quick introduction about yourself. Take this opportunity to share anything that highlights your passions and skills. This section is intended to provide the interviewer with a better understanding of you as an individual and should take around 5-10 minutes. The interviewer might ask you the following questions:

- Could you tell me a bit about yourself?
- Why are you applying to CCIR, and what interests you in conducting research?
- What draws you to the research areas of X?
- I noticed on your application that you have experience with X. Could you walk me through that?
- Have you taken any courses related to X?

During the interview, you may be asked general questions about your academic interests and experiences mentioned in your application. For example, if you stated in your personal statement that you have shadowed in a hospital or volunteered at a clinic, and you are applying for a research area in biology and medicine, we would like to know how these experiences helped you gain a better understanding of the subjects or if you learned something interesting from such experiences.

Additionally, we may ask you some questions to determine your level of preparation. For instance, if you are applying for Computer Science, it is natural for us to inquire about your familiarity with programming languages, years of programming experience, and whether you have taken higher-level math courses. If you are applying for humanities or social sciences, we may inquire about your research interests and what draws you to those particular areas. We would be interested in hearing about your preparation, including courses you have taken in school, attending summer school, or reading articles and books on that specific topic.

At CCIR, we recognize that the level of preparation for research can be influenced by a variety of factors. These factors may include the types of courses and resources available at your school, as well as your individual circumstances. Having a long list of extracurricular activities and prior experiences is not necessary for your application, but we would like to see if you have demonstrated curiosity and a willingness to go beyond what you have been offered. If you state in your application that you are interested in computer science and you have never had any formal education in this area, we would not hold that against you. You can still stand out as a strong candidate by taking free online courses and sharing with us what you have built in your spare time, such as projects or tools.

Academic Evaluation/Technical Questions

After conducting the background interview, the interviewer proceeds to ask some technical questions. This part of the interview is designed to assess the candidate's knowledge of the subject matter and their independent thinking skills. The types of questions you can expect during the interview will vary depending on your research interests. There are three types of questions you may encounter, and please note that not all three types of questions will occur. You might be given a more challenging question that takes you more time to solve.

During interviews, most interviewers will ask 2-3 technical questions from the following tiers. They will not cover all of the questions. It is possible that the interview will only ask one question from a single tier, but the question itself can be complicated and lead to a long discussion. All the questions in this assessment will be tailored specifically to your research interests. For example, if you are applying for an art history research course, you certainly would not encounter physics problems that are unrelated to your field of study.

Tier 1 (Simple questions) — These questions are simple and often have very straightforward answers. They rarely occur in interviews and are designed to help students feel comfortable during the interview.

Tier 2 (Multiple-solution questions) — These questions have only one correct answer, but there are multiple approaches to reaching it. Applicants will not only be asked the questions but also to articulate their step-by-step approach.

Tier 3 (Open questions) — These questions may not have a clear-cut answer, but they require a lot of critical thinking and self-reflection from the applicants. By answering these questions, the applicants have the opportunity to showcase their ability to analyse complex issues and articulate their thoughts in a clear and concise manner.

You may face a question or two that you are not familiar with or have no idea how to answer. In such cases, it is important to remain calm and composed and not let any anxiety or fear take over. Instead, take a deep breath and try to break down the question into smaller parts. If you are still unsure about how to approach the question, do not hesitate to ask the interviewer for clarification or tips. This not only shows that you are proactive and eager to learn but also helps you gain a better understanding of the question.

Remember, it is always better to ask questions and seek help instead of staying quiet. Share your thoughts and explain what you need to solve the problem. We are less concerned about whether you can solve the problem quickly, but rather about your thinking process and your willingness to engage with difficult questions.

Different Questions Types and Explanations

Tier 1 Questions

The questions classified as Tier 1 in the CCIR Academic Interview are designed to test a candidate's fundamental knowledge of the subject. These questions have only one correct answer, and the solution should be straightforward. They are typically basic questions that most high school students would know. The interviewer may ask you to define a term, explain a concept, or solve a basic problem related to the research areas in which you are interested.

Here are some sample questions:

- What is protein biosynthesis?
- Since you mentioned that you have some experience in machine learning, could you please explain the similarities and differences between machine learning and deep learning?
- How does DNA transcription work?

Tier 1 questions will not be the main focus of the interview. You may encounter one question in this tier, or you may not encounter any at all. This is because we are less interested in whether an applicant can remember a lot of facts (as this kind of knowledge depends on what they have been taught in school) and more interested in whether the applicant has a natural aptitude for the questions. Tier 1 questions are designed to help applicants feel more comfortable during the interview, as some applicants may be very nervous. The interviewer starts with these simple questions.

Additionally, you will not be asked Tier 1 questions that are not related to your research areas. For instance, if you are applying for computer science research courses, you would not encounter an art history question.

Tier 2 Questions

In Tier 2, the questions are typically more complex and may require applicants to think creatively. The questions may have only one answer, but there are different approaches to the solution. These types of questions occur quite often for STEM applicants.

Here are some sample questions:

- How many ways are there to cover a 2 x n rectangular grid with 2 x 1 tiles?
- Is "P → Q" equivalent to "Q → P"? If yes or no, why is that?

During an evaluation of a candidate's problem-solving skills, an interviewer may ask if the applicant is willing to provide alternative approaches to arrive at a solution. Additionally, candidates may be asked to compare various approaches and identify the advantages of one approach over another.

Tier 2 questions serve as intriguing challenges designed to assess your capacity for innovative thinking and adept problem-solving. These questions encourage you to explore uncharted territories of thought and delve into unique strategies. They are not only interested in the solution you provide but also in the creative process that leads you there.

Tier 3 Questions

Tier 3 questions can be quite challenging as they do not have a clear-cut right or wrong answer. The purpose of these types of questions is to gain a deeper understanding of your thought process and how you approach complex problems. It is essential to take your time when answering these questions and think through all possible angles and solutions.

Here are some sample questions:

- Why would Rolls-Royce choose to build cars by hand, and Honda by machine?
- Should poetry be difficult to understand?
- What recent social phenomenon captures your interest, and can you explain the potential sociological factors that contribute to it?
- What is a monopoly? Are there situations in which monopolies are good?

When you are dealing with Tier 3 questions, it is important to communicate your reasoning clearly and effectively, highlighting not only the answer, but also the thought process behind it. Remember that there is no one correct way to approach a Tier 3 question, as everyone's thinking process and problem-solving skills are unique. During an interview, the interviewer might ask follow-up questions or challenge your answers in order to gain a deeper understanding of your ideas. It is not necessarily a sign of disagreement, but rather an opportunity for you to demonstrate your ability to consider different perspectives.

A Tier 3 question is commonly asked during interviews. Its purpose is to assess whether you can be open-minded when encountering information that contradicts your own beliefs. In addition, we would like to understand your ability to manage and analyse novel information while maintaining your analytical acuity in the face of diverse and often difficult challenges.

SAMPLE INTERVIEW QUESTIONS

In the section below, we provide you with a list of sample questions that you may encounter during your interview. These questions have been compiled from a variety of sources, including questions written by the professors themselves and those by CCIR interviewers. The primary aim of these sample questions is to assist you in gaining a better understanding of the types of questions that you can expect to encounter during your interview.

During the interview, applicants may face questions of varying difficulty levels, including both simple and advanced questions. The specific questions asked will depend on various factors, such as the research courses that the applicants have applied for.

HUMANITIES/SOCIAL SCIENCE/ECONOMICS AND BUSINESS (SIMPLE QUESTION)

- Can you discuss a book, movie, or artwork that has significantly impacted you and your research interest, and could you explain the reasons behind this impact?
- Could you talk about a historical event you believe has shaped the course of human history and elaborate on its significance?
- What were the main factors that contributed to the outbreak of World War I, and how did it impact global politics and societies?
- Can you describe the process of decolonisation in Africa and Asia and discuss its implications for global politics?
- What recent social phenomenon captures your interest, and can you explain the potential sociological factors that contribute to it?
- What is inflation, and what are its potential effects on an economy? Could you provide an example of a situation where inflation becomes a concern?
- When a company is deciding on the pricing strategy for a new product, what factors should they take into consideration?
- How do cultural differences exert influence on international business operations and marketing strategies?

HUMANITIES/SOCIAL SCIENCE/ECONOMICS AND BUSINESS (ADVANCED QUESTION)

Question: Historians disagree over the role that "great individuals" play in history. Some think their influence is greatly exaggerated, while others believe they play an ineliminably pivotal role. What do you think? (Philosophy/History)

Explanation: By asking about the role of "great individuals" in history, the interviewer seeks to evaluate the candidate's understanding of different historiographical perspectives and their ability to engage with complex debates in the field at the conceptual and methodological level. The question challenges the candidate to consider the balance between individual agency and broader historical forces, highlighting the significance of context, societal structures, and collective actions in shaping historical outcomes. The candidate's response would showcase their capacity to think critically and philosophically about historical narratives and demonstrate their ability to navigate and appreciate varying viewpoints within the discipline.

Question: Does “might” make “right”? If so, why do some people think otherwise? If not, what is the difference between “power” and “authority” (Politics/Sociology/History/Laws)

Explanation: A question like this is useful for assessing a candidate’s critical thinking skills, ethical reasoning, and understanding of political theories. The question delves into the fundamental debate about the relationship between power and morality, exploring the concept of "might makes right" and its implications. The interviewer wants to gauge whether the interviewee can articulate their stance on this philosophical issue and whether they can recognize opposing perspectives on the matter. Additionally, the latter part of the question, regarding the difference between "power" and "authority," seeks to evaluate the candidate's comprehension of core political concepts. This is also a good chance for the interviewee to demonstrate background knowledge. Overall, the question helps the interviewer gauge the intellectual depth and analytical skills of the interviewee in the realm of political thought.

Question: Where do you see International Law in fifty years’ time? (Law/Politics/Economics)

Explanation: By asking about the future of international law, the interviewer seeks to gauge the candidate's ability to analye and predict potential developments in the field. The question also evaluates the candidate's awareness of current geopolitical trends, technological advancements, and socioeconomic factors that may influence the evolution of international law over the next five decades. A well-considered response demonstrates the candidate's capacity to think strategically, recognize emerging challenges, and propose thoughtful insights on the role of international law in shaping the world's legal, political, and economic landscape in the future.

Question: What is a monopoly? Are there situations in which monopolies are good? (Law/Politics/Economics/Business)

Explanation: This question is useful for assessing a candidate's understanding of a basic economic concept and their ability to critically evaluate complex issues. Enquiring about monopolies allows the interviewer to gauge the candidate's comprehension of market structures and their potential implications on competition and welfare. By probing whether there are situations in which monopolies can be considered beneficial, the interviewer seeks to identify the applicant's capacity to consider the nuanced political and ethical dimensions of real-world economic policy. A thoughtful response would demonstrate the candidate's ability to weigh the pros and cons of monopolistic situations, showing their analytical skills and grasp of how economic principles intersect with ethical, legal, and political considerations.

Question: The “developing world” should be given more freedom to pollute, as the “developed world” was able to pollute during its industrial revolution. Do you agree? Why or why not? (Law/Politics/Economics/Sociology/Environmental Sciences)

Explanation: This question delves into the complex and contentious topic of environmental science and global justice. By presenting a comparison between the historical industrialization of the developed world and the environmental challenges faced by the developing world today, the interviewer seeks to gauge the candidate's ability to engage in nuanced moral debates. The response would demonstrate the applicant's capacity to consider the implications of unequal historical development, environmental responsibilities, and the necessity for sustainable practices. It also invites the candidate to reflect on the concept of global justice and the balance between developmental aspirations and environmental protection in the context of the evolving world.

Question: Why would Rolls-Royce choose to build cars by hand, and Honda by machine? (Business/Economics)

Explanation: The interviewer might ask this question to candidates applying for economics and business to assess their understanding of business strategies, production methods, and the economics of luxury and mass-market products. By comparing Rolls-Royce's choice to build cars by hand with Honda's decision to use machines, the interviewer aims to evaluate the candidate's capacity to analyse the factors influencing production choices in different industries. The candidate's response should ideally demonstrate their ability to consider the trade-offs between craftsmanship and mass production, market segmentation, cost-benefit analysis, and the impact of these decisions on the respective companies' competitiveness and customer base.

STEM QUESTION (SIMPLE QUESTION)

- What is the difference between a hypothesis and a theory in scientific research?
- How do you differentiate between correlation and causation in research findings?
- What is a placebo, and why is it used in clinical trials?
- What is a neuron and what are its basic components?
- What are the major differences between the somatic nervous system and the autonomic nervous system?
- What is DNA? What is RNA?
- What is the primary function of enzymes in living organisms?
- What is machine learning, and how does it differ from traditional programming?
- What is training data in machine learning?

STEM QUESTION (ADVANCED QUESTION)

Question: What is the next number in this series? 4, 6, 12, 18, 30, 42, 60, xx? (General Aptitude)

Explanation: This type of question is relatively simple, and it often occurs at the beginning of an interview. Its purpose is to help the candidate prepare for some more in-depth questions later. The focus of the interviewer will be more on the thought process rather than just right or wrong answers. Along the way, it is essential to note how many different sequences the student can think of, including but not limited to summation, difference, squares, square roots, sums of halves, factors with an addition/subtraction, and so on.

Question: You need to measure out four gallons of water, but you only have a three-gallon jug and a five-gallon jug. How do you measure out four gallons exactly? (General Aptitude)

Explanation: For this question, the candidate would be evaluated on how much time they spend and how many different possibilities they are coming up with. Here are two approaches:

- Fill the five-gallon jug twice with the help of the three-gallon jug. You will be left with a gallon inside your three-gallon jug. Now you have one gallon. Another fully filled three-gallon jug, along with this one-gallon, will give you four gallons.
- Fill the three-gallon from a fully filled five-gallon hug, and you will be left with two-gallon. Repeat this one more time, to get another two-gallon. And you have achieved four gallons.

Question: **Suppose a study found that, within one and the same family, first borns tend generally to display higher IQs than second borns. What are some possible hypotheses you can think to account for this trend? What might be a tempting, but bad hypothesis, and why? (General Aptitude)**

Explanation: With this question, the interviewer aims to evaluate the candidate's ability to generate plausible hypotheses to explain a possible (imagined) trend. The question tests the applicant's knowledge of psychological and sociological theories and their capacity to consider various factors that could influence intelligence within family dynamics. Additionally, the interviewer seeks to identify if the candidate can distinguish between valid and flawed hypotheses. The temptation of a bad hypothesis could be to assume that birth order directly causes higher IQ, without considering confounding variables or alternative explanations, highlighting the importance of discerning sound research practices and avoiding hasty conclusions in sciences.

Question: **You're organising a May Ball (Cambridge Summer parties) and have ordered 1000 bottles of Grand Cru champagne. 20 hours before the event starts, the wine merchants inform you one bottle has been poisoned by 'the other place', with a poison that remains completely symptomless until it kills the victim 18 hours later. You have 10 first-years available to test the wine to find the poisoned bottle. Is there a way to find the poison before the ball starts? (Computer Science)**

Explanation: The time crunch posed by this problem makes our task all the more challenging. If it weren't for this, we could perhaps tackle the problem through a simple search algorithm.

Now, as to the task at hand. One way to tackle the problem is to label our bottles in order as 10-bit binary numbers, i.e. bottle 992 = 1111100000. Let undergraduate 1 take a sip from every bottle containing a 1 in the first bit, undergraduate 2 take a sip from every bottle containing a 1 in the second bit, and so on. Then, we may line up all the undergraduates on the 18th hour and count those standing as a 0 and those collapsed on the floor as a 1, thus giving us the position of our poisoned wine.

Question: **How to swap two integers without using a third variable? (Computer Science)**

Explanation: The questions in this assessment are designed to evaluate your quantitative and algorithmic capabilities, which are essential skills in computer science. You can achieve the answer through simple + and - operations:

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a = a + b;
b = a - b;
a = a - b;
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The follow-up question could be whether the answer holds up in all conditions. However, the answer is no. The integer will overflow if either - (1) the addition value is more than the maximum value of int defined by the Integer.MAX_VALUE or(2) the subtraction is less than the minimum value of int defined by Integer.MIN_value

Question: **You've been skipping supervisions (small group classes) for the past term and your professor is starting to get rather unhappy. You both tend to get hungry between 6 and 7pm and frequently spot each other in hall. You're both busy people and like to finish your meals in 10 minutes. What's the probability you meet each other over dinner?(Computer Science/Data Science)**

Explanation: Let us start by considering the criteria for a meeting. This should be relatively clear to a candidate as condensing down to (assigning random variables to the arrival times of supervisor and undergraduate as S and U, respectively) the criterion of $|S-U| \leq 10$. With this criterion in mind, a diligent candidate will then begin to question how we may be modelling these random variables, and what distribution we should assume for them. This presents an opportunity for discussion with the interviewer but for the sake of the interview, a uniform distribution between 0 and 60 makes the most sense.

The problem may then be tackled by performing integration using the derived criterion or may (perhaps more simply) be tackled graphically. Consider a diagram showing S against U. If we are to plot the criterion derived, we will find this to form a diagonal strip from the bottom left to the top right of the region. The area of this strip relative to the overall area will be the probability we are looking for. This is most easily found by subtracting the area of the two triangles formed around the strip from the overall area, i.e. $(60 \times 60 - 2 \times (0.5 \times 50 \times 50))/(60 \times 60) = 0.306$.

Question: **How to implement a queue using a stack? (Computer Science)**

Explanation: This would require two tacks. The implementation is as follows.
(1) An entry is inserted in the queue by pushing it into stack 1
(2) An entry is extracted from the queue by popping it from stack 2
(3)If stack 2 is empty, then all entries currently in stack 1 are transferred to stack 2 but in reverse order
(4) If stack 2 is not empty, just pop the value from stack 2.

This is a challenging question, and the candidate will be given ample time to think about it. The accuracy of the candidate's answer will depend on how well the candidate's implementation performs under various conditions. The implementation outlined above should perform well in all cases. However, the correctness of the candidate's answer will depend on the implementation and any expected errors involved.

Question: **Assume running linear regression on dataset X to obtain $y \sim ax + b$ and on dataset Y to obtain $x \sim cy + d$. What is the range of ac? (Computer Science/Data Science)**

Explanation: We do not expect candidates to have knowledge of linear regression or ask questions in this area unless they mention taking higher-level maths courses and being seriously engaged with machine learning or data science.

For simplicity, we can assume that both datasets have a mean value of zero. We can always scale the datasets to make the mean value to be zero.

The correlation measurement, called the correlation coefficient, will always take a value between 1 and -1.
If the correlation coefficient is one, the variables have a perfect positive correlation.
If the correlation coefficient is zero, the variables have no relationship.
If the correlation coefficient is -1, the variables have an inverse correlation.

Further, by employing Cauchy-Schwarz Inequality,
$|\langle x,y \rangle|2 \leq \langle x,x \rangle \langle y,y \rangle$

The bounds of ac will then be between 0 and 1.

Question: **How to avoid overfitting?**

Explanation: We do not expect candidates to have knowledge of linear regression or ask questions in this area unless they mention taking higher-level maths and computer science courses.

There are various solutions to improve the performance, including but not limited to: (1) Training with more data, (2) Tweaking existing data, (3) Cross-validation, (4) Regularization, and (5) Ensembling, among others. It's essential to be aware that the interviewer is likely to have follow-up questions and may engage in a more in-depth discussion on these topics.

Question: **You pick up a filthy stick covered in insects. The insects are facing random directions all along the stick. The stick has a length l and there are n insects. The insects start moving at a speed s as soon as you pick up the stick, with each insect reversing in direction as soon as it collides with another insect. As soon as an insect reaches the end of the stick, it tumbles to the ground and its untimely death. What is the maximum time you must hold the stick until all the insects are eradicated? You may assume the insects are a point. (Mathematics)**

Explanation: Many candidates may be thrown off by the mention of insects changing direction upon collision. Strong candidates will notice this to be a red herring. This may be seen by numbering the insects and assuming that each collision represents an exchange of the numbers associated with the colliding insects, at which point it may be observed that the number does not change direction or hesitate. This means the question is simply asking us the maximum time an insect may be on the stick. This becomes a trivial calculation of a distance l divided by the speed of an insect s, i.e. t = l/s.

A potential follow up question may ask a candidate to provide an expected time for the cleansing of the stick or potential effects of variable speeds among insects, etc.

Question: **Prove that $n^3 - n$ is divisible by 6. (Mathematics)**

Explanation: Some candidates may struggle with this type of question, but it is important to remember that the interviewer is not just looking for the correct answer. Instead, they want to see how you approach complex problems and how you think through challenges.

For this question, the key is to understand the question thoroughly. The main breakthrough is to begin by proving divisibility by 2 and 3. Additionally, recognizing that the three numbers are consecutive integers will simplify things further.

The answer is $n^3 - n = n(n^2 - n) = n(n+1)(n-1) = (n-1)*n*(n+1)$

Basically, there are three consecutive numbers. So, at least one of them should definitely be an even number and therefore divisible by 2. By the same logic, one of them should also be divisible by 3. Since it is both divisible by 2 and 3, it is also divisible by 6.

Question: **Conventional thinking suggests that adding insulation to a hot water pipe leads to less cooling of the water inside. Is this conventional thinking always correct? (Physics)**

Explanation: In the majority of cases, this logic is pretty sound. We can typically expect adding insulation to a pipe to help reduce heat flow from the pipe and thus less cooling of the water inside. This will not always be the case, however. Even with materials that may be considered insulators, situations may be conceived in which they do not fulfil their purpose.

A candidate would be expected to walk through the logic of how insulation would typically work and then, with this prompt in mind, think of an example of it not working.

Probably the most obvious reason for increases in the cooling of the water is the insufficient thickness of the insulator. It may be found that with only a thin layer of insulation, the increase in the surface area of the piping leads to greater heat loss. Candidates would be asked to discuss how this effect takes place and perhaps (with help) to derive some of the heat transfer equations.

Other examples could perhaps be disruption of air currents by the insulation leading to greater heat transfer from the surface to the surrounding air, changes in the colour leading to less heat absorption from incidental light, etc. Can you think of any more?

Question: **How far into space can we see? (Physics/Astronomy)**

Explanation: This question seems to be a really simple question, but it is interesting, and yet in-depth question touching various aspects of astronomy and astrophysics.

One straightaway answer could be 13.8 billion light years away. This could signal some understanding of the big bang timeline. But the exact answer is not that simple. The light from the big band might have taken 13.8 billion light years to travel. Considering that the big bang itself took very less time comparatively. The student will arrive at the right answer if they take into account that the universe is ever-expanding and that time and space are interrelated; Therefore, while the first light might have taken just 13.8 million light years, it travelled more than just that distance during this period to reach our eyes. Many concepts are intertwined in this discussion, including 'The Alcubierre drive', 'Red Light shift', and 'The big bang theory'.

Question: **How many subatomic particles can you think of? (Physics)**

Explanation: This question is designed to test the candidate's understanding of basic concepts. It is a common type of question asked at the beginning of interviews to assess the candidate's background knowledge. The candidate will be evaluated on their ability to name and quantify as many fundamental particles as possible. In theory, there are more than 36 confirmed fundamental particles, which can be classified into elementary and composite particles. These include various quarks and their corresponding anti-particles.

Question: **Can you list and differentiate different particle accelerators? (Physics)**

Explanation: This question is relatively straightforward. It can be asked at the beginning of the interview and used to open a conversation. Candidates could go beyond the three basic particle accelerators. Furthermore, candidates could consider additional factors beyond just the path shape. These factors might include the constituents used, size, year of discovery, speed reached, time taken, and collisions per second, among others.

Question: **Why do humans appear to have less body hair than many of their closest related species? (Biology)**

Explanation: One initial observation that a candidate may choose to make is to question the basis of the question. If we are to base our measurement on the number of hairs per square centimetre, the number remains about the same between apes and humans, around 60. This would naturally lead to questions about the difference in density and pigmentation.

One obvious next step is to suggest that there is an element of thermoregulation, as one can naturally imagine an increase in heat retention with a thick layer of fur. This is sound logic but other mechanisms of this interaction will be pushed by the interviewer. The relationship is not as simple as that of a layer of 'fur' trapping heat. One example to prompt thought that may be provided is that of the propensity of apes to pant when the temperature increases. Do we observe the same in humans? Why not?

This again, flows nicely into a discussion of the mechanism of human heat dissipation and the role of sweating in this. The loss of hair density dramatically aids the body's ability to perform evaporative cooling with sweating. Some debate certainly remains around the order of these adaptations (location of sweat glands vs reduction in hair density) but this provides ample opportunity for lively discussion!

Question: **What do antibiotics target? (Biology)**

Explanation: This question is relatively straightforward and is often asked at the beginning of an interview to help warm up the discussion. It might be wise to inquire back if the interviewer is interested in bactericidal antibiotics or bacteriostatic antibiotics. Bactericidal antibiotics kill the bacteria, whereas bacteriostatic antibiotics only stop the growth of the bacteria without killing them. You can use different classes of antibiotics to explain in more detail the workings of various types, including narrow-spectrum and broad-spectrum antibiotics.

Question: **What is Mendel's ratio? Can you explain Mendel's law? (Biology)**

Explanation: If candidates are applying for the biology research course or have studied biology at school, they may have already encountered Mendel's laws. However, the interviewer will take into consideration that some candidates might not be familiar with the name. In that case, the candidates will be directed to answer questions related to the laws of dominance, segregation, and independent assortment.

Question: **Taken in a broad enough sense, animals of course "think". But clearly, they don't think in the same sense or way that humans think. What is the essential difference between human cognition and animal cognition? (Biology/Neuroscience/Psychology)**

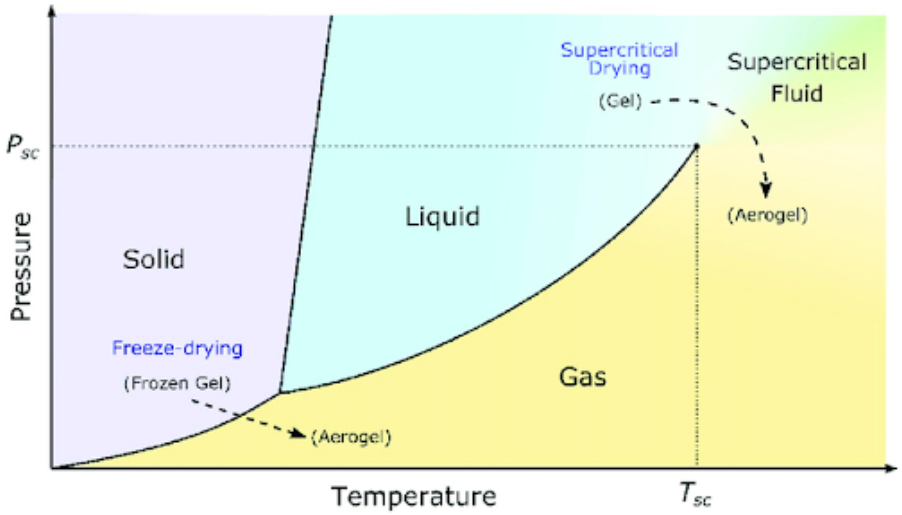
Explanation: This is an open-ended question that aims to encourage the interviewer and the candidate to engage in a deeper discussion on neuroscience, cognitive science, and psychology. The question delves into the distinction between human cognition and animal cognition, challenging the applicant to identify and articulate the essential differences in how these two groups of beings think. The interviewer might ask the candidate what is attributed to these differences, and then move on to more technical questions.

Question: **Aerogels are an interesting case of a material with some remarkable properties as an insulator with a very low density. This is by virtue of it being primarily composed of gas. They are essentially gels whereby the liquid component has been replaced by gas. They are typically very fragile structures. How might we go about forming these substances? (Chemistry)**

Explanation: This question raises some interesting opportunities for discussion of various aspects of physical chemistry. Candidates may initially see a replacement of a liquid component by gas and consider the possibility of boiling away the liquid. This seems sensible but is non-viable in practice due to the fragility of the material and the inevitability of collapse from this technique.

At this point, an interviewer would likely produce a phase diagram. The candidate will then have the opportunity to discuss possible paths to reach the desired phases while avoiding the liquid-vapour transition that causes collapse.

A strong candidate will spot the opportunity to pass through the supercritical fluid region by increasing pressure, increasing temperature, decreasing pressure, then decreasing temperature. This will elucidate discussion of the different phases and movement around a phase diagram. Many follow up questions about phases and potential properties of aerogels are available to an interviewer.



Nanomaterials in Advanced, High-Performance Aerogel Composites: A Review (https://www.researchgate.net/publication/332587174_Nanomaterials_in_Advanced_High-Performance_Aerogel_Composites_A_Review)

Question: **How many water molecules are present inside our body? (Chemistry)**

Explanation: For this question, we are not expecting the exact number from candidates. The interviewer does not anticipate the candidate to perform calculations and determine a specific number. Instead, what candidates should do is walk through the thinking process. If candidates need additional information, such as the percentage of water in our body and the average molar mass of water, they can ask the interviewer.

To solve this question, one would need to calculate the number of moles using the formula n = m/M. Once that has been done, one needs to make use of Avogadro's law to calculate the number of molecules present in the calculated moles.

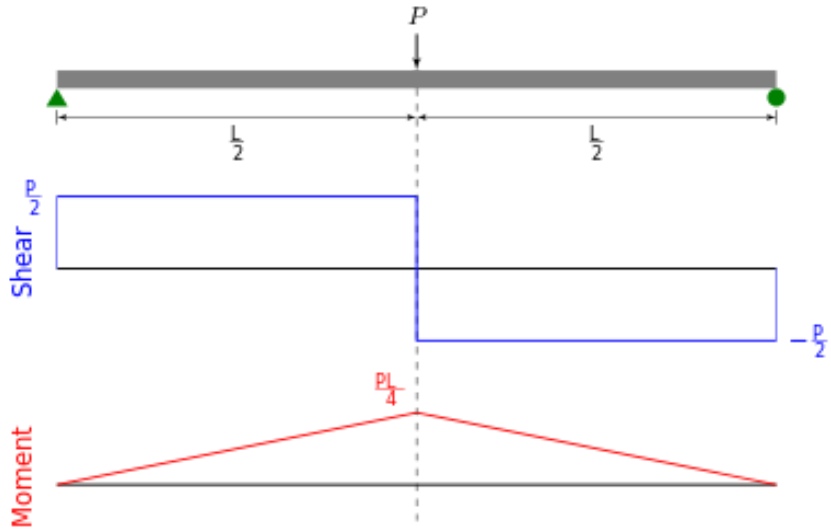
Question: **You wake up and find yourself clinging to a rope hanging over a pulley with a weight on the other end. You find yourself initially balanced with the weight and unmoving. You spot a ledge above you and a pit of vipers below you. Can you escape this treacherous situation? (Engineering)**

Explanation: The first step is really to consider what escape might look like. Perhaps you consider yourself invincible in the face of a thousand snakes, but I consider myself rather less so. So we'll establish that survival looks like reaching the ledge. The candidate should now begin to think about how they might be able to reach that ledge. One simple solution might be to shed some weight quickly, thus letting the weight raise you up. This would certainly work and leads to ample opportunity for creativity in how to shed weight quickly. But this one is rather boring.

ALet's instead assume you can't shed any weight. How could you then go about things? The only apparent method is to begin climbing up the rope. But will this work? What will happen as you begin climbing? It is found that the action of pulling on the rope to attempt to raise yourself up is indeed successful. It will lead to the raising of the weight while also raising yourself towards your escape. The additional force exerted by yourself on the rope will pull both you and the weight upwards, requiring more work than simply climbing a rope (twice as much in fact).

Question: **Explain the forces on a simply supported beam. (Engineering)**

Explanation: The question delves into the concepts of structural engineering, specifically focusing on bending moment and shear force diagrams. It would be sufficient if the candidate could justify how the forces act and their respective distribution. Importantly, candidates are expected to pinpoint the locations where the forces will be at their maximum and minimum values.



Question: **How are Torque and RPM related? (Engineering)**

Explanation: The answer is rather straightforward: there is an inverse relation. Torque = HP X 5252 / RPM, so as RPM increases, torque drops. The candidate will be given a chance to elaborate more. This question could be interpreted more as an automobile engineering question - why max torque is obtained at lower RPM. This type of question is often used by interviewers to open up further discussion and explore the candidate's knowledge in the field.

AFTER YOUR INTERVIEW

After the interview, your interview recording, interview report, and score written by the interviewer, as well as the application materials, will be shared with the professor in order for them to evaluate your suitability for the programme.

At CCIR, we embrace a holistic admission process. We take into consideration every aspect of your application, including your academic background, relevant experience, extracurricular activities, and personal qualities. Your performance during the interview will be taken into consideration. We will consider whether you have demonstrated the necessary skills, knowledge, and passion for the field.

Our goal is to make a decision that is not only fair but also benefits both the applicant and the peer-learning environment. With this objective in mind, we take great care to meticulously evaluate every aspect of the applicant's submission, weighing all the relevant factors before arriving at a final decision. We understand that this is a crucial decision for the applicant, and we are committed to ensuring that we take all the necessary steps to arrive at the best possible admission decision.

If you have any questions or concerns regarding the admission process or admission decision, please contact:

CCIR Admissions
admissions@cambridge-research.org

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