 Peer review is the system used to assess the quality – validity, significance and originality - of scientific research before it is published. It's not perfect, relies heavily on trust and, as scientists are human, there will always be cases of misconduct. But it is a process that is essential for the advancement of scientific knowledge and it helps the public get an understanding of research quality. Here are some challenging questions you might get asked about peer review and how to reply:

**Does the peer review process slow down advances in science?** In our fast-paced world, a deliberative process like peer review can seem frustratingly slow. Electronic communication has improved it, but good assessment of research does take time. But, although some papers take months to review and improve, if there is a major breakthrough the process can be completed in weeks. Furthermore, if the findings are very important e.g. they concern public health, then it's all the more necessary to check them through peer review.

**Why are some papers retracted even after they have been peer-reviewed?** Peer review is not a fraud detection system. Referees are likely to detect some wrongdoing, such as plagiarism or fraudulent data because they are knowledgeable about the area of research. However, if someone deliberately sets out to falsify data, there is sometimes no way of knowing this until the paper is published and others in the scientific community scrutinise and try to repeat the work.
Is maverick science rejected through peer review? Some people worry that new science might not be understood by other scientists. While referees can indeed be cautious about unusual findings, and important insights can initially be overlooked, if someone has been exceptionally clever, other scientists are most likely to recognise and distinguish it from flawed or inflated claims. Journal editors like novel ideas and scientific publishing has brought thousands of important discoveries to light.

Is there an alternative to peer review? The peer review system is not perfect and can suffer from problems of bias, fraud and a lack of transparency about how it works. To tackle some of these issues, a number of new approaches to peer review have arisen which seek to engage the reviewers and authors more actively in the process, before and after publication:

- **Preprint** – a paper that is posted online, often in a repository like arXiv, before it has been through the peer review process. This can allow researchers to access papers quickly, but it sometimes allows papers of insufficient quality out into the public.

- **Post-publication peer review** - when a paper is scrutinised and reviewed by experts after it’s published. This is in contrast to pre-publication peer review, which is the conventional process where research is peer-reviewed before it is published.

- **Collaborative peer review** – when two or more reviewers work together to review a paper and submit one unified report.

- **Transparent peer review** – when the entire peer review process, including reviewers’ reports, the authors’ replies, and the editorial decisions, are posted alongside the published article.