Annex A

Details of Projects submitted by the Singapore Delegation

S/N	Student(s)	Project Description and Team's Insights
1	**Name:** Austin Liu Zi Rui (刘子睿) **School:** Raffles Institution **Level:** JC2 **Age:** 17 **Language Proficiency:** English, Mandarin	**3DICE: Interpretable 3D Cross-Modal Learning for Drug–Target Interaction Prediction and Large-Scale Drug Discovery** Developing new medicines is extremely costly and time-consuming, where one major challenge is in identifying which drugs are likely to interact with which protein targets. To tackle this, Austin developed 3DICE, a novel AI framework that can predict drug–target interactions by learning both the chemical properties and physical shapes of drugs and proteins. Beyond providing a simple yes-or-no answer, the framework explains its reasoning, pinpoints the specific parts of a drug or protein it considers most important, and offers insights into where interactions would occur. 3DICE's combination of accuracy, efficiency, and transparency can therefore help to save costs and accelerate the search for new medicines. Representing Singapore at ISEF was a meaningful experience for Austin, who is grateful for the opportunity to engage in scientific discourse with like-minded peers that have inspired him with their passion for science. He is thankful for his teachers, mentors and friends for supporting him throughout this journey, as well as the new friendships forged along the way.

S/N	Student(s)	Project Description and Team's Insights
2	**Name:** Caelen Chang Kai Mun (程楷文) **School:** Hwa Chong Institution **Level:** JC2 **Age:** 18 **Language Proficiency:** English, Mandarin **Name:** Javier Ng Wei Quan (黄玮全) **Sex:** Male **School:** Hwa Chong Institution **Level:** JC2 **Age:** 17 **Language Proficiency:** English, Mandarin	**SNIPER: Engineered Specificity Unlocks Multi-Kilobase Isothermal Amplification for High-Throughput Sequencing** Deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) sequencing underpins a wide range of applications, from cancer screening to pathogen detection. However, sequencing often requires an initial amplification step using Polymerase Chain Reaction (PCR) to generate sufficient genetic material – a process that depends on repeated temperature cycling, which increases costs, labour and time. Caelen and Javier developed SNIPER, a long-target amplification method that operates at a single temperature. By streamlining cumbersome PCR workflows, they hope that SNIPER can make sequencing more accessible across clinical, field and laboratory settings. Reflecting on their ISEF experience, Caelen and Javier are glad to share their research with scientists from leading biotechnology companies and universities around the world, and to connect and bond with fellow student researchers through their shared love for STEM. They are thankful for the unwavering support of their research mentor, teachers, family, and friends throughout their ISEF journey.

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3	**Name:** Ge Jingyi (葛静怡) **School:** Raffles Institution **Level:** JC2 **Age:** 17 **Language Proficiency:** English, Mandarin	**Optimizing Bacterial Outer Membrane Vesicles (OMVs) for mRNA-Based Immunogene Therapy** Cancer is one of the leading causes of death worldwide, claiming nearly 10 million lives each year and driving an urgent search for new treatments. One promising approach is mRNA therapy, which helps the body produce proteins that stimulate the immune system to fight cancer, but delivering mRNA safely and effectively remains a major challenge. To address this, Jingyi explored bacterial outer membrane vesicles (OMVs) – tiny bubble-like nanoparticles released by bacteria – as a potential delivery vehicle. By coating these natural carriers with a sugar called mannose, she demonstrated better targeted delivery to certain immune cells. Her findings highlight the potential of using natural biological carriers alongside modern gene therapies to develop safer and more effective next-generation cancer treatments. For Jingyi, ISEF 2026 was a once-in-a-lifetime opportunity to engage with a global community of young researchers and to witness firsthand how science brings people together. It also provided her a platform to share her work with others in an environment that promoted conversations and the open exchange of ideas. She is thankful for the support of her mentors, teachers, friends.

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4	**Name:** Lee Chong Jin, Ian (李宗锦) **School:** NUS High School of Mathematics and Science **Level:** Year 5 **Age:** 16 **Language Proficiency:** English, Mandarin	**Death by Glucose: Limiting pyruvate kinase activity reduces cytotoxic effects of Spike protein of SARS-CoV-2** The SARS-CoV-2 virus – the coronavirus that causes COVID-19 – alters the way host cells metabolise glucose, by diverting the glucose in our cells away from energy production and towards the creation of new viruses. This explains why diabetics with high blood glucose levels experience more severe COVID-19 symptoms, and how individuals are at higher risk of developing new-onset diabetes post-infection. Understanding how the virus subverts our cellular glucose processing system is the first step towards designing metabolic therapy. Ian's project has uncovered one such pathway, by identifying effects of the viral Spike protein on a key glucose processing enzyme, and demonstrating that these effects can be reversed with an enzyme inhibitor. Ian found ISEF 2026 to be an unforgettable learning experience, where the calibre of scientific discoveries by high school students inspired him to stay curious and creative in his pursuit of new therapies for the benefit of society.

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5	**Name:** Tan Min Sen (陳銘森) **School:** Raffles Institution **Level:** JC2 **Age:** 17 **Language Proficiency:** English, Mandarin **Name:** Zachary Choy Kit Chun (蔡傑竣) **Sex:** Male **School:** Raffles Institution **Level:** JC2 **Age:** 18 **Language Proficiency:** English, Mandarin	**Keep Your Data Close, but Your Failures Closer: Failure-Driven Adversarial Self-Evolution of Language Models** Large language models (LLMs) can solve complex problems in mathematics, medicine, and science, yet they remain unreliable – small changes in how a question is worded can cause a model to fail, even on problems it has solved before. This poses serious risks in high-stakes settings such as medical diagnosis, where consistency is critical. To tackle this, Min Sen and Zachary developed an automated training framework that teaches an AI model to improve itself by learning from its own mistakes. Using language-based feedback, the framework systematically identifies each model's weak points and generates targeted training data at the boundary of what it can and cannot solve. Tested across mathematical reasoning, medical diagnosis and protein biology, the approach consistently outperforms existing training methods without the need for any human-designed training data. ISEF 2026 was a valuable opportunity for Min Sen and Zachary to connect with passionate students and researchers from around the world and to share what they had learned, where insightful conversations with experts and like-minded peers left them curious and inspired about the real-world potential of AI. They are grateful for the support of their mentors, teachers and families throughout their research journey.

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6	**Name:** Ying Liqian (应礼谦) **School:** NUS High School of Mathematics and Science **Level:** Year 5 **Age:** 16 **Language Proficiency:** English, Mandarin	**Complexity Functions Are All You Need** Integer Complexity is an active research area in number theory, concerned with determining the minimum number of ones required to construct an expression that evaluates to a given integer using only addition, multiplication and parentheses. Having identified gaps in existing research, Liqian developed both a general mathematical framework to tackle a broader class of problems, as well as specialised results targeting a highly generalised form of Integer Complexity. His framework and methodology uncover elegant connections across diverse subfields of mathematics and into fields like engineering and beyond. ISEF 2026 was an eye-opening experience for Liqian, who was captivated by the interdisciplinary work of his fellow student researchers. He looks forward to extending his research into the intersection of mathematics with other disciplines, and is thankful to his parents, mentor and friends for their support throughout this journey.