

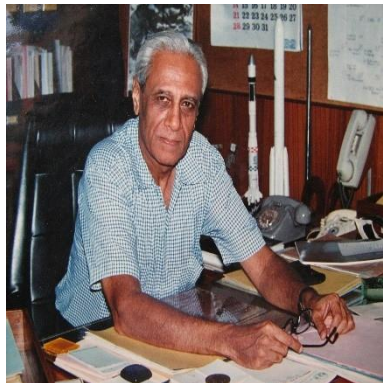


## Instructions

- The prelim consists of **30 questions, with a total score of 50.**
- The exam will start precisely at **10:00 AM, July 24, 2022 (IST)**
- The total time allotted for attending the quiz is 40 minutes. Teams must submit their answers by **10:40 AM, July 24, 2022 (IST).** **No late submissions are allowed.**
- **One of the team members should log in to the exam portal using their credentials and attend the exam.** Both members are NOT required to log in separately.
- All team participants are encouraged to take the test from a single PC, i.e., at the same location.
- Even if the team members are in different areas, they discuss the answers amongst each other on call or in whatever mode they deem fit.
- **A pdf file with the prelims questions will be sent to the registered mail-id of all participants within 5 minutes of the start of the quiz.** This is for the teams having teammates at a different location, one of the team members can use this pdf file to see the questions without logging into the exam portal.
- Discussion of answers with anyone other than your teammate is strictly prohibited.
- Cheating/use of the Internet is highly discouraged. Once you qualify from the prelims, there is an interview round to check whether you attempted the quiz honestly or not, which will decide qualification to the Finale.
- Questions are divided into **three sections — ten questions** each in every section.
  - Section 1 = 15 points
  - Section 2 = 15 points
  - Section 3 = 20 points
- **No negative marks on any questions.** In 80% of questions, the answer would be straightforward and familiar to you. Hence, you are encouraged to guess the answers.
- **Do not worry too much about the correct spelling; if we understand what you mean, you will get points. Try to give as complete an answer as you can.**
- The top 16 teams from the prelims will qualify for the interview. We can consider taking more teams depending on the performance.
- In the case of equal scores, the score obtained in section 3 will be used to break the tie. If the tie persists, we will use the section 2 score.
- For any clarifications regarding the questions during the exam, you can email the team at [quadsparks.pravega@gmail.com](mailto:quadsparks.pravega@gmail.com) or contact the coordinator, **Senin: 9847967902.**
- For any technical issues, please contact **Snehasish: 9547801124**

**Section 1 (15 marks)**

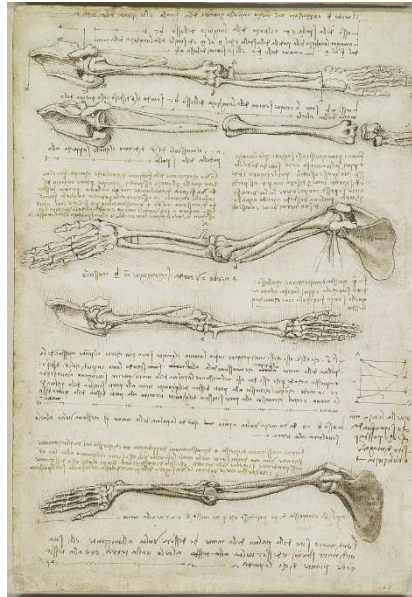
1. JN Tata established this Institute, famous for its academic research. Morris Travers was the first director in 1909 at the time of establishment, and CV Raman became the first Indian director in 1933. The first image shows a statue of JN Tata holding a replica of the main building of this Institute. The second image shows a former director of the same Institute and a familiar name for Indians. **Identify the institute, as well as the man in the image. (2 marks)**



2. This is a science award in India given annually by the Council of Scientific and Industrial Research (CSIR) for notable and outstanding research, applied or fundamental, in biology, chemistry, environmental science, engineering, mathematics, medicine, and physics. The prize comprises a citation, a plaque, and a cash award of ₹5 lakh. It is named in honor of the founder-director of CSIR, pictured on this postage stamp. It is arguably the most coveted science-and-technology honour in India. **Name the man, or the eponymous award. (1 mark)**



3. This extract explains the motion of the arm investigated by a famous polymath. Identify them. **(1 mark)**



4. In many caves, one can see these special structures, which are formed when water droplets with different concentrations of  $\text{CO}_2$  interact with air. These droplets must have calcite and aragonite crystals in them. The various craters in the soil act as nucleation points, and the lack of powerful degrading elements like strong wind and water facilitates their growth. **The ones growing downwards and those growing upwards have different names. What are they? (Identify both) (2 mark)**

5. In December 2012, Bhuvneshwar Kumar debuted in international cricket. In his debut match he got 2 wickets within the first 5 overs. In one of them, the Pakistani batsman felt that the ball was not going to hit the stumps and left it. However, to his surprise, the ball came back in, and he got bowled out. **This occurred due to a certain scientific effect. Name it. (1 mark)**

6. Connect the following images to a hormone. What does the third image indicate? (2 marks)



7. Galileo and this English playwright were born in the same year (1564). By the time Galileo aimed his telescope at the night sky however, the English playwright was nearing the end of his career. But he wasn't quite ready to put down the quill: his later play Cymbeline contains what may

be an allusion to one of Galileo's greatest discoveries. **Name the playwright and the discovery. (2 marks)**

8. The name of this space project was given by administrator Sean O'Keefe in 2002 after X, another administrator of the same organization during the 1960s. The name became controversial because of the involvement of X in the Lavender Scare – moral panic about homosexual people which led to their mass dismissal from government service. The logo of this project, which became very popular in July 2022, is given below. **Identify X or the name of the space project. (1 mark)**



9. We have seen many celebrities with blue eyes, such as Hrithik Roshan or Aishwarya Rai. The **phenomenon behind this occurrence** is named after a famous 19th-century Irish scientist, also credited with discovering another popular phenomenon in the atmosphere, which you may have experienced on a foggy morning. **What phenomenon are we talking about? (1 mark)**

10. This term became synonymous with research fraud after a 1974 incident. In the 1970s, a scientist became famous after his announcement that he could transplant tissue from unrelated animals by keeping the tissues in culture for a certain period. He demonstrated the breeding of white-furred mice with patches of fur from black mice and claimed the transplantation of black skin onto the white-furred mice. But one day, his lab assistant noticed that the black patch on the white mouse could be removed by applying alcohol. It was later proved that he had simply used a black marker pen to color the white fur. **What is the term inspired by this incident to describe research fraud, and who was the scientist involved? (2 marks)**

**Section 2: (15 marks)**

11. This picture shows a particular phenomenon, which, according to ancient folklore, is a sign that portals to the fairy world have opened. **What is this phenomenon?** Between the two-colored regions in the picture of the phenomenon, there are also darker regions. **What are these darker bands called? (2 marks)**

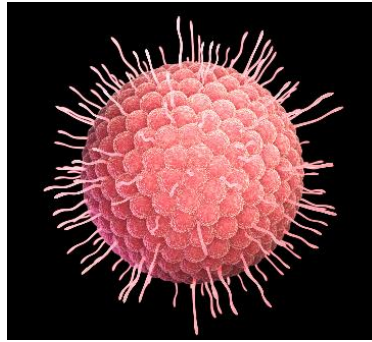


12. Boudhayan was an Indian mathematician and theological scholar who lived in the 8<sup>th</sup> century BC. Boudhayan's work is organized into six or more sutras, including the Shrautasutra, the Dharmasutra, and the Sulbasutra. The Sulbasutra, a primarily mathematical text, contains descriptions of what is today known as \_\_\_\_\_. He describes these using ropes for a real-life model and includes a list of numbers that satisfy \_\_\_\_\_. However, \_\_\_\_\_ is popularly attributed to another mathematician, born a few centuries after the Sulbasutra was written. **FITB.** (Blanks are not indicative) **(1 mark)**

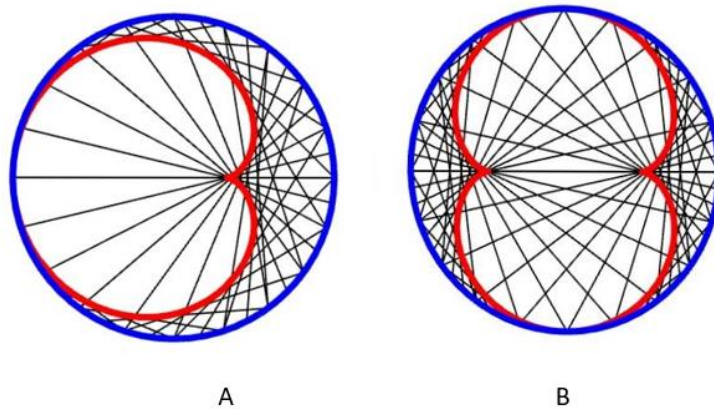
13. In the 1950s, this scientist worked at Cornell University where he built heart monitors for veterinary research. One day, he accidentally inserted a resistor of lower impedance into the circuit which immediately began to cyclically emit an electrical pulse. This mistake saves millions of lives at present! A company of this scientist used to make batteries for 90% of this instrument. (2 marks)  
**Who is the scientist, and which instrument? (2 marks)**

14. The following image shows virus X responsible for the well-known airborne disease Y. In the body of a recovered person, virus X can remain dormant for years, and it usually hides in the dorsal root ganglion. In some cases, this virus gets reactivated again – this can affect facial nerves leading to the disease Z. Z is named after the doctor who described it first in 1907. **Identify X, Y, and Z. Why has the disease Z grabbed eyeballs recently? (2 marks)**





15. What biological-sounding names are given to these two epicycloid structures A and B due to their shape? (2 marks)



16. What the Europeans used was limiting, difficult to use, and non-standardized for much of its history. What the Indians invented was far superior and opened immense possibilities to those using it. Though the European way is still used, it is for aesthetic purposes rather than functional. **Name this invention which has travelled from India to Europe through middle Eastern scholars and eventually became the standard for the entire world. (1 marks)**

17. A specific group of workers hired for a particular job after World War I was known as the X girls. Their job was to paint the dials of watches with the dust of an element. Their continued exposure to the dust made their clothes and body parts glow. Some of them applied it to their teeth to get shiny smiles and wore their best dresses to work to make them shine. They were also instructed to use their lips to bring the brushes to a fine tip - an act that led to fatal consequences. In 1925, scientists developed a test showing that element dust poisoned these workers severely from inside. Most of the X girls soon died due to X poisoning. This case was among the first in which a company was held responsible for the health and safety of its employees. **Identify the element X. (1 mark)**

18. This disease affected a certain group in the 20th century. Small red circles appeared on their limbs, along with yellowing and shriveling. Very strangely, they seemed to be crying tears of reddish-brown liquid, and there was a pungent smell at places where the disease broke out. The cause of this

disease was the chain of reactions happening in the patient's body which was triggered by traces of cellulose, vinegar, and sulphuric acid in the polymer. **Identify the disease. (1 mark)**

tears

disease ends in



1996

A DEADLY plague is sweeping through [redacted] [redacted] from the 1940s and 1950s. The diseased [redacted] cry brown viscous tears, stink of vinegar and infect neighbouring [redacted].

19. A, an entomologist, along with Michael Smith won the Ig Nobel prize for their research on hymenopterans. A developed a particular scale or an index to relatively quantify B from different hymenopteran \_\_\_\_ through his research. X organized Y to four different levels. The 4th level was the highest level, whose description included bullet ants. A described \_\_\_\_ of the bullet ant as "pure, intense and brilliant B, like walking over flaming charcoal with a three-inch nail embedded in your heel". The comment about \_\_\_\_ of the warrior wasp went like this: "Torture, you are chained in the flow of an active volcano".

**Identify A and B, in this tragicomic experiment. (2 marks)**

20. **Find the odd one out. Also mention the rationale behind your choice. (1 marks)**



A



B



C



D

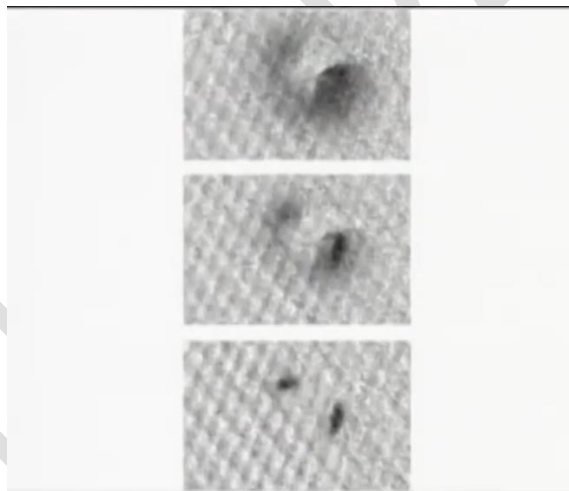
### **Section 3: (20 marks)**

21. The following is a representational sound of an incredibly powerful event that lasts only fractions of a second. **Name the event and what scientists measured to observe it.** In the first two runs of the animation, the sound-wave frequencies exactly match the frequencies of the measured quantity. The second two runs of the animation play the sounds again at higher frequencies that better fit the human hearing range. (The animation ends by playing the original frequencies again) **(2 mark)**

[Click here for the video](#)

22. In this audio – taken from a speech in the 2000s – the scientist talks about his Nobel prize-winning journey in observing a path-breaking discovery in physics. The image mentioned in the audio is given below. During his speech, he says that they observed the coldest matter in the universe. He also acknowledges a legendary Indian scientist in his speech for his mostly unrewarded contribution to the discovery. **What is the discovery in question, and who is the Indian scientist?** (2 marks)

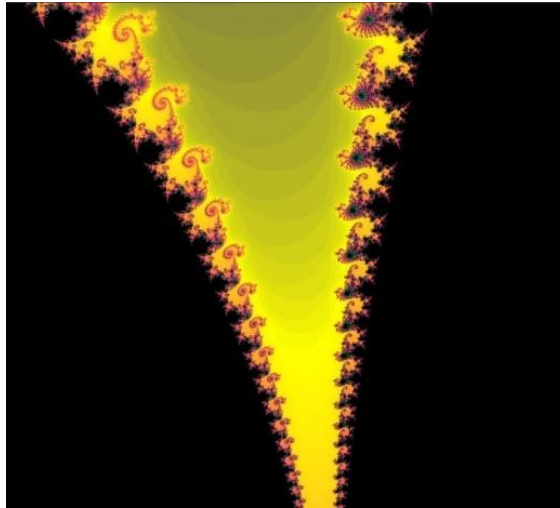
[Click here for the audio](#)



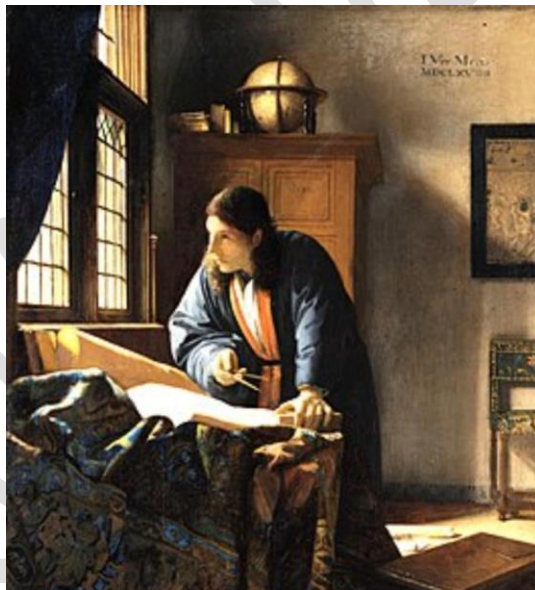
23. This flower, the national emblem of a particular region, shares the name with a well-known instrument in our school science lab and appears in the logo of a famous publication with a history of more than 250 years. It is an essential source of nectar for many pollinators. Even some ecological organizations raise awareness about their benefits because of the common notion that this is an unwanted weed. **What is the name of this flower? Also, identify the popular publication (2 marks)**

24. The following part is a zoomed-in portion of the visualisation of a famous mathematical set. This particular area of the set has a special name that you would normally associate with scuba diving, coral reefs, and sea creatures, more than math concepts. **Give the name of the mathematical set and the name of this area as well. (2 marks)**





25. This is a rare disease nicknamed after a pioneer scientist who suffered from it. He is believed to have been a muse for multiple 17th-century paintings, such as the one pictured, by the Dutch artist Vermeer. This disease is also nicknamed after an art form as it causes an uncontrolled movement of the front part of the body between chest and waist in its patients. **Which art form is being mentioned here, and which notable biologist lent his name to the disease? (2 marks)**



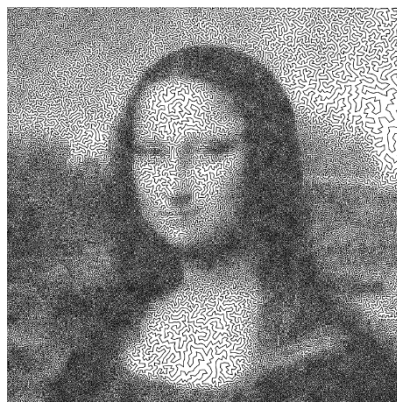
26. We are talking about India's first-of-its-kind satellite which was launched by a Bengaluru-based company. This company was founded by two BITS Pilani graduates in the first half of 2022 (their logo is provided here). The satellite shares its name with a famous Indian who got their calculations wrong in the Indian General Election arena. **What is the name of the above-mentioned satellite, and what is its claim to fame? (2 marks)**



27. Connect the following images to the genetics of an organism which has lot of importance in fundamental scientific research. **(2 marks)**



28. This optimization problem was first formulated in 1930 and is one of the most investigated problems ever. It is an 'NP-hard' problem in combinatorial optimization, and the routes mapped out by its solutions can be used to generate artworks – like the visual given below. Formulation of this problem has applications in planning, logistics and even in astronomy. **Which problem is being talked about?** (Even though the problem is hard, it has a very familiar and easy name) **(2 marks)**



29. XY (the scientific name of this species), the largest of its kind, had stayed hidden for almost 18 decades due to a misconception by the researchers. X refers to a famous monarch who ruled for

more than six decades and Y refers to a near-Equatorial country named after its first president. **Identify the species, ie; XY mentioned here. (2 marks)**



30. This popular product was discovered by a man named Sten along with two of his colleagues while working for a Swedish company in the 1960s. According to the inventors, they had created it to save the environment. The production of its alternative required deforestation alongside more energy and water in comparison to the production of the newer product. **What is this product that became a part of a national announcement a few weeks back? (2 marks)**



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