



QUADSPARKS



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ANSWER KEY AND RUBRIC

ONLINE PRELIMS, 22ND JULY 2023

- Answers are provided in italics.
- Part points are applicable wherever possible.
- Spellings are evaluated leniently, as long as it is comprehensible.
- Reach out to pravega.quadsparks@gmail.com for any clarifications on the answer key.

Section 1

1. According to sacred texts, Vaidoorya is the gemstone of Ketu. This gem is uniquely known as the " _ _ _ _ _ " because one can see a band of reflected light across the middle of the gemstone when light is shone on its rounded surface. This optical reflectance effect arises from the fibrous inclusions or cavities within the stone. This effect is termed as chatoyancy, which translates to "shining like a _ _ _ _ _".

Fill in the blanks. (Blanks are indicative)

(1)



Cat's eye

2. Referring to people with X syndrome as Y dates back to 1866, when Dr. John Langdon X published a paper "Observations on an Ethnic Classification of Idiots", in which he asserts that it is possible to classify different types of conditions by ethnic characteristics. He picked this up while working for the Royal Earlswood Asylum for Idiots with people having learning disabilities. He noticed a big group of people he was treating shared common appearance traits of round cheeks, flattened faces and oddly shaped eyes, and concluded that they are of Y ethnicity. From that time on, Y was the "clinical" term used for this syndrome.

In 1959, the true nature of this syndrome was understood, and a joint letter was written to The Lancet (a prominent medical journal) to change the name Y as it is "racially insensitive". In 1965, the country of Y joined the WHO and pleaded for the same. From then on it was changed to X syndrome.

Name X and Y.

(2)

X – Down (1)

Y- Mongoloid (1) (no credits for Chinese etc.)

3. **The following are the characteristics of the planet Vulcan:**
it was estimated to have an orbital inclination of between 5.3° and 7.3° , a longitudinal node of about 183° , an "enormous" eccentricity, and a transit time across the solar disk of 4 hours, 30 minutes.

Its orbit was described as follows by astronomer Lescarbault as follows:

- a period of 19 days, 7 hours;
- a mean distance from Sun of 0.1427 AU;
- an inclination of $12^\circ 10'$; and,
- an ascending node at $12^\circ 59'$.

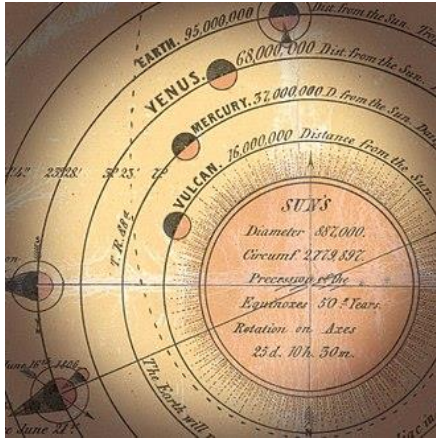
The diameter is considerably smaller than Mercury's and its mass is estimated at one-seventeenth of Mercury's mass.

What is special about Vulcan?

(1)

Vulcan is a hypothetical planet. It doesn't exist. (1)

It was believed to be a planet that existed closer to the Sun than mercury.



4. MIT meteorologist Edward Lorenz tried to create a mathematical model to quantify the behavior of atmospheric convection currents. Solving this system, he showed that at certain parameters, even a minuscule change in initial conditions could lead to a very different solution. To account for this large uncertainty, a technique was developed to make useful predictions.

What is the common name of the effect that calls into need this technique?

What is the name of the forecasting technique in question?

(2)



Butterfly effect (1)

Ensemble forecasting (1)

5. arXiv is a worldwide repository of electronic preprints and postprints of scientific literature, which are posted online for free access. The platform, owned and hosted by Cornell University, was one of the pioneers of the scientific open-access movement. Why is the name spelled this way?

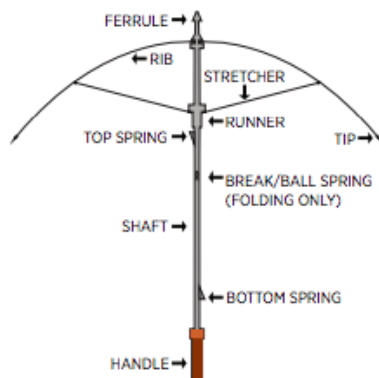
*X refers to the Greek letter chi (X). Hence, arXiv -> archive
(full credits for mentioning chi. Half for mentioning archive)*

6. **Pando is a male aspen clonal colony found in Fishlake National Park in Utah. The tree was identified in 1976 by Jerry Kemperman and Burton Barnes. Genetic marker analysis has led to a certain categorization of the organism. Why does it figure on this quiz?**

It is the world's largest and heaviest organism (either sufficient)

7. This commonly used item has several parts – a certain few essential ones are bottom and top springs, shaft, runner, ferrule and ribs. Ribs are connected via stretchers to runners on the shaft for its intended movement. The entity is commonly available in two varieties – telescopic and non-telescopic. Telescopic ones have a central spring along the shaft. What are we talking about?

Umbrella



8. Kamala Sohonie was the first Indian woman to receive a PhD in a scientific discipline. However, this was achieved after major controversy. When Kamala applied to the Indian Institute of Science for a research fellowship, her application was rejected by the then-Director solely on the grounds of her being a woman, and the director believing that women were not competent enough to pursue research. This led to Kamala holding a Satyagraha outside the director's office. Further, she was granted admission, albeit with some insulting limitations (such as a year of probation and not being granted regular student status). She joined the institute in 1933, and the director eventually allowed female students into the institute with no stipulations in 1936. Identify this director, who conducted some early scientific work into the acoustics of Indian musical instruments.

Sir CV Raman

9. The science-fiction movie 2012 dealt with an apocalyptic plot that dramatizes the end of the world. The historical backing was provided by the popular prediction in the Mayan calendar.

The makers also attempted to explain the rash of natural disasters by adding in ignorant scientific “quips”. In the storyline, an astrophysicist in India discovers that a huge solar flare is causing the temperature of the earth’s core to spike. With a horrified look on his face, he says that the _____ have mutated.

The blank indicates a class of subatomic particles, belonging to the larger group of fermions, which are now thought to be responsible for weak nuclear forces. The rest mass of the particle is much smaller than that of the other known elementary particles, leading to its erroneous description in pop-science arenas (and in actual science in the past) as being “massless”.

Fill in the blank.

Neutrinos

10. Charles ("Pete") Conrad Jr. was a Princeton University alumnus, having spent his undergraduate years there before getting selected for training. As the Commander of a certain mission, Pete decided to honour his alma mater by carrying the university Coat of Arms with him. The successful completion of the event meant that the Princeton University flag holds the distinction of having been at a specific place.

Which place?

What is Pete Conrad’s claim to fame?

(2)

The moon (1)

Conrad was third man on the moon – aboard the Apollo 12 mission, after Armstrong and Aldrin (1) (either third man, or Apollo 12)

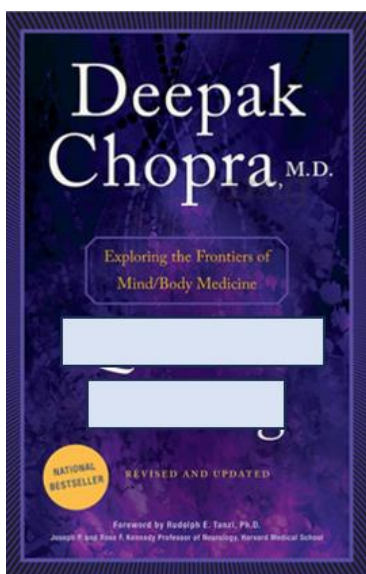
11. The following is a book by Deepak Chopra, a prominent Indian-American author and mystic, who is a leading figure in the New Age spiritual movement.

His books, including the one pictures, attempt to draw direct connections between an element of modern science and mind-body healing, a theory that has been widely characterized by physicists as “flapdoodle” that invigorates misinformation among the public, and as hijacking of the scientific discipline.

Earlier books of a similar genre include *The Tao of Physics: An Exploration of the Parallels Between Modern Physics and Eastern Mysticism*, written by physicist Fritjof Capra in 1975.

Fill in the blank on Chopra’s book title.

(1)



Quantum Healing (half credits for mentioning “quantum”)

12. While the irrationality of π was only proved in 17th century Europe by Johann Lambert, it is believed that a 6th century Indian mathematician might have implied the same in his book. Paraphrased, the book says that by doing some calculations (which compute to 62832), one can approach the circumference of a circle with diameter 20000. This gives the value of π as 3.1416. It is speculated that the use of the word “approached” implies that the mathematician knew that the value was incommensurable due to it being irrational. The book was translated into Arabic and the same approximation is mentioned in Al-Khwazirimi's book on Algebra.

Who is the Indian mathematician being talked about here?

(1)

Aryabhata

Section 2

13. The following is the chemical compound 6,6'-Dibromoindigo, commonly known as Tyrian _____.

This dye, extracted from desiccated hypobranchial glands of sea snails from the *Murex* species, which were further dyed and boiled. Fabrics once dyed retained the remarkable stench of the snail secretions.

The blanks indicate the rich colour provided by the dye. Worn by the rulers of the Byzantine empire, the Holy Roman Empire, and in more recent times, by Roman Catholic Bishops, this colour is most often associated with royalty, rarity, luxury and magic.

However, this colour does not appear on Newton's colour wheel. What is the closest colour to it that appears?

(1)

