VARC

Read the passage below and answer the questions that follow:

It's impossible to forget just how much the sun affects life on our planet. It's overwhelmingly the source of our light and heat, providing just enough to maintain the delicate climatic balance we enjoy. That's not a coincidence; life on Earth evolved under the sun's influence and, given time, adjusts to any changes. Adapting to the whims of a star is no small task, however. The sun may appear to be constant from day to day, but let time stretch out for millions or even billions of years, and things will change—a lot. And not always for the better.

For example, in its thermonuclear-driven core, the sun fuses about 700 million tons of hydrogen into 695 million tons of helium every second. The missing five million tons are converted into energy. This energy is enough, it turns out, to power a star. If you like mind-boggling numbers, the sun produces 4×10^{26} watts of power—400 trillion trillion watts. In other words, the energy our star emits in a single second is sufficient to satisfy humanity's total consumption for about 650,000 years.

It's also enough to warm our planet to its current comfy clime. In fact, by using some basic physics principles, it's possible to mathematically calculate how warm the Earth should be given the sun's energy emission rate. Solar energy flows into space in all directions around the sun, and a tiny fraction (about half of one billionth) of it is intercepted by Earth, heating our planet. Just how much heating takes place is a bit complicated and depends on the actual radiant flux from the sun, Earth's distance from it and reflectivity, and more. When we run the numbers, Earth's average calculated temperature today is approximately –15 degrees Celsius, colder than the freezing point of water.

Actual measurements of Earth's temperature, however, give a much warmer average: about 15 degrees C. The difference exists because greenhouse gases in the air essentially trap heat from the sun, warming Earth above the calculated temperature. This warming is mostly from natural greenhouse gases, mind you, but we're adding approximately 40 billion tons of carbon dioxide into the atmosphere every year, significantly increasing the warming effect. Note that this increase has occurred over the past century or so, a timescale far too short for there to have been any change in the sun; Earth's current climate change is all us.

But the sun's production of energy does change noticeably—over hundreds of millions of years. That helium created in the core is inert; think of it as ash from the nuclear fusion. It settles in the center of the sun, building up over time at the rate of 695 million tons per second! As it gains mass, it also gets squeezed by the tremendous weight of the sun's

layers above it and becomes compressed. A basic law of physics is that compressing a gas heats it, so even though the fusion rate is mostly the same, the core of the sun is still slowly heating up over time—which means the sun itself is getting more luminous.

1. From the passage, it can be inferred that if greenhouse gases were suddenly removed from Earth's atmosphere, then:
A. Earth's average temperature would likely drop below the freezing point of water.
B. The Sun would automatically increase its energy output to compensate.
C. The calculated and actual temperatures would become equal.
D. Earth's temperature would rise even further due to lack of reflection.

2. Which of the following, if true, would most weaken the author's statement that "Earth's current climate change is all us"?
A. Volcanoes emit greenhouse gases comparable in quantity to human emissions.
B. Satellite data reveal that solar energy output has risen sharply during the last century.
C. Ocean currents redistribute heat and cause regional temperature variations.
D. Some areas of the planet have cooled slightly in recent decades.

3. Suppose astronomers discover an Earth-sized planet orbiting a star that emits only half as much radiant energy as our Sun. According to the reasoning in the passage, which of the following outcomes would most likely occur?
A. The planet's lower solar flux would have little impact on temperature, since stellar radiation is not the main factor determining climate.
B. The planet's oceans and atmosphere would spontaneously generate extra heat to maintain thermal equilibrium similar to Earth's.
C. The planet's equilibrium temperature would remain identical to Earth's because the distance from the star can fully compensate for reduced luminosity.
D. The planet's surface temperature would be lower than Earth's unless its atmosphere trapped significantly more heat through greenhouse gases.

4. Which of the following assumptions is essential to the author's conclusion that the Sun's core heating makes the Sun gradually more luminous over time?
A. The compression of accumulated helium in the Sun's core increases temperature even if the overall fusion rate remains nearly constant.
B. The helium produced by fusion remains in the core long enough to influence internal pressure and density.
C. The mass lost as energy through fusion is too small to offset the effects of increasing core compression.

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D. The Sun's layers adjust in a way that allows additional heat from the core to reach the surface instead of being reabsorbed internally.

5. Five jumbled-up sentences (labelled 1, 2, 3, 4 and 5), related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd sentence and key in the number of that sentence as your answer.

1. And like many emotional topics, a lot of people would rather avoid thinking about it.

2. Budgets ensure that we are not overspending, and that your money is going where you need it to go.

3. Money is emotional - it determines where we live, what we eat, the education and healthcare we can access, how we socialize, what hobbies we can take up and how much we can travel.

4. But avoiding a budget is often more of a headache than making one.

5. By reviewing your past spending, you can begin to reflect on whether your spending behaviours are aligned with your financial goals.

6. The four sentences (labelled 1, 2, 3 and 4) given below, when properly sequenced, would yield a coherent paragraph. Decide on the proper sequencing of the order of the sentences and key in the sequence of the four numbers as your answer.

1. On rare occasions, some body parts—particularly hard ones such as shells, teeth, or bones—are preserved by being buried in mud or protected in some other way from predators and weather.

2. Eventually, they may become petrified and preserved indefinitely with the rocks in which they are embedded.

3. Methods such as radiometric dating—measuring the amounts of natural radioactive atoms that remain in certain minerals to determine the elapsed time since they were constituted—make it possible to estimate the time period when the rocks and the fossils associated with them were formed.

4. The earliest fossils resemble microorganisms such as bacteria and cyanobacteria (blue-green algae); the oldest of these fossils appear in rocks 3.5 billion years old.

7. Five jumbled-up sentences (labelled 1, 2, 3, 4 and 5), related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd sentence and key in the number of that sentence as your answer.

1. Over the years, I started hoarding languages, perhaps to redeem myself after losing my first: Spanish, Italian and – in one half-hearted attempt – Catalan.

2. Consequently, many do not feel the need to learn the language, but I wanted to be a 'good immigrant' and assimilate.

3. I love their sounds, but they never quite fit in my mouth, so I kept trying to find a language other than English in which I'd make sense.

4. But I've only ever achieved a passable fluency that can support my survival for maybe five minutes.

5. Beyond that, the conversation is perforated by silences – much like the ones that pockmarked my last trip to Vietnam.

8. The four sentences (labelled 1, 2, 3 and 4) given below, when properly sequenced, would yield a coherent paragraph. Decide on the proper sequencing of the order of the sentences and key in the sequence of the four numbers as your answer.

1. It is characterized by intentional violence on the part of large bodies of individuals organized and trained for that purpose.

2. War, a state of conflict, generally armed, between two or more entities.

3. On the national level, some wars are fought internally between rival political factions (civil war); others are fought against an external enemy.

4. Wars have been fought in the name of religion, in self-defense, to acquire territory or resources, and to further the political aims of the aggressor state's leadership.

9. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide where (option 1, 2, 3, or 4) the following sentence would best fit.

Sentence: It's only by building up our strength and endurance little by little that we may hope to get ourselves in the necessary shape.

Paragraph: Growing moral fibre requires time and effort – what Epictetus calls our 'winter training', referring to the exercises Roman soldiers carried out during the winter to get ready for their military campaigns in the spring. ___(1)___. A bit less dramatically, we may draw an analogy with practising to prepare ourselves to run a marathon. ___(2)___. If we did nothing for months, then all of a sudden started running, we would not be able to complete the forty-two-kilometre challenge. ___(3)___. The same is true for our moral fortitude. Some of us may be naturally prone toward acts of heroism, but I'm guessing most are not. ___(4)___. Nevertheless, we can practice courage by nudging ourselves to speak out whenever we see injustice, even though it may be uncomfortable

A. Option 1
B. Option 2
C. Option 3
D. Option 4

10. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

While most of what we consider to be "hi-tech" is closed off behind proprietary algorithms, the open-source technologies above all require community involvement. This can be immensely empowering, and can improve public trust: it's hard (and unwise) to give yourself over to a technology that won't tell you how it works, particularly when its predefined settings allow only for meagre approaches to "user privacy".

As I ask my students, if you could develop an AI at your own home, and programme it to reflect your values and prioritise your safety, wouldn't you trust it more? Well, the idea isn't so outlandish – it only feels impossible because big tech firms want us to think it is.

A. Open-source technologies, by encouraging transparency and community participation, can foster greater trust and empowerment than proprietary systems.

B. Proprietary technologies are safer than open-source technologies because they offer fixed privacy settings designed by experts.

C. It is impossible for individuals to create AI systems that align with their values because big tech monopolies control the market.

D. Open-source AI systems will eventually replace all proprietary technologies because users prefer transparency over privacy.

DILR

The crossword below consists of numbers. No number starts with a zero.

The hints are:

Across:
1: A two-digit number
2: Rearrange the digits of 6 across
6: Rearrange the digits of 1 across
8: 5 times 7 down
9: Ascending consecutive digits
10: 1 across plus 10

Down:
1: 1 across plus 5
3: Rearrange the digits of 8 across
4: Rearrange the digits of 6 across
5: 6 across plus 9
7: 11 times 4 down
8: 5 times 4 down

11. How many of the given numbers can be uniquely determined?
A. All
B. All but one
C. All but two
D. All but three

12. What is the second digit of 7 down?

13. What is the sum of the digits of 8 across?

14. Which of the following statements is true about 3 down?
A. It is a multiple of 5
B. It is a multiple of 3
C. It is a multiple of 4
D. None of these

15. Which of the pairs of numbers are equal?
A. 1 down and 4 down
B. 6 across and 10 across

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C. 9 across and 6 across
D. 1 across and 5 down

In a reality show called Whale Tank, five investors (called Whales), W1, W2, W3, W4, W5, invested a total of Rs. 50 Crores in 10 businesses – B1 through B10, such that each investor invested in exactly 3 businesses. All the amounts were integral multiples of 1 Cr.

- Only B1, B6 and B7 had multiple investors. Each investor had an equal stake in a business that had multiple investors.
- B1 received the highest investment of 12 Cr, while the highest investment by a single investor was 7 Cr in B3.
- The biggest investment of W5 was 5 Cr in B4. He also invested in B2 and B10.
- W3 did not invest in B3.
- W2 made the highest investment of 12 Cr, while W1 was one of the two investors who invested the least, i.e. 8 Cr.
- W1 and W4 invested in both B6 and B7.
- Except for W5, each investor invested a distinct amount in all three businesses.
- B5 received twice the money received by B8. W1 and W3 invested in these businesses, respectively.
- A total of 6 Cr was invested in B6.

16. Who invested in B9?
A. W1
B. W2
C. W3
D. W4

17. What was the amount invested in B2?
A. Rs. 2 Cr
B. Rs. 3 Cr
C. Rs. 5 Cr
D. Rs. 6 Cr

18. How many investors invested in B1?

19. What was the total amount invested by W3?
A. Rs. 11 Cr
B. Rs. 12 Cr
C. Rs. 8 Cr
D. Rs. 9 Cr

20. How many businesses received an investment of more than 5 Cr?


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QA

21. While working alone, Joy can complete a task in 'x' days; Imam can complete the same task in 'y' days. Hitesh alone can complete the task in (y–x) days. Joy and Imam together worked on the task and completed it in y/4 days. Which of the following can be the ratio of the efficiencies of Hitesh, Imam, and Joy?
A. 2:3:5
B. 6:2:3
C. 3:2:5
D. 3:2:6

22. In the given figure, PQRST is a regular pentagon. QR and PT are tangents to the circle. RS extended meets the circle at U. Find angle STU.
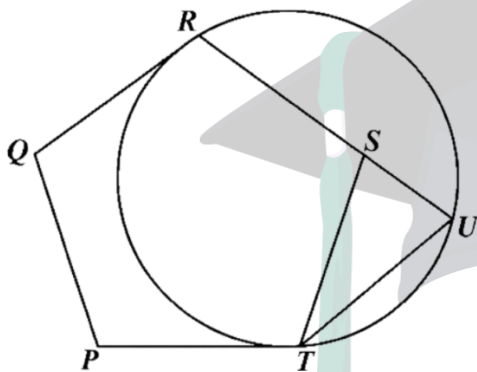
A. 36°
B. 30°
C. 27°
D. 24°

23. If $f(x+2) + f(x^2) = x^2 + x + 14$, find $f(4)$.

24. The lengths of two trains are in the ratio 7:10. Their speeds are 72 km/h and 96 km/h, respectively. If the longer train crosses a person sitting in the shorter train in 90 seconds while moving in the same direction, then find the time taken by the shorter train to cross the person sitting in the longer train while moving in the opposite direction.
A. 7 seconds
B. 8 seconds
C. 9 seconds
D. 10 seconds

25. Find the number of integral non-zero values of x that satisfy the inequality $|x^3 – 44| < 198$
A. 14
B. 13
C. 12
D. 11

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26. There are 'n' rounds in a quiz. The average points scored by Amit is 45.45% more than the average points scored by Bimal. However, the total points scored by Bimal are 45.45% more than those by Amit. The number of rounds played by Bimal are what percentage of the number of rounds played by Amit?
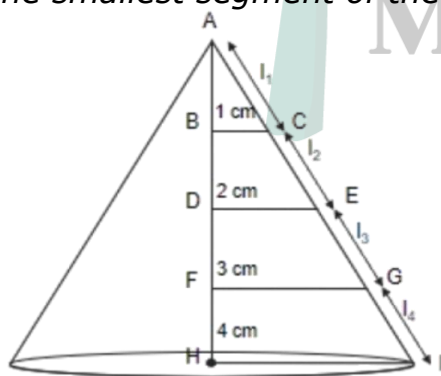A. 111%
B. 211%
C. 121%
D. 221%

27. What is the length of the longest side of a cyclic trapezium if the angle between the longer parallel side and either oblique side is 60°, each oblique side measures 8 units, and the area of the trapezium is 96√3 square units?
A. 20 units
B. 24 units
C. 28 units
D. 32 units

28. If the product of three consecutive positive even numbers is 26880, then find the square of the largest number.

29. Rajat had a certain amount with him. He could buy 12 pens or 28 pencils. He retained 15% of the amount for cab fare and bought 15 pencils and 3 pens. If he was left with Rs. 27, what is the price of a pen?

30. In the following figure, a cone is cut parallel to the base and extracted into four segments having slant heights l1, l2, l3, and l4, and the radius of their bases are 1 cm, 2 cm, 3 cm, and 4 cm, respectively. Find the ratio of the curved surface area of the second largest segment to that of the smallest segment of the cone.

A. 3:1
B. 7:2
C. 4:1
D. 5:1