



# Youth STEM Cup 2025

Preliminary Round  
(Junior Category)

Problems and Answers

19 April 2025

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# Committee and Contributions

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## Organising Committee

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## Problem Selection Committee

The Problem Selection Committee (PSC) is responsible for setting and selecting problems for the contest. It makes collaborative decisions on the suitability and format of the questions, and performs cross-checks to ensure the questions are valid, clear, and well-posed. It also produces the *Problems and Answers* document, the *Solutions* document and the question paper.

Special thanks to the PSC for contributing 36 problem proposals for the Preliminary Round:

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# Preliminary Round Analysis

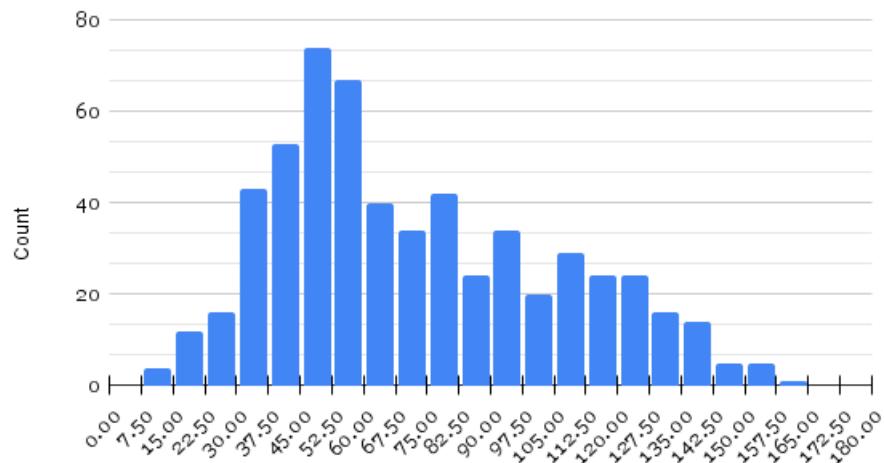
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## General Statistics

Duration	60 minutes
Full Score	180
Total Number of Responses (Individual participants + Teams)	581
Average Score	71.88
Median Score	64
Range	8-161
Standard Deviation	33.00

## Score Distribution

Histogram of Scores (Junior)



## Breakdown of Correct Responses

Bio		Chem		Phy		Maths		Planetary		Social	
Q	Freq	Q	Freq	Q	Freq	Q	Freq	Q	Freq	Q	Freq
1	149	1	198	1	275	1	128	1	252	1	276
2	373	2	198	2	275	2	141	2	231	2	189
3	131	3	196	3	273	3	259	3	266	3	205
4	276	4	270	4	225	4	131	4	272	4	239
5	343	5	217	5	285	5	241	5	219	5	166
6	320	6	321	6	124	6	175	6	245	6	246
$\Sigma$	1592	$\Sigma$	1400	$\Sigma$	1457	$\Sigma$	1075	$\Sigma$	1485	$\Sigma$	1321

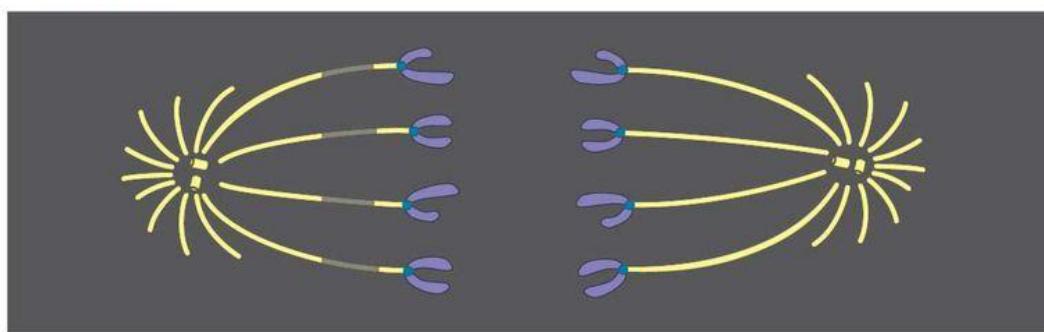
# Problems

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## Biology

- During anaphase, the mitotic spindle made of microtubules shortens, bringing the sister chromatids to opposite poles of the cell. The mitotic spindle is attached to the centromere of each sister chromatid via the kinetochore protein.

Gary Borisy and colleagues in the University of Wisconsin wanted to determine which end kinetochore microtubules shorten from during anaphase. To achieve this, his team tagged the microtubules of a pig kidney cell in early anaphase using a yellow fluorescent dye. Using a laser, they then marked a region of the kinetochore microtubules by eliminating its fluorescence (see diagram below).



**Diagram 1:** Anaphase stage of a pig kidney cell with marked region (gray segments).

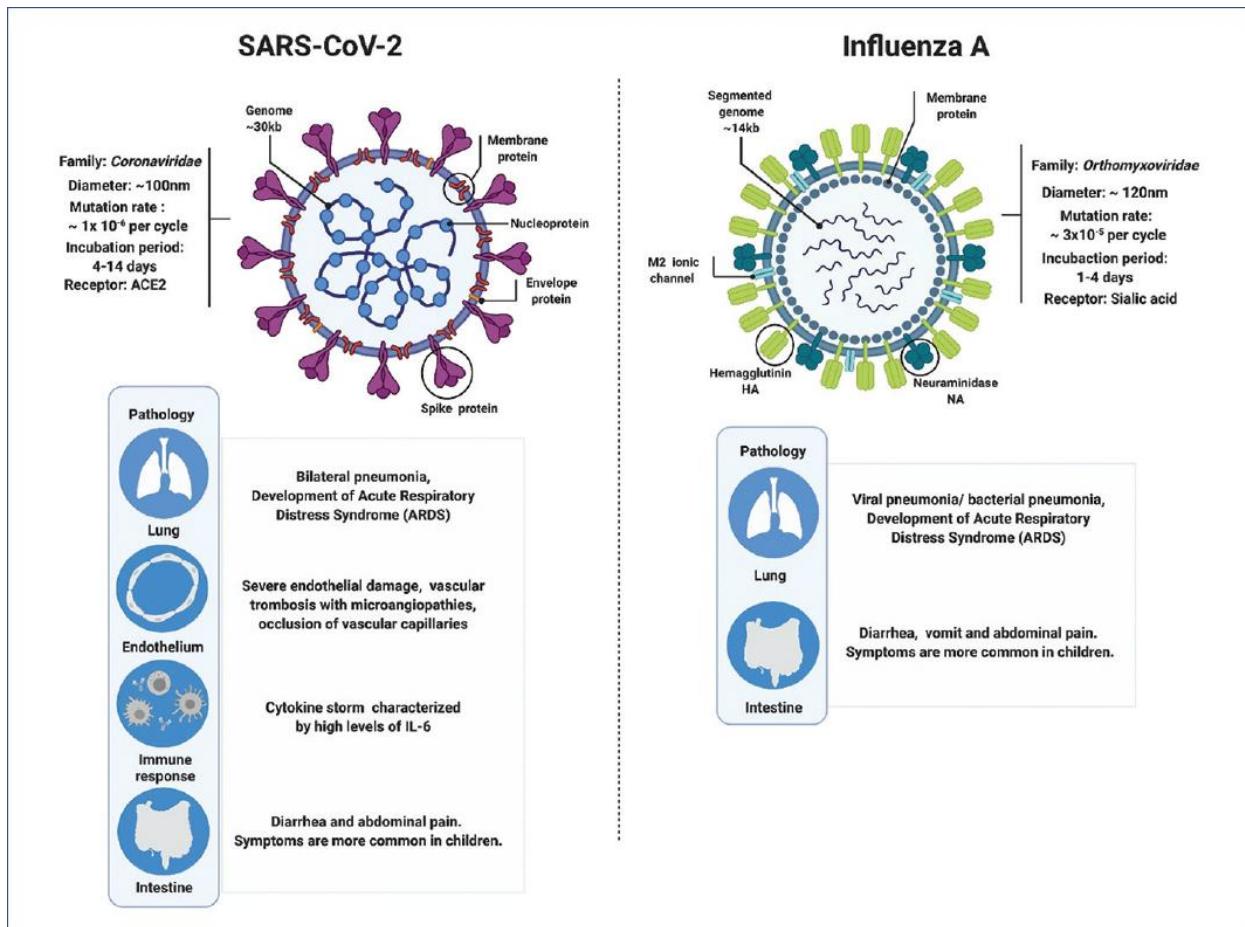
If the hypothesis of the microtubules shortening at the kinetochore end and not the pole end were true, which of the following observations do you expect to be **true** as the chromosomes move poleward?

[4 marks]

- A. The kinetochore microtubule segments at the pole end are shorter than the microtubule segments at the kinetochore end.
- B. The microtubule segment which has lost its fluorescence has appeared to move to the pole end.
- C. The kinetochore microtubule segments at the pole end are longer than the microtubule segments at the kinetochore end.
- D. Both kinetochore microtubule segments at the pole end and at the kinetochore end are shorter.

2. SARS-CoV-2 and influenza are both highly contagious viruses that primarily affect the respiratory system, leading to widespread illness across the globe. While they share similarities in symptoms, these viruses differ significantly in their transmission, severity, and the way they impact individuals and societies. Influenza has been a known health threat for centuries, with seasonal outbreaks occurring regularly. However, the emergence of SARS-CoV-2 in late 2019 caused a global pandemic, making it a more urgent focus of medical research and public health efforts. The differences in how these viruses spread, the complications they cause, and the treatments available have raised important questions regarding the best strategies to mitigate their impact. Understanding both viruses is essential for controlling their spread and minimizing the health risks they pose to individuals and communities.

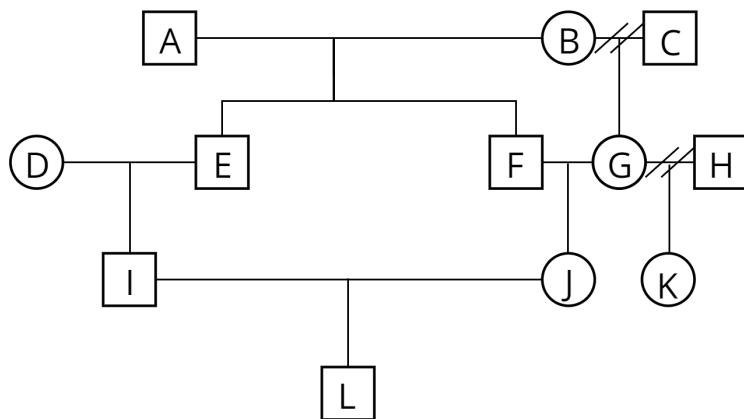
Both viruses spread through droplets in the air when infected people cough, sneeze, or talk. They affect the respiratory system, causing symptoms like fever, cough, and difficulty breathing. However, SARS-CoV-2 spreads more easily and can lead to more severe complications, such as acute respiratory distress syndrome (ARDS) and damage to multiple organs. Treatment for both includes antiviral medications like Remdesivir for COVID-19 and Oseltamivir (Tamiflu) for influenza. Vaccines also play an essential role in preventing both diseases. However, the flu vaccine needs to be updated annually, while COVID-19 vaccine development is ongoing to tackle emerging variants. Preventive measures like wearing masks, social distancing, and maintaining good hygiene are crucial for controlling both viruses, but COVID-19 demands more stringent efforts due to its higher transmissibility.



**Diagram 2:** Comparisons between SARS-CoV-2 and Influenza A.

Which of the following describe the biological characteristics of SARS-CoV-2 and influenza viruses in relation to their ability to cause illness? 5 marks

- I. Both SARS-CoV-2 and influenza are RNA viruses that infect respiratory cells.
  - II. SARS-CoV-2 primarily affects the gastrointestinal system, while influenza mainly affects the lungs.
  - III. Influenza viruses undergo frequent genetic mutations, which is why they require an updated vaccine every year.
  - IV. Both viruses replicate by inserting their RNA into the host cell's genome.
- A. I and II only
- B. I and III only
- C. II and III only
- D. II and IV only
3. The coefficient of relationship is a measure of the degree of biological relationship between two individuals. It can be thought of as the average percentage of DNA that two people share.



**Diagram 3:** Family tree of individuals A – L.

Consider the family tree of individuals A-L above. The two pairs BC and GH are divorced. Which of the following statements is **false**? 4 marks

- A. The coefficient of relationship between I and F is equal to the coefficient of relationship between I and B.
- B. The coefficient of relationship between L and B is 37.5%.
- C. If laws prohibit relationships with a coefficient of relationship of 25% and higher, then E can legally date K.
- D. I is genetically closer to G than L is to K.

4. In recent studies, researchers have identified a new species of oyster, *Crassostrea magallana saidii*, found exclusively in the Muar River Estuary in Malaysia. This oyster species is notable for its unique genetic traits and adaptability to the local environment, differentiating it from other oyster species around the world. The species has been confirmed to be endemic to the region, meaning it is found nowhere else on Earth. These findings hold significant implications for biodiversity and conservation efforts, as the oyster's genetic diversity could be key to its survival in the face of environmental changes.



**Diagram 4:** White Oyster found in Muar Johore.

Considering the new species of oyster found in the Muar River Estuary, what evolutionary processes are most likely at work in the development of new species such as *Crassostrea magallana saidii*? [6 marks]

6 marks

The Chikilidae family serves as a fascinating example of evolutionary adaptation. Their limbless bodies, burrowing habits, sensory tentacles, and transparent eggs all contribute to their survival in underground environments. Over time, these unique traits have evolved in response to environmental pressures. Studying these adaptations not only provides insights into the process of evolution but also highlights the significance of biosystematics in classifying and understanding life's diversity. Their transparent eggs, in particular, offer exciting research opportunities into developmental biology and reproductive strategies, further deepening our understanding of these remarkable amphibians.



**Diagram 5:** A Chikilidae with her transparent marble-like eggs.

In the context of biosystematics, how can the Chikilidae family help scientists understand amphibian evolution? 6 marks

- I. The discovery of legless amphibians suggests a separate evolutionary branch distinct from other amphibians.
  - II. The presence of limbs in related species indicates that legless amphibians are not fully evolved.
  - III. The distinct genetic makeup of Chikilidae helps clarify evolutionary pathways within amphibians.
  - IV. Their morphological and genetic differences allow for a clearer classification within the amphibian family tree.
- A. I, II and III only
  - B. I, II and IV only
  - C. I, III and IV only
  - D. II, III and IV only

6. In a region where industrial pollution has significantly declined over the last several decades, researchers observe a resurgence of the pale morph of the peppered moth (*Biston betularia*), which had previously been almost entirely replaced by the dark (melanic) morph during the height of the Industrial Revolution. What evolutionary mechanism is most likely responsible for this shift in morph frequency?

**5 marks**



**Diagram 6:** Pale and dark moths.

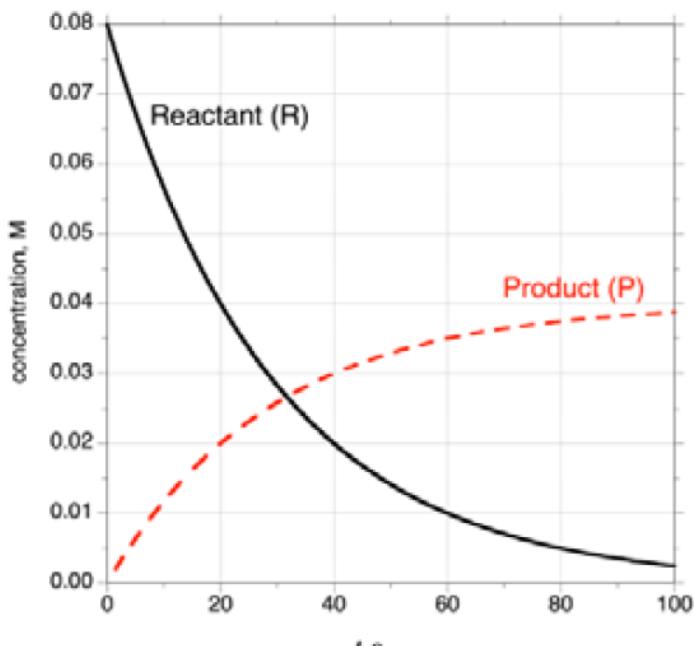
- A. Genetic drift due to small population size.
- B. Directional selection favouring darker moths due to better camouflage.
- C. Reversal of directional selection due to changes in environmental conditions.
- D. Founder effect caused by recolonization of rural habitats.

# Chemistry

- Petroleum is a fossil fuel extracted from underground reservoirs, consisting mainly of hydrocarbon mixtures. Among them, paraffins (alkanes) are widely used as fuels for vehicles, aircraft, and industrial applications. However, long-chain paraffins have limited direct use and are subjected to fractional distillation followed by catalytic cracking to yield smaller hydrocarbons.

Hexacosane ( $C_{26}H_{54}$ ) is an example of a long straight-chain hydrocarbon. If catalytic cracking of hexacosane produces **three different straight-chain hydrocarbons with at least 2 carbon atoms**, how many distinct sets of products can be obtained? [5 marks]

2. The time course of a reaction in which a reactant R is converted to a product P is shown below.



Which statements about the reaction is/are incorrect?

3. Amino acid X does not contain any elements other than carbon, hydrogen, nitrogen and oxygen. To confirm the molecular formula of X, Emine burns the liquid X under strong heat with excess oxygen in an isobaric (constant pressure of 1 atm) vessel and let it cool down to room temperature.

Given that 0.01 mol of liquid X is used for combustion, all species except nitrogen are fully oxidized (Nitrogen having an oxidation state of +4) in the combustion reaction, determine the molecular formula of X with the following details:

$$\begin{aligned}\text{Initial volume of gas (all oxygen)} &= 1600 \text{ cm}^3 \\ \text{Final volume of all gaseous species} &= 1420 \text{ cm}^3\end{aligned}$$

**Note:**

- Amino acid is a type of molecule having amine ( $-\text{NH}_2$ ) and carboxylic acid ( $-\text{COOH}$ ) attached on one carbon atom.
- Molar volume of gas under room conditions =  $24000 \text{ cm}^3$

**5 marks**

- A.  $\text{C}_3\text{H}_7\text{NO}_2$       B.  $\text{C}_3\text{H}_7\text{NO}_3$       C.  $\text{C}_5\text{H}_{11}\text{NO}_2$       D.  $\text{C}_2\text{H}_5\text{NO}_2$

4. The discovery of electrochemical processes is one of the pivotal moments in the history of sciences as it allows humanity to store energy in the form of chemicals. Which of the following best describes how energy is stored in chemicals?

**5 marks**

- A. Energy is stored as potential energy in the atomic nuclei, as the nucleus determines the oxidizing strength of an atom.  
B. Energy is stored as kinetic energy of electrons, since they move during a redox reaction.  
C. Energy is stored as a difference in electrical potential energy between the reducing agent and oxidizing agent.  
D. Energy is stored as a difference in the attractive force felt by electrons between the atoms of the reducing agent and oxidizing agent.

5. Quantum mechanics is perhaps one of the most important scientific discoveries of all time. At its core, quantum mechanics reveals that energy is quantized, meaning that energy does not vary continuously at the smallest scales. Instead, it exists in discrete packets, called quanta. This means that the energy levels of particles, such as electrons in an atom, can only take on specific values rather than any value within a range.

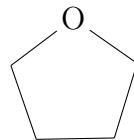
To better understand this, imagine you bought some sweets from 7-11. You can take one sweet, two sweets, three sweets, and so on—but you cannot take 1.25 sweets or 1.33 sweets. The number of sweets you can have is always a whole number. It is also understood that

the more sweets you consume, the higher your sugar intake. Therefore the amount of sugar intake per day doesn't depend on the amount of sugar per sweet assuming that all sweets have similar sugar content, rather it depends on the number of sweets taken per day.

Building on this concept, which of the following statements is/are correct regarding the nature of quantum mechanics? [5 marks]

- I. An electron cannot have a continuous range of energy.
  - II. Quantum mechanics can only be applied to particles on the smallest of scale.
  - III. Each photon emitted from a brighter light source contains more energy than those emitted from a dimmer light source assuming the same light source is used for both experiments.
  - IV. All waves in nature are quantised and can only possess certain values of frequencies.
- A. I only
  - B. II and III only
  - C. I, II and IV only
  - D. All of the above
6. Malaysia is well-known for having a tropical climate, which presents an unnecessary problem for researchers as the humidity (percentage content of water in air) is relatively high, causing a lot of research involving the usage of hygroscopic chemicals to be troublesome.

Tetrahydrofuran (THF) is one such compound as it is extremely hygroscopic and mixes well with water. As a prevalent and prominent organic solvent, it is vital for researchers to remove the water content before using it because it will cause unnecessary complications to water sensitive reactions. The skeletal structure of THF is as shown.



Which of the following is true regarding the usage of THF as an organic solvent? [5 marks]

- I. THF is miscible with water due to Van der Waals forces between water molecules and THF molecules.
  - II. THF is miscible with water due to hydrogen bonds formed between water molecules and THF molecules.
  - III. THF is miscible with hexane due to Van der Waals forces between hexane molecules and THF molecules.
  - IV. THF is miscible with hexane due to hydrogen bonds formed between hexane molecules and THF molecules.
- A. I and II only
  - B. II and III only
  - C. I and IV only
  - D. II and IV only

# Physics

- As the Army General of the small country, Amisoan ( $\sim 550$  BC), you need to protect your land against the invading Roman Empire! The Romans are advanced and will siege your country with catapults, but Amisoans are smart and armed with your bows you can stop these catapults by hitting the rocks at the peak of their trajectory.

Given that the catapults release the rocks at an angle of  $45^\circ$ , with a projectile speed of  $v = 100 \text{ ms}^{-1}$ . After the rocks are catapulted, the archers wait  $\tau$  seconds before firing their arrows vertically upward. The arrows, as they move up, collide with the rocks at the peak of the rocks' trajectory. Find  $\tau$ .

4 marks

**Note:**

You may assume  $g = 10 \text{ ms}^{-2}$ , the arrows have a speed of  $u = 90 \text{ ms}^{-1}$  and that air resistance is negligible.

- A. 2.56 s      B. 3.64 s      C. 4.04 s      D. 5.20 s
- Celebrating his victory during the YSC 2023, Ashwin decided to leap into the lake right outside the award ceremony hall. While in the lake, Ashwin noticed that he could see light from outside the lake within a circle above him, and beyond the circle, he could only see the reflection of the lake bottom below him. At a depth of 3 m below the surface of the water, help Ashwin calculate the diameter of this circle given that  $n_{\text{air}} = 1$  and  $n_{\text{water}} = 1.33$ .

6 marks

- A. 6.84 m      C. 4.44 m  
B. 5.76 m      D. 5.00 m
- Patrick, who was a fisherman, noticed that two airplanes were diverging from their original paths. Airplane **A** starts at position  $(1, 2, 3)$  with velocity function  $v_A(t) = (6t, 9t^2 - 1, 2t)$ , and airplane **B** starts at position  $(4, 5, 6)$  with velocity function  $v_B(t) = (3t^2, 8t - 2, 4t)$ . Determine if the airplanes will crash at any time  $t > 0$ .

4 marks

- A. They will crash at  $t = 5s$ .      C. They will crash at  $t = 12s$ .  
B. They will crash at  $t = 10s$ .      D. They will not crash.
- During the 18th Century, the world saw the British Empire rapidly grow. In contribution to this growth was their mode of transportation: ships! As the captain of one of those ships, what changes in the water level of the sea would you observe if you throw your ship's anchor off board?

4 marks

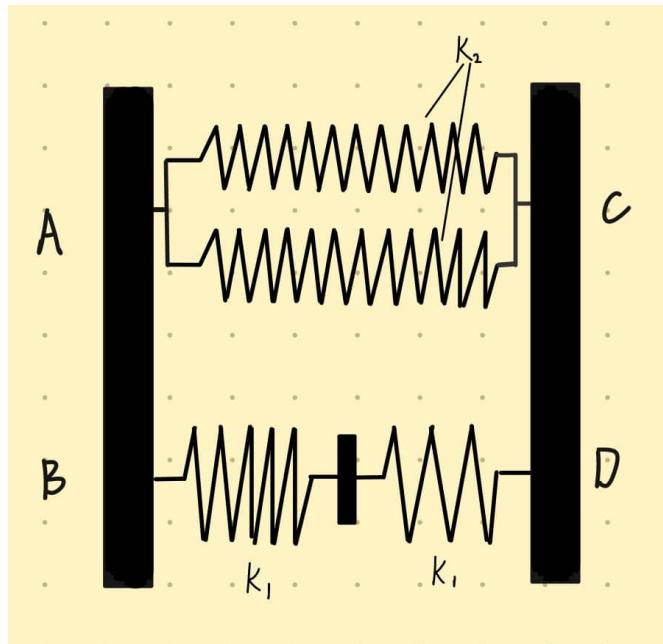
- A. It rises very slightly.      C. It falls very slightly.  
B. It stays exactly the same.      D. "There is no way of tellin', cap'n!"

5. William was bored and felt sleepy during a physics class. He pushed a large hollow wheel A of radius  $2R$  which rotated clockwise with an angular velocity,  $\omega_1 = +5 \text{ rad s}^{-1}$ . A smaller hollow wheel B of radius  $R$  located inside and in contact with wheel A rotates in the opposite direction without slipping. Determine the angular velocity  $\omega_2$  of the smaller wheel.

**6 marks**

- A.  $+5 \text{ rad s}^{-1}$       C.  $-5 \text{ rad s}^{-1}$   
 B.  $-10 \text{ rad s}^{-1}$       D.  $-2.5 \text{ rad s}^{-1}$

6. William's friend, Tom, was also bored. He found two identical blocks and attached them with 2 identical springs in parallel on the top at points A and C, and 2 other identical springs in series on the bottom at points B and D as shown in the diagram. The distance between A and B (C and D) is 3 cm.



The spring constant of the springs in series,  $k_1$  is 3 and the spring constant of the springs in parallel,  $k_2$  is 2. When Tom pushes points A, B, C and D with forces of 0.1 N, what will be the angle of inclination of the two blocks? Neglect any frictional forces.

**6 marks**

- A.  $12.06^\circ$       C.  $34.81^\circ$   
 B.  $23.57^\circ$       D.  $46.02^\circ$

# Mathematics

1. A 2-digit number  $N$  is called *magical* if there exists a 4-digit number such that the result when subtracted by  $N$  is its reverse. How many magical numbers exist? 4 marks

A. 1      B. 2      C. 4      D. 8

2. Find the unit digit of 4 marks

$$\left\lfloor (\sqrt{20} + \sqrt{25})^{20 \times 25} \right\rfloor.$$

**Remark:**  $\lfloor \bullet \rfloor$  is the largest integer smaller or equal to  $\bullet$ .

A. 0      B. 1      C. 4      D. 9

3. Define  $N$  as the smallest positive integer that has 2025 distinct positive divisors (including 1 and 2025), and  $M$  as the product of all divisors of  $N$ . Determine the value of

$$\frac{\log M}{\log N}. \quad \text{[5 marks]}$$

A.  $\frac{2025}{2}$       B.  $\frac{2025}{3}$       C.  $\frac{2025}{4}$       D.  $\frac{2025}{5}$

4.  $\triangle ABC$  is an equilateral triangle with side length  $\ell$ .  $D$  is a point such that  $AD = AB$ . The line connecting midpoints of  $AB, CD$ , and the line connecting midpoints of  $AC, BD$  intersect at a point  $P$ . The locus of  $P$  as  $D$  moves is drawn. The area of the locus is expressed in  $u_\ell + v_\ell\pi$  if it is an enclosed curve, where  $u_\ell, v_\ell$  are rational constants depending on  $\ell$ . What is the smallest  $s \geq 1$  such that

$$(u_1 + v_1) + (u_2 + v_2) + \dots + (u_s + v_s)$$

is an integer? 5 marks

A. 16      B. 31      C. 32      D. The locus is not an enclosed curve.

5. In a  $3 \times 3$  matrix, each entry is either 0 or 1, and the matrix satisfies:

- (a) The sum of the elements in each of the three rows is equal.  
(b) The sums of the elements in each of the three columns are all distinct.

Help Ming Tao to determine the number of such matrices. 6 marks

A. 32      B. 34      C. 36      D. 38

6. Find the number of real polynomial with  $\deg P \leq d$  such that for every nonzero real number  $x$ ,

$$P(x)P\left(\frac{1}{x}\right) = P(x) + P\left(\frac{1}{x}\right). \quad \text{[6 marks]}$$

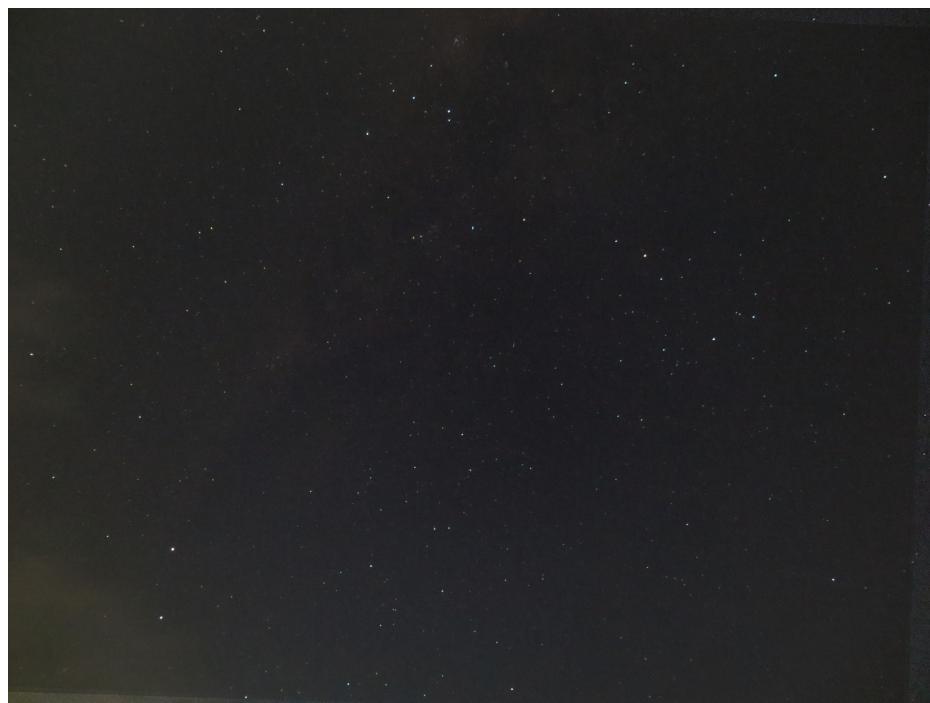
A.  $2d$       B.  $2d + 1$       C.  $2d + 2$       D.  $2d + 3$

Planetary Science

1. The photograph was taken in central Australia at noon of \_\_\_\_\_.

4 marks



3. The following outcrop was found at Desaru. A sample was taken from this outcrop for analysis. (A 20 sen coin is used as a scale in the image below.)



Given the following properties, identify the type of rock.

5 marks

- Creates a dull sound when hit with another sample from the same outcrop.
- The sample is brittle and can be easily scratched with a fingernail.

- A. Conglomerate
- B. Shale
- C. Slate
- D. Basalt

4. In seismology, the two main waves produced by earthquakes are P waves and S waves. Which of the following statements about them are **false**?

5 marks

- A. P waves can only travel through solids.
- B. S waves produce greater destruction during earthquakes than P waves.
- C. During any given earthquake, P waves can be detected anywhere around the world while there exists an S wave shadow zone.
- D. S waves travel slower than P waves through solids.

5. In July 2020, Comet NEOWISE (C/2020 F3) dazzled observers as one of the brightest comets of the 21st century.



Imagine observing the Sun from NEOWISE's aphelion—the farthest point in its orbit from the Sun. What is the apparent magnitude of the Sun as seen from this point? 6 marks

**Given:**

- Apparent magnitude of the Sun from Earth =  $-26.74$
- Aphelion distance of Comet NEOWISE = 716 AU

- A.  $-19.58$
- B.  $-12.47$
- C.  $-2.85$
- D.  $+14.10$

6. A fast-growing megacity in a low-lying river delta is experiencing more frequent and intense floods, even though it has built many flood protection structures like concrete walls and drains. At the same time, poorer informal settlements on the edge of the city—where there are no such flood defenses—seem to flood less and recover more quickly.



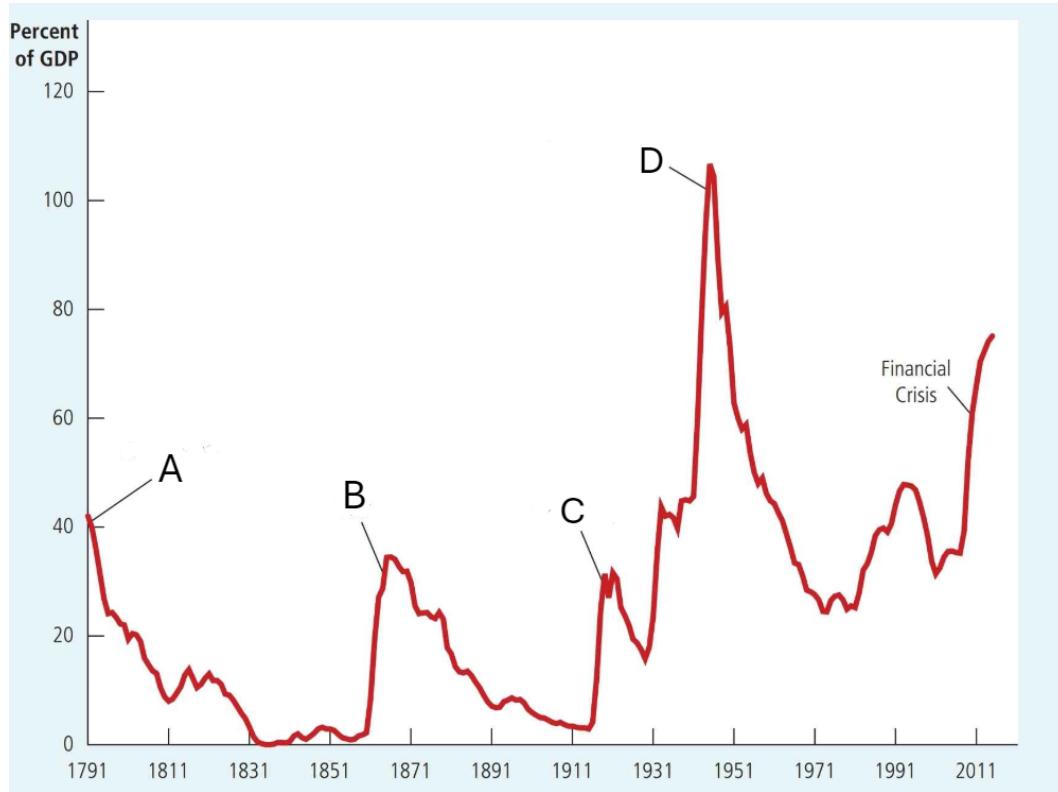
Which of the following most plausibly explains this seemingly paradoxical situation?

**6 marks**

- A. The grey infrastructure is causing increased land subsidence within the city center, exacerbating flood risk.
- B. Informal settlements utilize natural drainage pathways and permeable surfaces that mitigate flooding locally.
- C. Climate change impacts are disproportionately affecting the city center due to its higher concentration of impervious surfaces.
- D. The maintenance and operation of the grey infrastructure are inadequate, leading to system failures during heavy rainfall.

## Social Science

1. Observe the following graph which shows the debt of the US federal government, expressed here as a percentage of GDP.



What is the most likely cause of the peaks A, B, C and D in the graph?

[4 marks]

- A. Pandemics
  - B. Changes in fiscal policy
  - C. Natural disaster relief efforts
  - D. Wartime spending
2. The quantity equation is a fundamental part of monetarist theory, which models the aggregate demand in an economy. It is described by

$$M_t V_t = P_t Y_t$$

where  $M_t$  is the quantity of money,  $V_t$  is the velocity of money,  $P_t$  is the price level, and  $Y_t$  is the output of an economy in a specific time period  $t$ .

Classical economics suggests that if there is a shock to money supply (a sudden increase or decrease), prices will change immediately in response (meaning all producers adjust their prices in the very next period).

However, Keynesian economics suggests that prices are actually sticky (meaning there is a response lag of 1 time period). Prices can be sticky for various reasons: sellers may be afraid to lose customers, menu costs, or coordination issues if sellers do not know if other sellers will change their prices.

Let us then consider an economy. We will analyze three time periods,  $t = 1, 2, 3$ . Given the following information:

$$M_1 = M, \quad P_1 = P, \quad Y_1 = Y$$

$$V_1 = V_2 = V_3 = \bar{v}$$

$$M_2 = \alpha M, \quad P_2 = \boxed{?}, \quad Y_2 = \boxed{?}$$

and

$$M_3 = \alpha M, \quad P_3 = \boxed{?}, \quad Y_3 = Y$$

**Side note:**

What do you think this notation ( $\bar{v}$ ) means economically?

Use the question below to guide your selection of the value of  $\alpha$ :

Which of the following is not a desirable characteristic of money?

- A. Fixed quantity ( $\alpha = 2$ )
- C. Easily divisible ( $\alpha = 2$ )
- B. Fixed and stable value ( $\alpha = 3$ )
- D. Durable ( $\alpha = 3$ )

What is the value of  $P_2$ ,  $Y_2$  and  $P_3$ ?

6 marks

- A.  $P_2 = P, Y_2 = 2Y, P_3 = 2P$
- B.  $P_2 = 2P, Y_2 = Y, P_3 = P$
- C.  $P_2 = 3P, Y_2 = Y, P_3 = P$
- D.  $P_2 = 3P, Y_2 = Y, P_3 = P$

3. GDP is defined as the total monetary or market value of all the finished goods and services produced within a country's borders in a specific time period.

John and Ron are Malaysians taking a walk in Desa Park City when they come across a chilli plant on the sidewalk. John offers Ron RM100 to eat all the chilli on the plant. Ron accepts, eats the chilli, and earns RM100. A few metres ahead, they find another chilli plant on the sidewalk. Ron now offers John RM100 to eat the chilli. John accepts, eats the chilli, and gets RM100. In the end, both are hospitalised from the extreme spiciness, and John has his original RM100 in his wallet.

Does GDP rise, fall, or stay unchanged? By how much? Assume the calculation of GDP in this world does not require reporting and the Department of Statistics Malaysia (DOSM) is omniscient.

5 marks

- A. Falls by RM100
- B. Rises by RM100
- C. Rises by RM200
- D. Remains unchanged

For Questions 4 and 5, refer to the information below.

Qia Juan is a huge fan of Korean culture. One day, he decides to create a script to replace the Latin alphabet, based on Korean. The script has two forms: a horizontal form and a word blocks form.

The following is a quote in English transliterated into both the horizontal and word blocks form. The Latin alphabet transliteration is not given.

### Horizontal

הַלְלוּ יְהוָה כִּי־בְּרֹכָה הַזֶּה בְּרֹכָה וְאֶת־הַזֶּה.

בְּרוּךְ יְהוָה כִּי־בְּרֹכָה הַזֶּה בְּרוּךְ יְהוָה כִּי־בְּרֹכָה.

לְבָרְכוּ יְהוָה כִּי־בְּרֹכָה!

### Word blocks

בְּרוּךְ יְהוָה כִּי־בְּרֹכָה

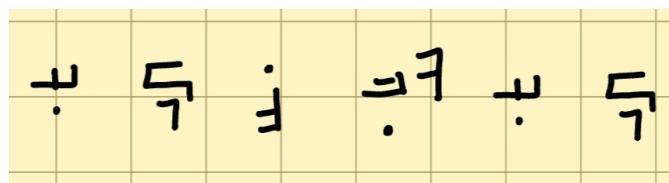
בְּרוּךְ יְהוָה כִּי־בְּרֹכָה

בְּרוּךְ יְהוָה כִּי־בְּרֹכָה

#### Hint:

Try to figure out how the horizontal form is transliterated into the word blocks form. Note that the letters might be written in different ways between the two forms!

4. Transliterate the following message in the word blocks form into the horizontal form.



5 marks

- A. ㄱ ㅓ ㅏ ㅓ ㅓ ㅓ  
B. ㅓ ㅓ ㅓ ㅓ ㅓ ㅓ  
C. ㅓ ㅓ ㅓ ㅓ ㅓ ㅓ  
D. ㅓ ㅓ ㅓ ㅓ ㅓ ㅓ

5. Transliterate the following message in the word blocks form into the Latin alphabet.



5 marks

- A. Luck is rare but bliss is sure.
- B. Tiny is fame but grand is love.
- C. Long is life but short is time.
- D. Fear is gone and peace is here.

6. Read the following quote.

*“...the presence of this suffering would be bad (for the sufferers) and the absence of the suffering is good (even though there is nobody to enjoy the absence of suffering). By contrast...the absence of pleasure...will not be bad, because there will be no one who will be deprived of this good.*

...

*We feel sadness by the fact that somewhere people come into existence and suffer, and we feel no sadness by the fact that somewhere people did not come into existence in a place where there are happy people. When we know that somewhere people came into existence and suffer, we feel compassion. The fact that on some deserted island or planet, people did not come into existence and suffer is good. ...on the other hand, we do not feel sadness by the fact that on some deserted island or planet, people did not come into existence and are not happy...”*

Which of the following concepts best suits the following quote?

5 marks

- A. Solipsism: The philosophical idea that only one's mind is sure to exist.
- B. Antinatalism: A philosophical view that deems procreation (process of creating offspring) to be unethical or unjustifiable.
- C. Existentialism: A philosophical movement that explores the human individual's struggle to lead an authentic life despite the apparent absurdity or incomprehensibility of existence.
- D. Utilitarianism: A normative ethical theory that prescribes actions aimed at maximizing happiness and well-being for the affected individuals, emphasizing the greatest good for the greatest number.

# Answers

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## Biology

1. C
2. B
3. D
4. A
5. C
6. C

## Mathematics

1. A
2. D
3. A
4. B
5. C
6. C

## Chemistry

1. B
2. C
3. A
4. C
5. A
6. B

## Planetary Science

1. B
2. C
3. B
4. A
5. B
6. B

## Physics

1. B
2. A
3. D
4. C
5. B
6. D

## Social Science

1. D
2. A
3. C
4. A
5. D
6. B

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