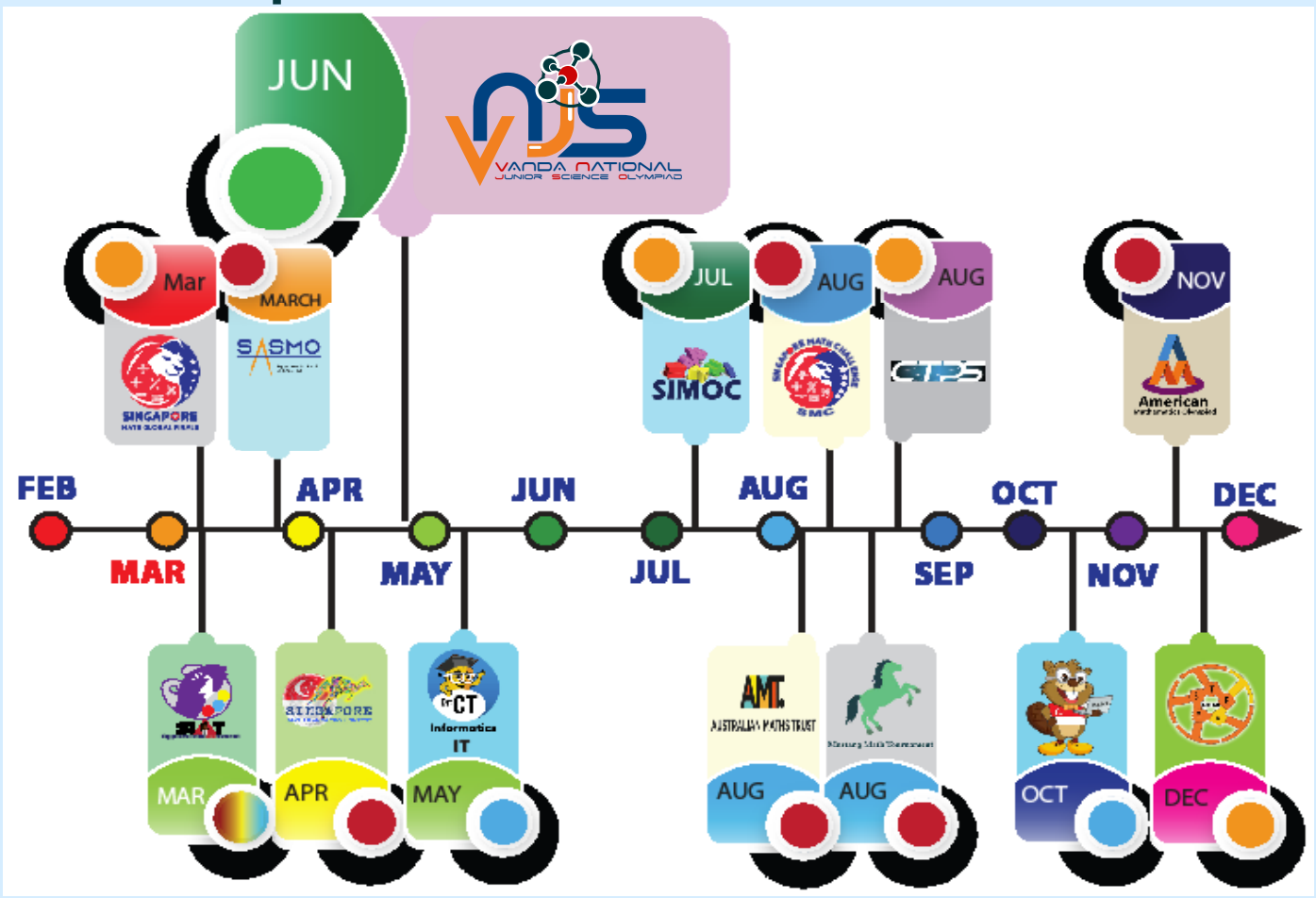
SINGAPORE INTERNATIONAL MASTERY CONTESTS CENTER
SIMCC

VANDA NATIONAL
JUNIOR SCIENCE OLYMPIAD

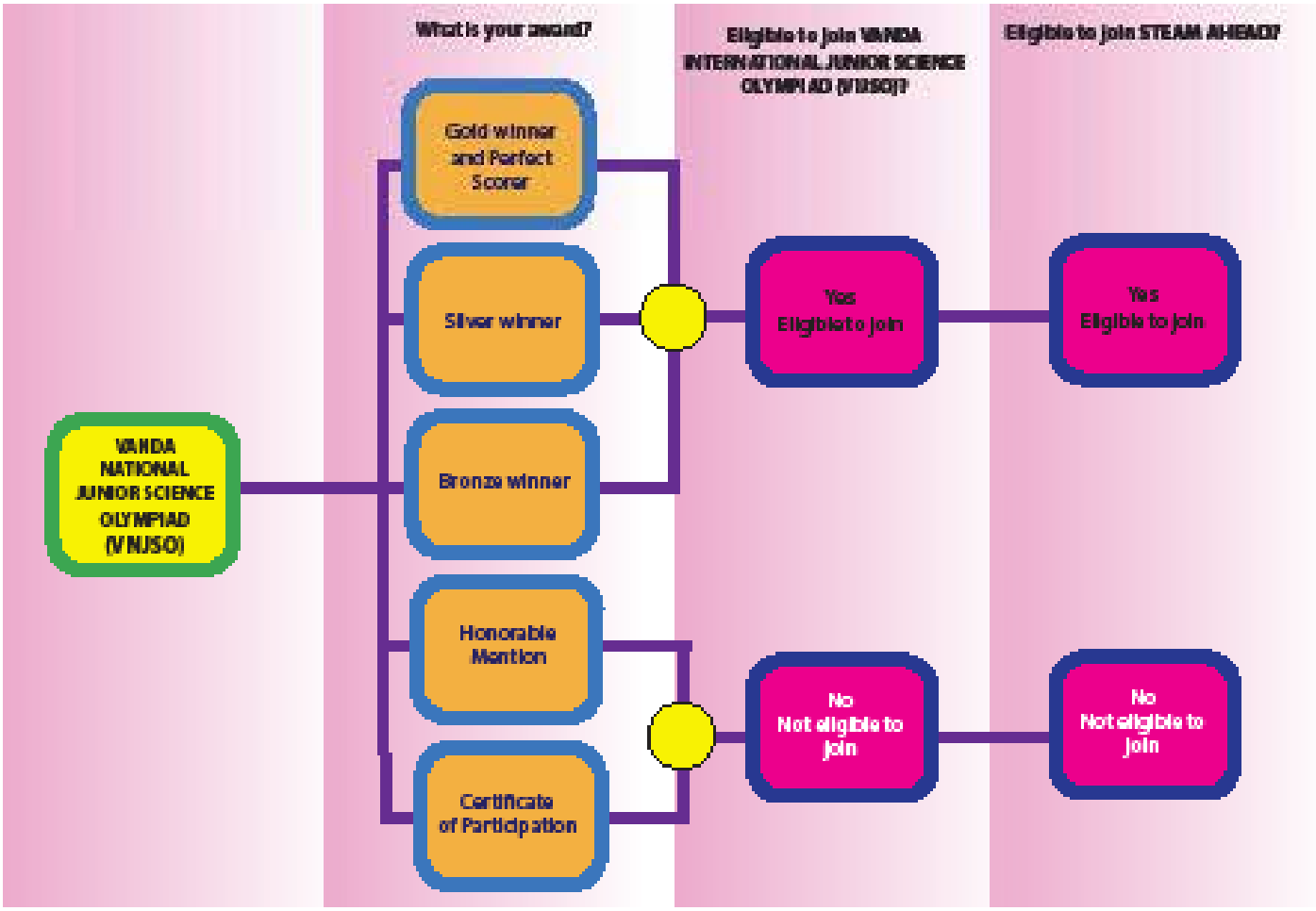
VNJSO
INFO PACK 2024

International

SIMCC Competition Timeline



SIMCC Competition progression



NURTURING THE SCIENTISTS AND INNOVATORS OF TOMORROW

As educators, you hold the key to unlocking the boundless potential within your students. Science education is not just about imparting knowledge; it's about shaping future scientists and innovators who will drive progress in our rapidly changing world. Join us at the VNJSO and be a catalyst for transformation!

Cultivate 21st Century Skills

01

As an educator/parent, you understand the importance of equipping your students with more than just facts. VANDA National Junior Science Olympiad (**VNJSO)** focuses on developing critical thinking, problem-solving, collaboration, and communication skills – essential for success in the 21st century.

Global Benchmarking

02

Wonder how your students fare on an international stage? Participating in our VANDA National Junior Science Olympiad (**VNJSO)** allows you to compare your students' performance to peers in the region and from around the world.Gain insights into your teaching and your students' learning journey.

Inspire Excellence

03

Challenge your students with Olympiad-level problems and concepts that go beyond the standard curriculum. Motivate them to excel in science and kindle a lifelong passion for discovery.

Recognition and Awards

04

Celebrate your students' achievements on a global scale. They'll receive trophies, certificates, medals, and the incredible opportunity to represent your school and country at international events.

STEAM INTERNATIONAL TOURNAMENT

There is a strong demand globally for STEAM talent led by corporations to get talent for their businesses. Hence, SIT is a great initiative to identify these talents for corporations and also various organisations giving scholarships to prepare talent for STEAM.

STEAM INTERNATIONAL TOURNAMENT (SIT)

SIMCC and Scholastic Trust Singapore (STS) is delighted to launch the STEAM International Tournament (SIT). SIT is a collection of reputable academic competitions in Science, Mathematics, Informatics, and Arts which help distinguish students' achievements in STEAM. Students who win awards in any of the qualifying contests below score points for the SIT Awards:

1. **Science** = Vanda National Junior Science Olympiad (VNJSO)
2. **Informatics** = National Junior Informatics Olympiad (NJIO) / Design thinking with robotics and Computational Thinking (DrCT) International Competition
3. **Arts** = National Junior Arts Olympiad (NJAO) / Singapore International Art Tournament (SIAT)
4. **Mathematics** = American Mathematics Olympiad (AMO) and Singapore and Asian Schools Math Olympiad (SASMO)

Rules

1. Each student will be awarded SIMCC Scholarship points from each contest.
2. SIT points must be collected within one academic year from August 1 to July 31.
3. The SIT points collected will determine the SIT Award won for that year.

IJHS Scholarship points

Grant additional IJHS Scholarship points based on the combined awards received from AMO/SASMO, NJIO, NJOS, NJAO, and NJCO.

SIT Star Award ⟶ Earn extra 3 IJHS Scholarship points (SPs)

SIT Platinum Award ⟶ Earn extra 2 IJHS Scholarship points (SPs)

SIT Tri Award ⟶ Earn extra 1 IJHS Scholarship points (SPs)

SIT Award ⟶ Earn extra 0.5 IJHS Scholarship points (SPs)

SIT Star Awardees will be trained as SIMCC STEAM camp leaders in 2024 and awarded S$200 voucher upon completion.

Top 5 SASMO Winners from each grade by country* get Contest Scholarship (CS) to compete in MMT.

No Travel needed, and earn more IJHS Scholarship points to advance to top schools and universities with scholarships

Earn additional scholarship points

Table of scholarship points from all SIMCC competitions

SIT awards will be announced together with the induction of IJHS Scholars annually on September 15, 2024.

National Contest award	Perfect Score	Gold	Silver	Bronze
IJHS Scholarship Point	3	2	1	0.5

Combined Qualifying National Contest IJHS Scholarship Points	≥ 10 points	8 to 9 points	6 to 7 points	5 points
Award	SIT Star	SIT Platinum	SIT Tri	SIT Award
Extra IJHS Scholarship Point For Award	3	2	1	0.5

Contents

About VANDA National Junior Science Olympiad

Overview

VANDA National Junior Science Olympiad **(VNJSO)** is held annually around the globe. It focuses on the student's ability to think critically and creatively to pick out hidden information to aid them in solving the question.

VNJSO is for students from primary 3 to secondary 4 (Grade 3 to Grade 10/11). It follows the Singapore School Science Syllabus with a focus on higher order thinking skills. This allows participants to do better compared to pure-Olympiad papers since they are familiar with most of the topics.

Science Questions in the competition have a strong foundation in scientific knowledge and methodology which include the development of reasoning and analytical skills, decision, and problem-solving skills, flexible to respond to different context and possessing an open and inquiring mind that is willing to explore new territories and learn new things which are aligned to the desired 21st century competencies.

Objectives

IGNITE YOUR PASSION

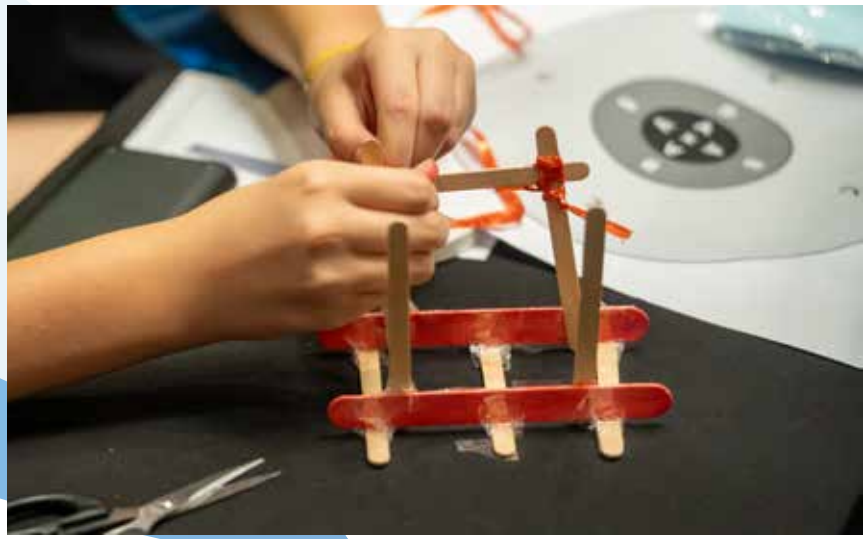
VNJSO ignites students' hidden passion for science! Vanda provides a range of interesting content in questions to spark their curiosity and encourages them to venture deeper into the world of science.

AN OPPORTUNITY FOR ALL

VNJSO exposes students to a Science Olympiad Competition that focus on higher order thinking skills. This gives them the confidence to take part in more challenging science competitions and start scoring "A*" in Science.

REACHING GREATER HEIGHTS

VNJSO helps students to be comfortable with various science Olympiad papers in the right environment. **VNJSO** wants students to utilize this experience to continue to take part in more challenging Science Olympiad Competitions in the future.



About STS

Scholastic Trust Singapore Ltd (STS) is a non-profit foundation that supports international academic and cultural competitions. With donations from revenue generated from these contests, STS awards scholarships and mentorship programs for students and teachers to transform lives. Using knowledge building pedagogies and Singapore's expertise in education, STS supports and mentors teachers and students through ACAs. We provide leading edge professional development for teachers in English, Mathematics, Science, IT, Pedagogy, and School Leadership to improve education in many developing countries. STS manages the International Junior Honor Society (IJHS), Young Achievers Leadership Academy (YALA), a live-in 5-day 4 night leadership camp, and Southern Illinois University (SIU) Dr. Jared Dorn Scholarship and SIU International Student Tuition Grants.

About SIMCC

SIMCC is a social enterprise and donates 20% of her contest revenues to support students and teachers. SIMCC is one of the largest academic contest organizers in Singapore and Asia. We are committed to popularizing education through thinking games and competitions, and allowing students to interact, cooperate and build lasting bonds of friendship that transcend borders.

SIMCC has sales offices in Cambodia (Phnom Penh), Indonesia (Jakarta), and Singapore along with More than 500,000 participants from over 100,000 schools participated in our competitions. In 2024, we now have more than 45 countries and territories

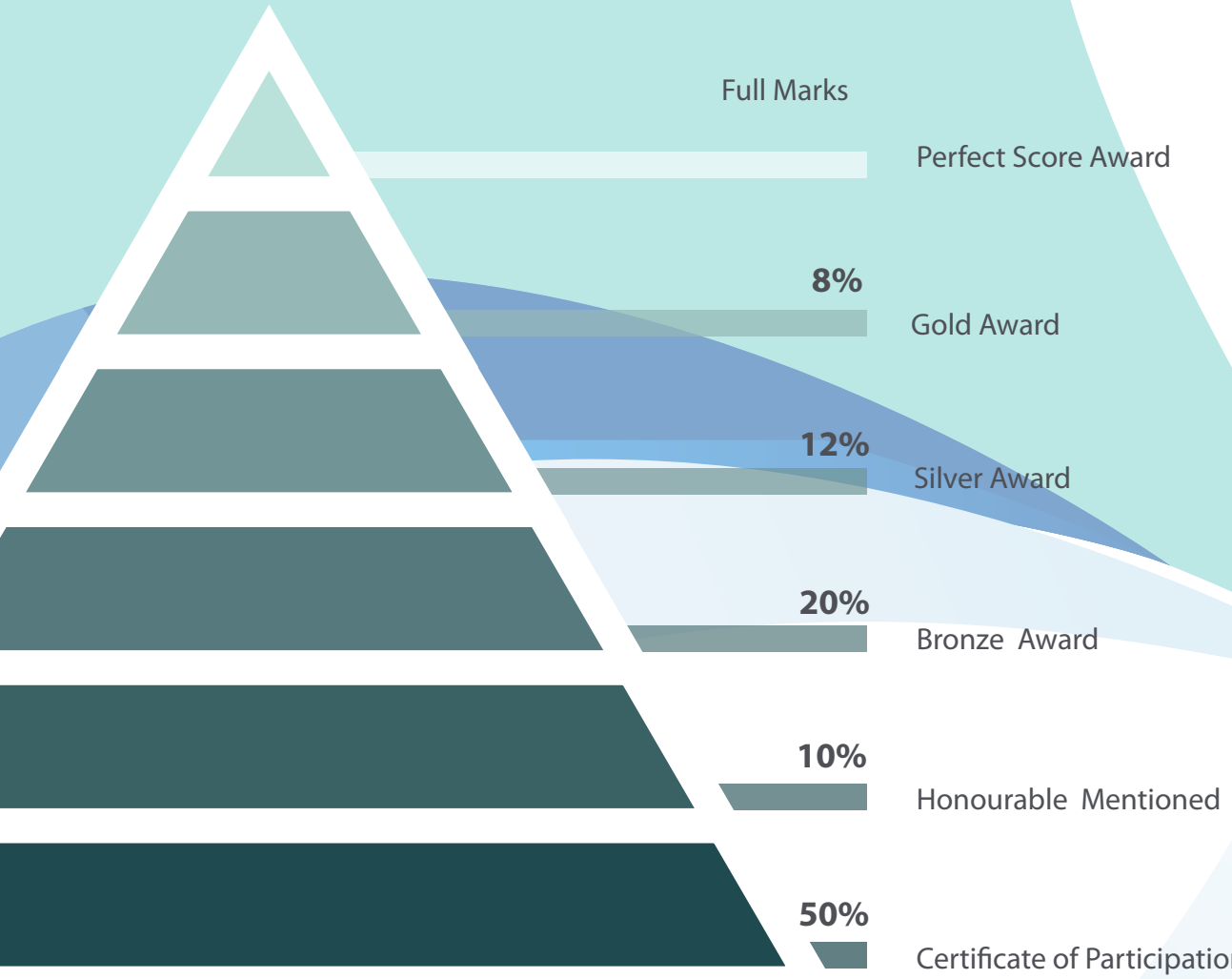
Format of the Test

Written paper - 90 Minutes, Total points: 77

Section A	Question 1 - 10	2 points for correct answer
		0 points for unanswered question
		Penalty point (deduct 1 point) for wrong answer
Section B	Question 11 - 20	3 points for correct answer
		No points deducted for wrong answers
Section C	Question 21 - 23	3 points each, with no points deducted for wrong answers
	Question 24 - 25	4 points each, with no points deducted for wrong answers

To avoid negative scores, each student will begin with 10 bonus points.

Awards



Gold Medal

Silver Medal

Bronze Medal

The top 50% of the participants will receive an award certificate. Top 40% of winners are invited to compete at STEAM AHEAD 2024 – VANDA International Junior Science Olympiad on December 8, 2024 in Istanbul, Turkiye. The top 40% of the participants will receive an award certificate and a medal. Students must register with the SIMCC country organizer and the contest entry is available on a first come first served basis, so register as soon as possible to avoid disappointment.

Participation Awards

Schools and participants will receive the following:

1. Award voucher for Perfect Scorers.

2. Certificates for Perfect Scorers, Gold, Silver and Bronze winners.

3. E-certificates are also given to participants who qualify for Honourable Mentioned or attain Certificate of Participation.

Performance Statistical Report

Performance by Questions

Table below shows which questions student got correct.

Q1 Correct	Q2 Correct	Q3 Correct	Q4 N/A	Q5 Correct
Q6 Correct	Q7 Correct	Q8 Correct	Q9 Correct	Q10 Correct
Q11 Correct	Q12 N/A	Q13 Correct	Q14 N/A	Q15 Incorrect
Q16 Correct	Q17 Correct	Q18 Correct	Q19 Correct	Q20 Correct
Q21 Correct	Q22 Correct	Q23 N/A	Q24 Correct	Q25 Correct
Q26 Correct	Q27 Incorrect	Q28 Incorrect	Q29 Incorrect	Q30 N/A

Performance by Topics

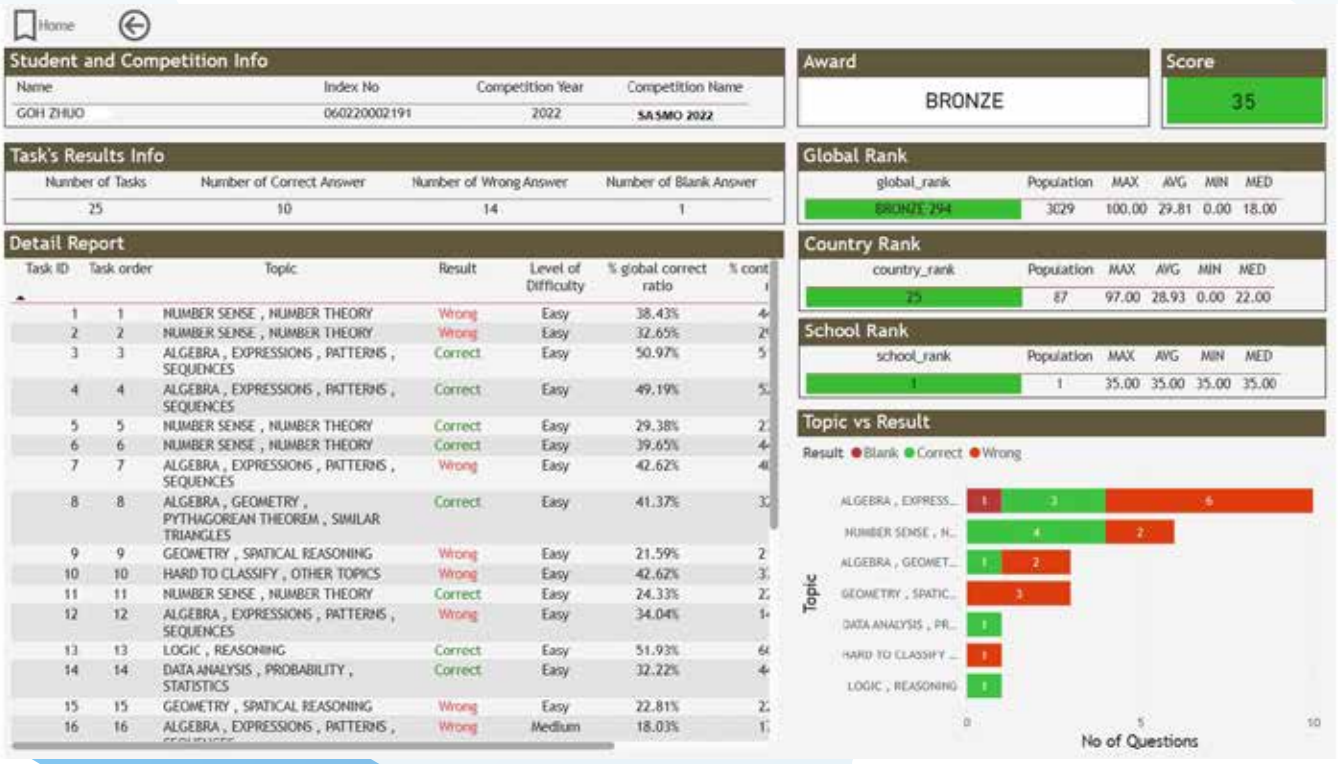
Percentage on top: Student's average by topics | Percentage middle: School average by topics | Percentage below: National average by topics

ARITHMETIC AND NUMBER CONCEPTS	ALGEBRAIC THINKING AND PATTERNS	REASONING AND PROBLEM SOLVING	ART OF COUNTING	GEOMETRIC AND SPATIAL REASONING
100%	50%	71%	43%	67%
76%	45%	43%	29%	27%
76%	45%	43%	29%	27%

Grade Performance Analysis

Topic	Your Score	School Range	Average
ARITHMETIC AND NUMBER CONCEPTS	30	18 - 30	22

Each participant will receive a digital report detailing their performance, along with dynamic statistical analysis that highlights their strengths and areas for improvement across different topics. Additionally, this report includes a comparison of their performance with that of their peers in the same grade, both within their country or territory.



Home

Student and Competition Info

Name	Index No	Competition Year	Competition Name
GOH ZHUO	060220002191	2022	SASMO 2022

Award: BRONZE

Score: 35

Task's Results Info

Number of Tasks	Number of Correct Answer	Number of Wrong Answer	Number of Blank Answer
25	10	14	1

Global Rank

global_rank	Population	MAX	AVG	MIN	MED
BRONZE 294	3029	100.00	29.81	0.00	18.00

Country Rank

country_rank	Population	MAX	AVG	MIN	MED
25	87	97.00	28.93	0.00	22.00

School Rank

school_rank	Population	MAX	AVG	MIN	MED
1	1	35.00	35.00	35.00	35.00

Detail Report

Task ID	Task order	Topic	Result	Level of Difficulty	% global correct ratio	% cont
1	1	NUMBER SENSE , NUMBER THEORY	Wrong	Easy	38.43%	4
2	2	NUMBER SENSE , NUMBER THEORY	Wrong	Easy	32.65%	2
3	3	ALGEBRA , EXPRESSIONS , PATTERNS , SEQUENCES	Correct	Easy	50.97%	5
4	4	ALGEBRA , EXPRESSIONS , PATTERNS , SEQUENCES	Correct	Easy	49.19%	5
5	5	NUMBER SENSE , NUMBER THEORY	Correct	Easy	29.38%	2
6	6	NUMBER SENSE , NUMBER THEORY	Correct	Easy	39.65%	4
7	7	ALGEBRA , EXPRESSIONS , PATTERNS , SEQUENCES	Wrong	Easy	42.62%	4
8	8	ALGEBRA , GEOMETRY , PYTHAGOREAN THEOREM , SIMILAR TRIANGLES	Correct	Easy	41.37%	3
9	9	GEOMETRY , SPATICAL REASONING	Wrong	Easy	21.59%	2
10	10	HARD TO CLASSIFY , OTHER TOPICS	Wrong	Easy	42.62%	3
11	11	NUMBER SENSE , NUMBER THEORY	Correct	Easy	24.33%	2
12	12	ALGEBRA , EXPRESSIONS , PATTERNS , SEQUENCES	Wrong	Easy	34.04%	1
13	13	LOGIC , REASONING	Correct	Easy	51.93%	6
14	14	DATA ANALYSIS , PROBABILITY , STATISTICS	Correct	Easy	32.22%	4
15	15	GEOMETRY , SPATICAL REASONING	Wrong	Easy	22.81%	2
16	16	ALGEBRA , EXPRESSIONS , PATTERNS ,	Wrong	Medium	18.03%	1

Topic vs Result

Result: Blank, Correct, Wrong

Topic: ALGEBRA , EXPRESS... (1, 3, 6); NUMBER SENSE , N... (4, 2); ALGEBRA , GEOMET... (1, 2); GEOMETRY , SPATIC... (3); DATA ANALYSIS , PR... (1); HARD TO CLASSIFY ... (1); LOGIC , REASONING (1)

0 5 10

No of Questions

Syllabus

Primary 3 to 6 (Grades 3 to 6)

Levels	P3	P4	P5	P6
Themes	**Diversity . Cycles . Systems . Interactions . Energy**			
Topics	• Diversity of living and non-living things (General characteristics and classification) • Diversity of materials • Cycles in plants and animals (Life cycles) • Interaction of forces (Magnets)	• Plant system (Plant parts and functions) • Human system (Digestive system) • Cycles in matter and water (Matter) • Energy forms and uses (Light) • Energy forms and uses (Heat)	• Cycles in plants and animals (Reproduction) • Cycles in matter and water (Water) • Plant system (Respiratory and circulatory systems) • Human system (Respiratory and circulatory systems) • Electrical system	• Energy forms and uses (Photosynthesis) • Energy Conversion • Interaction of forces (Frictional force, gravitational force, elastic spring force) • Interactions within the environment

Syllabus

Secondary 1 and 2 (Grades 7 and 8)

Planned Curriculum	
1. The Scientific Endeavour	
Themes	**Topics**
Diversity	2. Exploring Diversity of Matter by its Physical Properties 3. Exploring Diversity of Matter by its Chemical Composition 4. Exploring Diversity of Matter using Separation Techniques
Models	5. Ray Model of Light 6. Model of Cells - the Basic Unit of Life 7. Model of Matter - The Particulate Nature of Matter 8. Model of Matter - Atoms and Molecules
Interactions	9. Application of Forces and Transfer of Energy 10. Transfer of Heat Energy and its Effects 11. Chemical Changes 12. Interactions within Ecosystems
Systems	13. Electrical Systems 14. Human Digestive System 15. Transport Systems in Living Things 16. Human Sexual Reproductive System

Secondary 3 and 4 (Grades 9 and 10/11)

Biology

Sections	Topics
Cells and the Chemistry of Life	1. Cell Structure and Organisation
	2. Movement of Substances
	3. Biological Molecules
The Human Body – Maintaining Life	4. Nutrition in Humans
	5. Transport in Humans
	6. Respiration in Humans
	7. Infectious Diseases in Humans
Living Together – Plants, Animals and Ecosystems	8. Nutrition and Transport in Flowering Plants
	9. Organisms and their Environment
Continuity of Life	10. Molecular Genetics
	11. Reproduction in Humans
	12. Inheritance

Syllabus

Physics

Sections	Topics
Measurements	1. Physical Quantities, Units and Measurements
Newtonian Mechanics	2. Kinematics
	3. Force and Pressure
	4. Dynamics
	5. Turning Effects of Forces
	6. Energy
Thermal Physics	7. Kinetic Particle Model of Matter
	8. Thermal Processes
Waves	9. General Wave Properties
	10. Electromagnetic Spectrum
	11. Light
Electricity and Magnetism	12. Electric Charge and Current of Electricity
	13. D.C. Circuits
	14. Practical Electricity
	15. Magnetism and Electromagnetism
Radioactivity	16. Radioactivity

Chemistry

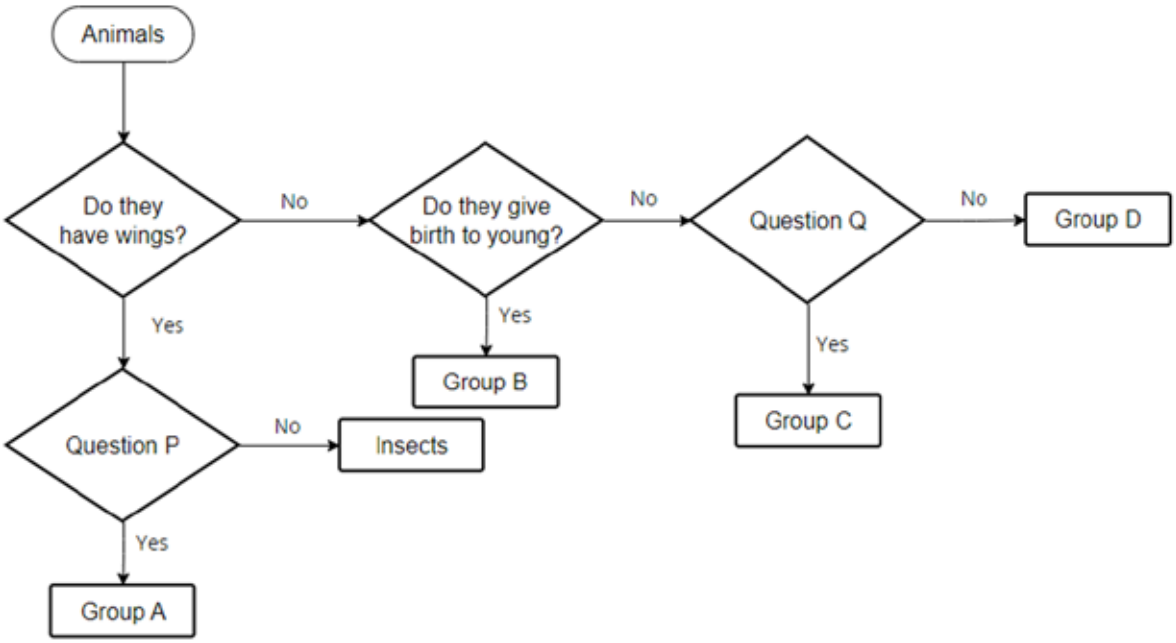
Sections	Topics
Matter – Structures and Properties	1. Experimental Chemistry
	2. The Particulate Nature of Matter
	3. Chemical Bonding and Structure
Chemical Reactions	4. Chemical Calculations
	5. Acid-Base Chemistry
	6. Qualitative Analysis
	7. Redox Chemistry
	8. Patterns in the Periodic Table
	9. Chemical Energetics
	10. Rate of Reactions
Chemistry in a Sustainable World	11. Organic Chemistry
	12. Maintaining Air Quality

Sample Questions

Primary 3 (Grade 3)

Question 1

The below flowchart illustrates how certain animals are categorised in different groups. Each group represents a category of animals.

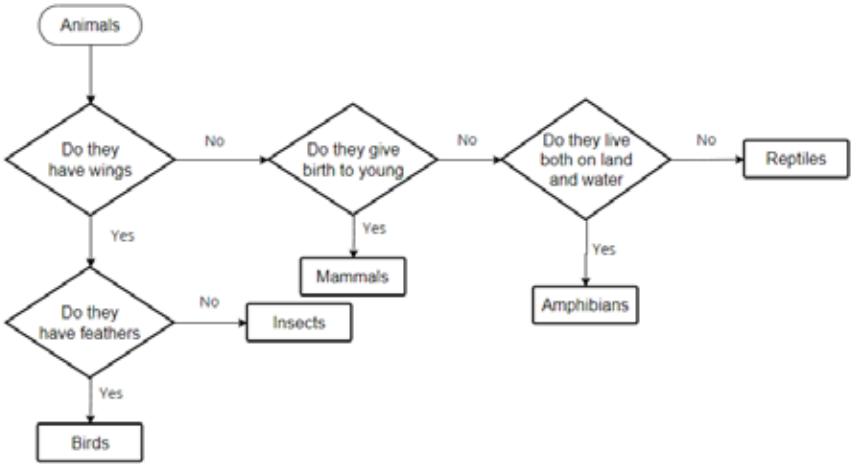


Based on the information, what could question P and Q be?

	Question P	Question Q
A	Do they lay eggs?	Do they fly?
B	Do they fly?	Do they lay eggs?
C	Do they have feathers?	Do they live both on land and water?
D	Do they have vertebrae?	Do they have fur?

Answer: C

Explanation:



Sample Questions

Question 2

A student loves experimenting with magnets. He had a collection of five bar magnets and a horseshoe magnet stored in a box. During his latest experiment, he picked up one of the bar magnets from the box and held it close to a compass. To his amazement, he noticed that the compass needle aligned itself with the magnet, as shown in diagram A.

However, while trying to place the magnet back in the box, Billy had a little mishap. The magnet slipped from his hand and broke in the middle, resulting in two pieces, as depicted in diagram B.

Diagram A

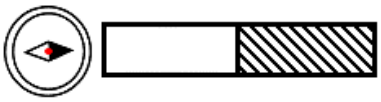
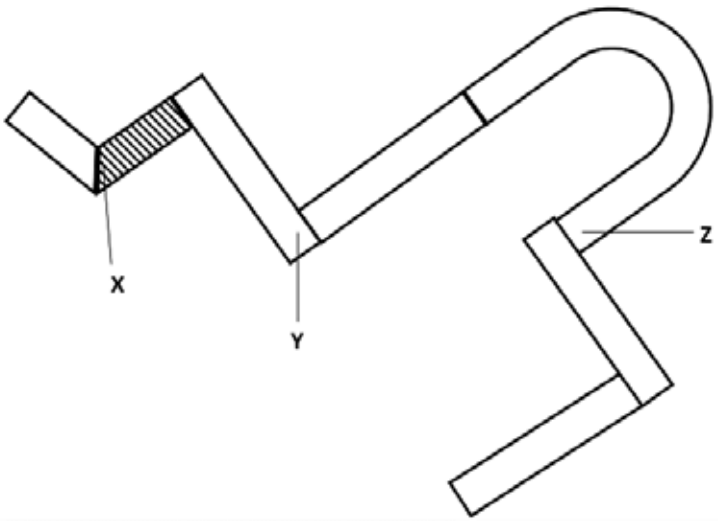


Diagram B

He later used all the magnets and made a shape as shown in the diagram below.



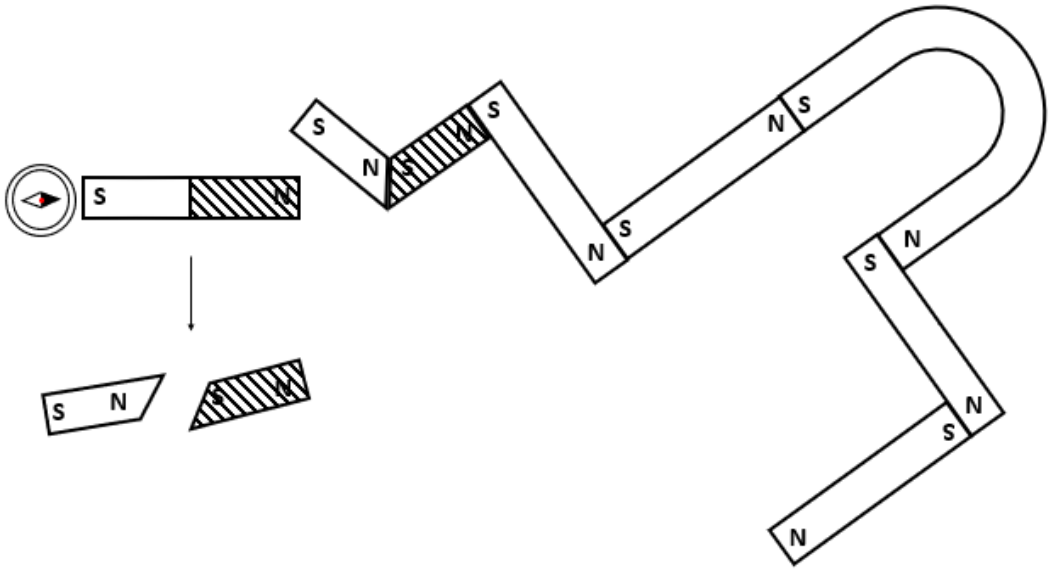
Which of the following rows correctly represents the poles X, Y and Z of the respective magnets?

	Pole X	Pole Y	Pole Z
A	South	North	South
B	North	South	North
C	North	South	South
D	South	North	North

Sample Questions

Answer: D

Explanation: Using the compass, we can find out the non-shaded part of unbroken magnet is south as the dark part of the compass needle (north) points towards it. Using this the remaining poles can be mapped as shown in the diagram below.



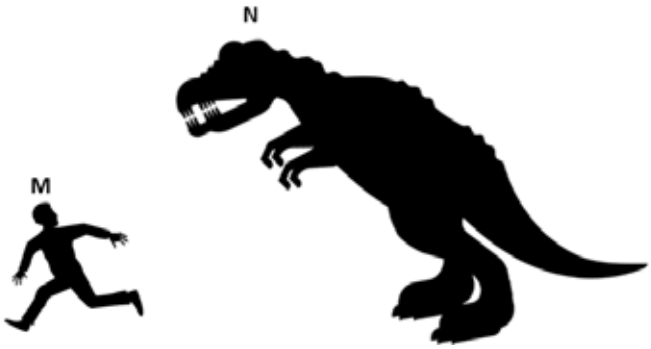
Sample Questions

Primary 4 (Grade 4)

Question 1

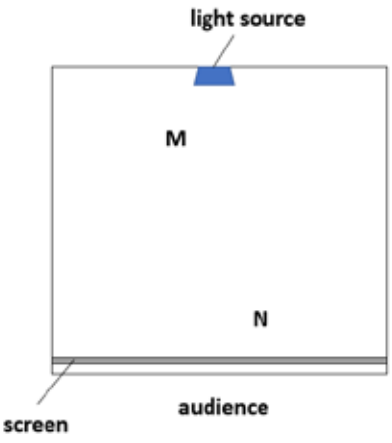
Shadow plays are a prime example of how lighting, shadows, and perspectives can be used in entertainment. These techniques are also commonly used in movies to create stunning visual effects that enhance storytelling and immerse the audience in the story's world. Lighting is a critical tool employed in shadow plays to manipulate the audience's perception of size. Play makers can create the illusion that characters are either larger or smaller than their actual size.

For instance, two objects, M and N, which are of the same size, were positioned in a particular way and projected onto a screen to appear as different sizes, as shown in the image below. This technique creates an illusion for the audience.

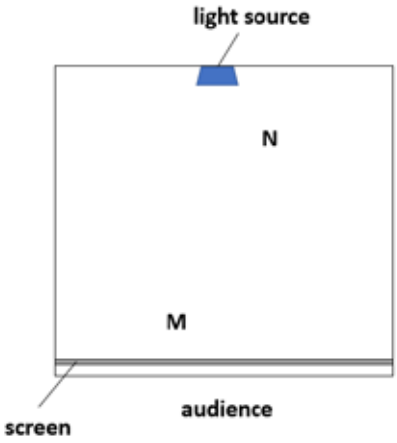


Which of the following layouts correctly illustrates the positions of objects M and N in relation to the light source and the screen?

A

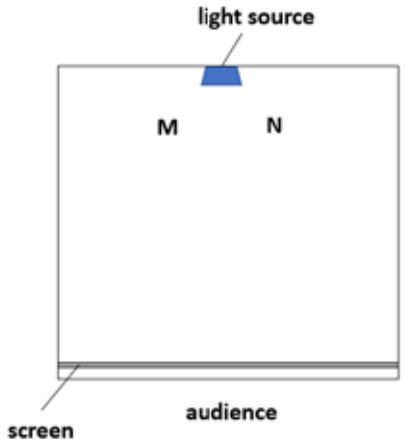


B

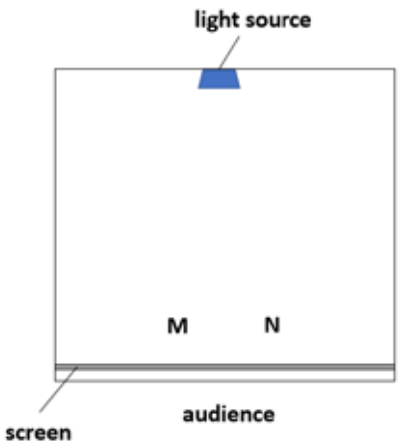


Sample Questions

C



D



Answer: B

Explanation: The illusion of size manipulation in shadow plays is achieved by manipulating the position of objects in relation to the light source and the screen. In this case, object M is appearing smaller than object N, so it should be positioned closer to the screen, while object N should be positioned further away. The light source should also be positioned closer to object N and further away from object M. This creates a larger shadow for object N and a smaller shadow for object M, giving the illusion of different sizes. Therefore, option B is correct, as it shows the correct positions of objects M and N in relation to the light source and the screen to achieve this illusion of size manipulation.

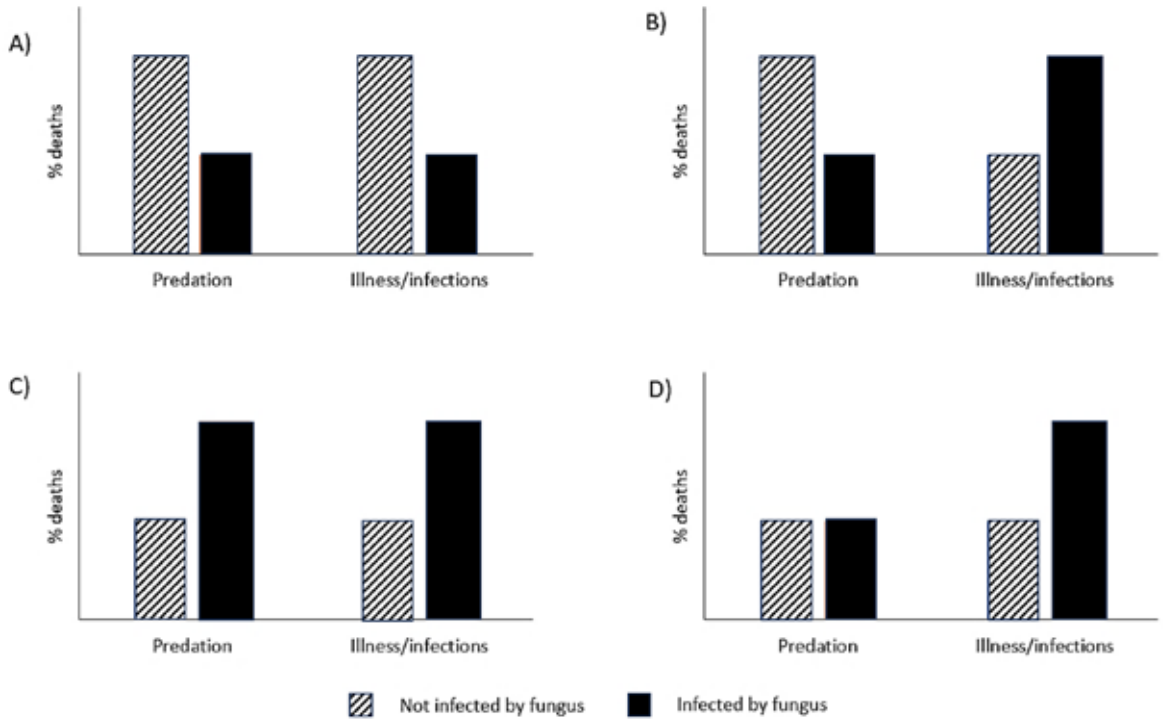
Sample Questions

Question 2

Study the scenario below:

A species of rock pythons lays its eggs in swamps where the hatchlings hide and forage for food. Unfortunately, these hatchlings are preyed upon by bigger animals. To avoid detection, they hide beneath water plants, but they must venture out to find food, leaving themselves vulnerable to predators. It has been found that the health and fitness of hatchlings are strongly linked to their hiding behaviour. The eggs of these rock pythons are susceptible to infection by a fungus which causes skin lesions in hatchlings. This infection weakens and immobilizes the hatchlings, making them less likely to leave their hiding places, which negatively affects their health. Two causes of hatchling death have been found. They are predation by bigger animals, and illness or other infections.

Which graph would be the most suitable to illustrate the situation outlined above?



Answer: B

Explanation: Hatchlings which are not infected by fungus are active and venture out leading to more susceptibility to predation. So not infected by fungus should have a higher % of deaths by predation which eliminates options C and D. % of deaths would obviously be higher in those infected by the fungus as those not infected may actively forage for food so they are less likely to die because of non-infection related causes. Therefore, the answer is B.

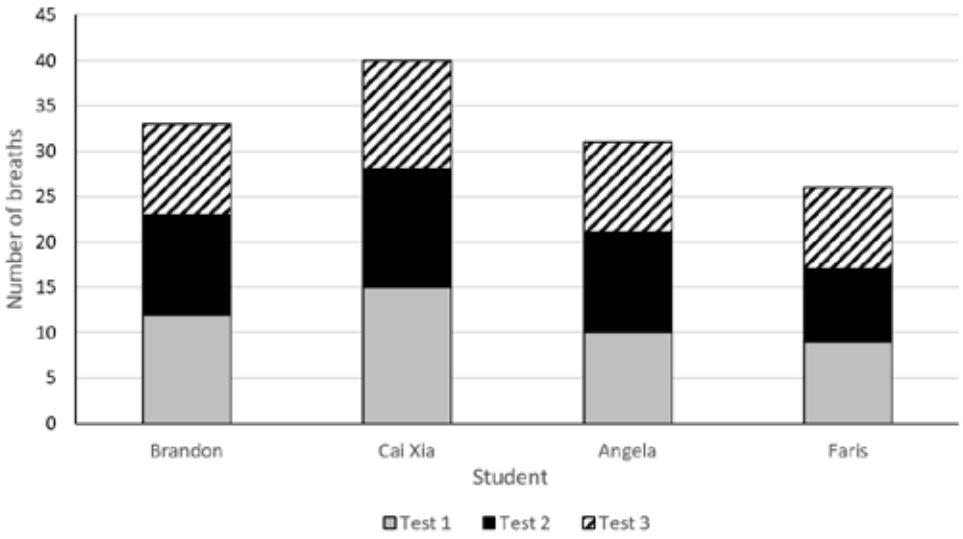
Sample Questions

Primary 5 (Grade 5)

Question 1

Brandon, Cai Xia, Angela and Faris wanted to find out who among them had the greatest lung capacity.

They each took turns to blow into a straw inserted into an inverted glass jar submerged in water. They are required to use as many breaths as needed to fill up the inverted glass jar with air. The number of breaths taken was recorded and they repeated the test a total of 3 times. The resulting graph is shown below.



Based on the given information, who had the greatest lung capacity?

A. Brandon
B. Cai Xia
C. Angela
D. Faris

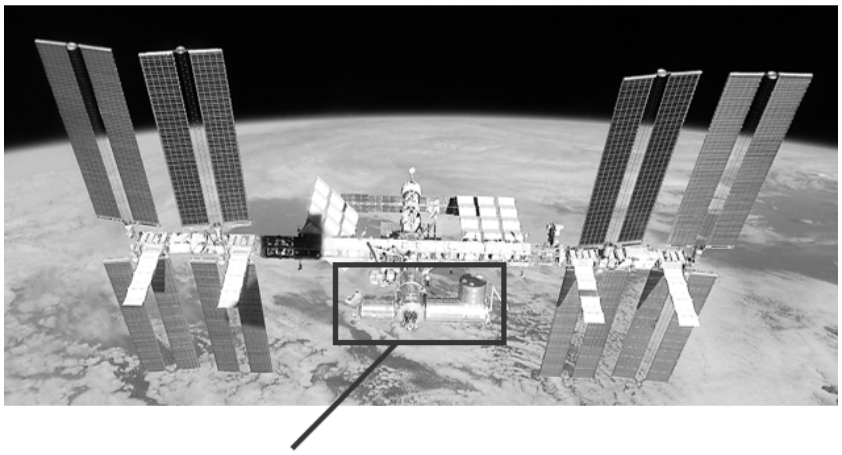
Answer: D

Explanation: Faris has the greatest lung capacity as he used the least number of breaths across Test 1, 2 and 3, to fill up the inverted glass with air. This means that each of his breath has a larger volume of air, in total, that would mean that his lungs are better able to hold more air.

Sample Questions

Question 2

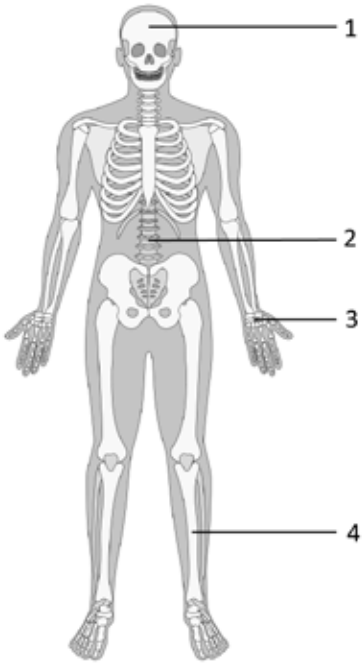
Scientists from Tokyo University of Agriculture and Technology (TUAT), Japan, conducted some interesting experiments in space. They used Japanese experiment special space station called Kibo, which is aboard the International Space Station (ISS), shown in the image below. They found that changes in gravity can have an effect on our bones and muscles.



Kibo, Japanese experiment module attached to ISS

When we are in zero gravity, we do not have to fight against the pull of gravity like we do on Earth. This means our bodies can relax, and it reduces the stress on our bones. Our bones need to bear weight to stay strong and dense. But when there is less stress on our bones, our bodies do not make as many bone-building cells called osteoblasts, which leads to a loss of bone mass. This is important because it makes our bones weak and puts us at risk for fractures.

Based on the information provided, which of the following bones is/are most likely to be affected in individuals who remain in space for prolonged periods without suitable activities designed to minimise the effects of zero gravity?



Sample Questions

A	B	C	D
1 is correct only	1 and 3 correct only	2 and 4 correct only	1,2,3,4 are correct

Answer: C

Explanation: Based on the information, zero gravity has most effect on bones which are weight bearing. Among the labelled structures, 1, 2 3 and 4 weight bearing structures are 2 – vertebral column and 4 – tibia. 1 is skull and 3 is wrist bones.

Sample Questions

Primary 6 (Grade 6)

Question 1

Which of the following flowers are typically wind pollinated?

A

B

C

D

Answer: B

Explana1on: A – Lavender; B – Alder; C – Hibiscus; D – Passionflower

Pollina<on is the process by which pollen is transferred from the male reproduc<ve structures (anthers) of a flower to the female reproduc<ve structures (s<gma) of the same or another flower, resul<ng in fer<liza<on and the produc<on of seeds. This transfer of pollen can be achieved through various means, including wind, water, and animals.

In wind-pollinated plants, the transfer of pollen occurs through the movement of pollen grains by the wind. These plants ohen have small, inconspicuous flowers with no scent or nectar, but produce large amounts of lightweight pollen that can be easily carried by the wind. The pollen may be released directly into the air or held on structures such as catkins or tassels that sway in the wind.

Wind-pollinated flowers are typically small and inconspicuous, with no bright colours or strong scents. They ohen have long, dangling stamens that release pollen directly into the wind. In contrast, insect-pollinated flowers are ohen larger and showier, with brightly coloured petals and strong scents to aKract pollinators. Wind-pollinated flowers are ohen arranged in clusters or spikes to maximize exposure to the wind, while

insect-pollinated flowers are ohen arranged singly or in small groups to make it easier for pollinators to find them.

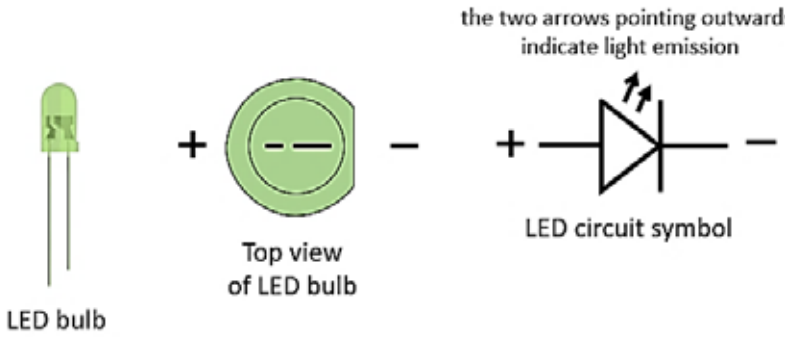
Sample Questions

insect-pollinated flowers are often arranged singly or in small groups to make it easier for pollinators to find them.

Question 2

LEDs are a type of light bulb that uses electrical energy to produce light. They are much more energy-efficient than traditional incandescent bulbs because they use a process called electroluminescence to convert electricity into light. This process requires far less energy to produce the same amount of light.

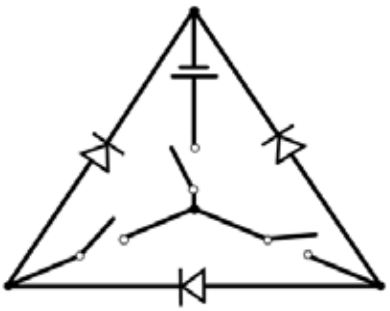
LEDs have two terminals: a positive and negative terminal just like a battery. They only work if connected with the correct polarity which is positive terminal of the LED to positive terminal of a battery or a cell. This is because they are a type of diode, which is a two-terminal electronic component that allows current to flow in only one direction.



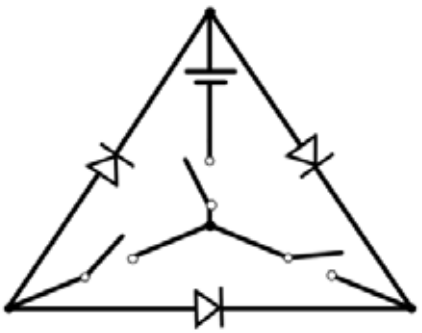
LEDs also have a longer lifespan than traditional bulbs. Incandescent bulbs typically last for around 1,000 hours, while LEDs can last for tens of thousands of hours. LEDs are an important technology for sustainability and energy conservation, and they are increasingly used in lighting and electronics.

A student has built four different circuits as shown in the diagrams below, where she used LEDs instead of regular bulbs and an appropriate power source to be able to lit all LEDs. When the switch positions are set to close from open, which of the following circuits will have the most LEDs lit?

A

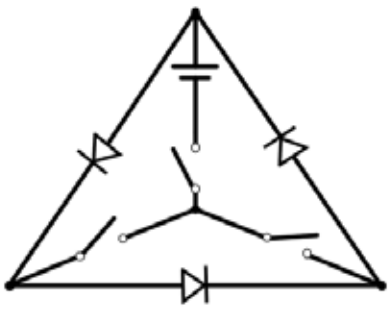


B

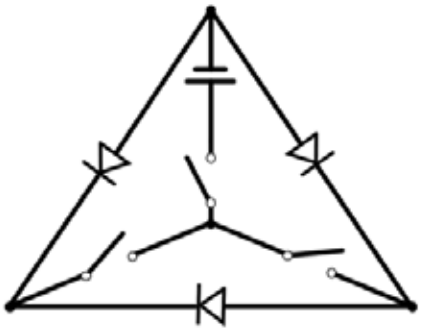


Sample Questions

C

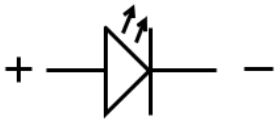


D

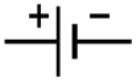


Answer: A

Explanation: A – 2 LEDs; B - 1 LED; C – 1 LED; D – 0 LEDs



LED circuit symbol



Cell symbol

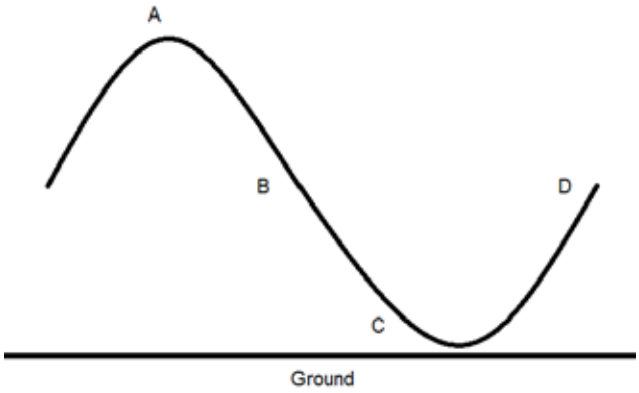
LEDs have two terminals: a positive and negative terminal just like a cell/battery. They only work if connected with the correct polarity which is positive terminal of the LED to positive terminal of a battery or a cell. This is because they are a type of diode, which is a two-terminal electronic component that allows current to flow in only one direction. Only option A has maximum number of LEDs connected to the cell with correct polarity, positive side of the LED connected to the positive side of the cell.

Sample Questions

Secondary 1 (Grade 7)

Question 1

The diagram below shows a section of a roller-coaster ride.



Which point of the ride is the velocity of the roller coaster the highest?

A. A
B. B
C. C
D. D

Answer: C

Explanation: At the lowest point of the roller coaster ride near the ground, the roller coaster possesses the greatest amount of kinetic energy. Hence, the velocity of the roller coaster is the highest.

Question 2

Human activities have significant impacts on the ecosystems around us, which are mostly negative. However, if proper investigations are conducted and appropriate actions are implemented, the extent of damage caused can be reduced or reversed. Ecological impact rating is a measure used to assess the effect of human activities on ecosystems.

Tina is working on an assignment related to the ecological impact rating, where she needs to rate different activities, including dam construction, agriculture, urbanization, and tribals living in forests. She has developed a rating scale based on the degree of impact of each activity on the environment as shown in the table below:

Ecological impact rating Symbol	Description
+	Has a positive effect on the environment
–	Has a negative effect on the environment
*	Has no significant effect on the environment

However, as she continued to work on the assignment, she realised that there may be other activities that could also affect the ecological impact rating.

Sample Questions

Which of the following activities is most appropriate choice for the ecological impact rating based on their impact on the environment?

	Rating symbol	Activities
A)	+	Supporting intensive animal farming, using synthetic fertilizers in agriculture, discharging excess nutrients into rivers.
B)	–	Supporting intensive animal farming, using synthetic fertilisers in agriculture, release large amount of nutrients into rivers
C)	+	Using only single-use plastics, supporting timber industries, using a laptop or computer instead of a smartphone.
D)	*	Using a gas-powered lawnmower instead of an electric one, using fluorescent light bulbs instead of LED bulbs, supporting industries that are dependent on natural resources such as mining and logging.

Answer: B

Explanation: Option B is the correct answer as it includes activities that have a negative impact on the environment. Supporting intensive animal farming and using synthetic fertilizers in agriculture can lead to soil and water pollution, as well as contribute to greenhouse gas emissions. Discharging excess nutrients into rivers can lead to eutrophication, which can cause a decline in water quality and harm aquatic life.

Option A includes similar activities as option B, but mistakenly uses the positive rating symbol for them, which is incorrect.

Option C includes activities that are mix of neutral and negative impact. Using a laptop or computer instead of a smartphone and supporting timber industries have a neutral impact, while using single-use plastics has a negative impact.

Option D includes activities that are either neutral or have a small negative impact. Using a gas-powered lawnmower instead of an electric one and using fluorescent light bulbs instead of LED bulbs have a small negative impact or neutral, while supporting industries that are dependent on natural resources such as mining and logging has a significant negative impact.

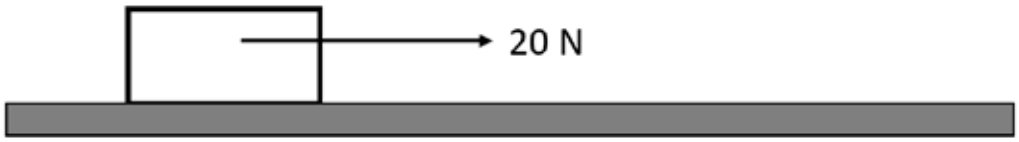
Therefore, option B is the most appropriate choice for the ecological impact rating based on their impact on the environment.

Sample Questions

Secondary 2 (Grade 8)

Question 1

A block of mass was placed on a surface. A man pulled the block with a force of $20\ N$ for $3.0\ s$.



Given that the block is moving at a constant speed of $5.0\ m\ s^{-1}$, which of the following statements about the frictional force between the block and the surface is correct?

A. The frictional force is $0\ N$.
B. The frictional force is $20\ N$.
C. The frictional force is larger than $20\ N$.
D. The frictional force is smaller than $20\ N$.

Answer: B

Explanation: Since object is moving at constant speed, applied force = frictional force = 20 N.
The block is moving at a constant speed, which means that it is not accelerating. According to Newton's first law of motion, if an object is moving at a constant velocity (which includes a constant speed in a straight line), the net force acting on it must be zero. This means that the forces acting on the block are balanced.

In this case, the man is applying a force of 20 N to pull the block. If the block is moving at a constant speed, the frictional force opposing this pull must be equal in magnitude and opposite in direction to the pull to ensure that the net force is zero. Thus, the frictional force must also be 20 N.

Question 2

Chocolates are made from roasted and ground cacao beans, which typically have a very strong bitter taste. It is consumed around the world and is one of the most popular food types that is also added into many foodstuffs such as cakes, puddings, brownies, and cookies. Milk chocolates contains an excellent source of dietary vitamins and minerals such as riboflavin, vitamin B12, calcium, magnesium and iron. However, it contains a high amount of calories.

A student wants to buy some chocolates to distribute to his friends but is unsure of how many bars of chocolates are contained inside as that information was missing from the package.

The nutritional information of a packet of VANDA chocolates of 288 grams is given below:

Sample Questions

Nutritional Information Typical Values	Per 100 g	Per bar
Energy	2156KJ	690kJ
Fat of which : saturates	21.2g 15.3g	8.7g 4.9g
Carbohydrate of which: sugars	58.6g 47.1g	18.8g 15.1g
Fibre	2.4g	0.8g
Protein	7.9g	2.5g
Salt	0.22g	0.07g

Based on the information given above, determine how many bars of VANDA chocolates are there inside this packaging.

A. 3
B. 8
C. 9
D. 10

Answer: C

Explanation: Using the energy per 100g, 2156/100 x 288/690 = 8.999 or about 9 bars of chocolates.

Sample Questions

Secondary 3 (Grade 9)

Question 1

Dengue fever is an illness caused by the dengue virus, which is carried and spread by the *Aedes* mosquitoes. Some symptoms include tendency to bleed from the nose and gums, bruises from minor bumps and in more severe cases, shock due to leaking blood vessels.

Based on the symptoms mentioned, which component of the blood is affected by the virus?

A. White blood cell
B. Plasma
C. Red blood cell
D. Platelets

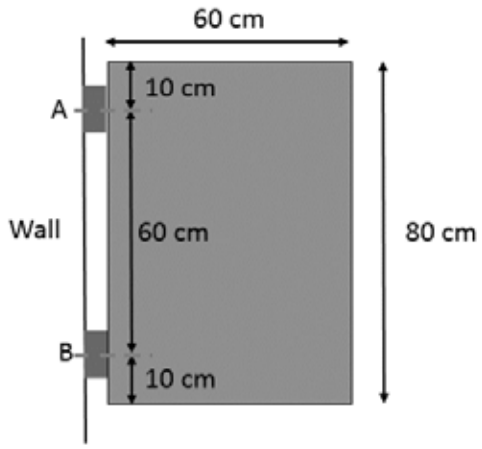
Answer: D

Explanation: The symptoms mentioned suggest a problem with blood clotting. Platelets, also known as thrombocytes, are the components of the blood that are primarily responsible for clotting and stopping bleeding. Therefore, based on the symptoms provided, the component of the blood affected by the dengue virus is: D. Platelets

When platelets are affected or their levels are reduced, it can lead to increased bleeding and bruising, which is characteristic of dengue fever, particularly in its severe form known as dengue haemorrhagic fever.

Question 2

The diagram below shows a signboard attached by hinges A and B of 10 cm each to a wall. The signboard weighs 5 kg and it is stationary.



Determine the normal force that is acting by hinge A on the wall.

A. 12.5 N
B. 21.0 N
C. 24.5 N
D. 49.5 N

Answer: C

Explanation:

The weight of the signboard (W) is 5 kg, which means the gravitational force acting on it is

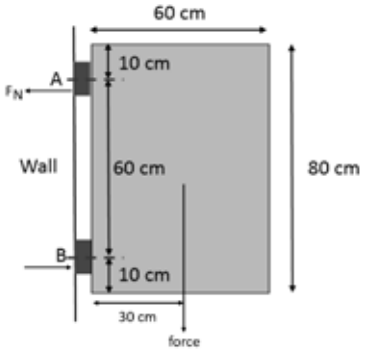
Sample Questions

$W = 5\ kg \times 9.81\ m/s^2 = 49.05\ N$

The weight can be considered to act at the centre of gravity, which is at the centre of the board (30 cm from either hinge).

There are two hinges, A and B, and they are likely to share the load equally because they are at the same height and the board is uniform.

The normal force we are looking for is the vertical component of the force that hinge A/B exerts on the signboard.



Taking point B to be a pivot,

Sum of clockwise movement = sum of anticlockwise movement

$49 \times 30 = F_N \times 60$

$F_N = 24.5\ N$

Sample Questions

Secondary 4 (Grade 10/11)

Question 1

Sickle cell anaemia is a genetic disorder that affects the shape of the red blood cells due to a mutation in the haemoglobin-Beta gene. Red blood cells appear sickle-shaped instead of biconcave, reducing its ability to bind to oxygen.

Table below shows the genetic code encoding for amino acids 4 – 8 in the normal haemoglobin and mutated haemoglobin.

Normal haemoglobin					
Position of amino acid	4	5	6	7	8
DNA bases	ACT	CCT	GAG	GAG	AAG
Mutated haemoglobin					
Position of amino acid	4	5	6	7	8
DNA bases	ACT	CCT	GTG	GAG	AAG

Table below shows the genetic code.

First Base	Second Base: U	Second Base: C	Second Base: A	Second Base: G	Third Base
U	UUU, UUC – Phe; UUA, UUG – Leu	UCU, UCC, UCA, UCG – Ser	UAU, UAC – Tyr; UAA, UAG – STOP	UGU, UGC – Cys; UGA – STOP; UGG – Trp	U, C, A, G
C	CUU, CUC, CUA, CUG – Leu	CCU, CCC, CCA, CCG – Pro	CAU, CAC – His; CAA, CAG – Gln	CGU, CGC, CGA, CGG – Arg	U, C, A, G
A	AUU, AUC, AUA – Ile; AUG – Met or Start	ACU, ACC, ACA, ACG – Thr	AAU, AAC – Asn; AAA, AAG – Lys	AGU, AGC – Ser; AGA, AGG – Arg	U, C, A, G
G	GUU, GUC, GUA, GUG – Val	GCU, GCC, GCA, GCG – Ala	GAU, GAC – Asp; GAA, GAG – Glu	GGU, GGC, GGA, GGG – Gly	U, C, A, G

Sample Questions

Study the following statements:

I. Protein synthesis cannot occur
II. A different amino acid is encoded for at position 6
III. The mutated haemoglobin is shorter than normal
IV. The mutated haemoglobin protein is in a different shape compared to the normal haemoglobin.

Based on the information given, which of the above statement(s) is/are correct?

A. I only
B. II and III only
C. II and IV only
D. III and IV only

Answer: C

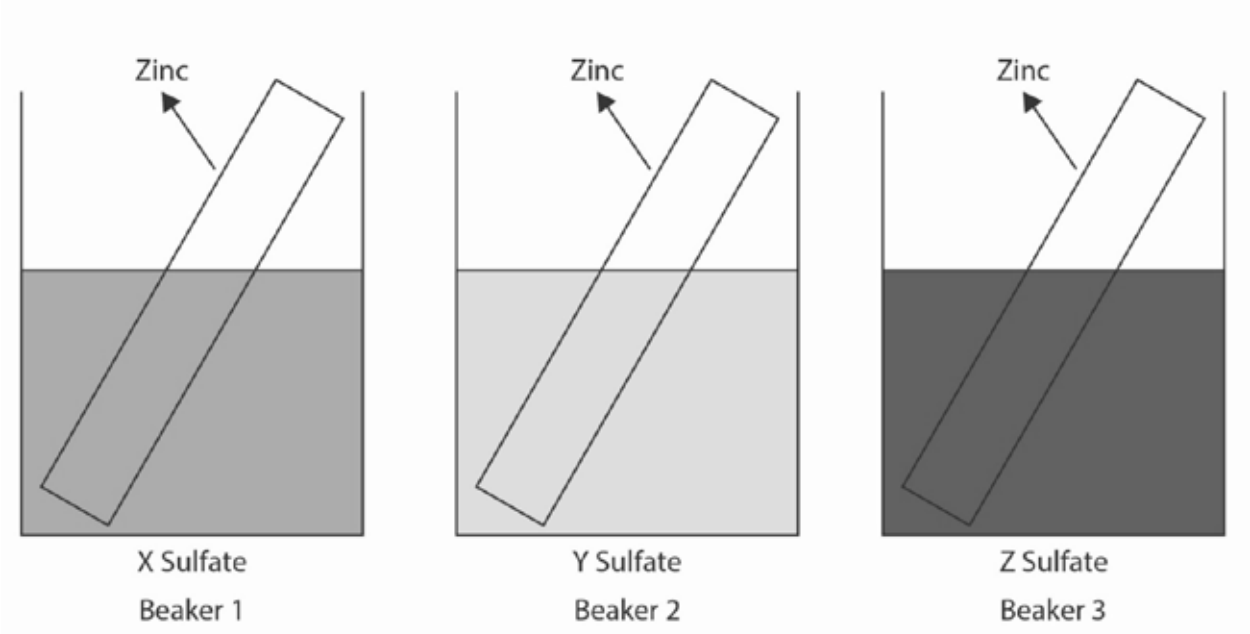
Explanation: Codon sequence of the 6th amino acid is different. In the mutated haemoglobin, valine is encoded for instead of glutamine. The rest of the codon sequences remain unchanged. With a different amino acid sequence, the folding of the protein will change. This results in a haemoglobin that has a different shape, causing the shape of the red blood cell to be sickle-shaped.

Option A is wrong as the mutated haemoglobin protein is still produced.

Option B and D are wrong as statement III is wrong. Mutated haemoglobin will only be shorter if a stop codon is introduced. Based on the mutation seen in Table 2.1, no stop codon is introduced.

Question 2

In chemistry class, Yan and LJ investigate the reactivity series of metals. The chemistry teacher gave them three zinc strips with three different solutions in beakers labelled as X sulphate, Y sulphate and Z sulphate.



Sample Questions

When the students placed zinc strips into the aqueous solutions, the following observations were made:

	Colour Change	Formation of Precipitation
X Sulphate	Nothing	Nothing
Y Sulphate	The initial green colour fades away and becomes colourless after a while	Grey precipitate forms at the bottom
Z Sulphate	Initial blue colour fades away and becomes colourless	The reddish-brown coating on the zinc strip and solids at the bottom of the beaker

What is the correct matching of X, Y and Z? (ignore the solution colours in the figure)

	X Sulphate	Y Sulphate	Z Sulphate
A.	Iron II Sulphate	Hydrogen Sulphate	Magnesium Sulphate
B.	Magnesium Sulphate	Iron II Sulphate	Copper Sulphate
C.	Copper Sulphate	Iron II Sulphate	Magnesium Sulphate
D.	Hydrogen Sulphate	Copper Sulphate	Magnesium Sulphate

Answer: B
Explana1on: The reac5vity of metals goes as Magnesium>Zinc>Iron>Copper
To determine the correct matching of X, Y, and Z with their respec<ve sulfates, we need to consider the chemical reac<ons that could take place between zinc and the metal sulfates, using the reac<vity series of metals as a guide. Zinc will react with solu<ons of metals that are lower in the reac<vity series than zinc itself, leading to a displacement reac<on where zinc takes the place of the other metal in the sulfate compound.
Here are the key points for each reac<on:
X Sulfate: There is no colour change and no forma<on of precipita<on. This suggests that the metal in X sulfate is either less reac<ve than zinc, so no reac<on occurs, or it could be that the solu<on does not have a metal that would react with zinc.
Y Sulfate: The ini<al green colour fades away and becomes colourless, and a grey precipitate forms at the boKom. The grey precipitate suggests the forma<on of a metal, and the green colour fading could indicate the presence of iron II sulfate, as iron (II) ions can impart a green colour to solu<ons. Zinc is more reac<ve than iron, so zinc can displace iron from its sulfate to form zinc sulfate, which is colourless, and iron metal, which appears grey.
Z Sulfate: The ini<al blue colour fades away and becomes colourless, and there is a reddish-brown coa<ng on the zinc strip and solids at the boKom of the beaker. The blue colour is characteris<c of copper (II) sulfate, and the reddish-brown solid would be copper metal. Zinc is more reac<ve than copper and can displace copper from copper sulfate to form zinc sulfate and copper metal.
With this understanding, we can match:
X Sulphate: This must be a metal sulfate that is more reac<ve than zinc or not a metal sulfate (e.g., magnesium sulfate), as there is no reac<on.
Y Sulphate: This should be iron II sulfate because of the green colour and the grey precipitate of iron.
Z Sulphate: This should be copper sulfate because of the blue colour and the reddish-brown copper metal that forms.
The correct matching is:
X Sulphate: Magnesium Sulfate (Magnesium is more reac<ve than zinc, so no displacement reac<on occurs) Y Sulphate: Iron II Sulfate (Iron is less reac<ve than zinc, so it is displaced)
Z Sulphate: Copper Sulfate (Copper is less reac<ve than zinc, so it is displaced)
Therefore, the answer is B

Registration Information

Competition Dates	Registration Fees	Platform
		Online / Paper based.

HOW TO REGISTER

Kindly check with your country partner for registration and competition details. For more information about your country partner, please refer to our website below
https://simcc.org/country-partners/

Refund Policy

The contest fees paid by students to the competition are non-refundable. To host the competition, our organization invests a significant amount of time and resources, not to mention the various charges incurred to process the payments and registration.

As a social enterprise, SIMCC operates with a very lean team and limited resources to keep our operating costs low in order to make our competition affordable to all students. Hence, we will not be able to offer any refunds for competition fees to students who withdraw or cancel beyond our control.

If any student has been wrongly charged by SIMCC, or we cancel an event due to reasons under our control, we will happily refund the fees paid by the students.

VANDA Science International 2024 Science Olympiad Preparation Classes Programs and Schedules

Weekdays Regular Program

Time Slot (Singapore Time)	Day	Class/Level	Dates	L#
04.45 PM to 06.30 PM	Tue, Wed	Primary 3 (Grade 3) ONLINE	Mar 19, 20, 26, 27|Apr 2, 3, 9, 10	8
07:15 PM to 09:00 PM	Tue, Wed	Primary 4 (Grade 4) ONLINE	Mar 19, 20, 26, 27|Apr 2, 3, 9, 10	8
04.45 PM to 06.30 PM	Thu, Fri	Primary 5 (Grade 5) ONLINE	Mar 21, 22, 28, 29 | Apr 4, 5, 11, 12	8
07:15 PM to 09:00 PM	Thu, Fri	Primary 6 (Grade 6) ONLINE	Mar 21, 22, 28, 29 | Apr 4, 5, 11, 12	8
07:15 PM to 09:00 PM	Tue, Wed	Secondary 1/2 (Grade 7/8) ONLINE	Mar 19, 20, 26, 27|Apr 2, 3, 9, 10	8
07:15 PM to 09:00 PM	Thu, Fri	Secondary 3/4 (Grade 9/10) ONLINE	Mar 21, 22, 28, 29 | Apr 4, 5, 11, 12	8

Weekends Regular Program

Time Slot (Singapore Time)	Day	Class/Level	Dates	L#
12:00 PM to 01:45 PM	Sat, Sun	Primary 3 (Grade 3) ONLINE	Mar 2, 9, 16, 23, 30 | Apr 6, 13, 14	8
12:00 PM to 01:45 PM	Sat, Sun	Primary 4 (Grade 4) ONLINE	Mar 2, 9, 16, 23, 30 | Apr 6, 13, 14	8
2:30 PM to 04:15 PM	Sat, Sun	Primary 5 (Grade 5) ONLINE	Mar 2, 9, 16, 23, 30 | Apr 6, 13, 14	8
2:30 PM to 04:15 PM	Sat, Sun	Primary 6 (Grade 6) ONLINE	Mar 2, 9, 16, 23, 30 | Apr 6, 13, 14	8
05:00 PM to 06:45 PM	Sat, Sun	Secondary 1/2 (Grade 7/8) ONLINE	Mar 2, 9, 16, 23, 30 | Apr 6, 13, 14	8
07:30 PM to 09:15 PM	Sat, Sun	Secondary 3/4 (Grade 9/10) ONLINE	Mar 2, 9, 16, 23, 30 | Apr 6, 13, 14	8

Intensive Holiday Training Program

Time Slot (Singapore Time)	Class/Level	Dates	L#
09:00 AM to 12:00 PM	Primary 3 (Grade 3)	Mar 12, 13, 14, 15	4
09:00 AM to 12:00 PM	Primary 4 (Grade 4)	Mar 12, 13, 14, 15	4
01:00 PM to 04:00 PM	Primary 5 (Grade 5)	Mar 12, 13, 14, 15	4
01:00 PM to 04:00 PM	Primary 6 (Grade 6)	Mar 12, 13, 14, 15	4
4:15 PM to 7:15PM	Secondary 1/2 (Grade 7/8)	Mar 12, 13, 14, 15	4

STEAM AHEAD

(A COMBINATION OF 5 COMPETITIONS: IJMO, VANDA International Junior Science Olympiad, International Junior Informatics Olympiad (IJIO), International Junior Arts Olympiad (IJAO) and International Junior CyberSecurity Olympiad. (IJCO)

The National University of Singapore Centre for Nurturing Computing Talent (NUS CeNCE) and Singapore's National Cybersecurity R&D Lab (NCL) will be offering Capturing the Flag (CTF) as part of the International Junior CyberSecurity Olympiad (IJCO). Optional training will be provided by NUS CeNCE and NCL professors and the contest certificates and medals will be provided by NUS and NCL.

STEAM stands for Science, Technology, Engineering/Entrepreneurship, Arts and Mathematics. STEAM AHEAD is our initiative to combine our international academic competitions to educate students and bring them international exposure about possible career choices in these fields.

So, STEAM AHEAD offers multiple opportunities for students to win awards in IJMO Individual & Team, VANDA Individual & Team, and NJIO Individual & Team, together with IJAO, plus Overall Champion in each grade level for IJMO, VANDA IJSO and IJIO, and Triple Gold Medal winners in IJMO, IJCO, VANDA IJSO, IJIO and IJAO will be awarded the President's Award for Excellence in STEAM STAR (PAExS STAR) - more than 6 awards can be won! Students winning 2 gold medals in any of the STEAM AHEAD Competitions will be awarded President's Award for Excellence in STEAM (PAExS). Students with 3 gold awards will be conferred the PAExS Star Award.

Please refer to the STEAM AHEAD info pack for more details or visit our website. WEBSITE: https://ijmo.asia/

International Junior Honor Society

"Leaders Give, Givers Get!"

IJHS is an honor society that focuses on developing leaders and enabling its members to achieve success in academic and life pursuits. IJHS provides its members with a variety of platforms and opportunities to unleash their full potential, as well as connect to their community.

IJHS is fully funded by Scholastic Trust Singapore (STS), a non-profit foundation, and supported by a prominent volunteer board of advisors to help guide bright young leaders.

About IJHS

- **Vision**: a strong community of compassionate leaders.
- **Values**: humility, empathy, adaptability, resolute, truthfulness.

Goals

- Unlock the potential, talents, passions, and interests of aspiring Fellows.
- Empower young leaders to give back to their local and global communities.
- Pave the way for members to gain entry into top schools and qualify for scholarships.
- Provide top institutions' admission and scholarship coaching to high achievers.
- Make the world a better place.

Why should you join IJHS?

01 Expert guidance on how to gain entrance into renowned educational institutions/universities.

02 Important internship opportunities where members can explore a variety of career options while enhancing their leadership skills and admission/scholarships at top universities.

03 Myriad resources and support to enable members to contribute back to their community.

04 Mentorship to assist members in qualifying for prestigious scholarships.

05 Access to a global network of like-minded Leaders and Givers.

How to earn IJHS SPs?

Students can earn IJHS Scholarship point (SP) by winning awards in SIMCC competitions. There are 3 levels of SIMCC competitions with different score.

Individual contests	National Contest	Global Finals Online	Global Finals
Perfect Score	3	3.5	4
Gold Award	2	2.5	3
Silver Award	1	1.5	2
Bronze Award	0.5	0.75	1

Team contests	MMT	VANDA GF	SIMOC
Gold Award	2	2	1
Silver Award	1	1	0.5
Bronze Award	0.5	0.5	0.25

IJHS Membership Level

04 **Honorary Lifetime**
Special membership award for those who contribute to the society

03 **Lifetime**
3rd Entry
Lifetime membership

02 **Senior**
2nd Entry
2 years membership

01 **Junior**
1st year Entry
1 year membership

Other Awards counted for IJHS points

STEAM International Tournament (SIT) PAExS (Gold in VANDA, DrCT, SIAT GFs and IJMO) Overall Champions.

YALA Scholarships

YALA
YOUNG ACHIEVERS LEADERSHIP ACADEMY

Every member of IJHS (grades 4 and above) will automatically receive a scholarship to join the YALA Camp every year.

There are 4 levels of scholarships based on IJHS Scholarship Points (SPs).

1. **Platinum Scholarship (100%)**
2. **Palladium Scholarship (75%)**
   New class of scholarships for IJHS members to apply for YALA scholarships
3. **Gold Scholarship (50%)**
4. **Silver Scholarship (30%)**
   Open to all IJHS members to apply

Gained >= 4 IJHS SPs → **Member of IJHS**

Gained more IJHS SPs → **Better and more scholarships**

Young Achievers Leadership Academy (YALA) Camp

Watch a video of YALA 2023 hosted in Bali, Indonesia and see the exciting skills and recognition IJHS members have acquired through the YALA Scholarship and how they have contributed back to their local and global communities through the Community Support Projects (CSPs).
https://simccorg.sharepoint.com/:v:/s/CompetitionContestPapersCountrypartnersandPrintedversion/EWTGH59emOhDkW_Xfs3iUgIBPxt_615k1oRCQihWkFFyrA?e=FcX6ZK

Singapore International
Mastery Contests Center