



VANDA

SCIENCE GLOBAL FINALS

Primary 5 / Grade 5

Full Name: _____ Country: _____

School: _____ Index Number: _____

Instructions to Students:

1. Only scientific calculators are allowed during the contest for secondary school/Grade 7 and above students.
2. The duration of this contest is **1 hour**. You may not leave the contest venue within the first half an hour of the paper.
3. This examination paper contains **20** questions and comprises of **18** printed pages, inclusive of the cover page.
4. Each question has only 4 possible answers: **A, B, C** and **D**. You must shade your correct option on the Answer Entry Sheet provided.
5. The total marks for this paper is 70 points:

Section A:

Question 1 to 5: +2 points for correct answer, 0 points for no answer and –1 point for wrong answer.

Section B:

Question 6 to 10: +3 points for correct answer, 0 points for no answer or wrong answer.

Section C:

Question 11 to 20: +4 points for correct answer, 0 points for no answer or wrong answer.

6. You are not allowed to bring the question paper and answer script out of the contest venue.

Note:

- 1) You may assume that there is no air resistance throughout the contest, unless otherwise stated.
- 2) All temperatures are in degree Celsius, unless otherwise stated.
- 3) Room temperature is 25°C at 1 atmospheric pressure.
- 4) Gravitational Acceleration is taken to be 9.8 m/s².

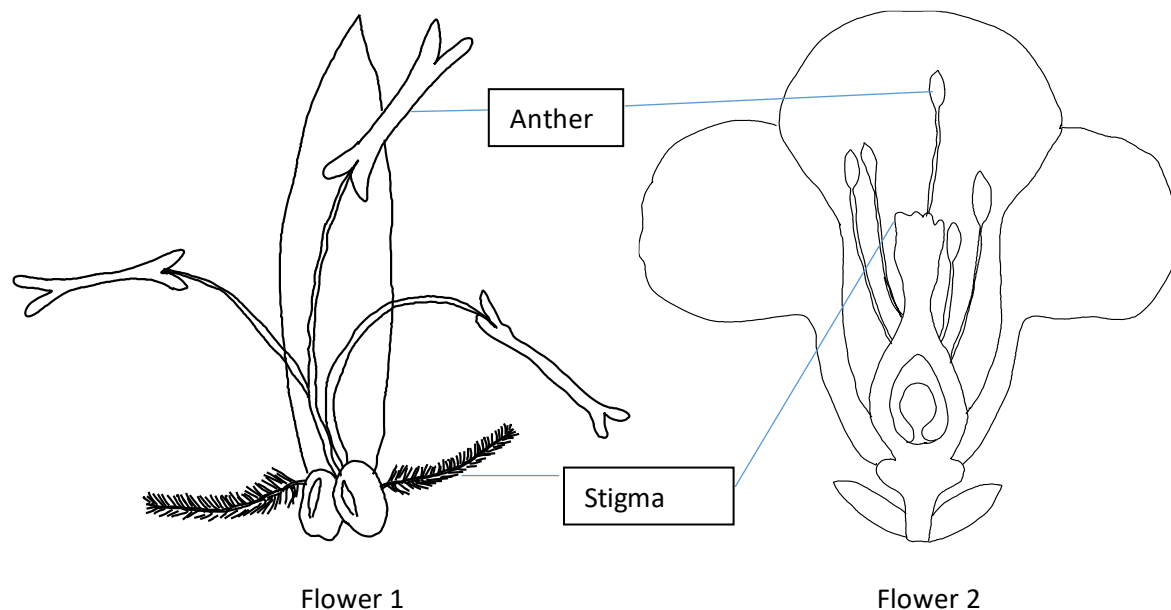
Rough Working

Section A: (Question 1 to 5: +2 points for correct answer, 0 points for no answer and –1 point for wrong answer.)

Refer to the information below for question 1 and 2.

- Q1) Flowers have to be pollinated in order for them to reproduce and continue their kind. They can be wind-pollinated or insect-pollinated. Wind-pollinated flowers have their pollen grains carried by the wind instead of insects. These pollen grains are light, tiny and there are numerous of them in the anther. Pollen grain from insect-pollinated flowers are fewer in number compared to wind-pollinated flowers. They are bigger, coarser and sometimes even spiky.

The diagram below shows 2 flowers, one of them wind-pollinated and the other insect-pollinated.



Based on the information above, which flower is likely to be wind-pollinated?

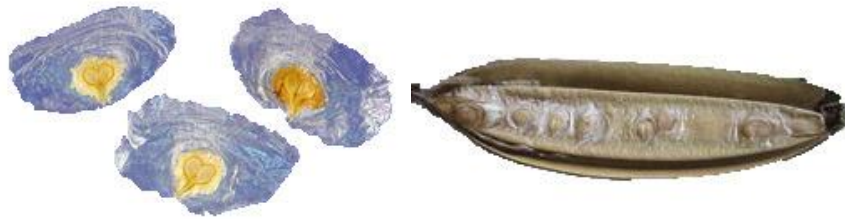
- A) Flower 1
- B) Flower 2
- C) Both flowers
- D) None of the flowers

Q2) Wind-pollinated and insect pollinated flowers are examples of which scientific concept(s)?

- 1) Evolution and natural selection
- 2) Adaptations
- 3) Newton's Laws of Motion
- 4) The Scientific Method

- A) Option 4
- B) Option 2
- C) Option 1 and 2
- D) Option 1, 2 and 3

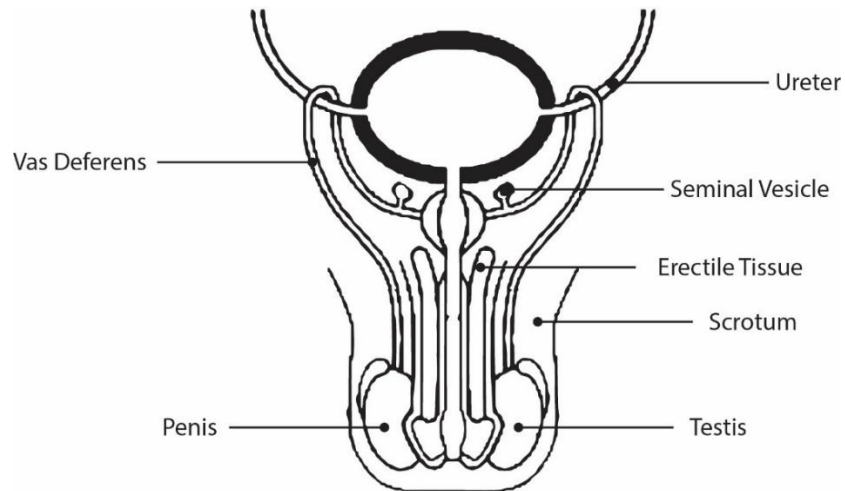
Q3) The diagram below shows the cross-section of a fruit, R.
How are the seeds of R likely dispersed in their natural environment?



- 1) By wind
- 2) By water
- 3) By explosive action
- 4) By animals

- A) Option 1 only
- B) Option 3 only
- C) Option 1 and 3
- D) Option 2 and 4

- Q4) More men are increasingly open to the concept of vasectomy as a form of family planning. During a vasectomy, the sperm duct (also known as the vas deferens) is cut and tied. This is considered a permanent form of contraception. Even though it can be reversed, the reversal process is costly and do not always work.



Based on the diagram shown, how does cutting and tying the sperm duct (also known as vas deferens) act to achieve contraception?

- A) The seminal vesicles are unable to produce sperms, and reproduction is not able to happen.
- B) It causes the testis to no longer produce sperms and without sperms, reproduction is not able to happen.
- C) Sperms are unable to travel to the penis where they leave the body as the passageway has been severed.
- D) The scrotum is no longer able to produce sperms and without sperms, reproduction is not able to happen.

Refer to the following diagram for questions 5 and 6.

- Q5) A terrarium is a collection of small plants growing in a transparent, sealed container and it is self-sufficient. It is important to make sure that the soil left in the terrarium is moist.



The plants get water from the terrarium and light is available for photosynthesis to take place. Where does the water vapour in the air in the jar come from?

- 1) Evaporation from the glass container
 - 2) Transpiration by the plants
 - 3) Condensation
 - 4) Evaporation from the soil
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- A) Option 1, 2 and 3
 - B) Option 1 and 2
 - C) Option 2, 3 and 4
 - D) Option 2 and 4

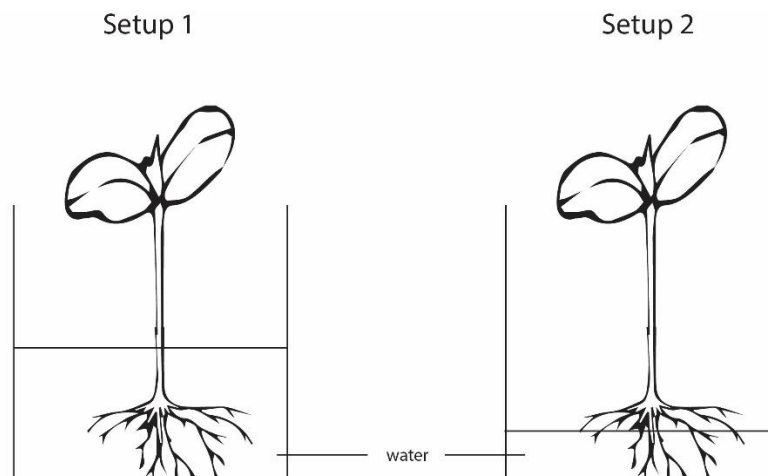
Section B: (Question 6 to 10: +3 points for correct answer, 0 points for no answer or the wrong answer.)

Q6) Jackie noticed that in her terrarium, mould was growing. This would eventually affect the plants in the terrarium as they can compete for air, light, water and space. What can she do to prevent further growth of mould?

- A) She can scrape off the mould and add a chemical substance that would absorb oxygen.
- B) She can introduce insects to the terrarium to consume the mould.
- C) She should add more plants to absorb the extra moisture.
- D) She should open the lid of the jar to allow excess water to evaporate and regulate the terrarium's moisture.

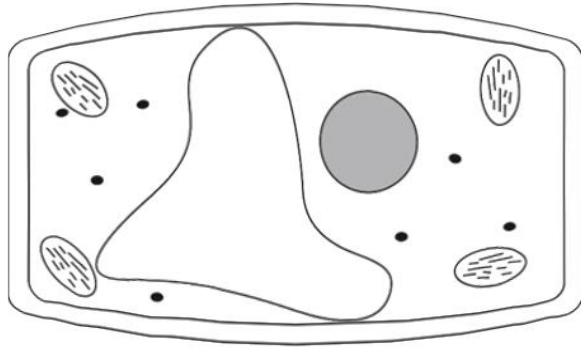
Refer to the following information and answer questions 7 and 8.

Q7) Sathi is trying to find out if the amount of water available affects the growth of plants. She set up the experiments below. Both set ups are left in an area with sunlight and is well ventilated. Her friend, Jo, told her that her experiment is not accurate, why is this so?

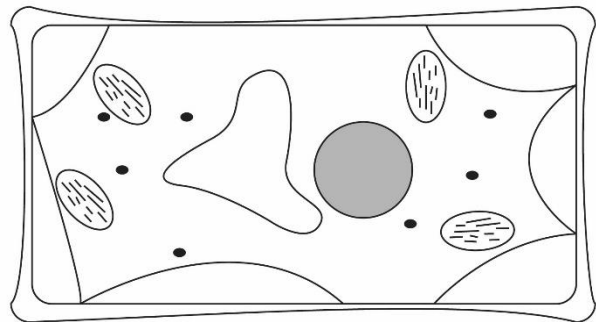


- A) The plants used were unhealthy.
- B) There was no layer of oil on the water for both set ups.
- C) She did not add nutrients to the water for both set ups.
- D) She should have used 2 different types of plants.

- Q8) After a few days, she noticed that the plant in set up 2 wilted and had become soft and weak. The plant in set up 1 was healthy. She took the leaves of both plants and put them under a microscope. This was what she saw.



Turgid

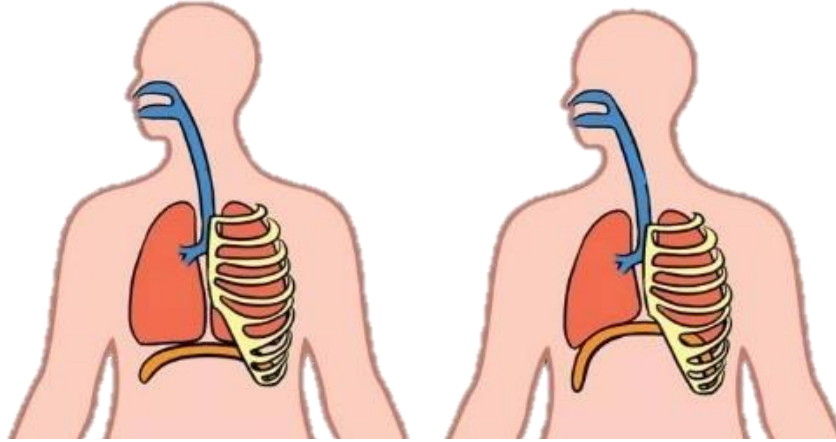


Plasmolysed

What can she conclude about her observations and the aim of the experiment?

- 1) When plants have sufficient water, the cells are turgid and the plant can maintain its shape and stand upright.
 - 2) When plants have insufficient water, the cells become stiff and the cells die immediately.
 - 3) The cytoplasm and vacuole of the plant cell likely contains a lot of water.
 - 4) Water is essential in the plant's growth.
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- A) Option 2 and 4
 - B) Option 1, 3 and 4
 - C) Option 1 and 4
 - D) All of the above

- Q9) Which of the following correctly shows the changes in the volume of the lungs, diaphragm and the corresponding pressure changes in the chest cavity when exhaling?



	Volume of lungs	Diaphragm	Pressure in chest cavity
A)	Decreases	Upwards	Higher than usual
B)	Increases	Downwards	Lower than usual
C)	Decreases	Downwards	Higher than usual
D)	Increases	Upwards	Lower than usual

- Q10) Which of the following shows the correct sequence of blood flow within the double loop of our circulatory system?

- A) Aorta (to all parts of the body) → right ventricle → right atrium → pulmonary vein → lungs → pulmonary artery → left atrium → left ventricle → Vena cava (from all parts of the body)
- B) Vena cava (from all parts of the body) → left atrium → left ventricle → pulmonary vein → lungs → pulmonary artery → right atrium → right ventricle → aorta (to all parts of the body)
- C) Vena cava (from all parts of the body) → right atrium → right ventricle → pulmonary artery → lungs → pulmonary vein → left atrium → left ventricle → aorta (to all parts of the body)
- D) Aorta (to all parts of the body) → left atrium → left ventricle → pulmonary vein → lungs → pulmonary artery → right atrium → right ventricle → Vena cava (from all parts of the body)

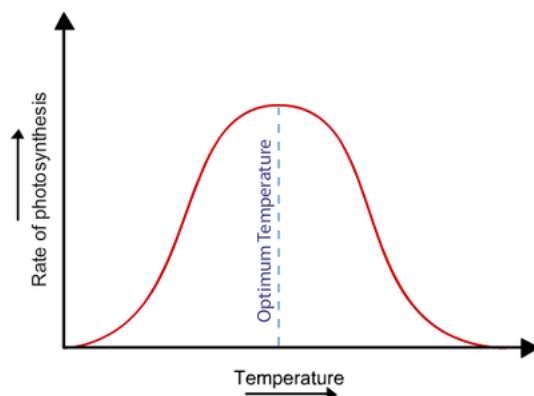
Section C: (Question 11 to 20: +4 points for correct answer, 0 points for no answer or the wrong answer.)

Q11) Which of the following is not an adaptation which most plants' leaves possess?

- A) Presence of xylem and phloem to allow for transport of water and food respectively
- B) Thin leaves for rapid loss of water
- C) Presence of chloroplasts
- D) Large surface area of leaves to maximise amount of light captured

Refer to the following information for questions 12 and 13.

Q12) Photosynthesis has 2 sets of reactions, the light reactions, and the dark reactions. Light reactions are where light energy is used to create ATP and NADPH in the chloroplasts. ATP and NADPH is then used to synthesise glucose in the absence of light, this process called the dark reactions. During photosynthesis, oxygen is also produced and released. A scientist discovered that the rate of photosynthesis decreases past a certain temperature. He plotted the rate of photosynthesis against temperature.



He also noted that enzymes* are involved in the dark reactions.

*Enzymes are biological substances which speed up a chemical reaction without reacting in the reaction itself. They are sensitive to changes in temperature and pH past their tolerable range.

Based on the information given, what is the role of the enzyme involved in the dark reactions of photosynthesis?

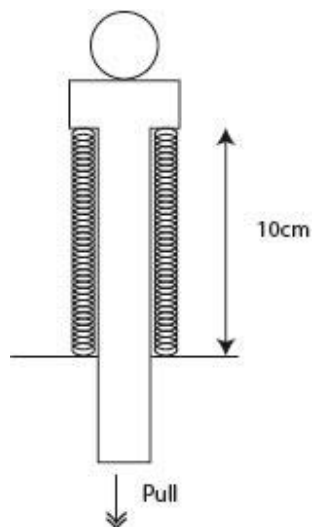
- A) The enzymes help to synthesise ATP and NADPH.
- B) The enzymes are broken down to release energy to produce glucose.
- C) The enzymes are essential in the production of glucose.
- D) The enzymes are not involved in the production of glucose.

- Q13) Enzymes have 'active sites' which dictate which substance they can work on. This is specific and fixed. Active sites are not changed after the enzyme has worked on a substance (known as a substrate). Hence enzymes are reusable. However, huge changes in temperature and pH can damage the active sites on the enzymes. This causes them to be 'denatured'.

Which of the following explains why a huge increase in temperature can affect the rate of photosynthesis?

- A) The enzymes slow down as they have gained too much heat and is no longer able to function. Hence, the rate of photosynthesis decreases.
- B) The enzymes move faster and speed up the glucose production process. Hence, the rate of photosynthesis decreases.
- C) Enzymes change into other chemical substances and no longer participate in the glucose production process. Hence, the rate of photosynthesis decreases.
- D) When temperature increases beyond the optimum working temperature of the enzyme, the enzyme becomes denatured and is no longer able to participate in the glucose production process. Hence, the rate of photosynthesis is affected.

- Q14) Ainah created a simple 'pinball' mechanism. She pulls the handle backwards and lets it go so that the ball can be pushed forward and it rolls on the ground. The mechanism is shown below in the diagram.



She recorded her observations in a table.

	Test 1	Test 2	Test 3	Test 4
Original length of spring (cm)	10	10	10	10
Length of stretched spring (cm)	12	16	20	20
Distance travelled by the ball (cm)	52	64	76	78

Which of the following are some of the forms of energy involved in this action?

- 1) Chemical potential energy
- 2) Elastic potential energy
- 3) Heat energy
- 4) Gravity

- A) Option 1 and 2
- B) Option 1 and 3
- C) Option 1, 3 and 4
- D) Option 2 only

Q15) Which of the following examples involve a push and a pull being exerted?

- A) Turning the door knob
- B) Closing the car door
- C) Ironing clothes on an ironing board
- D) Putting on a pair of pants

Q16) Surya was holding onto the object shown below, upright, on her palms. She noticed that the ink level started to rise and eventually entered the top bulb. What should she do so that the ink level will decrease and return to the bottom bulb?



- A) She should hold the top bulb only without touching the bottom bulb for 30 seconds.
- B) She should hold both top and bottom bulbs with equal strength for 30 seconds.
- C) She should leave it untouched on the table for 30 seconds.
- D) She should place the entire object in warm water for 30 seconds.

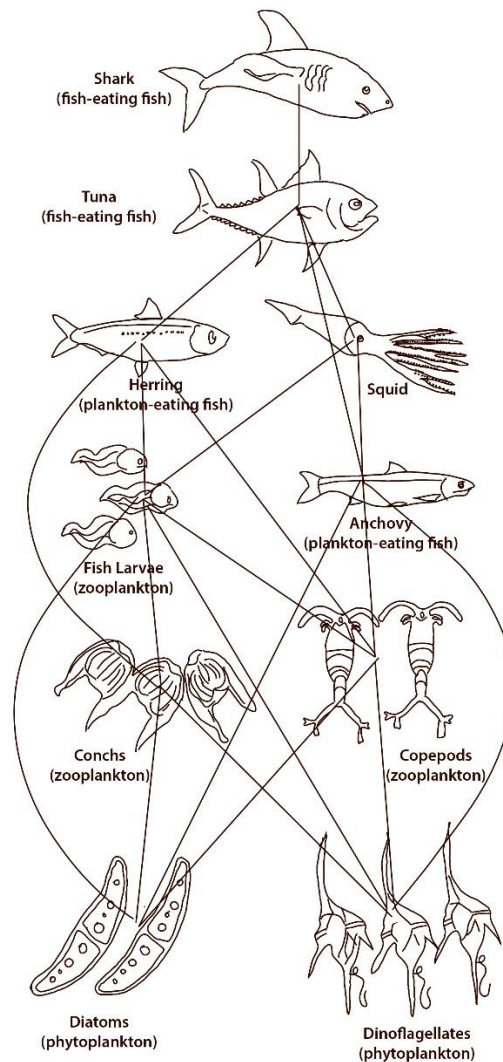
- Q17) Succulents are plants which have parts of them, usually their leaves, that are thick and fleshy, for storage of water. A commonly known succulent is the cactus. Succulents usually grow in arid conditions. Lithops are a type of succulent, stemless and each plant has 2 leaves that are conical and connect directly to tap roots. They grow in clusters. Most of the plant is underground with only the top exposed at the surface of the soil. Because of the way they look, they camouflage and are known as 'living stones'. They originate from southern Africa. Below is a picture of Lithops.



Based on the information above and the picture shown, which of the following statements are true about Lithops?

- 1) They do not have leaves to minimise water loss through transpiration.
 - 2) The 'flat tops' on the plant are cells that act like windows, allowing sunlight to enter deep into the plant where there is more chlorophyll.
 - 3) They draw moisture from mist or fog.
 - 4) They are flowering plants.
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- A) Option 1 and 3
 - B) Option 2, 3 and 4
 - C) Option 1, 2 and 3
 - D) All of the above.

- Q18) Ecosystems exist in our oceans. It is important to protect our ocean wildlife and maintain the balance of our ecosystems. The diagram below shows part of a food web that exists in our oceans.



What will happen if the tuna population was decreasing due to overfishing?

- 1) The herring and squid population will decrease.
 - 2) The shark population will decrease.
 - 3) There will be no predator to control the population of herring and squid.
 - 4) Phytoplankton, zooplankton, fish larvae and anchovy will rapidly decrease in numbers.
- A) Option 1, 2 and 4
B) Option 2 and 3
C) Option 2, 3 and 4
D) Option 1 and 4

Q19) Which of the following is not a possible solution to overfishing?

- A) Working with governments of countries who depend largely on fishing and agricultural industries to create sustainability programs and regulations against overfishing.
- B) Educating the buyers of fish stock to purchase only from sustainable fisheries, creating support and pressurising more fisheries to comply with the set standards.
- C) Educate governments of countries who have a large fishing industry to refine their subsidies grant programs to be given only to the sustainable fisheries.
- D) Allowing fishermen to fish in other waters instead of their usual waters.

Q20) Prema filled up a kettle with water and put it to boil on the stove. When the water was boiling, she observed that there are white 'clouds' forming further away from the spout of the kettle. What are these white 'clouds'?

- A) Dry steam
- B) Air
- C) Water droplets
- D) None of the above

Rough Working

Rough Working