NSAA Preparation Workshop

Today's session

- Introduction to the NSAA and Natural Sciences

- Advice on how to tackle the NSAA

- Problem solving practice:
    - Part A – Mathematics
    - Part C – Chemistry
    - Part D – Biology
    - Part Z – Biology (Advanced)

Introduction to the NSAA

Section	Details
Section 1	1 hour Answer 40 MCQs *(1.5 minutes per question)* 20 Qs – Compulsory Part A (Maths) 20 Qs – Choose Part B,C or D (Physics, Chemistry or Biology) Uses knowledge around GCSE level
Section 2	1 hour Answer 20 MCQs *(3 minutes per question)* Choose 1 from Part X, Y or Z (Physics, Chemistry or Biology) Expects more advanced science knowledge (closer to AS Levels/Year 12)

Both sections:
Non-calculator
No negative marking

First Year Natural Sciences

Compulsory – Mathematics or Mathematical Biology

Choose 3 from:
- Biology of Cells
- Chemistry
- Earth Sciences
- Evolution and Behaviour
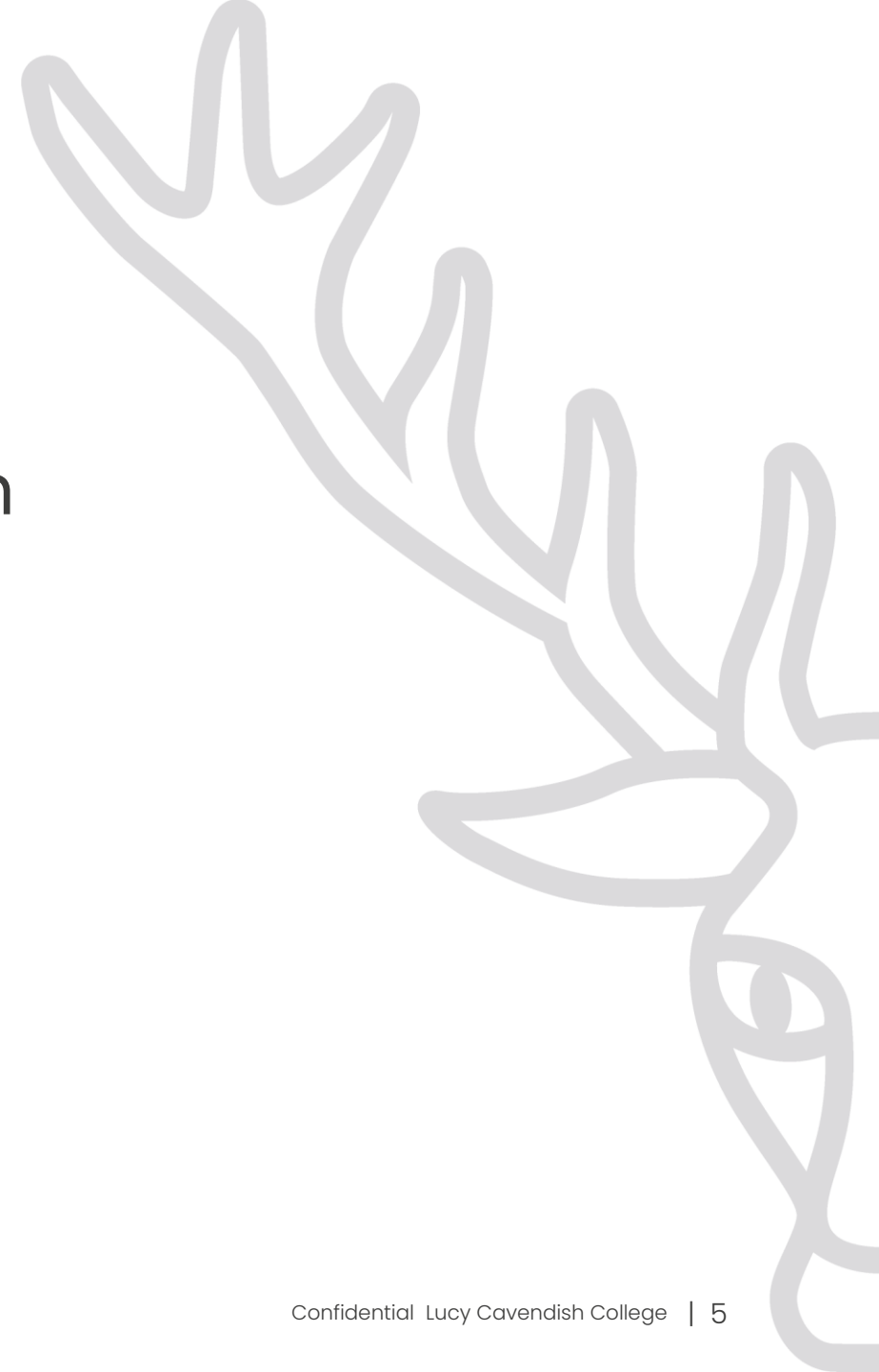- Materials Science
- Physics
- Physiology of Organisms

Your NSAA choices do **not** influence what you can choose in first year Natural Sciences!

Preparing for the NSAA

- Look **closely** through the specification
  - Use this as your basis for revision

- Practice!
  - Time management
  - Answering strategies
  - Applying your knowledge

- Choose your parts in advance

- Use your teachers

Specification

Example:

Part A –Mathematics

M5. Geometry

M5.1   Use conventional terms and notation: points, lines, line segments, vertices, edges, planes, parallel lines, perpendicular lines, right angles, subtended angles, polygons, regular polygons and polygons with reflection and/or rotational symmetries.

M5.2   Recall and use the properties of angles at a point, angles on a straight line, perpendicular lines and opposite angles at a vertex.

Understand and use the angle properties of parallel lines, intersecting lines, triangles and quadrilaterals.

Calculate and use the sum of the interior angles, and the sum of the exterior angles, of polygons.

M5.3   Derive and apply the properties and definitions of special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus.

Derive and apply the properties and definitions of various types of triangle and other plane figures using appropriate language.

M5.4   Understand and use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS).

M5.5   Apply angle facts, triangle congruence, similarity, and properties of quadrilaterals to results about angles and sides.

M5.6   Identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement (including fractional and negative scale factors).

Describe the changes and invariance achieved by combinations of rotations, reflections and translations.

Describe translations as 2-dimensional vectors.

Specification

Example:

Part Z – Biology (Advanced)

AB2. Biological membranes

AB2.1 Know and understand the roles of membranes within cells and at the surface of cells.

AB2.2 Know and understand the fluid mosaic model of membrane structure and the roles of its main components, including:

    a. phospholipids

    b. cholesterol

    c. glycolipids

    d. proteins

    e. glycoproteins

AB2.3 Understand and predict the effect of temperature on membrane structure and permeability, and how this effect could be investigated.

AB2.4 Know and understand the process of facilitated diffusion, including the roles of carrier proteins and channel proteins.

AB2.5 Understand the process of osmosis in terms of water potential, including how different water potentials can affect plant and animal cells, and how this can be investigated in both living and non-living plant and animal cells.

AB2.6 Know and understand the processes of active transport, including the roles of carrier proteins and ATP.

Practice Q1

Part A: Mathematics

Q4 from the Specimen Paper, 2022 update (accessible on the Natural Sciences webpage)

4 If you look at a clock and the time is 9:45, what is the angle between the hour and the minute hands?

A 0°

B 7.5°

C 15°

D 22.5°

E 30°

Practice Q2

Part D – Biology

Q71 from the 2021 NSAA Past Paper (accessible on the Natural Sciences webpage)

71 Two identical plant cells were removed from a leaf. One was placed in a concentrated sugar solution and the other was placed in distilled water, and both were left for 2 hours.

All other factors were kept constant during the experiment. The diagram shows the results, with regions of each cell labelled Q and S.

cell in distilled water

cell in concentrated sugar solution

S

Q

Q
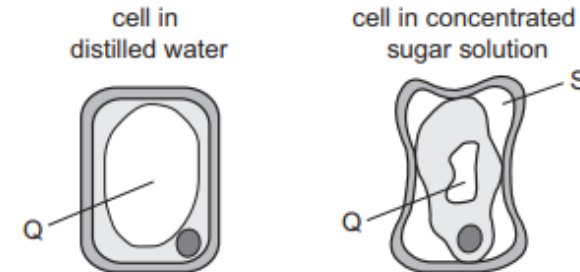
Which of the following statements is/are correct?

1 In the cell in distilled water, Q contains only distilled water.

2 In the cell in concentrated sugar solution, the number of solute particles in Q increased over the two hours.

3 S is a vacuum.

A none of them

B 1 only

C 2 only

D 3 only

E 1 and 2 only

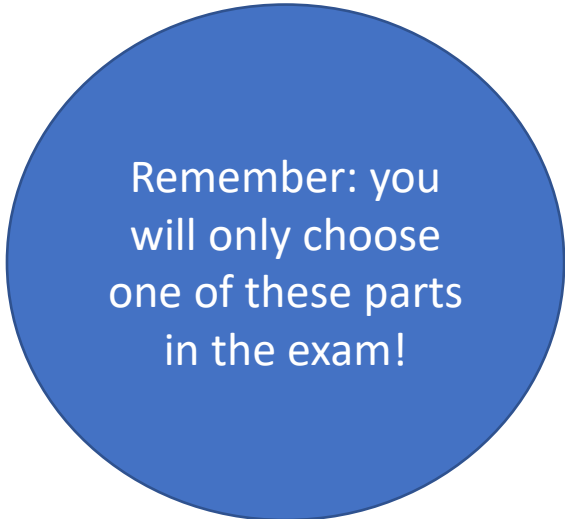F 1 and 3 only

G 2 and 3 only

H 1, 2 and 3

Practice Q3 – choose a breakout room

Part D: Biology

OR

Part C: Chemistry

Both questions are from the NSAA Specimen paper (update for 2020)

Remember: you will only choose one of these parts in the exam!

Q3 – Biology option

77 Which of the following could be produced when a mutation occurs in a cheek cell of an organism?

1 a change in the sequence of amino acids used to make a protein

2 an advantageous allele that can be passed on to the offspring of that organism

3 a change of an essential cell process that causes the death of the cell

A none of them

B 1 only

C 2 only

D 3 only

E 1 and 2 only

F 1 and 3 only

G 2 and 3 only

H 1, 2 and 3

Q3: Chemistry option

45   An oxide of iron has the formula Fe_3O_4 and contains both Fe^{2+} and Fe^{3+} ions.

Which one of the following is the fraction of iron ions that are in the Fe^{2+} state?

A $\frac{1}{4}$

B $\frac{1}{3}$

C $\frac{1}{2}$

D $\frac{2}{3}$

E $\frac{3}{4}$

Q4 – Biology (advanced)

Part Z Biology

Part Z – Biology (advanced)

Q21 from the NSAA Specimen Paper (updated for 2022)

21 Stearic acid is a fatty acid. It contains 18 carbon atoms and zero carbon–carbon double bonds.

It can be represented by the notation C18:0, where 18 is the number of carbons and 0 is the number of carbon–carbon double bonds present.

The table shows this notation for two other fatty acids:

fatty acid	notation
oleic	C18:1
linoleic	C18:2

A triglyceride was formed using one of each of the three fatty acids.

Which statement about this triglyceride is correct?

A Linoleic acid is the most saturated fatty acid used to form the triglyceride.

B In the triglyceride, the stearic acid chain has 36 atoms of hydrogen.

C All the hydrocarbon chains in the triglyceride have a terminal carboxyl group.

D In the triglyceride, the three hydrocarbon chains would be the same length and parallel to each other.

E The triglyceride molecule has the same number of oxygen atoms as a molecule of glucose.