



KNOX
GRAMMAR
SCHOOL

STATE

DA VINCI DECATHLON 2021

CELEBRATING THE ACADEMIC GIFTS OF STUDENTS
IN YEARS 9, 10 & 11



ENGINEERING

TEAM NUMBER _____

Question Booklet 1-5	Design Model	Total	Rank
/16	/30	/46	

A CHANCE TO INNOVATE

BACKGROUND

Engineers are constantly taking a chance on new ideas in order to revolutionise the designs that are fundamental to the functioning of modern humanity. Whether it be improving the functionality of a system, solving a design problem or improving methods of production, engineers look for ways they can enhance their designs to create efficient, functional and purpose-fulfilling creations.

CASE STUDY: THE HOOVER DAM

A fundamental example of engineers taking a chance on a new idea was in the method of production that was used in the construction of the Hoover Dam. The primary challenge associated with the construction of the Hoover Dam was concrete management, with the dam requiring significantly more concrete than any construction project before it. When cement and



water are mixed, an exothermic reaction occurs, which produces heat, resulting in significant expansion of the concrete. This will crack the outside of the dam. In order to solve this problem, engineers took a chance on a radical new technique that involved creating smaller concrete blocks that would be fitted together like bricks, leaving gaps in between each block that was laid. The gaps allowed the concrete to expand without cracking, solving the fundamental challenge associated with concrete engineering. The concrete blocks are visible in the image below.



THE TASK

Your task is to design a prototype for a new system of energy production that solves a key issue associated with energy today. The issue you choose can be as small or large scale as you want. For example, you may choose to tackle the small scale problem of noise-pollution from wind turbines, and design a system that reduces noise. Alternatively, you may choose to confront a large scale issue and design a completely new method of harnessing energy.

In this task, you must reflect on a current challenge in the energy sphere, design your new energy system and construct a working model of your design. Originality is key, so be creative! Take a chance on a new idea.

DESIGN PARAMETERS

You will have **eighty minutes** to design, construct and reflect upon your energy production system. Your prototype will be marked based on its:

- Ability to solve the challenge you identified
- Ability to represent your idea (e.g. if your design involves movement, does your model have moving parts?)
- Creativity and originality
- Design aesthetics
- Structural build quality
- Use of materials



You will be provided with various materials. It is up to you to decide what materials to use to construct your energy prototype. The materials available are as follows:

- 4 pieces of A4 paper,
- 2 pieces of A4 cardboard,
- 8 popsicle sticks,
- 8 plastic straws,
- 8 pipe cleaners,
- 20 match sticks,
- 1 meter of string,
- 100 grams of plasticine,
- Your own sticky tape (use sparingly).



Please Note: If you are competing virtually, your question time will cease after the allocated 80 minutes, but you will have an extra **10 minutes** to upload images and a video of your design. The images must capture all angles of your prototype and the video must show the functionality of your prototype.

Glue and staples are prohibited and will result in disqualification from the task.

MARKING CRITERIA

QUESTION BOOKLET

Question	Skilful	Sound	Limited
Question 1	4	3-2	1
Question 2	4	3-2	1
Question 3	4	3-2	1
Question 4	4	3-2	1
Total	/16		

ENERGY PROTOTYPE

Criteria	Skillful	Effective	Sound	Basic	Limited
Ability to solve challenge	5	4	3	2	1
Ability to represent idea	5	4	3	2	1
Creativity and originality	5	4	3	2	1
Design aesthetics	5	4	3	2	1
Structural build quality	5	4	3	2	1
Use of materials	5	4	3	2	1
Total	/30				

TOTAL

/46
