

## APTITUDE PAPER

FOR SCHOLARSHIPS TO BE AWARDED IN SEPTEMBER 2011

**WEDNESDAY 2<sup>nd</sup> FEBRUARY 2011**

**DURATION 2 HOURS**

### INSTRUCTIONS TO CANDIDATES

You are required to answer **ONE** question from Section 1 and **ONE** question from Section 2.

In **Section 1** you are asked to provide **three** solutions to a design problem. You will be marked on the following:

	Mark
a) The quality of your concepts – how well you solve the problem	15
b) The functionality of your concepts – how well they may work	10
c) The quality of your annotation / notes – how well you explain and evaluate your concepts	10
d) The level of flair and imagination shown within the concepts	15
<b>SECTION 1 TOTAL</b>	<b>50</b>

In **Section 2** you are asked to solve a more focused design problem, providing only **one** solution.

You will be marked on the following:

	Mark
1) The quality of your given proposal	20
2) The consideration given to material choice	10
3) The consideration given to construction	20
<b>SECTION 2 TOTAL</b>	<b>50</b>

<b>FINAL TOTAL</b>	<b><u>100</u></b>
--------------------	-------------------

**ALL YOUR A3 ANSWER SHEETS MUST HAVE IN THE TOP RIGHT HAND CORNER**

- ◆ Your name and school clearly printed
- ◆ The number of the question you have chosen to answer.
- ◆ The page number

N.B. Please start each question on a fresh sheet of paper

**DO NOT TURN OVER UNTIL YOU ARE INSTRUCTED TO DO SO**

# Section 1

## OPEN-ENDED DESIGN QUESTIONS.

In this section you will be assessed upon your ability to solve problems in a creative and innovative way.

Answer one question only from the following two questions.

### Question 1

A cordless drill, as in Figure 1, is a useful portable source of power that has a rotary output of around 500 to 1200rpm (revs per minute).



Figure 1

Design three devices that utilise a cordless drill to perform secondary functions around the home and garden: an example of this would be turning kebabs on a barbeque.

Using clearly annotated sketches, show three concept designs that perform three different functions. In your answers show the means by which the drill is attached to your device and the means by which the power is transferred.

---o0o---

### Question 2

Childhood obesity is a growing problem. The benefits of walking are being promoted by schools and, as a result, a product is required that will be used by children in primary schools to further encourage the benefits of walking.

In conjunction with this campaign a company has produced a 'kinetic charger' that stores energy as a child walks along. In order to maximize the benefits of this scheme it will be necessary to display the results from each kinetic charger.

You are asked to produce concept designs for three different displays that make use of this stored energy. Each display must:

1. Show the quantity of accumulated stored energy,
2. Be suitable for use in a Primary School,
3. Connect easily to the charger (You should state / illustrate how the connection will be made),
4. Be exciting to children in a way that stimulates further exercise by virtue of the visual/mechanical/electrical/electronic output chosen.

You should consider how the performance of individuals and groups might be recorded and stored, so as to monitor commitment. Each concept should be different in kind. Key features and working principles should be provided.

## Section 2

### **FOCUSED DESIGN QUESTIONS**

**In this section you will be assessed upon your ability to solve a specific design problem.**

**Answer one question only from the following two questions.**

#### **Question 3**

Golf driving ranges use machines to collect golf balls from the ground in the target area. A new automatic machine is being developed which can operate even when golfers are using the range. The key specification points for the machine are:

1. It is powered by an onboard battery and electric motor
2. It should be able to withstand direct hits from stray golf balls.
3. When the hopper is full the machine will return to base for emptying.

Using clearly annotated drawings show, in detail, the method by which the balls are picked up and transferred to the hopper. There should be some means of indicating when the hopper is full. Your response should indicate suitable systems, materials and construction processes.

---o0o---

**Question 4 overleaf**

## Question 4

Electricians, when wiring up a building, take the cable from a large reel. There is currently no way of knowing how much cable is left on a reel. It would be beneficial to have a device that recorded the length of cable remaining.



Key specification points for the device are:

1. Each reel starts with 100m of cable
2. Must work with cable from 3mm Ø to 10mm Ø

Using clearly annotated drawings show, in detail, a device that will measure cable usage from a reel and record the amount remaining.

Your response should indicate suitable systems, materials and construction processes.

END