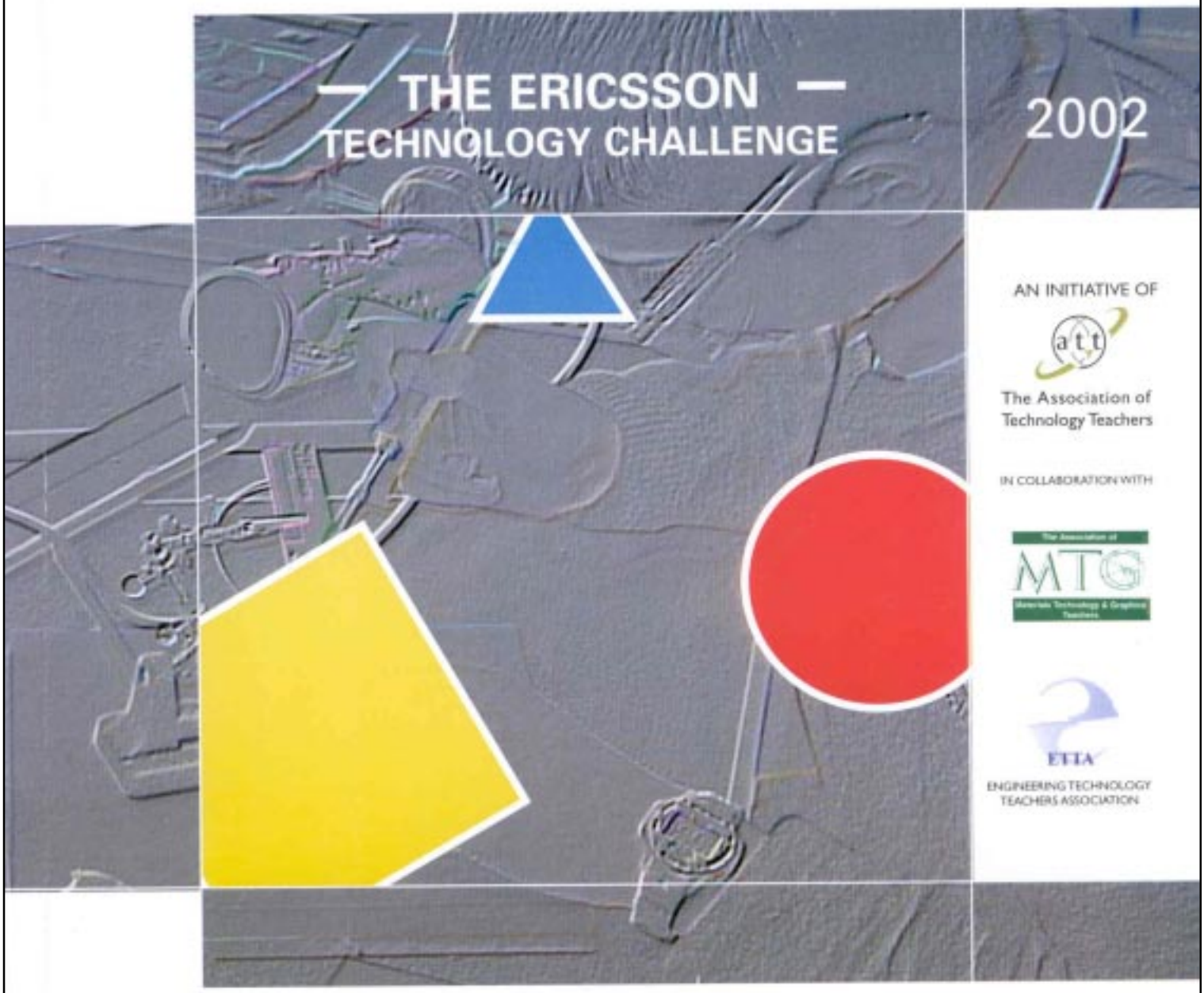
ERICSSON

THE ERICSSON TECHNOLOGY CHALLENGE

2002



AN INITIATIVE OF

The Association of Technology Teachers

IN COLLABORATION WITH

ETTA

ENGINEERING TECHNOLOGY TEACHERS ASSOCIATION

SCIENCE TECHNOLOGY INNOVATION

SCIENCE FOR A SUCCESSFUL IRELAND

Entry Form

We wish to enter as a school team for the Ericsson Technology Challenge 2002

Collaborative teamwork will be essential at round 2. You may wish to nominate your team so as to ensure a wide range of relevant expertise.

	Student Name	Expertise: What I contributed to this project
1		
2		
3		
4		
5		(substitute team member)

School Name:..... School Phone:.....
School Fax:..... Contact Email:.....
School Address:.....
Name of supporting teacher:.....

RULES

1. The Ericsson Technology Challenge is open to students of second level schools in Ireland excluding the schools of those teachers directly involved in the organisation of the competition.

2. Entries must be on the basis of teams of 4 students and one supporting teacher. Schools may submit multiple entries. Schools may wish to nominate a fifth student as substitute.

3. The closing date for receipt of entries of round one, i.e. submission of this booklet when completed, is by post delivered on Monday December 3rd, 2001.

4. A prize fund to the value of £2,000 will be awarded to the winners. Details of the prizes will be announced in due course.

5. The decision of the adjudicators will be final on all matters relating to the operation of the competition. Correspondence will not be entered into.

6. On completion of round 1, 6 teams of 4 students each will be selected to go forward to round 2. Round 2 will take place on a single day at Easter 2002 at a national venue.

7. Training and support will be offered to schools and teachers involved in round 2 of the competition. Subject to availability of places other schools and teachers may also be invited to participate.

8. Completed entries should be posted to:

   The Ericsson Technology Challenge Coordinator
   c/o CBS, Sexton Street, Limerick.

The Ericsson Technology Challenge 2002

Welcome to the Ericsson Technology Challenge. This challenge comes in two parts. Part 1 is this booklet. Work your way through the pages completing the tasks and solving the problems as you go. When finished you may wish to send your completed work in as a part of the competition. 6 schools will be chosen from the entries to go forward to part 2, the one day challenge event.

Part 2 will take place at Easter 2002. The six teams (4 students per team) will gather at a national venue. Each team will be presented with a single common task. Using computers to research develop and present their solutions they will complete the task by the end of the day. The best solution to the task at day's end will be judged the winner of the Ericsson Technology Challenge 2002.

Good Luck! Get going with part one now. The brief is given below.

The Brief

Cars are a part of our everyday life. Love them or hate them there is no getting away from them.

Your task is to explore aspects of cars in general. You are then asked to design and specify an urban car for use by students. We'll call this the 'urban youth car' for the moment until you come up with a better name for it!

Page 2 asks you to look at aspects of the mechanics of such a car.

Page 3 asks you to look at aspects of the electronics of such a car as you would model it in a technology class.

Page 4 asks you to look at the materials which could be used in the manufacture of a student car.

Page 5 asks you to look at issues of structures.

Page 6 asks you to design a body for the urban youth car.

Page 7 asks you to look at how such a vehicle could be powered.

Page 8 asks you to look at Technology & Society issues as they arise with this car.

Mechanisms

Cars are good examples of machines. Machines can be complex devices, however, all machines consist of one or more mechanisms.
Here are some mechanisms which operate in a car. Name each one of them:

Name

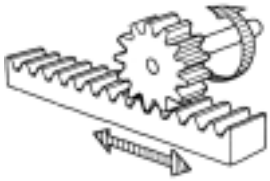
2.1

2.3

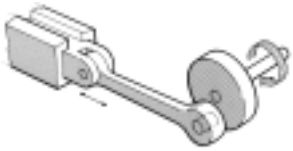
2.5

Name

2.2



2.4



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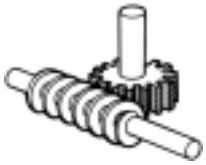
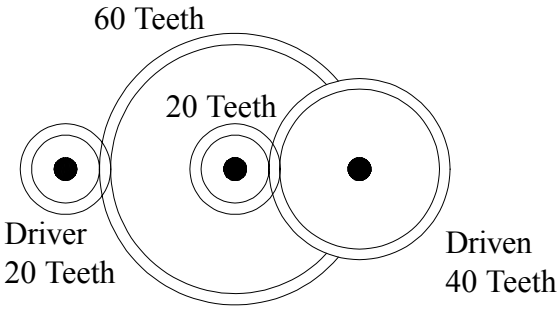


Work this out!

A simplified compound gear train for a vehicle is shown opposite.The crank shaft of the vehicle (driver shaft) has an input speed of 4800 RPM and the number of teeth on the gears is as shown in the diagram.



2.7 Calculate the speed of rotation of the driven shaft.

2.8 The road wheels of the car are 1.2m in circumference and are rotated by the driven shaft. Calculate the distance in kilometres travelled by the car in one hour.

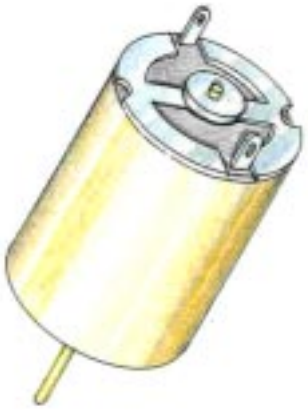
Solution 2.7

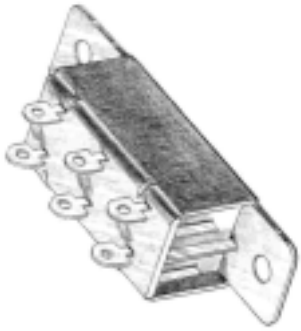
Solution 2.8

Electronics

3.1 Wire this!

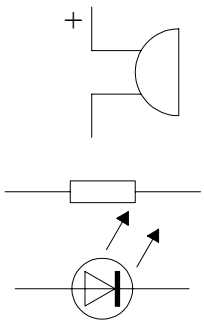
In order to control a model of a motorised vehicle so that it can be moved in forward and reverse direction a double-pole double-throw (dpdt) switch is used. In the illustration below there are the three electronic components needed for this circuit: a miniature DC motor, a battery snap and a dpdt switch. Use a pencil to sketch in the wiring necessary to enable the motor to be switched off and on/forward as well as on/reverse.

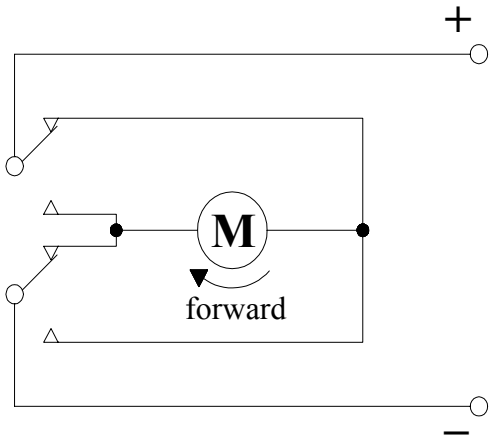




3.2 Solve this!

A schematic circuit diagram of the forward/reverse circuit above is shown below. Also given below are the symbols for a buzzer, LED and a resistor. Use a pencil to show how these components can be inserted into the circuit diagram so that the LED is lighting when the motor is going forward and the buzzer sounds when the motor is in reverse.





Materials

4.1 Cars today are manufactured from a wide range of materials using a variety of processes. Suggest a material for each of following car parts and give a reason for your choice. Use the table below to explain your answer.

	Part of car	*Suggested material*	*Reason*
1	bonnet		
2	bumper		
3	wheel rim		
4	brake pedal foot plate		
5	underside of door sills		

4.2 Here are 5 types of material. In each case name one example of that material which could be used in manufacturing a car. Suggest where exactly it might be used in the car. For example you might suggest that a metal like chrome could be used to decorate external parts of the body for the sake of style or aesthetics. (Don't use that example though!)

	Material type	*Name the material*	*Suggest an application in the car*
1	Natural fibre		
2	Synthetic fibre		
3	Metal		
4	Plastic		
5	Alloy		

4.3 On page 6 youare asked to design a logo for your urban youth car.. Suggest a material in which to manufacture the logo. State how you would fasten the logo to the car body. In the large box below sketch the car (as drawn by you on page 6) and show where you would position the logo.

Material	***Fastening method***

Logo Design in Position

Structures and Mechanisms

5.1 Study the illustration above carefully. Match the structural terms in column 'A' with the answers in column 'C'. Write your answers in column 'B'. Use each answer only once.

Column A	
1	a strut
2	a tie
3	a redundant member
4	a frame structure
5	a shell structure
6	a pivot point
7	a fixed joint
8	a pneumatic structure
9	a natural structure
10	a shear force

Column B	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Column C
E4
N2
H6
L3
I6
E3
D3
J6
Q5
G4

5.2 Is the barrier in the illustration,
a first class ☐ second class ☐ or third class ☐ lever?
(tick the relevant box)

5.3 The centre of gravity of the car is likely to be found at which of the following areas?
I6 ☐ J6 ☐ K6 ☐
(tick the relevant box)

5.4 The car in the illustration above exerts a force of 250N when pulling the trailer. Calculate the total work done by the car in travelling a distance of 1.5 kilometres.

Design

Cities today are crowded, busy and polluted places. An urban car should be compact, efficient and economic to manufacture and operate.
Your task is to design a compact vehicle capable of carrying two students around the city with their essential daily luggage.
Draw a single rendered isometric (3D) drawing of your design. Show outline dimensions in millimetres.

Energy and Design

Most cars today are powered by fossil fuels such as petrol or diesel. Fossil fuels are a non-renewable resource and contribute to pollution in several ways.

Use the questions below to explore an alternative energy source for your urban car.

7.1 Name an alternative fuel for the urban youth car.

7.2 State two advantages of your chosen fuel

i

ii

7.3 How could this fuel be made available around the city?

7.4 How would you encourage people to use the alternative fuel? Give one reason in your answer.

7.5 Your urban youth car needs to appeal to the young buyer. Suggest a name for the car and design a logo to feature on the bodywork of the vehicle.

Name:

Logo

Technology and Society

Use this information to calculate answers to the questions below.
Petrol costs 64.9 pence per litre.
1 gallon = 4.54 litres
Fuel efficiency is measured in miles per gallon (mpg)
and litres per 100 Km (l/100Km)
1 kilometre = 0.62 miles

Answers

8.1 How many litres of petrol can you buy for £10?

8.2 How much will 5 litres of petrol cost to buy?

8.3 A car uses 13.62 litres of petrol to travel 195 miles.

i How many miles does it travel per litre?

ii How many miles does it travel per gallon (mpg)?

iii How many litres does it use per 100 Km (L/100Km)?

8.6 The red car delivers 55 mpg. The green car delivers 4.7litres/100Km
Which car is more fuel efficient and economic to run?

8.7 ***Pollution and Recycling***
Cars pollute the environment when used and when they are disposed of at the end of their useful lives. Much of the car is not suitable for dumping in a landfill. Suggest 3 parts or materials in the car which could be recylced or remanufactured. Use the table below to organise your answer.

	Car part or material	*Reason for not dumping in a landfill*	*Suggestion for recycling or remanufacture*
1			
2			
3			

8.8 Cars are commonly fitted with safety features such as seatbelts and airbags. Suggest one other essential safety feature to be fitted to your urban youth car. Give a reason for your answer.

Feature:

Reason: