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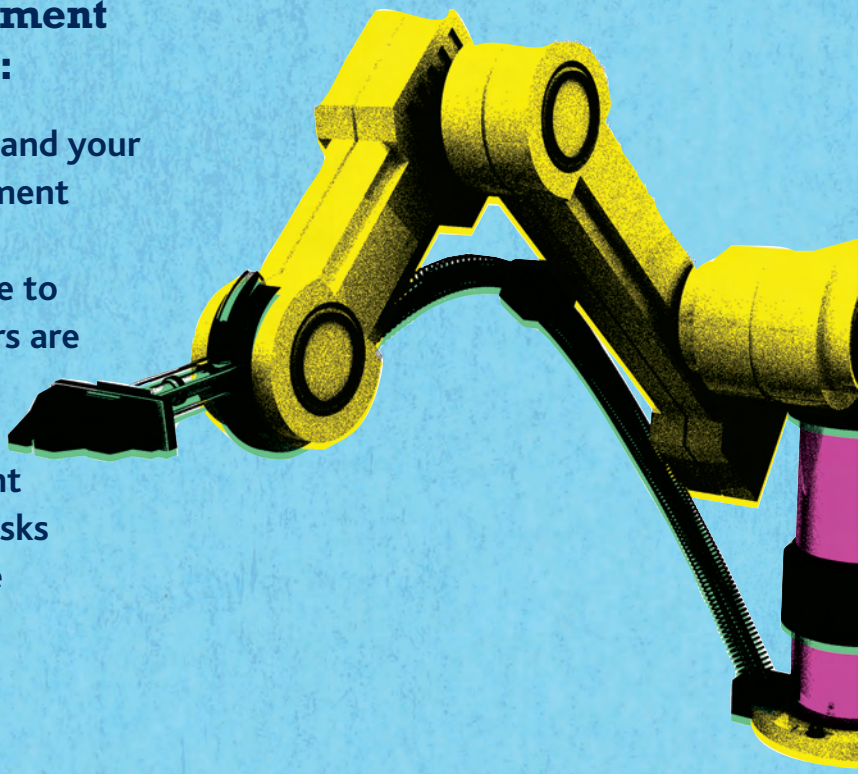
Sample Assessment Materials

Edexcel GCSE in Design and Technology: Electronic Products (2EP01)

Inside this Sample Assessment Materials pack you'll find:

- An accessible paper to help you and your students prepare for the assessment
- A clear and concise mark scheme to let you know what the examiners are looking for
- Supported controlled assessment information including sample tasks and assessment criteria to share with students.



A PEARSON COMPANY

Welcome to the GCSE 2009 Design and Technology: Electronic Products Sample Assessment Materials

These sample assessment materials have been written to accompany the specification. They have been developed to give you and your students a flavour of the actual exam paper and mark scheme so they can experience what they will encounter in their assessments. They feature:

- **An accessible paper** using a mixture of question styles. We've worked hard to ensure the paper is easy to follow with an encouraging tone so that the full range of students can show what they know.

- **A clear and concise mark scheme** outlining what examiners will be looking for in the assessments, so you can use the sample paper with students to help them prepare for the real thing.

- **Supported controlled assessment,** including sample controlled assessment tasks to show you the sort of activity students will undertake. Used in conjunction with the guidance in the Teacher's Guide, these tasks will help you manage the controlled assessment in your centre and help students achieve their best.

Our GCSE 2009 Design and Technology: Electronic Products qualification will be supported better than ever before. Keep up to date with the latest news and services available by visiting our website: **www.edexcel.com/gcse2009**

Contents

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, ie. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:
- *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
- *select and use a form and style of writing appropriate to purpose and to complex subject matter*
- *organise information clearly and coherently, using specialist vocabulary when appropriate.*

Edexcel GCSE

Design and Technology: Electronic Products

Unit 1: Creative Design and Make Activities

Sample Controlled Assessment Material

Paper Reference
5EP01/01

You do not need any other materials.

Turn over ▶

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Delivery of the controlled assessment

You will design and make an **electronics product**.

In order to complete this task you will undertake the following **design** activity:

Stages	Tasks	Suggested times
1. Investigate	1.1 Analysing the brief	1 hour
	1.2 Research	3 hours
	1.3 Specification	1 hour
2. Design	2.1 Initial Ideas	5–6 hours
	2.2 Review	1 hour
	2.3 Communication	Evidenced throughout
3. Develop	3.1 Development	5–6 hours
	3.2 Final design	1–2 hours

In order to complete this task you will undertake the following **make** activity:

Stages	Tasks	Suggested times
4. Plan	4.1 Production plan	1–2 hours
5. Make	5.1 Quality of manufacture	16 hours
	5.2 Quality of outcome	
	5.3 Health and Safety	Evidenced throughout
6. Test and evaluate	6.1 Testing and evaluation	1–2 hours

Controlled conditions
Development of the student's design folder and manufacture of the product(s) must take place under controlled conditions. Students will be supervised by a teacher at all times.

Students' work must be collected in at the end of the lesson and handed back at the beginning of the next lesson. Students must produce their work individually.

Feedback control
Teachers are allowed to provide regular, formative feedback throughout the creative design process. Student progression should be supported by the centre's own Assessment for Learning (AFL) strategies.

Demonstrations of practical activities are allowed in order to develop knowledge, understanding and skills and to identify health and safety issues relating to specific tools, equipment and processes.

Collaboration control
Where group work is carried out, evidence of individual contributions must be clearly identified and recorded.

Resources
Access to resources is determined by those available to the centre.

Quality of written communication
Quality of written communication (QWC) will be assessed throughout the student's design folder. This will assess students on their ability to organise information clearly and coherently, using specialist vocabulary when appropriate.

Tasks
Suggested electronic products are:

1. **Security**, eg
   - An electronic device to warn when a bicycle is being moved without permission.
   - An alarm system to protect a garden shed from being broken into.
2. **Recording**, eg
   - An electronic score counter to record scores between teams in a 5-a-side or netball match.
   - An electronic die for use when playing board games.
3. **Environmental control**, eg
   - A sensing system to warn when soil in a greenhouse becomes too dry.
   - A sensing system that turns on a fan automatically when it is too hot.
4. **Indicators**, eg
   - A safety warning lighting system for use by pedestrians on roads in dark conditions.
   - Flashing/chasing bike lighting system for use in dark conditions.
5. **Entertainment**, eg
   - A board game timer that will record times between a few seconds and a few minutes.
   - An electronic moneybox that rewards the user for saving.

Centres can contextualise the task(s) to best suit their specific circumstances, which includes the availability of and access to resources.

Task taking
All work, with the exception of research, must be done under informal supervision. Research may be completed under limited supervision.

Initial research
Students can undertake research to locate sources outside of the classroom without supervision. They can locate as many sources to take into the write up phase as they wish.

Design and make tasks
The student must complete the following under classroom supervision:

- write up of their portfolio
- making of their product

However, Students are allowed to us the following to help them with completing their task:

- their initial research they have undertaken outside of the classroom to produce focused selective research for their portfolio
- sources the centre provides.

A student can bring in additional research notes at any time provided the write up of their research is done under the same supervised conditions.

Task marking
Marking of the tasks will be carried out by teachers and moderated by Edexcel.

Assessment criteria

For these tasks teachers must mark students' work using the assessment criteria specified below. Teachers should check that students' work is their own and is not copied from source material without any attempt by students to put the material into their own words.

Design activity (50 marks)

Investigate (15 marks)		
Sub-sections	**Descriptor**	**Mark range**
a) Analysing the brief	Level of response not worthy of credit.	0
	Analysis is superficial leading to unclear design needs.	1
	Analysis is limited with some design needs clarified.	2
	Analysis is detailed with most design needs clarified.	3
b) Research	Level of response not worthy of credit.	0
	Research is superficial and does not focus on the design needs identified in the analysis. Analysis of existing products is insufficient to aid the writing of specification criteria.	1-2
	Research is general, focusing on some of the design needs identified in the analysis. Product analysis is used to inform the writing of some specification criteria.	3-4
	Research is selective and focuses on the design needs identified in the analysis. The performance, materials, components, processes, quality and sustainability issues of relevant existing products are explored in sufficient detail to aid the writing of specification criteria.	5-6
c) Specification	Level of response not worthy of credit.	0
	Specification points are superficial and not justified.	1-2
	Some specification points are realistic and measurable. Some specification points are developed from research but are not justified.	3-4
	Most specification points are realistic, technical, measurable and address some issues of sustainability. Specification fully justifies points developed from research.	5-6

Design (20 marks)		
Sub-sections	**Descriptor**	**Mark range**
d) Initial ideas	Level of response not worthy of credit.	0
	Alternative design ideas are similar and simplistic. Ideas are superficial and limited research is used. Limited specification points are addressed.	1-4
	Alternative design ideas are realistic and workable. Ideas are detailed and relevant research is used. Ideas address most specification points.	5-8
	Alternative design ideas are realistic, workable and detailed. Ideas demonstrate detailed understanding of materials, processes and techniques and are supported by research information. Ideas address all key specification points.	9-12
e) Review	Level of response not worthy of credit.	0
	General and subjective comments against some specification points. Limited use of user group feedback.	1-2
	Objective evaluative comments, against most specification points, that consider user group feedback and issues of sustainability.	3-4
f) Communication	Level of response not worthy of credit.	0
	Use of a range of communication techniques, including ICT where appropriate, with sufficient skill to convey an understanding of design ideas.	1-2
	Use of a range of communication techniques and media, including ICT and CAD where appropriate, with precision and accuracy.	3-4

Develop (15 marks)		
Sub-sections	**Descriptor**	**Mark range**
g) Development	Level of response not worthy of credit.	0
	Developments from alternative design ideas are minor and cosmetic. Simple modelling is used to test an aspect of the final design proposal against a design criterion.	1-3
	Developments are appropriate and use details from alternative design ideas to change, refine and improve the final design proposal. Modelling using traditional materials and/or 3D computer modelling is used to test some aspects of the final design proposal against relevant design criteria.	4-6
	Development is used to produce a final design proposal that is significantly different and improved compared to any previous alternative design ideas. Modelling to scale using traditional materials or 2D and/or 3D computer simulations is used to test important aspects of the final design proposal against relevant design criteria. User group feedback is used in final modifications.	7-9
h) Final design	Level of response not worthy of credit.	0
	Final design proposal includes limited consideration of materials and/or component parts, processes and techniques.	1-2
	Final design proposal includes details of some materials and/or component parts, processes and techniques.	3-4
	Final design proposal includes technical details of all materials and/or component parts, processes and techniques.	5-6

Make activity (50 marks)

Plan (6 marks)		
Sub-sections	**Descriptor**	**Mark range**
a) Production plan	Level of response not worthy of credit.	0
	Superficial production plan that outlines some stages of manufacture with limited reference to quality control.	1-2
	Limited production plan that considers the main stages of manufacture with some reference to appropriate forms of quality control.	3-4
	Detailed production plan that considers all stages of manufacture in the correct sequence including specific forms of quality control.	5-6

Make (38 marks)		
Sub-sections	**Descriptor**	**Mark range**
b) Quality of manufacture	Level of response not worthy of credit.	0
	Tools, equipment and processes, including CAD/CAM where appropriate, are selected with guidance. Limited understanding of the working properties of materials when selecting to manufacture a product. The task is undemanding. A limited range of skills and processes is used that show little attention to detail in their use.	1-8
	Tools, equipment and processes, including CAD/CAM where appropriate, are selected with some guidance. Some understanding of the working properties of materials when selecting to manufacture a product. The task offers some challenge. A range of skills and processes is used demonstrating attention to detail in their use.	9-16
	Tools, equipment and processes, including CAD/CAM where appropriate, are selected for specific uses independently. An appropriate understanding of the working properties of materials when selecting to manufacture a product. The task is challenging. A wide range of skills and processes is used with precision and accuracy.	17-24
c) Quality of outcome	Level of response not worthy of credit.	0
	Product includes the manufacture of some good quality component parts that remain either unassembled or poorly assembled and finished. Completed product functions poorly.	1-4
	Product includes the manufacture of good quality component parts that are generally well assembled and finished. Completed product functions adequately.	5-8
	Product includes the manufacture of high-quality component parts, accurately assembled and well finished. Completed product is fully functional.	9-12
d) Health and safety	Level of response not worthy of credit.	0
	Demonstrate an awareness of safe working practices for most specific skills and processes.	1
	Demonstrate a high level of safety awareness throughout all aspects of manufacture.	2

Test and evaluate (6 marks)		
Sub-sections	**Descriptor**	**Mark range**
e) Testing and evaluation*	Level of response not worthy of credit.	0
	One or more simple tests carried out to check the performance and/or quality of the final product. Evaluative comments are subjective and reference a few specification points superficially. Use of basic language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar used with limited accuracy.	1-2
	A range of tests carried out to check the performance and/or quality of the final product. Evaluative comments are objective and reference most specification points. Use of some design and technology terms and some focus and organisation. Spelling, punctuation and the rules of grammar used with some accuracy. Some spelling errors may still be found.	3-4
	A range of tests carried out to check the performance and/or quality of the final product with justifications. Objective evaluative comments, including user group evaluation, consider the most relevant, measurable specification points in detail, including sustainability issues. Use of a range of appropriate design and technology terms and good focus and organisation. Spelling, punctuation and the rules of grammar used with considerable accuracy.	5-6

* Opportunity for students to be assessed on quality of written communication: strand (iii) — organise information clearly and coherently, using specialist vocabulary when appropriate.

Write your name here

Surname	Other names

Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Design and Technology: Electronic Products
Unit 2: Knowledge and Understanding of Electronic Products

Sample Assessment Material

Time: 1 hour 30 minutes

Paper Reference

5EP02/01

You do not need any other materials.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** the questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Answer ALL the questions.

For each question 1 to 10, choose an answer A, B, C or D. Put a cross in the box indicating the answer you have chosen ☒. If you change your mind, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 Which of the following components is an output device?

☒ **A** Transistor

☒ **B** Thyristor

☒ **C** Buzzer

☒ **D** Thermistor

(Total for Question 1 = 1 mark)

---

2 Which of the following components is an input device?

☒ **A** LED

☒ **B** LDR

☒ **C** 555 timer

☒ **D** Operational amplifier

(Total for Question 2 = 1 mark)

---

3 Which of the following units is used to measure current?

☒ **A** Amp

☒ **B** Volt

☒ **C** Ohm

☒ **D** Watt

(Total for Question 3 = 1 mark)

---

4 Which of the following is a ferrous metal?

☒ **A** Aluminium

☒ **B** Steel

☒ **C** Brass

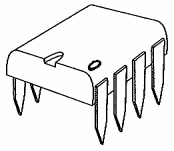
☒ **D** Copper

(Total for Question 4 = 1 mark)

---

5 The number of the pin marked by the letter X is:

- ☒ **A** 1
- ☒ **B** 2
- ☒ **C** 3
- ☒ **D** 4



X

(Total for Question 5 = 1 mark)

6 The production process that best describes the manufacture of a prototype is:

- ☒ **A** batch
- ☒ **B** high volume
- ☒ **C** mass
- ☒ **D** one-off

(Total for Question 6 = 1 mark)

7 The process best suited to forming a 90° angle in acrylic sheet is:

- ☒ **A** vacuum forming
- ☒ **B** injection moulding
- ☒ **C** line bending
- ☒ **D** blow moulding

(Total for Question 7 = 1 mark)

8 As darkness falls, the resistance of a LDR:

- ☒ **A** increases
- ☒ **B** halves
- ☒ **C** stays the same
- ☒ **D** decreases

(Total for Question 8 = 1 mark)

9 Which of the following input conditions would make a two-input AND gate output 1?

- ☒ **A** 0 0
- ☒ **B** 0 1
- ☒ **C** 1 0
- ☒ **D** 1 1

(Total for Question 9 = 1 mark)

10 The value of a 1 kΩ resistor and a 100 Ω resistor connected in series is:

☒ **A** 900 Ω

☒ **B** 1100 Ω

☒ **C** 101 Ω

☒ **D** 100 kΩ

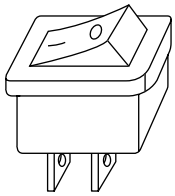
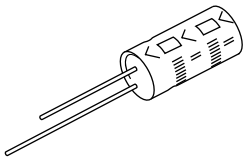
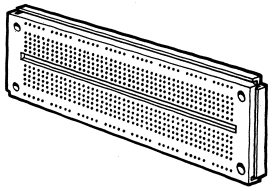
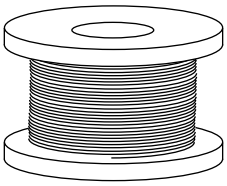
(Total for Question 10 = 1 mark)

(Total = 10 marks)

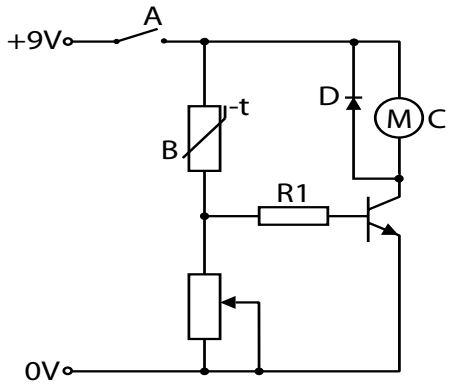
11 (a) The table below shows some tools and components.

Complete the table below by giving the missing names and uses.

(4)

Tools/Components	Name	Use
	Rocker switch	
	Electrolytic capacitor	
		To build prototype circuits
		To join components to PCB

(b) A student is making a desk fan using the circuit shown below.



Name the components marked A, B, and C.

(3)

A .....

B .....

C .....

(c) The resistor R1 is colour coded with the following bands:

Brown Black Red Gold

The resistor colour code is given below:

Black	Brown	Red	Orange	Yellow	Green	Blue	Violet	Grey	White
0	1	2	3	4	5	6	7	8	9

(i) Using the resistor colour code, determine the resistance of R1.

(2)

.....

(ii) State what the gold band represents.

(1)

.....

(d) Component D is a diode.

Describe the function of a diode in the circuit.

(2)

.....

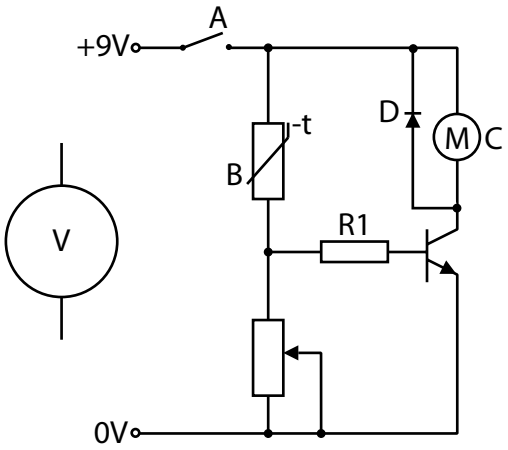
.....

.....

.....

(e) A model of the circuit was tested and found not to work. The student tested the battery using a voltmeter. Complete the diagram below to show how the voltmeter should be connected.

(1)

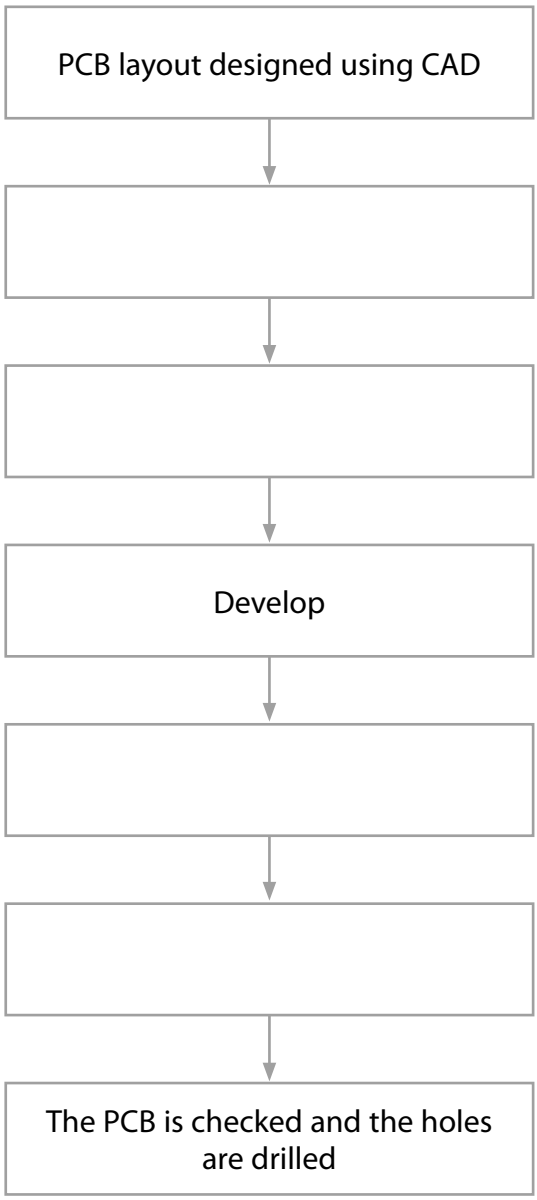


(f) Some circuits are manufactured using photosensitive printed circuit board (PCB).

(i) Complete the block diagram below, to show the correct sequence of events for the manufacture of a photosensitive printed circuit board.

Some of the stages have been done for you.

(4)



(ii) Give **two** health and safety precautions that should be observed when manufacturing a photosensitive printed circuit board.

(2)

1 .....

2 .....

(Total for Question 11 = 19 marks)

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12 You have been asked to design a child's night light that gives out light as darkness falls.

The specification for the child's night light is that it must:

- have a casing that will appeal to children
- be safe for children to use
- give out light
- be battery operated
- be able to be turned on/off
- be able to be adjusted so that it can turn on at different levels of darkness
- be made from materials available in a school workshop
- be made by a process available in a school workshop

In the boxes opposite, use sketches and, where appropriate brief notes to show **two different** design ideas for the child's night light that meet the specification points above.

Candidates are reminded that if a pencil is used for diagrams/sketches it must be dark (HB or B).

Coloured pens, pencils and highlighter pens must **not** be used.

Write your answers in the boxes provided opposite.

Design idea 1

(8)

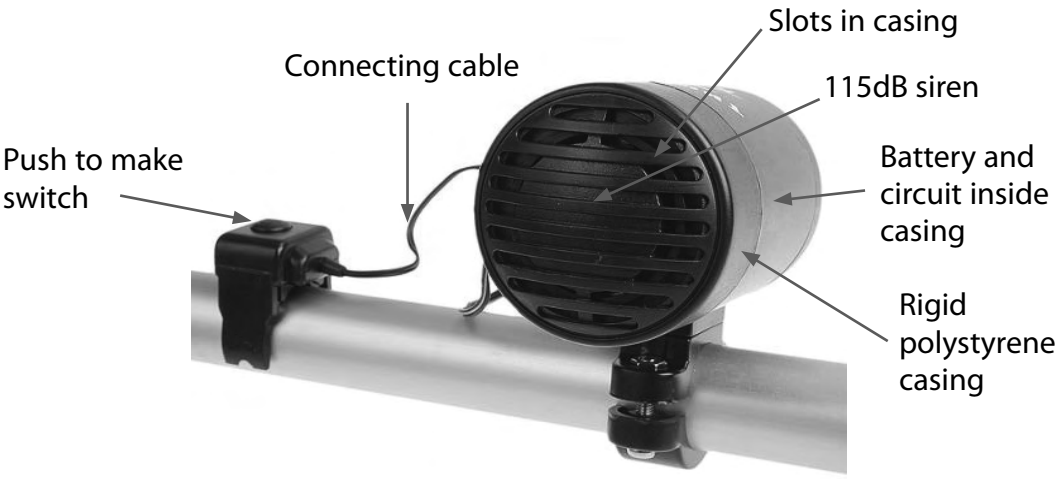
Design idea 2

(8)

(Total for Question 12 = 16 marks)

13 The drawing below shows details of a bicycle horn. It is used to warn other road users and pedestrians of the bicycle's presence.

It is operated by pressing a push to make switch.



(a) Give **two** reasons for using a push to make switch to operate the bicycle horn.

(2)

1 .....

2 .....

(b) The connecting cable of the bicycle horn is made from plastic coated copper wire.

Give **two** properties of copper that make it suitable for making the connecting cable.

For each property, justify your answer.

(4)

Property 1 .....

Justification .....

.....

Property 2 .....

Justification .....

.....

(c) Explain why the bicycle horn is successful in meeting the following specification points:

(i) The circuit and battery are protected from the weather.

(2)

(ii) Sound emits clearly through the casing.

(2)

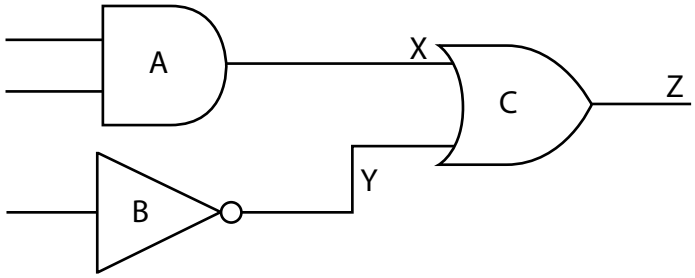
*(d) The bicycle horn casing is made from rigid polystyrene using the injection moulding process.

Evaluate injection moulding compared with vacuum forming as a suitable process for producing the rigid casing for the bicycle above.

(6)

(Total for Question 13 = 16 marks)

14 The logic diagram shown below is part of a house security system.



(a) Name logic gate A.

(1)

(b) Complete the truth table below for logic gate C.

(2)

X	Y	Z
0	0	
0	1	
1	0	
1	1	

(c) In the future, logic gates and other Integrated Circuits could be made using carbon nanotubes.

Describe **one** advantage of using carbon nanotubes to make Integrated Circuits.

(2)

(d) The manufacturer of a security system is considering using a programmable interface controller (PIC) instead of a range of logic chips.

Explain **two** advantages to the manufacturer of using a PIC instead of a range of logic chips.

(4)

1 .....

.....

.....

.....

2 .....

.....

.....

.....

(e) CAM (computer aided manufacture) systems are used in the electronics industry to produce PCBs in high volume.

Explain **two** advantages of using CAM, compared with using hand assembly, for high volume production of PCBs.

(4)

1 .....

.....

.....

.....

2 .....

.....

.....

.....

*(f) A company manufacturing PCBs is closing down its UK factory and moving the manufacture abroad where labour is much cheaper and people work longer hours.

Discuss the possible effects of the company moving its manufacturing abroad. **(6)**

(Total for Question 14 = 19 marks)

TOTAL FOR PAPER = 80 MARKS

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Sample Mark Scheme

Question Number	Answer	Mark
1	C	**(1)**

Question Number	Answer	Mark
2	B	**(1)**

Question Number	Answer	Mark
3	A	**(1)**

Question Number	Answer	Mark
4	B	**(1)**

Question Number	Answer	Mark
5	A	**(1)**

Question Number	Answer	Mark
6	D	**(1)**

Question Number	Answer	Mark
7	C	**(1)**

Question Number	Answer	Mark
8	A	**(1)**

Question Number	Answer	Mark
9	D	**(1)**

Question Number	Answer	Mark
10	B	**(1)**

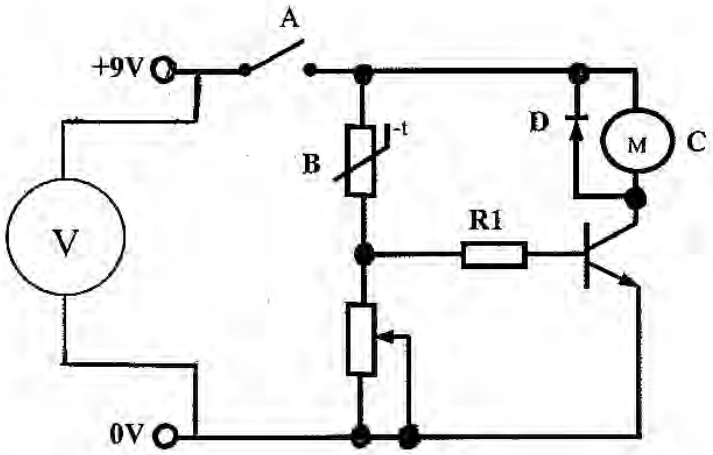
Question Number	Answer	Mark
11(a)	Rocker switch — To turn circuits on or off (1) **1x1** Electrolytic capacitor — Stores electricity/used in time delay circuits (1) **1x1** Breadboard (1) — To build prototype circuits **1x1** Solder (1) — To join components to PCB **1x1**	**(4)**

Question Number	Answer	Mark
11(b)	• A Switch (accept any type) (1) **1x1** • B Thermistor (1) **1x1** • C Motor (1) **1x1**	**(3)**

Question Number	Answer	Mark
11(c)(i)	• 1000 1 mark for the first two numbers 1 mark for two zeros **(NB** Award 2 marks for the answer 1K) **2x1**	**(2)**

Question Number	Answer	Mark
11(c)(ii)	• Tolerance (accept comments that convey meaning) (1) **1x1**	**(1)**

Question Number	Answer	Mark
11(d)	• To protect (a transistor) (1) from back EMF/trapped current (1) **2x1**	**(2)**

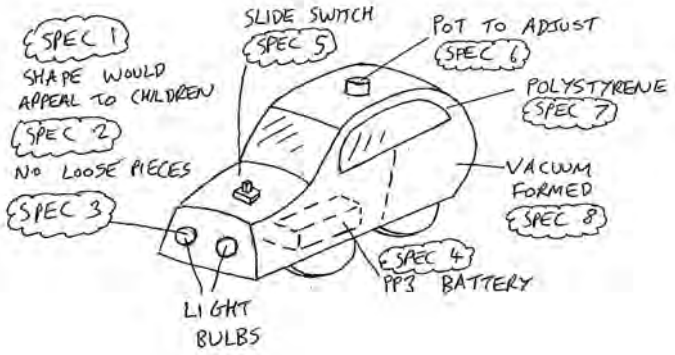
Question Number	Answer	Mark
11(e)	 Ends of voltmeter connected to power rails as shown above. **1x1**	**(1)**

Question Number	Answer	Mark
11(f)(i)	• Print mask (1) • Expose to UV light (1) • Etch (1) • Clean/wash (1) **1x1** **1x1** **1x1** **1x1**	**(4)**

Question Number	Answer	Mark
11(f)(ii)	**Two** safety precautions given from: • wear goggles (1) • wear gloves (1) • wear apron (1) • protect eyes from UV light (1) **1x1** **1x1**	**(2)**

Question Number	Answer	Mark
12	**Design idea 1** 1 mark should be awarded for evidence of each point of the specification resolved in the design. When an answer does not viably answer a specification point 0 marks. For each specification point with the element viably satisfied 1 mark. Candidates may answer any specification point in either graphical form or by annotation. **No marks are awarded for the quality of communication.** • **have a casing that will appeal to children** (1): any creative design idea that will appeal to children/use of bright colours/interesting shape • **be safe for children to use** (1): reference to no small pieces/no sharp edges/non-toxic materials • **give out light** (1): evidence that the output emits light, eg light bulb/LED • **be battery operated** (1): battery type must be named, eg PP3/9V/AA/AAA/C/D • **be able to be turned on/off** (1): reference to a named switch, eg toggle/slide/rocker/PTM • **be able to be adjusted so that it can turn on at different levels of darkness** (1): reference to a named variable resistor, ie pot or preset • **be made from materials available in a school workshop** (1): accept any suitable named material, eg polystyrene/MDF/aluminium • **be made by a process available in a school workshop** (1): accept any workshop process, eg vacuum forming/sanding/bending	

Design idea 1

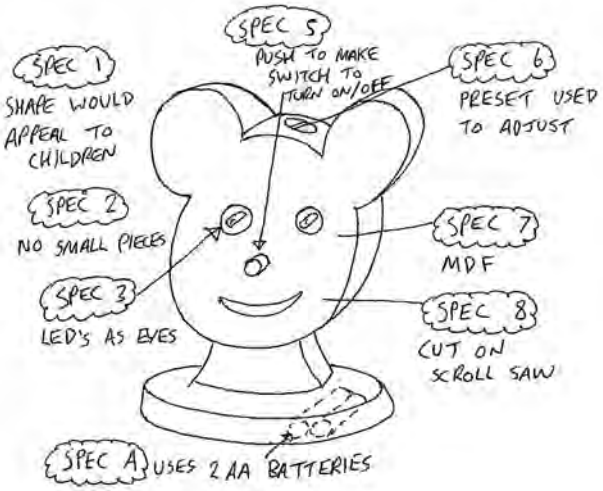


8x1 **(8)**

Design idea 2

To score a mark for design idea 2, each specification point must be resolved in second design idea but the second design idea **must be technically/conceptually different in design and construction** from the first and not a simple variation on a theme to score the mark.

Use exactly the same criteria as design idea 1 to mark design idea 2.



8x1 **(8)**

Question Number	Answer	Mark
13(a)	**Two** reasons given from: • it is easy to use (1) • it will only sound the horn when pressed (1) • it is cheap (1) • it has no protruding parts (1) **1x1** **1x1**	**(2)**

Question Number	Answer	Mark
13(b)	**Two** properties and linked justification from: • **Property**: it is ductile (1) • **Justification**: therefore can be drawn into wire (1) • **Property**: it is an excellent conductor (1) • **Justification**: so there is little resistance/low energy loss/high current (1) **2x1** **2x1**	**(4)**

Question Number	Answer	Mark
13(c)(i)	The following explanation: • rigid polystyrene is waterproof (1) and therefore rain/water cannot get to the circuit (1) **2x1**	**(2)**

Question Number	Answer	Mark
13(c)(ii)	The following explanation: • the casing has slots in the front (1) and therefore the sound will be able to emit from it (1) **2x1**	**(2)**

Question Number	Answer
13(d) **QWC (iii)**	**Evaluation to address the following issues:**

Injection Moulding	Vacuum Forming
Fast and accurate process that is suited only to high volume production.	Slower process; used in batch production.
High set-up costs of machinery and tooling; high quality steel moulds last for many thousand mouldings.	Cheap to set-up; moulds made from materials with limited lifespan.
Once set-up costs are recovered, mouldings are cheap to produce.	Mouldings are relatively cheap to produce; production costs do not change.
Complex shapes can be moulded in one piece.	Moulds must have draft angles and can only produce shapes that have no undercuts.
Mouldings require no finishing and rejects can be remoulded.	Mouldings require trimming from a sheet of material; rejects are wasted, cannot be reformed.

Level	Mark	Descriptor
	0	No rewardable material
Level 1	1-2	Candidate identifies the area(s) of comparison with no development OR identifies and develops one area. Shows limited understanding of the comparison. Writing communicates ideas using everyday language but the response lacks clarity and organisation. The student spells, punctuates and uses the rules of grammar with limited accuracy.
Level 2	3-4	Candidate identifies some areas of comparison with associated developments showing some understanding of the comparison. Writing communicates ideas using D&T terms accurately and showing some direction and control in the organising of material. The student uses some of the rules of grammar appropriately and spells and punctuates with some accuracy, although some spelling errors may still be found.
Level 3	5-6	Candidate identifies a range of areas of comparison with associated developments showing a detailed understanding of the comparison. Writing communicates ideas effectively, using a range of appropriately selected D&T terms and organising information clearly and coherently. The student spells, punctuates and uses the rules of grammar with considerable accuracy.

Question Number	Answer	Mark
14(a)	• AND (1) **1x1**	**(1)**

Question Number	Answer	Mark
14(b)	**0** **1** **1** **1** One mark for correct first output, ie **0** One mark for three **1**s as shown in table **2x1**	**(2)**

Question Number	Answer	Mark
14(c)	**One** advantage described from: • Nanotubes are very small (1) so devices can be miniaturised (1) • Nanotubes are very small (1) so more powerful Ics can be made with no increase in size (1) • Electric current travels much faster in nanotubes (1) so faster switching can be achieved (1) **2x1**	**(2)**

Question Number	Answer	Mark
14(d)	**Two** advantages explained from: • less components/soldering will be needed (1) and this will reduce costs (1) • PCBs would be smaller (1) and this would reduce material/transport costs (1) • the PICs could be reprogrammed (1) without the need to make a new circuit (1) **2x1** **2x1**	**(4)**

Question Number	Answer	Mark
14(e)	**Two** advantages explained from: • pick and place machines/CAM assemble much quicker than operators (1) and therefore costs / time will be reduced (1) • there will be no human error (1) as components are assembled by machine (1) • machines can work 24/7 (1) so more PCBs can be manufactured (1) **2x1** **2x1**	**(4)**

Question Number	Answer	
14(f) **QWC (iii)**	Indicative content **Discussion to address the following issues:** • existing employees could lose their jobs after years of loyal service and become unemployed • new workers may be exploited by receiving poor pay for long hours • could bring employment/wealth/training to new employees and improve their life • more energy could be used exporting/importing the components and that is bad for the environment • more energy would be used as workers/executives travel between UK base and factory abroad and more fuel/earth's resources will be used less energy may be used abroad as labour may be used instead of machines	
Level	Mark	Descriptor
	0	No rewardable material
Level 1	1-2	Candidate identifies the effect(s) with no development OR identifies and develops one effect. Shows limited understanding of the effects. The student uses basic language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar used with limited accuracy.
Level 2	3-4	Candidate identifies some effects with associated developments showing some understanding of the effects. The student uses some design and technology terms and shows some focus and organisation. Spelling, punctuation and the rules of grammar used with some accuracy. Some spelling errors may still be found.
Level 3	5-6	Candidate identifies a range of effects with associated developments showing a detailed understanding of the effects. The student uses a range of appropriate design and technology terms and shows good focus and organisation. Spelling, punctuation and the rules of grammar used with considerable accuracy.