

GENERAL CERTIFICATE OF SECONDARY EDUCATION

DESIGN AND TECHNOLOGY: ELECTRONICS AND CONTROL SYSTEMS

J301

Unit A515/01 Sustainability and technical aspects of designing and making_Electronics

Candidates answer on the question paper
A calculator may be used for this paper

OCR Supplied Materials:

None

Duration: 1 hour 30 minutes

Other Materials Required:

- Pencil
- Ruler (cm/mm)

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions in Section A **and** Section B.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.
- Do not write in Bar Codes.
- Show all working out for calculations.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with an asterix (*).
- The number of marks for each question is given in brackets [] at the end of the question or part question.
- Dimensions are in millimetres unless stated otherwise.
- The total number of marks for this paper is **80**.
- This document consists of **20** pages. Any blank pages are indicated.

For Examiner's Use		
	Max	Mark
1	1	
2	1	
3	1	
4	1	
5	1	
6	1	
7	1	
8	1	
9	1	
10	1	
11	1	
12	1	
13	1	
14	1	
15	1	
16	20	
17	15	
18	15	
19	15	
TOTAL	80	

Section AAnswer **all** questions**On questions 1 – 5 Circle your answer**

1 If a product is said to have a large carbon footprint, does it:

- (a) Leave large black marks on a carpet
- (b) Need special care when transporting it
- (c) Produce a significant amount of carbon dioxide during its manufacture or use
- (d) Only fit into large recycling bins

[1]

2 What information does this symbol tell the consumer about the product?



- (a) Product won't tip over
- (b) It is made of polystyrene
- (c) It is repairable
- (d) It is person safe

[1]

3 Solar power devices are fitted to houses to:

- (a) Save water
- (b) Stop draughts
- (c) Make houseplants grow
- (d) Reduce energy costs

[1]

4 A biomass boiler burns which of the following to produce energy:

- (a) Plant and wood-derived pellets or shavings
- (b) Coal
- (c) Crude Oil
- (d) Natural Gas

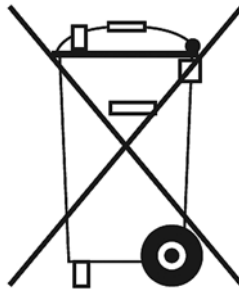
[1]

5 When a re-chargeable battery is discharged, you should:

- (a) Return it
- (b) Reverse it
- (c) Complain to the manufacturer
- (d) Recharge it

[1]

6 State what is meant by the symbol shown below:



..... [1]

7 State the name of one green source of energy.

..... [1]

8 State why the use of recycled paper is a good idea.

..... [1]

9 State why plumbers are required to use lead-free solder for connecting domestic water pipes.

..... [1]

10 State the term that describes the design of an electronic product to ensure the comfort of its user.

..... [1]

Decide whether each of the following statements is true or false.

Tick (✓) the box to show your answer.

- | | True | False | |
|---|--------------------------|--------------------------|------------|
| 11 An energy saving light bulb is easier to switch on than a filament bulb | <input type="checkbox"/> | <input type="checkbox"/> | [1] |
| 12 A “sweatshop” is somewhere with poor working conditions | <input type="checkbox"/> | <input type="checkbox"/> | [1] |
| 13 Recycling is an initiative to promote bicycle sharing | <input type="checkbox"/> | <input type="checkbox"/> | [1] |
| 14 Car sharing decreases overall carbon emissions | <input type="checkbox"/> | <input type="checkbox"/> | [1] |
| 15 The Forest Stewardship Council encourages using sustainable forest products | <input type="checkbox"/> | <input type="checkbox"/> | [1] |
| 16 Fig. 1 shows an assembled solar powered lamp. | | | |



Fig. 1

- (a)** The solar powered lamp is packaged in a box made of recycled cardboard.
- (i)** State why this is considered good environmental practice.

..... **[1]**

- (ii) The manufacturer has printed assembly instructions showing how to assemble the lamp on the outside of the box.

State which of the 6Rs this illustrates.

..... [1]

- (iii) State **one** benefit of printing the assembly instructions on the outside of the box.

..... [1]

- (b) The solar powered lamp contains a Ni-Cad cell.

- (i) State how a worn out Ni-Cad cell should be disposed of.

..... [1]

- (ii) If the worn out cell was replaced, state which of the 6Rs would have been fulfilled.

..... [1]

- (iii) Since 2008 an EU directive has banned all manufacturers/distributors from importing Ni-Cad batteries into Europe.

Give **one** reason why this legislation has been introduced.

..... [1]

- (c) The WEEE Directive aims to both reduce the amount of electrical and electronic equipment being produced and to encourage everyone to reuse, recycle and repair it.

Look at Fig. 2a and 2b and explain how the designer has made the solar powered lamp WEEE compliant.



Fig. 2a



Fig. 2b

.....

.....

.....

..... [3]

- (d) (i) Fig. 3 shows a solar torch built using the components from a solar powered lamp.



Fig. 3

State which of the 6Rs the designer of this product has applied.

..... [1]

- (ii) Although fully functional, the solar torch in Fig. 3 lacks user appeal.

Use sketches and notes to show an improved version of the torch below.

[4]

Section BAnswer **all** questions

- 17 (a)** Soldering wires to LED legs is a job that often needs doing when constructing electronic products.

A soldered joint with wire and leg side by side is shown in Fig. 5.



Fig. 5

- (i)** The following equipment wire is available to connect to the LED cathode:

- yellow 1/0.6mm
- black 7/0.2mm
- red 7/0.2mm.

State the most suitable wire to use.

..... [1]

- (ii)** Give **one** reason for your choice of wire.

..... [1]

- (b) The quality of an electronic product can be improved by the use of materials such as heat shrink sleeving on soldered joints.



Fig. 6

Fig. 6 shows an LED with heat shrink sleeving in place.

- (i) State **two** benefits of using heat shrink sleeving on a joint.

1

2 [2]

- (ii) The heat shrinking can be carried out with the cooler part of a soldering iron tip as shown in Fig. 7.

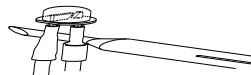


Fig. 7

In this process there is a danger of burns from the soldering iron.

Describe the procedure that should be followed if a burn from a soldering iron occurs in a school workshop.

.....

.....

..... [2]

(iii) The stages in soldering a wire to an LED leg are given below. Use the stages in the correct order to complete the block diagram.

The first stage has been completed.

tin the wire and LED leg

strip insulation from wire



heat joint to melt solder



strip insulation from wire



place wire next to LED leg



place heat shrink sleeving over wire

[2]

(c) LEDs are available in a number of different styles.

Give **three** ways in which LEDs for a product can be specified.

1.....

2.....

3..... [3]

(d) Fig. 8 shows screw terminals that will be used to attach the LED wires to the circuit board.

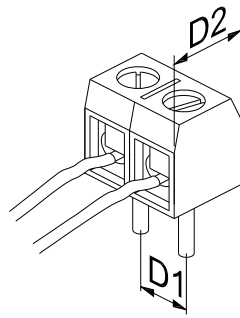


Fig. 8

(i) Explain why the dimensions, **D1** and **D2**, marked on the screw terminal drawing are important to the PCB designer.

.....

.....

.....

..... [2]

(ii) When the LED wires are connected to the screw terminals a quality control check should be carried out to ensure that the connection is good.

Describe **two** visual checks that should be carried out when looking at the quality of the connection.

1.....

.....

2.....

..... [2]

18 Fig. 9 shows a small novelty electronic toy which makes a buzzing insect sound in the dark.

The case has been injection moulded from plastics.

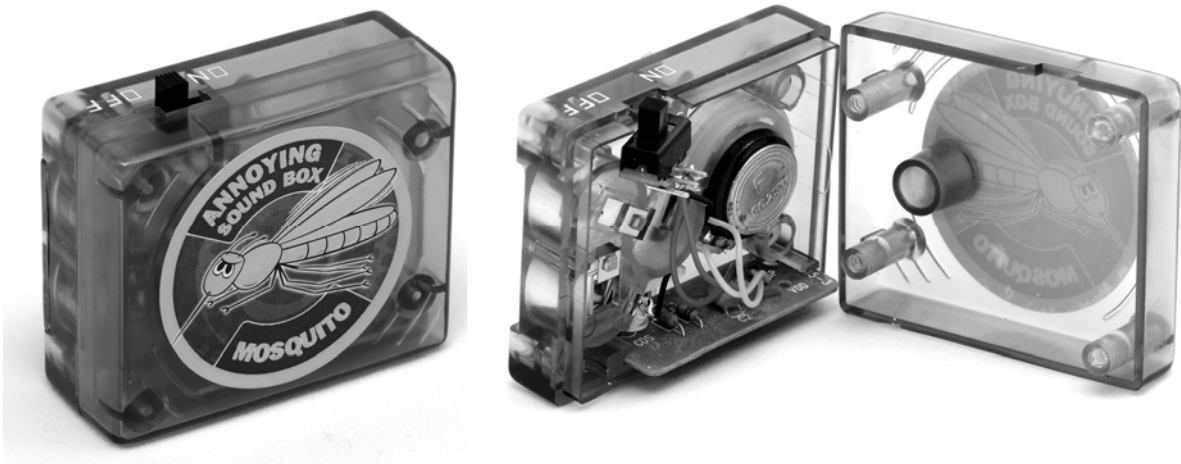


Fig. 9

(a) (i) Give **one** property of plastics that makes it suitable for injection moulding.

..... [1]

(ii) Give **two** benefits to a manufacturer of using injection moulding for product cases.

1

2 [2]

(b) The surface of the battery case has three symbols moulded into it as shown in Fig. 10.

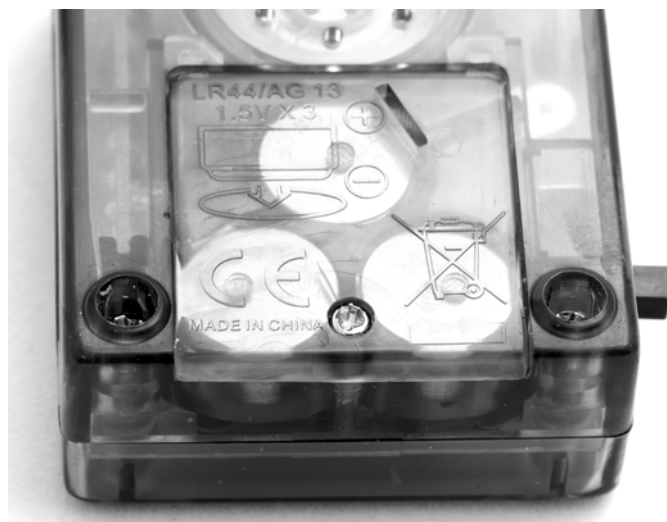


Fig. 10

State **two** items of information on the case that will be of help to the user.

1.....

2..... [2]

(c) The circuit board for the toy is shown in Fig 11a.

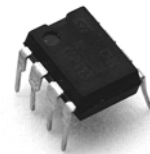
A chip on board (COB) integrated circuit is used.

Explain why this is better for the manufacturer than using either of the other two types of integrated circuit shown in Fig. 11b.



Fig. 11a

surface
mount IC



DIP IC

Fig. 11b

.....
.....
.....
..... [3]

(d) (i) The toy will only make a sound in the dark.

State the name of **two** components that can be used to detect light level.

1 [1]

2 [1]

(ii) An operational amplifier could be used to compare the signal from a light sensor to a reference voltage.

Complete Fig. 12 to show how a variable reference voltage could be connected to the non inverting input of the operational amplifier.

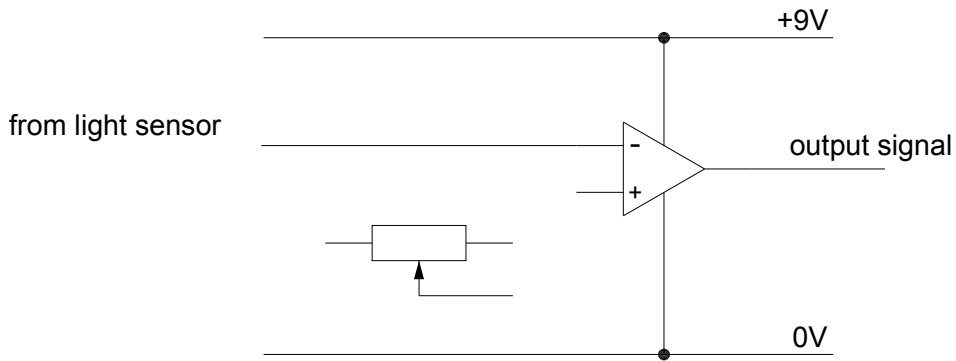


Fig. 12 [3]

(e) Ergonomics is often used when designing toys.

Describe how the toy shown in Fig. 9 could be tested for ergonomic suitability.

.....
.....
..... [2]

PIC circuits and many logic circuits require a precise voltage supply.

19 Fig. 13 shows part of a circuit being designed to provide a smooth +5V supply.

The circuit is based on a 7805 voltage regulator IC.

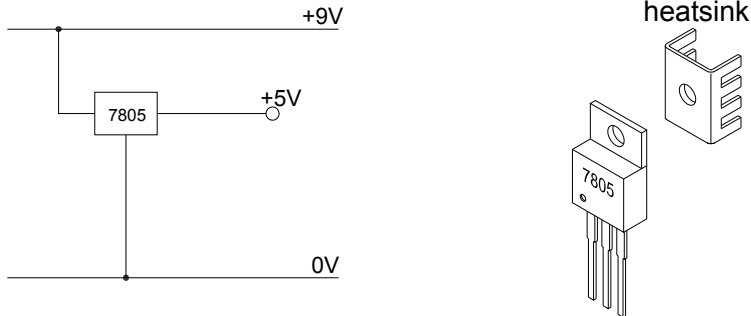


Fig. 13

(a) (i) Give **one** reason why a heatsink may need to be attached to the IC.

..... [1]

(ii) State the name of a suitable material for a heatsink.

..... [1]

(b) When a 230VAC mains power adaptor is tested using an oscilloscope the output voltage appears as shown in Fig. 14a.

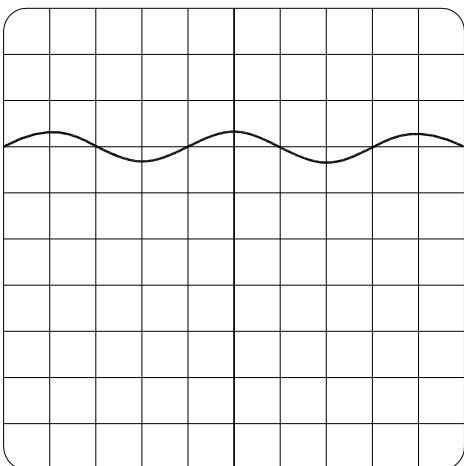


Fig. 14a

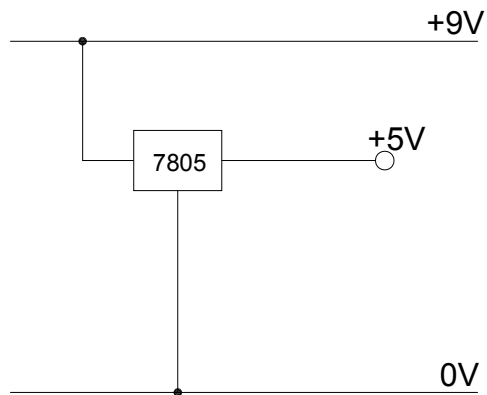


Fig. 14b

(i) To remove the ripple from the output the following components are added:

- 47 μ F electrolytic capacitor across the input voltage
- 100nF capacitor across the output voltage

Complete Fig. 14b to show the capacitors in place.

[2]

(ii) Fig. 15 shows part of the PCB layout for the smoothed supply.

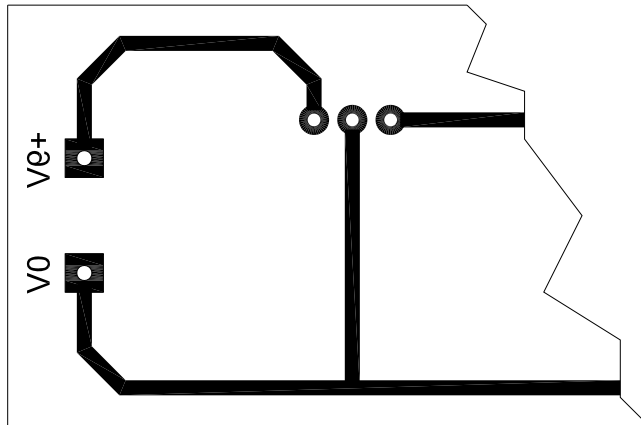


Fig. 15

Add the following to the layout:

- pads and tracks for the 47 μ F capacitor
- an indication of capacitor polarity

[2]

(iii) The working voltage must be considered when choosing a suitable 47 μ F capacitor to use in the circuit.

Explain why the working voltage of a capacitor is important.

.....

.....

..... [2]

(iv) Give **one** way of identifying the negative leg of a polarised capacitor.

..... [1]

END OF QUESTION PAPER

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SPECIMEN

Sample Assessment Material

DESIGN AND TECHNOLOGY: ELECTRONICS AND CONTROL SYSTEMS

A515/01 Sustainability and technical aspects of designing and making_Electronics

MARK SCHEME

Duration: 1 hour 30 minutes

MAXIMUM MARK 80

DRAFT

This document consists of 15 pages

MARKING INSTRUCTIONS

PREPARATION FOR MARKING
SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal: <http://www.rm.com/support/ca>
3. Log-in to scoris and mark the **required number** of practice responses (“scripts”) and the **number of required** standardisation responses.

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

TRADITIONAL

Before the Standardisation meeting you must mark at least 10 scripts from several centres. For this preliminary marking you should use **pencil** and follow the **mark scheme**. Bring these **marked scripts** to the meeting.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the scoris messaging system, or by email.
5. Work crossed out:
 - a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks
 - b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.
7. There is a NR (No Response) option. Award NR (No Response)
- if there is nothing written at all in the answer space
 - OR if there is a comment which does not in anyway relate to the question (e.g. 'can't do', 'don't know')
 - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question
- Note: Award 0 marks - for an attempt that earns no credit (including copying out the question)
8. The scoris **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
If you have any questions or comments for your team leader, use the phone, the scoris messaging system, or e-mail.
9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.
10. For answers marked by levels of response:
- a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
 - b. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

Section A

Question		Answer	Mark	Guidance
1		(c) Produce a significant amount of carbon dioxide during its manufacture or use	1	
2		(b) It is made of polystyrene	1	
3		(d) Reduce energy costs	1	
4		(a) Plant and wood-derived pellets or shavings	1	
5		(d) Recharge it	1	
6		Item should not be placed in (domestic waste) bin, not intended for landfill	1	Reason stated. Not 'recycle'
7		Wind, wave, hydro-electric, solar (voltaic or heat), geothermal, tidal	1	Not water alone
8		Means that trees are not used to produce new product	1	
9		Lead is poisonous / harmful to humans / a cumulative poison /hazardous	1	Do not accept 'dangerous'
10		Ergonomics or anthropometrics	1	No variations
11		False	1	
12		True	1	
13		False	1	
14		True	1	
15		True	1	
Total			15	

Question			Answer	Mark	Guidance
16	(a)	(i)	Does not use any trees or new material or saves energy in making, no need to make new cardboard.	1	Not 'can be recycled'.
		(ii)	Reduce or Rethink.	1	
		(iii)	Any one from: uses less materials/paper in making product, potential purchaser can see if it is within their capabilities, less space needed in box, so transport costs are reduced, will user be able to assemble, less likely to lose instructions.	1	
(b)	(i)	Taken to a battery bank / "batteryback" container / battery container / back to shop where bought / council waste facility for 'recycling'.	1	Not 'recycling' alone.	
	(ii)	Repair, do not allow reuse.	1		
	(iii)	To help stop cadmium from non-recycled cells entering landfill sites, cadmium is poison/harmful to life.	1	Needs to focus on poison, toxic to Environment /human.	
(c)		Max three marks for an accurate explanation: Points relating to how the object can be reduced to its component parts (1) quickly and easily without recourse to tools (1) so that they can be re-used or recycled (1) especially removal of circuitry and/or cell (1) and separation of plastic parts from each other/circuitry (1). No tools required in this case to repair circuit or replace cell (1)	3	Repair, reuse and recycle ONLY if justified or explained.	
(d)	(i)	Reuse, do not allow repair.	1		
	(ii)	Sketches and notes, ergonomic shape and/or grip/switch placement/type or modification e.g. slide switch, slimmer / longer / rounder shape to suit the human hand, carrying strap, more aesthetically pleasing. Features or features and justification, internal circuitry or additional functions. 4x1 or 2x2.	4	Must IMPROVE aspects of the existing boxy design / red / white only. Watch for duplicate sketch and description.	

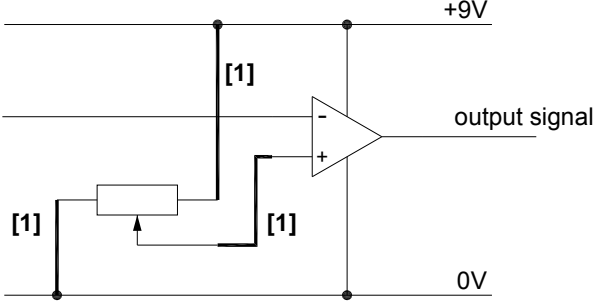
Question		Answer	Marks	Guidance	
				Content	Levels of response
	(e)*	<p>Answers should have information showing some relevant knowledge of likely impact wind farms could have on the UK:</p> <ul style="list-style-type: none"> • realistic figures for % contribution (1-20%), • possible locations, not just 'hilly' or 'windy' places" • impact on environment should mention visual, wildlife hazard, migrating birds, noise of blades, visual disturbance strobe effect, loss of visual amenity for residents • NIMBYism / NOMFDS, • benefits of offshore/onshore, • large amounts of concrete needed, • capital cost, • offset consumption of fossil fuel, • less CO2 emission. 	6	Relevant points need justification.	<p>Level 3 (5-6 marks) Thorough discussion, showing a clear understanding of the likely impact wind farms could have on the UK. There will be three or more clearly identified and explained points. Specialist terms will be used appropriately and correctly. The information will be presented in a structured format. The candidate will demonstrate the accurate use of spelling, punctuation and grammar.</p> <p>Level 2 (3-4 marks) Adequate discussion, showing an understanding of the likely impact wind farms could have on the UK. There will be some use of specialist terms, although these may not always be used appropriately. The information will be presented for the most part in a structured format. There may be occasional errors in spelling, grammar and punctuation.</p> <p>Level 1 (1-2 marks) Basic discussion, showing some understanding of the likely impact wind farms could have on the UK. There will be little or no use of specialist terms. Answers may be ambiguous or disorganised or 'list like'. Errors of grammar, punctuation and spelling may be intrusive.</p> <p>0 marks = no response or no response worthy of credit</p>
		Total	20		

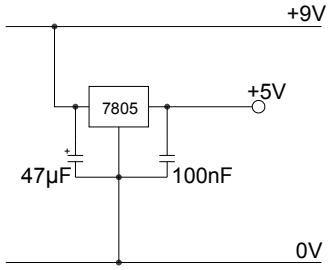
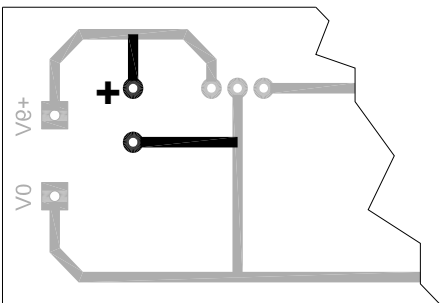
Section B

Question			Answer	Mark	Guidance
17	(a)	(i)	The most suitable wire is black 7/0.2mm. Allow any method of indication, in list or on diagram.	1	
		(ii)	Reasons for choice to be: <ul style="list-style-type: none"> black to indicate negative for the cathode leg or 7 stranded wires are flexible and will allow movement of LED. 	1	Allow a good reason for choice of other wires.
	(b)	(i)	Any two benefits of heat shrink sleeving, one mark each: <ul style="list-style-type: none"> will increase strength of joint insulation of legs from each other colour coding of leg. 	2	
		(ii)	Max two marks for an accurate description of the procedure for dealing with burns, one mark each: <ul style="list-style-type: none"> cool with water report incident to teacher / seek medical advice make sure that soldering iron is placed back safely in stand. 	2	

Question	Answer	Mark	Guidance
<p>(b) (iii)</p>	<p>1 mark for connection statements in the correct order. 1 mark for heat shrink statement in suitable position.</p>	<p>2</p>	<p>Heat shrink can be placed in boxes 2, 3, or 5. Connection statements must be in correct order for mark: Tin - Place - Heat</p>
<p>(c)</p>	<p>Any three ways of specifying LED's, one mark each: Colour, shape, intensity, size, angle of illumination.</p>	<p>3</p>	<p>Do not allow duplication of methods.</p>
<p>(d) (i)</p>	<p>D1 gives spacing of the pins which are needed for pad positioning or pad size, (1) D2 gives the depth of the terminal block which is needed to ensure that other components have enough room, or that there is room to fit wires, (1)</p>	<p>2</p>	
	<p>(ii) Any two checks, one mark each:</p> <ul style="list-style-type: none"> • no stray strands sticking out • insulation going right up to hole in terminal block • no sharp bends in connecting wires • make sure that screws are tight / secure. <p>Allow other valid checks</p>	<p>2</p>	
<p>Total</p>	<p>15</p>		

Question			Answer	Mark	Guidance
18	(a)	(i)	Property given must refer to the thermoplastic nature of the plastics used, accept will melt with heat, re-melt etc.	1	
		(ii)	Any two benefits of injection moulding, one mark each: <ul style="list-style-type: none"> • repeatable process • suitable for large volume production • low cost per unit in volume production • accurate • easy to change colour of case • can use recycled materials. 	2	'Quick' or reference to speed must be qualified. Cost must be qualified - do not accept 'cheap'.
	(b)		Any two items of information, one mark each: <ul style="list-style-type: none"> • type of battery • CE symbol to show compliance with a standard • voltage of battery • number of batteries • polarity of battery when inserting • do not place in bin / household rubbish or should be recycled. 	2	Allow reference to 'testing'.
	(c)		Explanation should include reference to: <ul style="list-style-type: none"> • compact size • disposable low cost item so does not need replacing • lower assembly costs – no soldering required • connections protected from damage • cannot be assembled incorrectly. <p>2 x 1 marks for giving benefits of COB IC 1 mark for referring to other types of IC in explanation.</p>	3	Allow two marks for one well justified point. 'Cost' must be qualified.
	(d)	(i)	Any two suitable components for detecting light, one mark each: <ul style="list-style-type: none"> • LDR - accept CSd sensor • phototransistor • photovoltaic cell / solar panel • photodiode. 	2	No mark for 'light sensor'.

Question	Answer	Mark	Guidance
(ii)		3	1 mark for each correct connection.
(e)	<p>Tests for ergonomic suitability could include:</p> <ul style="list-style-type: none"> • comparison of toy size to anthropometric data • test with children of different age / size • ease of using slide switch • choke test for safety with small children • safety checks for sharp edges on case moulding. <p>1 mark each for two points mentioned 2 x 1. 2 marks for a single point well justified.</p>	2	
	Total	15	

Question		Answer	Mark	Guidance	
19	(a)	(i)	Heatsink may be needed to keep the voltage regulator cool if the load on output is high. Allow mark for understanding shown.	1	Allow any reference to reduction of heat / temperature in IC or reduction of damage to IC. Must refer to overheating
		(ii)	Suitable materials; aluminium or copper . Do not allow steel.	1	
	(b)	(i)	Correct symbol and value for $47\mu\text{F}$ capacitor, 1 mark. Correct symbol and value for 100nF capacitor, 1 mark 	2	Mark can be awarded if polarity and correct symbol are used to indicate the different capacitors but no values are stated.
		(ii)	Suitable position for pads and tracks, 1 mark. Indication of polarity, '+' next to positive connection, 1 mark. 	2	Polarity mark can be given even if capacitor negative track is incorrect (positive track must be connected to positive rail).

Question		Answer	Mark	Guidance
	(iii)	Explanation to refer to the maximum voltage that can be safely applied to the capacitor, [1] the consequences of using too low a value, e.g. capacitor destroyed, [1]	2	
	(iv)	Negative leg can be identified by stripe on body of capacitor or with negative leg is shorter, 1 mark.	1	

Question		Answer	Marks	Guidance	
				Content	Levels of response
	(c)*	Points for comparison could include: <ul style="list-style-type: none"> • Voltages available • Disposable / rechargeable batteries • Power output • Safety • Environmental concerns with battery disposal • Falling level of voltage on batteries • Portability • Cost - must be qualified • Physical size. 	6	Maximum of 2 marks for short bullet point list	<p>Level 3 (5-6 marks) Shows detailed understanding of the issues when comparing and contrasting batteries and mains powered adaptors and analyses most of the issues involved. Specialist terms will be used appropriately and correctly. The information will be presented in a structured format. The candidate demonstrates accurate use of spelling, punctuation and grammar.</p> <p>Level 2 (3-4 marks) Shows some understanding of the issues when comparing and contrasting batteries and mains powered adaptors; some analysis of the issues involved. There will be some use of specialist terms although these may not always be used appropriately. The information will be presented for the most part in a structured format. There may be occasional errors in spelling, punctuation and grammar.</p> <p>Level 1 (1-2 marks) Shows limited understanding of the issues when comparing and contrasting batteries and mains powered adaptors. There will be little or no use of specialist terms. Answers may be ambiguous or disorganised. Errors of grammar, punctuation and spelling may be intrusive.</p> <p>0 marks = no response or no response worthy of credit</p>
		Total	15		

Assessment Objective Grid					
GCSE Design & Technology: Electronics					
		Recall, select and communicate	Apply knowledge, understanding and skills	Analyse and evaluate	
Question		A01	A02	A03	Mark
1		1			1
2		1			1
3		1			1
4		1			1
5		1			1
6		1			1
7		1			1
8		1			1
9		1			1
10		1			1
11		1			1
12		1			1
13		1			1
14		1			1
15		1			1
16 ai			1		1
16 aii			1		1
16aiii				1	1
16bi		1			1
16bii			1		1
16 biii			1		1
16 c			1	2	3
16di			1		1
16dii			3	1	4
16 e*		2	3	1	6
17 ai		1			1
17 aii		1			1
17 bi		1		1	2
17 bii		2			2
17 biii		1		1	2
17 c		3			3
17 di		2			2
17 dii		2			2
18 ai		1			1
18 aii		2			2
18 b		1		1	2
18 c		1	1	1	3
18 di		2			2
18 dii		2		1	3
18 e		2			2

19 ai		1			1
19 aii		1			1
19 bi		1		1	2
19 bii		1		1	2
19 biii		2			2
19 biv		1			1
19 c*		3	1	2	6
Total		52	14	14	80