Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Design and Technology Electronic Products

Unit 2: Knowledge and Understanding of Electronic Products

Friday 25 May 2018 – Afternoon
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.
- If pencil is used for diagrams/sketches it must be dark (HB or B). Coloured pens, pencils and highlighter pens must **not** be used.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** 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 on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*
- You may wish to use a calculator.

Advice

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

Turn over ▶

P55552A

1/1/1/1/1/1/1/1/1

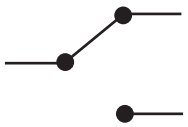
P 5 5 5 5 2 A 0 1 2 0

Pearson

Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 Identify the switch represented by the symbol shown below:



☒ **A** single pole double throw (SPDT)

☒ **B** single pole single throw (SPST)

☒ **C** double pole double throw (DPDT)

☒ **D** push to break (PTB)

(Total for Question 1 = 1 mark)

2 A non-polarised capacitor can be used:

☒ **A** with any voltage level in a circuit

☒ **B** with any current level in a circuit

☒ **C** at any temperature in a circuit

☒ **D** any way round in a circuit

(Total for Question 2 = 1 mark)

3 The standard output voltage of mains power in UK homes is closest to:

☒ **A** 20v

☒ **B** 120v

☒ **C** 240v

☒ **D** 360v

(Total for Question 3 = 1 mark)

4 The Kyoto Protocol was an agreement in which nations agreed to:

- ☒ **A** set international standards for electronic symbols
- ☒ **B** set targets to reduce greenhouse gas emissions
- ☒ **C** reduce the use of toxic materials in electronic products
- ☒ **D** reduce damage to the ozone layer from CFC gases

(Total for Question 4 = 1 mark)

5 In Bluetooth® technology, a PAN is a:

- ☒ **A** Personal Area Network
- ☒ **B** Paired Area Network
- ☒ **C** Passive Area Network
- ☒ **D** Positive Area Network

(Total for Question 5 = 1 mark)

6 Biomass is a substance used to produce:

- ☒ **A** biorobots
- ☒ **B** biosensors
- ☒ **C** biofuels
- ☒ **D** biomaterials

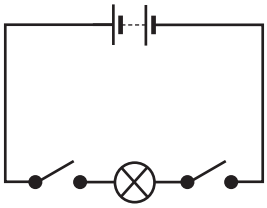
(Total for Question 6 = 1 mark)

7 When using the 4 Rs, 'Recover' means recovering:

- ☒ **A** materials from products
- ☒ **B** components from products
- ☒ **C** energy from waste
- ☒ **D** energy by using less

(Total for Question 7 = 1 mark)

8 The circuit below represents the function of a:



- ☒ **A** OR logic gate
- ☒ **B** AND logic gate
- ☒ **C** XOR logic gate
- ☒ **D** NOR logic gate

(Total for Question 8 = 1 mark)

9 The value of a resistor with the colour bands: red, red, red and gold is

- ☒ **A** 222 Ω
- ☒ **B** 22 kΩ
- ☒ **C** 2.2 kΩ
- ☒ **D** 222 kΩ

(Total for Question 9 = 1 mark)

10 The value of a 100μF capacitor in Farads is:

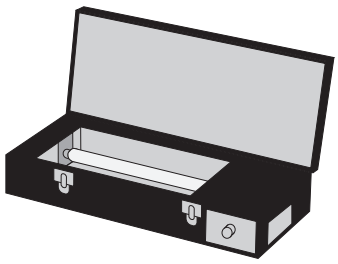
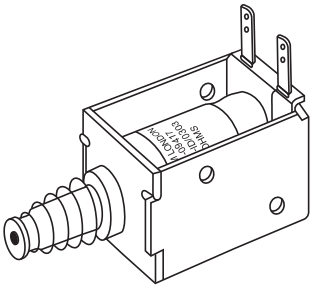
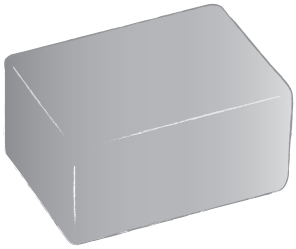
- ☒ **A** .1F
- ☒ **B** .01F
- ☒ **C** .001F
- ☒ **D** .0001F

(Total for Question 10 = 1 mark)

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

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

(4)

Equipment/Component	Name	Use
		Used to expose photosensitive / photoresist board
	Diode	
		An electromechanical component that converts electrical energy into linear motion
	PCB rubber	

(b) Figure 1 shows a prototype circuit that operates an automatic fan.

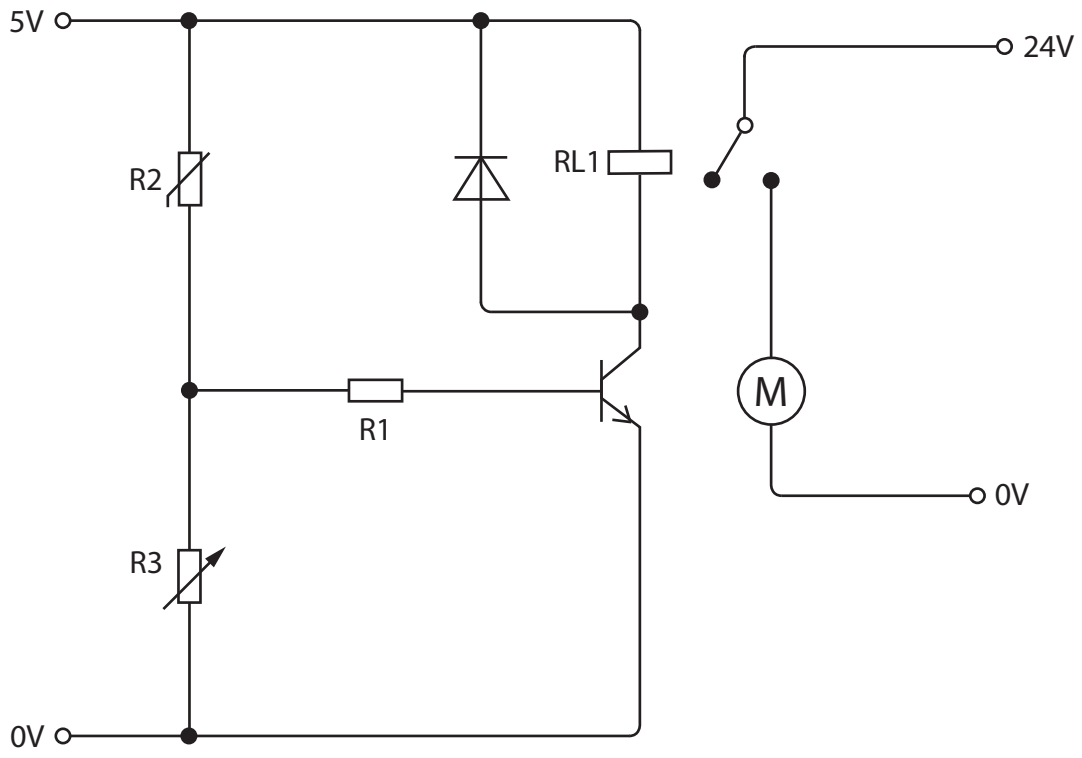


Figure 1

(i) Identify **one** output component in Figure 1.

(1)

.....

(ii) Identify **one** input component in Figure 1.

(1)

.....

Semiconductor components, such as transistors, are easily damaged. The circuit diagram in Figure 1 shows two methods of protecting the transistor.

(c) Describe the **two** methods, shown in Figure 1, used to protect the transistor.

(4)

Method 1

Method 2

A relay is an electromagnetic switch that turns the motor on and off.

(d) Explain **one** other reason why the relay is used in this circuit.

(2)

(e) Explain the purpose of component R3.

(2)

(f) The electronic engineer wants to measure the current drawn by the motor.

(i) Name a piece of equipment that could be used to measure current levels.

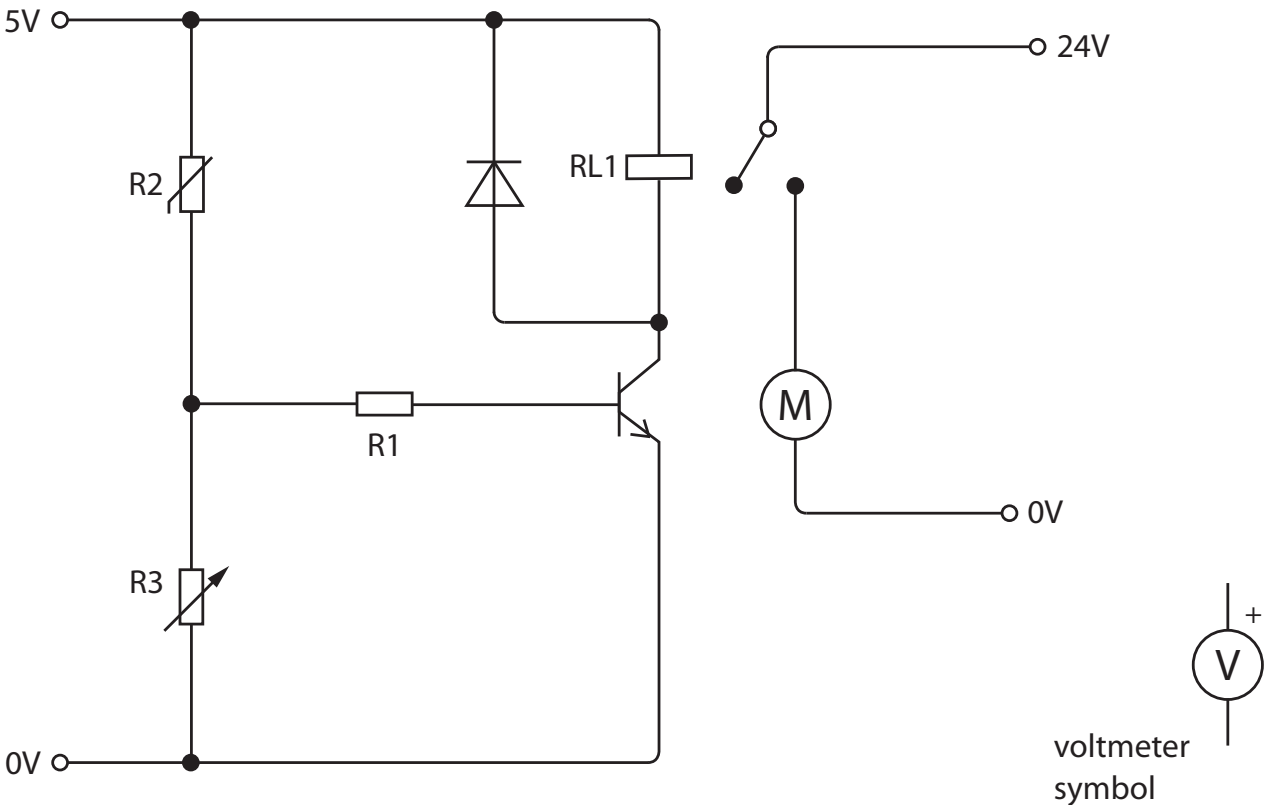
(1)

.....

The electronic engineer wants to measure the voltage at the base of the transistor. The symbol for the voltmeter has been added to the diagram.

(ii) Copy the voltmeter symbol onto the circuit below so that it is connected correctly to measure the voltage at the base of the transistor.

(1)



(Total for Question 11 = 16 marks)

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12 A company is planning to manufacture a range of weather stations. They will house a sensor and will be used outside in open fields, to sense changes in weather conditions such as rain or frost or light levels.

Design the weather station only. Do not design any circuits.

The specification for the weather station is that it must:

- have a weather theme
- be made from materials that are weatherproof
- be able to sense a change in weather conditions
- be able to be fixed securely, 1 metre above the ground in open fields
- provide a secure means of access to the electronic circuit
- be visible at night
- have an independent power supply
- have an output that can display different symbols, letters and numbers.

In the spaces opposite, use sketches and, where appropriate, brief notes to show **two** different design ideas for the weather station 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.

PLEASE USE THE SPACES OPPOSITE FOR YOUR DESIGNS.

Design idea 1

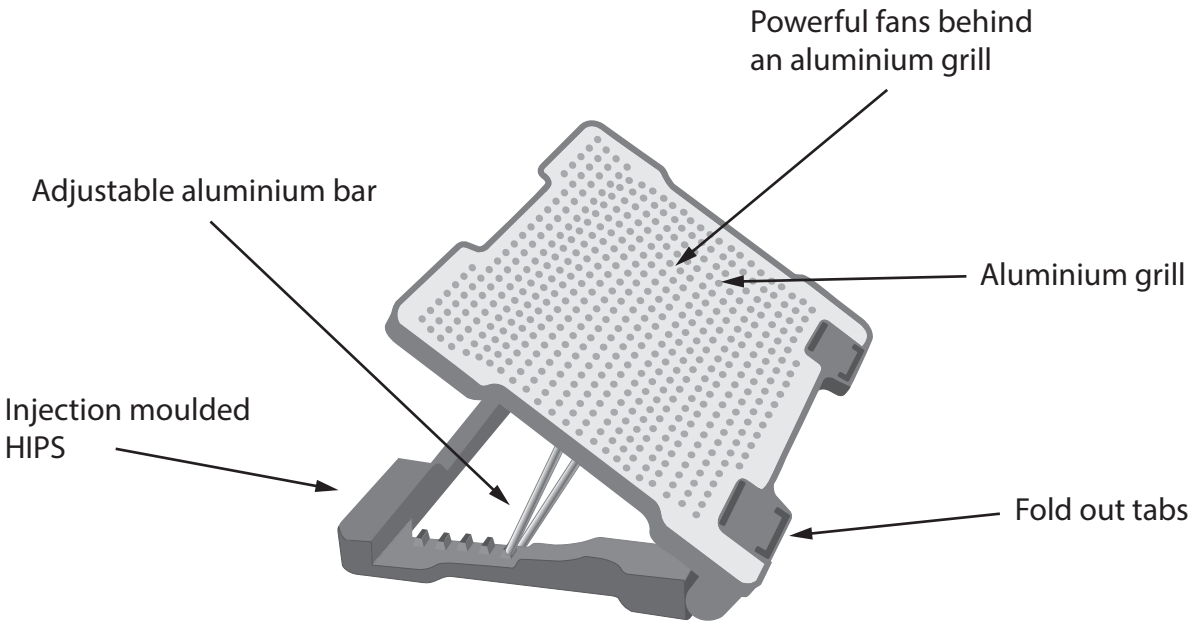
(8)

Design idea 2

(8)

(Total for Question 12 = 16 marks)

13 The drawing below shows a USB-powered laptop/tablet stand. The product has been mass-produced.



(a) Explain **one** way in which the USB-powered laptop/tablet stand is successful in meeting the following specification points:

(i) helps to protect the laptop/tablet.

(2)

.....

.....

.....

.....

(ii) makes the laptop/tablet easier to use.

(2)

.....

.....

.....

.....

(b) Give **two** properties of aluminium that make it a suitable material for parts of the stand and justify your answers.

(4)

Property 1

Justification

Property 2

Justification

The HIPS components of the stand are injection moulded.

(c) Describe **two** reasons why injection moulding is a more suitable process than vacuum forming for these components.

(4)

Reason 1

Reason 2

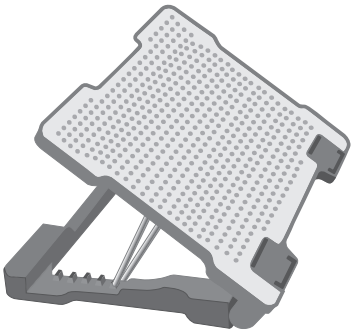
*(d) The drawings below show two different USB-powered laptop/tablet stands with built in fans.

Stand B is adjustable, made from solid pine, varnished and bolted together with mild steel nuts and bolts. It has foldaway legs, a sliding drawer and carved fan holes.

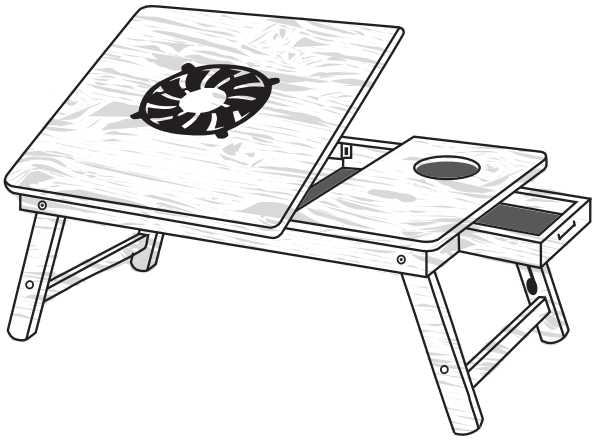
Evaluate laptop/tablet stand A compared with laptop/tablet stand B, in terms of:

- function
- sustainability.

(6)



Stand A



Stand B

(Total for Question 13 = 18 marks)

14 The circuit in Figure 2 controls an output in response to changing light levels.

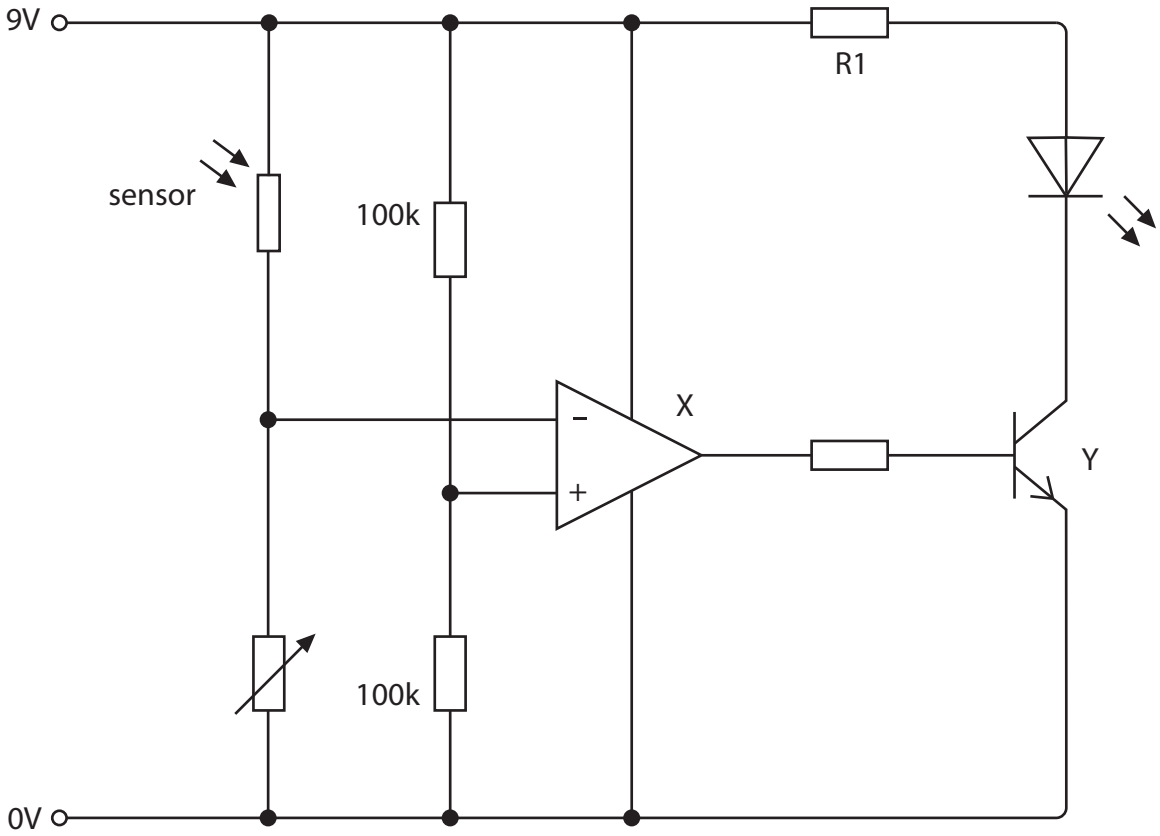


Figure 2

(a) Describe the function of the sensor in Figure 2.

(2)

Component X is acting as a comparator.

(b) Describe the action of the 'comparator' in Figure 2.

(2)

Components X and Y are different types of amplifier.

(c) Complete the following sentences:

(2)

Component X amplifies

.....

Component Y amplifies

.....

(d) The circuit is protected by a dome blown cover.

Give **four** of the main stages in the dome blowing process.

(4)

1 .....

2 .....

3 .....

4 .....

Component R1 is included in the circuit to protect the LED.

(e) Apply the formula V = I x R to calculate the correct value for R1, using the information below.

- The LED requires 3V at 20mA.

You must show your working.

(4)

Answer ..... Ω

*(f) The circuit needs to be tested before the design is finalised.

Evaluate the advantages and disadvantages of using both virtual modelling and a prototyping board (breadboard) to produce prototype circuits.

(6)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(Total for Question 14 = 20 marks)

TOTAL FOR PAPER = 80 MARKS