| Surname | | Other Names | |
|---|---|---|---|
| Centre Number | | | Candidate Number | | | | |
| Candidate Signature | | Date | |

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General Certificate of Secondary Education
June 2008 / June 2009

**SCIENCE / PHYSICS** **SCYC/PHYC/P1.3**
**ISA P1.3 Efficiency of Light Bulbs**

To be conducted before 4 May 2009
For submission in May 2008 or May 2009 or May 2010

**For this paper you must have:**
- results tables and charts or graphs from your own investigation

You may use a calculator.

| For Teacher's Use | |
|---|---|
| Section | Mark |
| 1 | |
| 2 | |
| Total (max 34) | |

Time allowed: 45 minutes

**Instructions**
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in **Section 1** and **Section 2**.
- Answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

**Information**
- The maximum mark for this paper is 34.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

| Did this candidate take part in the practical activity? | **YES / NO** |
|---|---|

Signature of teacher marking this ISA ..... Date .....

## SECTION 1

These questions are about the investigation that **you** did.

Answer **all** questions in the spaces provided.

**1** What were you trying to find out in your investigation?

.....

.....

*(1 mark)*

**2** (a) In your investigation, what was the **independent** variable (the variable that you deliberately changed)?

.....

*(1 mark)*

(b) How many different values of this variable did you use?.....

Was this a suitable number to choose?
Draw a ring around your answer. **Yes / No**

Write down the reason for your answer.

.....

.....

*(1 mark)*

(c) If you had been able to use one more value of this variable, what value would you have chosen? .....

Give a reason for your choice.

.....

.....

*(2 marks)*

**3** One of the things that you probably measured in your investigation was the temperature.

What kind of variable is temperature?
Draw a ring around your answer.

**categoric** **continuous** **discrete** **ordered**

*(1 mark)*

LEAVE MARGIN BLANK

**4** What did you find out from this investigation?

I found out that.....

.....

.....

.....

*(2 marks)*

**5** Think about the **reliability** of your results.

(a) What does it mean to say that results are reliable?

.....

.....

*(1 mark)*

(b) Do you think that your results are reliable?

Draw a ring around your answer. **Yes / No**

Write down the reason for your answer.

.....

.....

*(1 mark)*

**6** Some groups in your class may have obtained different results.

Suggest and explain **one** possible cause for these different results.

Cause .....

.....

*(1 mark)*

Explanation .....

.....

*(1 mark)*

**7** Make sure that **your** results tables and charts or graphs are handed in with this paper.
You will be awarded up to 6 marks for these. *(6 marks)*

**18**

LEAVE MARGIN BLANK

## SECTION 2

These questions are about an investigation that may be similar to the one that you did.

Answer **all** questions in the spaces provided.

**8** A light bulb manufacturer produced the following table of efficiencies.

The efficiency is given as a mean percentage.

| Type of bulb | Mean efficiency |
|---|---|
| 40 W tungsten filament | 1.9 % |
| 60 W tungsten filament | 2.0 % |
| 100 W tungsten filament | 2.6 % |
| Quartz-halogen | 3.5 % |
| 13 W fluorescent tube | 8.2 % |

(All efficiencies are quoted to ± 0.1)

(a) Which type of bulb is the most efficient at producing light?

.....

*(1 mark)*

(b) The manufacturer states: all efficiencies are quoted to ± 0.1 .

(i) Why can the manufacturer **not** be more certain of the values?

.....

.....

*(1 mark)*

(ii) What could be the highest efficiency of the 60 W tungsten filament bulb?

Highest efficiency ..... % *(1 mark)*

(c) Which type of bulb will change the largest percentage of electrical energy into **thermal** energy?

Ideas from your own investigation should help you to answer this question.

.....

*(1 mark)*

(d) The manufacturer tested 100 bulbs of each type.

(i) Why did the manufacturer test so many bulbs instead of testing just one?

Explain your answer.

.....

.....

.....

.....

*(2 marks)*

(ii) The table does not show the results for all 100 bulbs that were tested.

What has the manufacturer done with the results for each type of bulb to get the figure shown in the table?

.....

.....

*(1 mark)*

(iii) It might have been better if the manufacturer had shown all 100 results for each type of bulb.

Suggest **one** advantage and **one** disadvantage of showing the results for all 100 bulbs of each type.

*To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.*

Advantage .....

.....

.....

Disadvantage .....

.....

.....

*(3 marks)*

**Question 8 continues on the next page**

To help you with this question, the table is reprinted here.

| Type of bulb | Mean efficiency |
|---|---|
| 40 W tungsten filament | 1.9 % |
| 60 W tungsten filament | 2.0 % |
| 100 W tungsten filament | 2.6 % |
| Quartz-halogen | 3.5 % |
| 13 W fluorescent tube | 8.2 % |

(e) Does the table on its own give you enough information to decide which bulb would be the best to use?

Draw a ring around your answer. **Yes / No**

Explain your answer.

.....

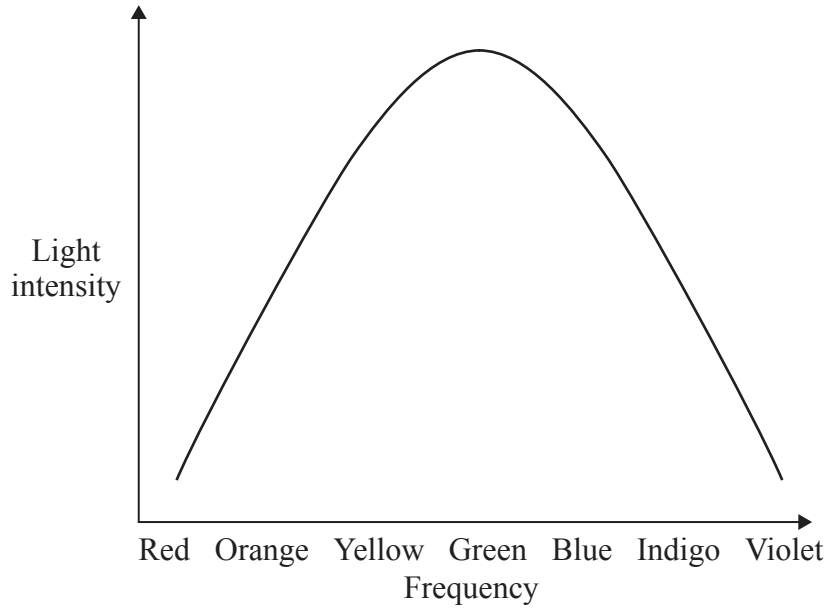
.....

.....

.....

*(2 marks)*

**9** The manufacturer produced the following sketch graph. It shows how the light intensity (brightness) from one of the bulbs varies with the frequency (colour) of light produced.




Describe what the graph shows.

.....

.....

.....

.....

*(2 marks)*

**10** It is important that all bulbs should be as efficient as possible.

Give **two** reasons for this.

.....

.....

.....

.....

*(2 marks)*

**16**

**END OF QUESTIONS**

**There are no questions printed on this page**