

Q1.(2018)

a)

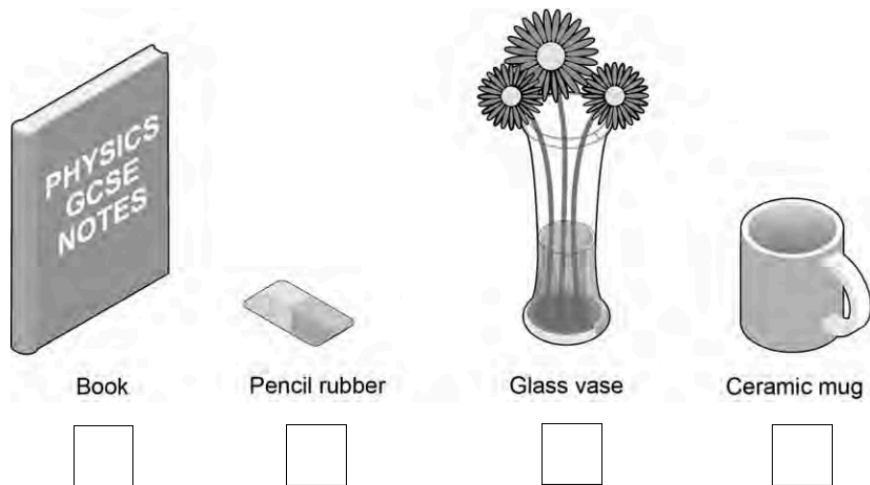
Some objects are transparent and some objects are opaque.

Which **one** of the objects in **Figure 5** is transparent?

Tick **one** box.

[1 mark]

Figure 5



b)

Complete the sentence.

Choose an answer from the box.

[1 mark]

|        |         |          |
|--------|---------|----------|
| absorb | reflect | transmit |
|--------|---------|----------|

An opaque object does not \_\_\_\_\_ light.

Q2.(2018)

a)

A student wears a white T-shirt and a red baseball cap to a party.

Why does the T-shirt look white in white light?

[1 mark]

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b)

Explain how the colour of the baseball cap appears to change when the room lights at the party change from white to blue.

[2 marks]

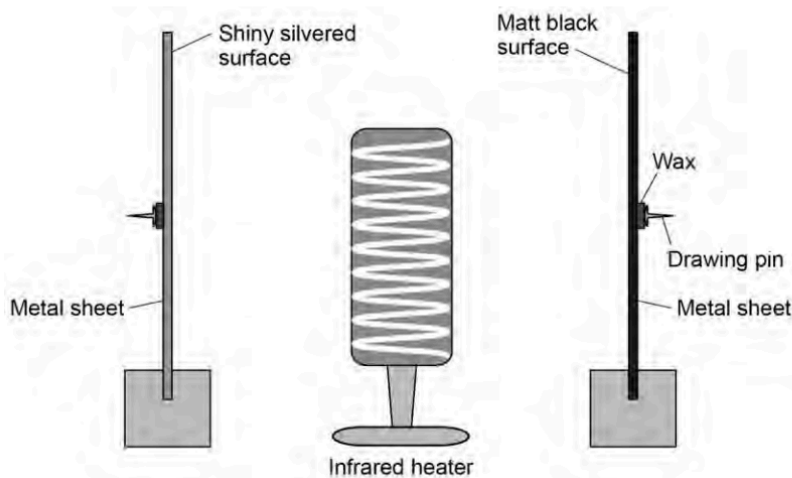
Q3.(2018)

a)

A student investigated how the type of surface affects the amount of infrared radiation the surface absorbs.

Figure 6 shows the equipment that the student used.

Figure 6



The metal sheets absorb infrared radiation. The wax melts and the drawing pins fall off the surfaces.

In the investigation there are several variables.

Draw **one** line from each variable to the correct description of that variable.

[2 marks]

| Variable    | Description                                            |
|-------------|--------------------------------------------------------|
| Control     | Distance from the metal sheets to the infrared heater. |
| Dependent   | The surface colour of the metal sheets.                |
| Independent | Time taken for the drawing pins to fall off.           |

b)

What is the main hazard in this investigation?

[1 mark]

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c)

The drawing pin attached to the matt black metal sheet fell off first.

What can be concluded from this result?

[1 mark]

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Q4.(2019)

What is infrared used for?

[1 mark]

Tick (✓) **one** box.

Electrical heating

☐

Energy efficient lamps

☐

Satellite communications

☐

Sun tanning

☐

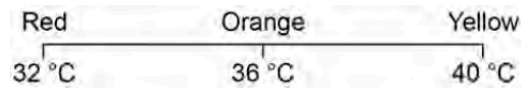
Q5.(2019)

a)

An infrared camera produces a colour image. Different colours show different temperatures.

People emit infrared radiation. **Figure 12** shows how the colour of the image of a person on an infrared camera depends on the person's body temperature.

**Figure 12**



Complete the sentence.

Choose the answer from the box.

[1 mark]

|        |     |        |
|--------|-----|--------|
| orange | red | yellow |
|--------|-----|--------|

The image produced by an infrared camera of a person with a body temperature of 37 °C is mainly \_\_\_\_\_ .

b)

Rescue workers use infrared cameras to search for people trapped under rubble after an earthquake.

How does the image of a trapped person change if the person's body temperature drops from 37 °C to 33 °C?

[1 mark]

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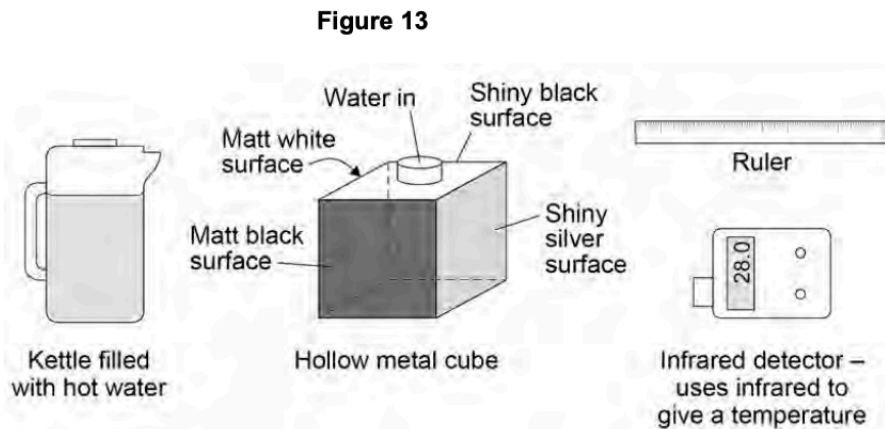
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Q6.(2019)

a)

A student investigated how the type of surface affects the amount of infrared the surface radiates.

**Figure 13** shows the equipment used.



Complete the sentence.

Choose the answer from the box.

**[1 mark]**

|                  |                      |                        |
|------------------|----------------------|------------------------|
| <b>a control</b> | <b>the dependent</b> | <b>the independent</b> |
|------------------|----------------------|------------------------|

In this investigation the type of surface is \_\_\_\_\_ variable.

b)

Describe how the equipment shown in **Figure 13** would be used to compare the infrared radiation emitted from the vertical surfaces of the cube.

**[3 marks]**

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c)

**Table 1** shows the results.

**Table 1**

| Type of surface | Temperature in °C |
|-----------------|-------------------|
| Matt black      | 68.0              |
| Matt white      | 65.5              |
| Shiny black     | 66.3              |
| Shiny silver    | 28.0              |

What is the resolution of the infrared detector?

[1 mark]

Tick (✓) **one** box.

0.1 °C

☐

1.0 °C

☐

1.7 °C

☐

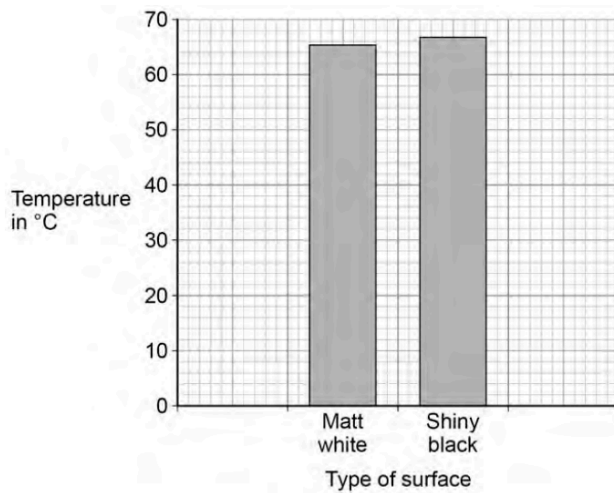
68.0 °C

☐

d)

The bar chart in **Figure 14** shows two of the results.

**Figure 14**



Complete the bar chart to show all of the results.

[3 marks]

e)

Give **one** conclusion that can be made from the results.

[1 mark]

Q7.(2020)

a)

Visible light is used for communications.

Which other parts of the electromagnetic spectrum are used for communications?

[2 marks]

Tick (✓) **two** boxes.

Gamma rays

☐

Microwaves

☐

Radio waves

☐

Ultraviolet

☐

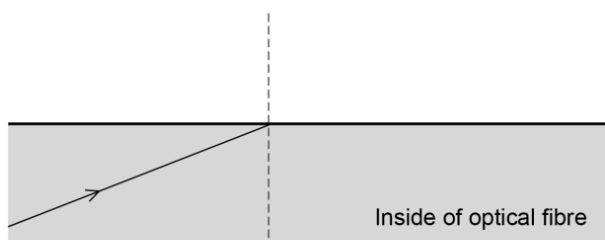
X-rays

☐

b)

**Figure 5** shows a ray of light in an optical fibre.

**Figure 5**



What is the name given to the dotted line on **Figure 5**?

[1 mark]

c)

Where the ray of light touches the edge of the optical fibre it is reflected.

Draw the reflected ray on **Figure 5**.

[2 marks]

d)

Optical fibres need to be able to bend around corners without breaking.

Suggest the property that optical fibres must have to allow them to bend around corners.

[1 mark]

e)

The appearance of visible light can change when it interacts with different objects.

Complete the sentences.

Choose the answers from the box.

Each answer may be used once, more than once or not at all.

[3 marks]

|                 |                  |                  |                    |
|-----------------|------------------|------------------|--------------------|
| <b>absorbed</b> | <b>reflected</b> | <b>refracted</b> | <b>transmitted</b> |
|-----------------|------------------|------------------|--------------------|

When white light is incident on a green filter, only green light passes through the filter.

This is because green light is \_\_\_\_\_ by the filter.

All other colours of light are \_\_\_\_\_ by the filter.

When red light shines on a blue object the red light is \_\_\_\_\_.

Q8.(2020)

A doctor needs to obtain an image of a bone in a patient's injured arm.

The doctor takes an X-ray of the arm.

Give **one** possible harmful consequence of receiving a dose of X-ray radiation.

[1 mark]

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Q9.(2020)

a)

**Table 3** gives information about two methods of bone imaging.

**Table 3**

| Method         | Radiation dose in millisieverts |
|----------------|---------------------------------|
| X-ray of arm   | 0.1                             |
| CT scan of arm | 6.0                             |

Compare the risk of harm to the patient of having an X-ray rather than a CT scan.

**[2 marks]**

b)

Which of the following is the same as 6.0 millisieverts?

**[1 mark]**

Tick (✓) **one** box.

0.60 sieverts

☐

0.060 sieverts

☐

0.0060 sieverts

☐

0.00060 sieverts

☐

c)

The patient received a total radiation dose of 2.5 millisieverts during one year.

Calculate the percentage of this dose that came from one X-ray of the arm.

Use the data in **Table 3**.

**[2 marks]**

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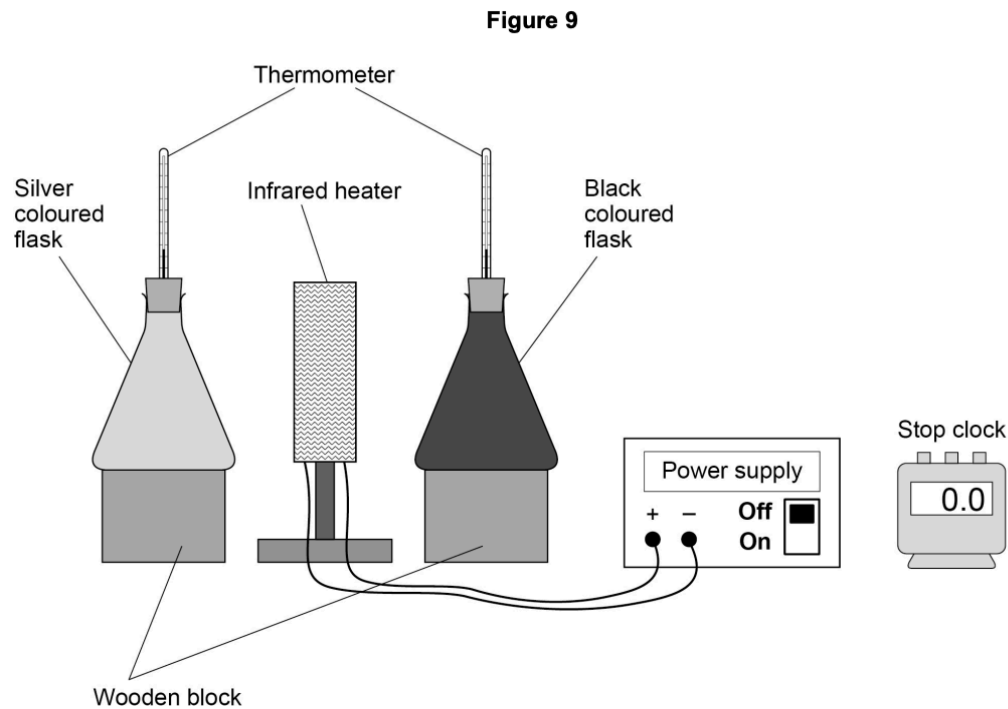
Percentage = \_\_\_\_\_ %

Q10.(2021)

a)

A student investigated how the colour of a surface affects the amount of infrared the surface absorbs.

Figure 9 shows the equipment used.



Complete the sentence.

Choose the answer from the box.

[1 mark]

a control      the dependent      the independent

In this investigation the distance between each flask and the infrared heater  
is \_\_\_\_\_ variable.

b)

The student wrote the hypothesis:

'Surface colour of the flask affects the amount of infrared absorbed when the heater is switched on for five minutes.'

Describe how the equipment in **Figure 9** could be used to test this hypothesis.

[4 marks]

c)

**Table 1** shows the results.

**Table 1**

| Colour of flask | Temperature increase in °C |        |        |
|-----------------|----------------------------|--------|--------|
|                 | Test 1                     | Test 2 | Test 3 |
| Black           | 19                         | 17     | 27     |
| Silver          | 10                         | 12     | 11     |

Which **one** of the results for the black flask is anomalous?

[1 mark]

d)

The anomalous result was caused by reading the thermometer incorrectly.

What should the student do with the anomalous result?

[1 mark]

e)

Calculate the mean temperature increase for the silver flask.

[1 mark]

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Mean temperature increase = \_\_\_\_\_ °C

f)

What conclusion can be made from **Table 1**?

[1 mark]

Tick (✓) **one** box.

Both flasks absorbed the same amount of infrared during the five minutes.

☐

The black flask absorbed the most infrared during the five minutes.

☐

The silver flask absorbed the most infrared during the five minutes.

☐

Q11.(2022)

Ultraviolet and visible light are both parts of the electromagnetic spectrum.

How does the speed of ultraviolet in a vacuum compare to the speed of visible light in a vacuum?

[1 mark]

Tick (✓) **one** box.

Ultraviolet travels at a faster speed than visible light.

☐

Ultraviolet travels at a slower speed than visible light.

☐

Ultraviolet travels at the same speed as visible light.

☐

Q12.(2022)

a)

**Figure 10** shows how different types of ultraviolet are absorbed by the ozone layer in the Earth's atmosphere.

**Table 4** shows the relative ionising power from each type of ultraviolet.

**Figure 10**

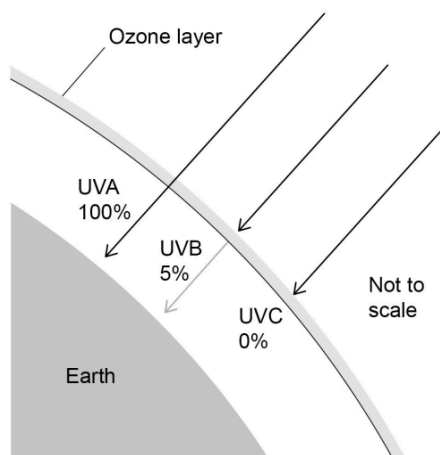


**Table 4**

| Type | Relative ionising power |
|------|-------------------------|
| UVA  | Low                     |
| UVB  | Medium                  |
| UVC  | High                    |

Explain the importance of the ozone layer in reducing the risk to people from all types of ultraviolet.

Use **Figure 10** and **Table 4**.

[4 marks]

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b)

The Sun emits visible light.

A student concludes that visible light is **not** absorbed by the ozone layer.

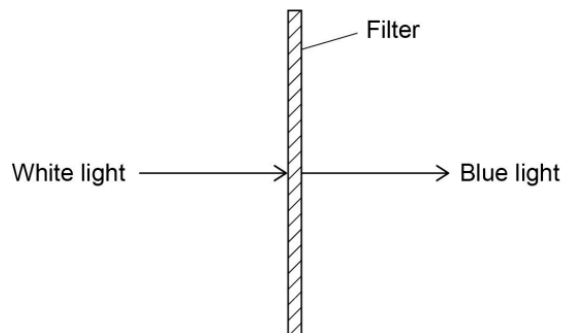
Give **one** piece of evidence that shows the student's conclusion is correct.

[1 mark]

c)

**Figure 11** shows white light incident on a colour filter.

**Figure 11**



Complete the sentence.

Choose the answers from the box.

[2 marks]

|          |          |           |           |             |
|----------|----------|-----------|-----------|-------------|
| absorbed | radiated | reflected | refracted | transmitted |
|----------|----------|-----------|-----------|-------------|

When white light is incident on the filter, only blue light is \_\_\_\_\_

and all other colours of light are \_\_\_\_\_ .

Q13.(2023)

a)

Microwaves are electromagnetic waves used for mobile phone communications.

Which other type of electromagnetic wave is also used for communications?

[1 mark]

Tick (✓) **one** box.

Radio waves

☐

Ultraviolet

☐

X-rays

☐

b)

Microwaves from a mobile phone take 0.000 009 s to reach a mobile phone mast.

speed of microwaves = 300 000 000 m/s

Calculate the distance between the mobile phone and the mobile phone mast.

Use the equation:

$$\text{distance} = \text{speed} \times \text{time}$$

[2 marks]

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Distance = \_\_\_\_\_ m

c)

Mobile phone communications is only one of the uses for microwaves.

Give **one** other use of microwaves.

[1 mark]

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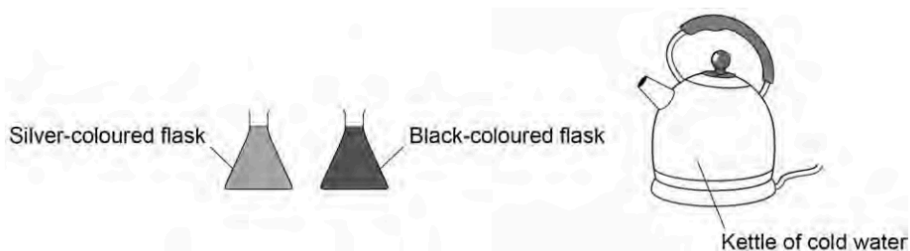
Q14.(2023)

a)

A student investigated how the colour of a surface affects the rate at which the surface emits infrared radiation.

Figure 23 shows some of the equipment used.

Figure 23



The student wrote the following hypothesis:

'The black-coloured flask will emit more infrared radiation than the silver-coloured flask during 10 minutes of cooling.'

Describe a method to test this hypothesis.

[6 marks]

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b)

When will the flasks emit infrared radiation at the greatest rate?

Give a reason for your answer.

[2 marks]

Tick (✓) **one** box.

During the 1st minute

☐

During the 5th minute

☐

During the 9th minute

☐

Reason \_\_\_\_\_

c)

Another student investigated the absorption of infrared radiation by different surface colours.

The student filled four hollow metal cubes with cold water.

Each cube was the same size but had a different surface colour.

The cubes were then placed the same distance from an infrared heater.

After 10 minutes, the student measured the temperature increase of the water inside each cube.

What was the dependent variable in this investigation?

[1 mark]

d)

**Table 2** shows the results.

**Table 2**

| Surface colour of the cube | Temperature increase after 10 minutes in °C |
|----------------------------|---------------------------------------------|
| Matt white                 | 3.0                                         |
| Shiny white                | 2.0                                         |
| Matt black                 | 6.5                                         |
| Shiny black                | 4.0                                         |

Give **two** conclusions that can be made from the results in **Table 2**.

[2 marks]

1 \_\_\_\_\_

\_\_\_\_\_

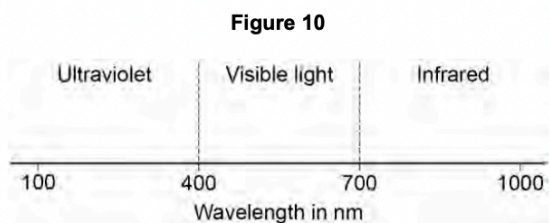
2 \_\_\_\_\_

\_\_\_\_\_

Q15.(2024)

a)

Figure 10 shows the wavelengths of some types of electromagnetic radiation.



Suggest **one** piece of equipment that can be used to detect infrared radiation.

[1 mark]

b)

Which of the following values is a wavelength of red light?

[1 mark]

Tick (✓) **one** box.

320 nm

☐

410 nm

☐

690 nm

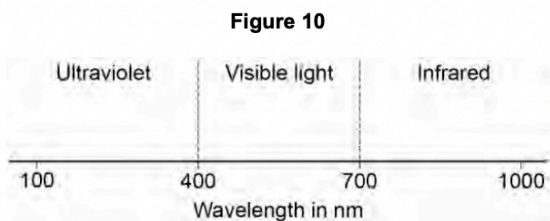
☐

750 nm

☐

Q15.c)(2024)

Figure 10 is repeated below.



The eyes of a bee can detect electromagnetic radiation with wavelengths between 300 nm and 600 nm.

Give **two** ways the radiation detected by the eyes of a bee is different from the radiation detected by human eyes.

[2 marks]

d)

Complete the sentences.

Choose the answers from the box.

[2 marks]

|                 |                |                  |                  |
|-----------------|----------------|------------------|------------------|
| <b>absorbed</b> | <b>emitted</b> | <b>reflected</b> | <b>refracted</b> |
|-----------------|----------------|------------------|------------------|

When sunlight shines on a red flower, the red light  
is \_\_\_\_\_.

All other colours of light shining on the red flower  
are \_\_\_\_\_.

Q16.(2024)

a)

A gardener looks at a red flower through a green filter.

How does the flower appear to the gardener?

[1 mark]

Tick (✓) **one** box.

|       |                          |
|-------|--------------------------|
| Black | <input type="checkbox"/> |
| Green | <input type="checkbox"/> |
| Red   | <input type="checkbox"/> |
| White | <input type="checkbox"/> |

b)

The leaves of the plant reflect light.

The leaves have a rough surface.

What type of reflection happens at the leaf surface?

[1 mark]

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