Section A   Multiple-Choice Questions (15 marks)

	1	2	3	4	5	6	7	8	9	10
A	✓		✓			✓				
B				✓						✓
C		✓						✓	✓	
D					✓		✓			

Section B   Fill Blanks (8 marks)

(a) *reflected*	(b) *interface / boundary*
(c) *ratio*	(d) *proportional*
(e) *away*	(f) *higher*
(g) *denser*	(h) *critical*

Section C   Questions (22 marks)

1. (a) Kitty mentioned many uses of different kinds of electromagnetic waves in her diary below.

Use the information to complete the following table. (4 marks)

Electromagnetic wave	One use mentioned by Kitty
Radio wave	*Octopus card / TV broadcast*
Microwave	Microwave oven
Infrared radiation	*Ear thermometer / Heater*
Visible light	*Watching TV / Sunny*
Microwave	Mobile phone

(b) Name the radiation in the sunlight that can turn our skin dark. Write down ONE use of this radiation. (2 marks)

Ultraviolet radiation

Kill bacteria / Sterilize water / Check banknotes

2.

foam cup

water
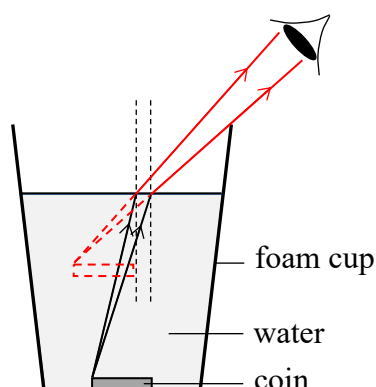
coin

In the diagram, the coin in the foam cup is observed from a fixed position (the eye).
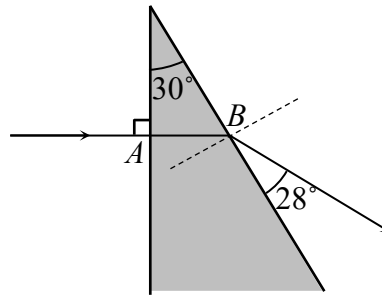
(a) Explain why the coin cannot be seen by the eye when the cup is empty. (2 marks)

The coin is not on the line of sight. /

The cup blocks the light from the coin.

(b) Complete the two rays from the coin to show how the coin can be seen by the eye after adding the water to the cup. (2 marks)

(c) Hence locate the image of the coin in the diagram. (2 marks)

3.

In the diagram, a light ray passes through a corner of a prism.

(a)   The ray enters the prism at *A* without changing its direction. Write down the sizes of the angle of incidence (*i*) and the angle of refraction (*r*).   (1 mark)

i = 0, r = 0

(b)   Consider the refraction at *B*.

   (i)   Find the angle of incidence.   (1 mark)

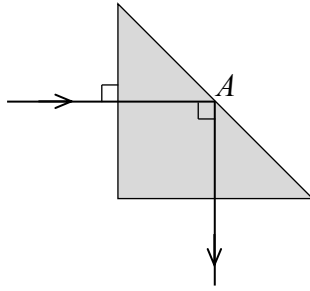*30˚*

   (ii)   Find the angle of refraction.   (1 mark)

62˚

   (iii)   Hence find the refractive index of the material of the prism.   (2 marks)

n = sin 62˚ / sin 30˚

   = 1.77

4. In the figure below, the light ray is turned 90˚ by a right-angled triangular prism.
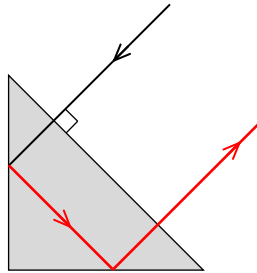

(a) No light comes out from the prism at *A*. What do we call this phenomenon? (1 mark)

Total internal reflection

(b) What is the angle of incidence at *A*? (1 mark)

45˚

(c) Now a light ray hits the prism as shown.
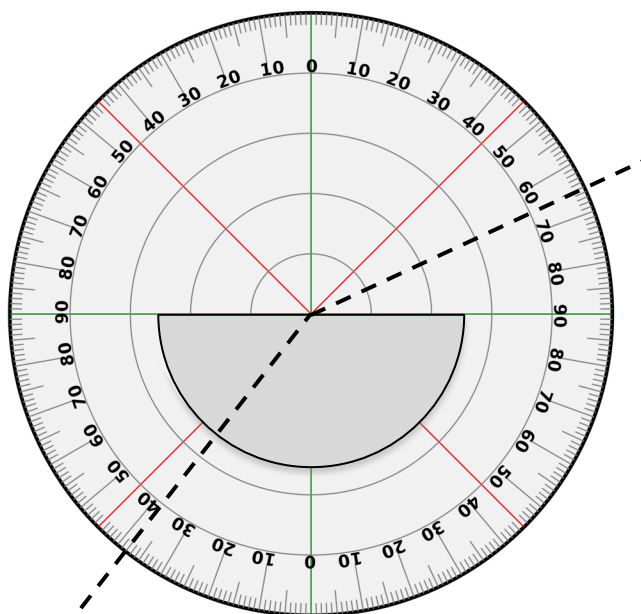

    (i) Complete the path of the light ray through the prism. (2 marks)

    (ii) Give ONE practical use of the result. (1 mark)

Headlight reflector / Cat's eye

In the diagram, the thick broken line shows the path of light through the semi-circular glass block.

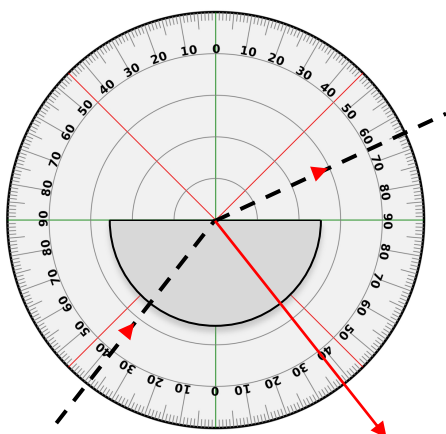(a)   (i)   Calculate the refractive index of the glass.   (2 marks)

n = sin 65˚ / sin 38˚

    = 1.47

        (ii)   Although you can find the result in (i), you cannot tell which way the light actually goes. Explain briefly.   (1 mark)

Reversibility of light

(b)   Choose a direction for the rays shown by adding arrows to the diagram. Also add the corresponding reflected ray.   (1 mark)

OR