CALVINKONG PHYSICS TUITION

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NAME : CLASS : DATE :

THEME : LIGHT, WAVES AND SOUND

Unit 12
LIGHT

Guided Study Notes
with Examples and Practice

Hello,

You have made a very important and right decision to look at this sample learning material created by Calvin Kong, a former MOE Senior Teacher in Physics with more than a decade of experience, also trained under the Research for Better Teaching, Inc. (Massachusetts) and New Teacher Centre (California).

This set of **Guided Study Notes** is designed for concept attainment. It will be followed up with a series of worksheets that address specifically on structured questions. Please refer to **Consolidation Worksheet Parts 1 and 2** after reading this document.

This set of notes is designed based on numerous pedagogical research findings (theoretical) and fine-tuned based on feedback and response of students who uses them (theories put to test).

UNIT 12 – LIGHT

FOCUS 1	FOCUS 2	FOCUS 3
Reflection of Light	Refraction of Light	Refraction by Thin Lenses

1	recall and use for reflection, normal, angle incidence and reflection				
2	state that, for the angle of i equal to the a reflection and principle in c measuremen calculations				
			angle and total internal reflection		
		7	identify the main ideas in total internal reflection and apply them to the use of optical fibres in telecommunication and state the advantages of their use		

Chunking: Key Focuses and Key Concepts

A cookie is more enjoyable and easily eaten in bite-size pieces as compared to as one whole. It is the same for learning. For each Chapter, Calvin Kong has broken it down into a few focuses (2-3 bite-size pieces). Each Key Focus can be further broken down into a few key concepts. Once a student can learn a topic in this approach, they will know what to expect in the tests or examination

This is a research-proven pedagogy, the first step to a series of teaching strategies that Calvin Kong practices.

ORGANISATION OF CONTENT IN NOTES

12.1	Laws of Reflection	**12.3**	Laws of Refraction	**12.6**	Types of Lenses
12.2	Mirrors	**12.4**	Refractive Index	**12.7**	Different Types of Images Formed

Mental Compartmentalisation

When things are well organised, they will be easy to retrieve. Our brain works in the same way.

This is why for every topic, Calvin Kong had organised the key concepts into mental shelves. Students will remember better.

FOCUS 1
Reflection of Light

12.1 Laws of Reflection

- Reflection is the bouncing of ligh hits

Key Concept 1 (of Focus 1)

Each key concept is laid out clearly, very often in the form of pictures and diagrams instead of texts. Calvin Kong will then explain them so clearly that it will be impossible to not pick it up.

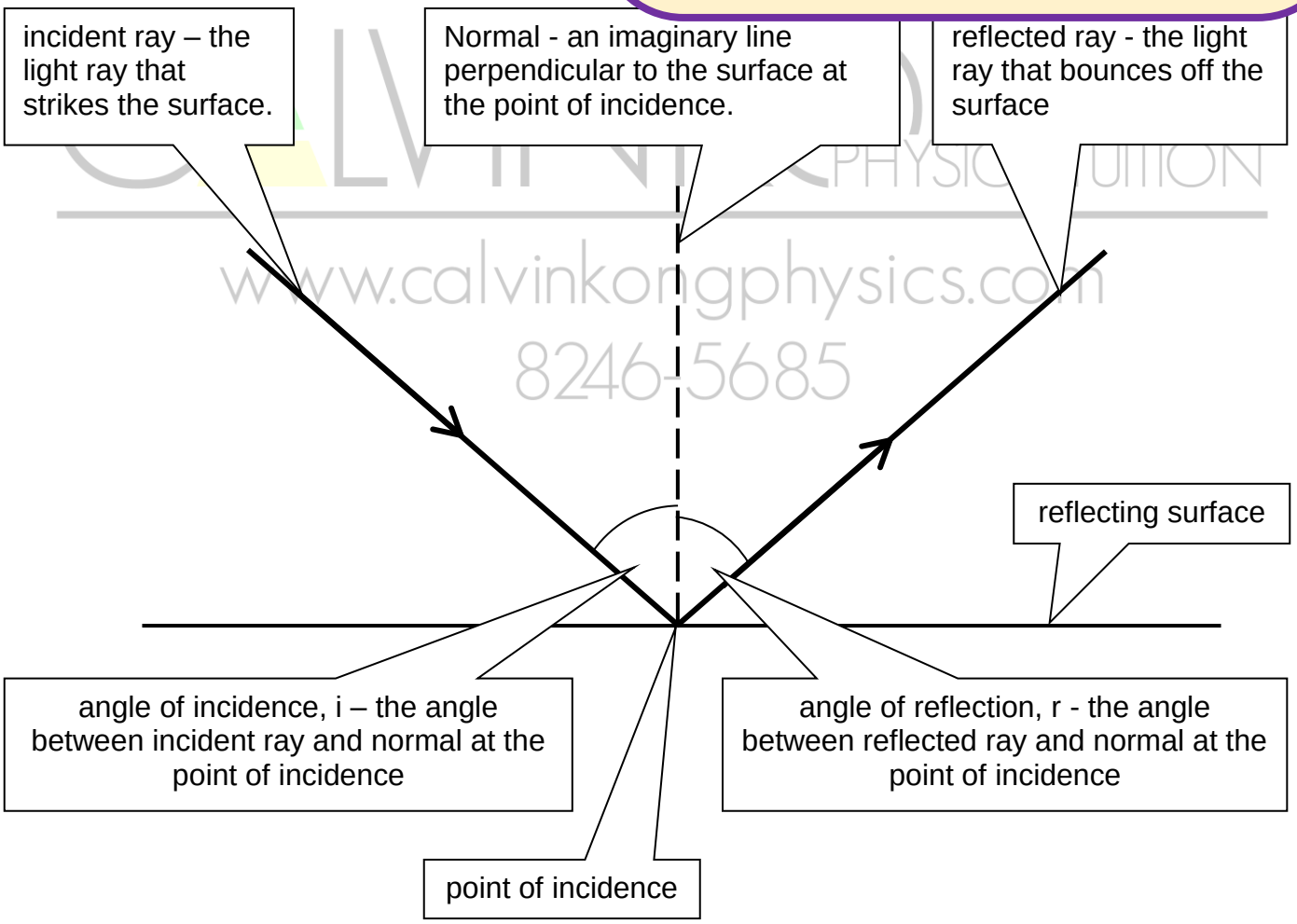
During lessons, he will also touch on the common conceptual challenges that students face.
He already knows the questions that students will ask and will answer them before they do so.

First Law of Reflection

The incident ray, the reflected ray and the nor

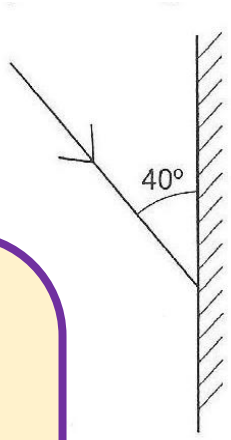
Second Law of Reflection

The angle of incidence i is equal to the angle o



Concept Builder *Exercise Questions*

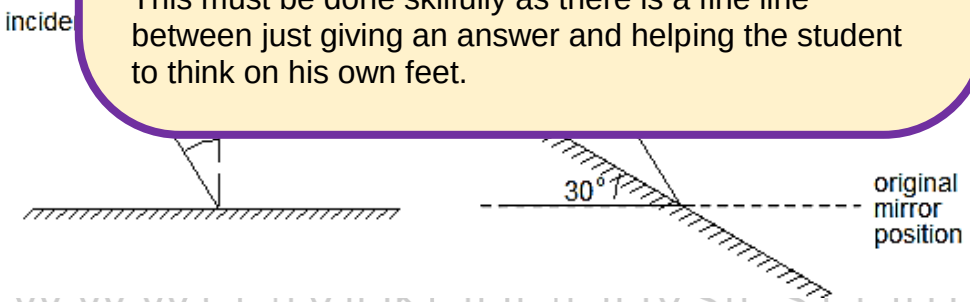
1. The diagram shows a sing[illegible]y of light being directed at a plane mirror. What are the angles[illegible]dence and reflection?



	angle of incidence	[illegible]tion
A	40°	
B	40	
C	50	
D	50	

( )

2. A ray of light is inc[illegible]urned through 30° with the direct[illegible]



What is the final value of the angle of reflection?

A 30 ° **B** 45 ° **C** 60 ° **D** 90°

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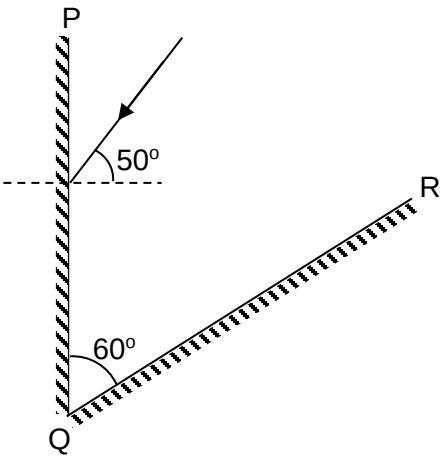
3. The figure shows a ray of light incident at an angle of 50^0 to a mirror PQ. Another mirror QR is arranged at an angle of 60^0 to PQ. After reflection, the ray is incident on QR.

The angle of incidence of the ray at the mirror QR is

A 10 °
B 30 °
C 50 °
D 60 °



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Chewing

This stage of learning allows students to try out what they have learnt.

It is the time where they strengthen their understanding of concepts, make mistakes, and learn from it.

It is also crucial that the tutor with rich experience is there to already foresee the potential challenges and mistakes by students, and guide the students along. This must be done skilfully as there is a fine line between just giving an answer and helping the student to think on his own feet.

12.2 Mirror Images

Properties of Mirror Images

- The characteristics of [illegible]rmed by a plane mirror are:
  1. Laterally i[illegible]
  2. Upright
  3. Distance [illegible] to distan[illegible]
  4. The imag[illegible] object.
  5. Virtual

Key Concept 2 (of Focus 1)

In pedagogical terms, this can be called the second chunk of the first cookie.
Here, you will observe that the cycle is repeated till the end of the chapter.

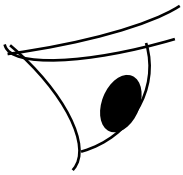
Upon completion of this set of Guide Study Notes, students will continue with a series of worksheets that address specifically on structured questions. Please refer to **Consolidation Worksheet Parts 1 and 2** after reading this document.

Ray Diagrams

The following diag[illegible]e mirror to the eyes of the viewer.

It is important to note the following

- The image will always be located directly across other side of the mirror, at the same distance as the object.
- Extend the line of reflection if necessary to aid in your drawing.



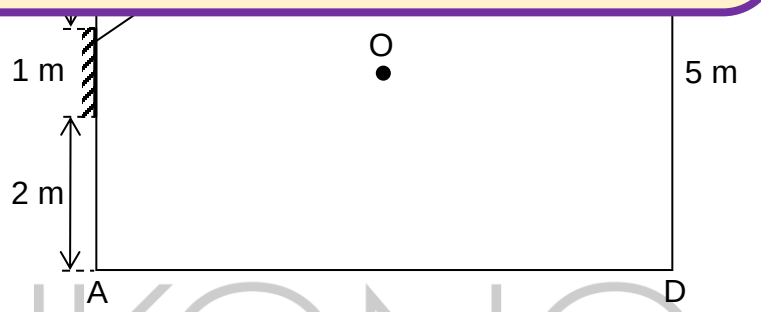
Object ●

Example 1

The figure shows [illegible]oom ABCD with a plane mirror fixed on the middle of the wall AB. The width of the [illegible]gth and width of the room are 6 m and 5 m respectively. A

Essential Examples

Whenever necessary, a well-chosen example is inserted to better illustrate a concept. The term well-chosen in the sense that it gels all the concepts involved in 1 or 2 questions. They have to be of the right difficulty level for students to grasp the ideas and get them ready for the next higher level of thinking.



(a) Draw, in the figure,

(i) the image of the wall CD formed by the mirror, and [1]

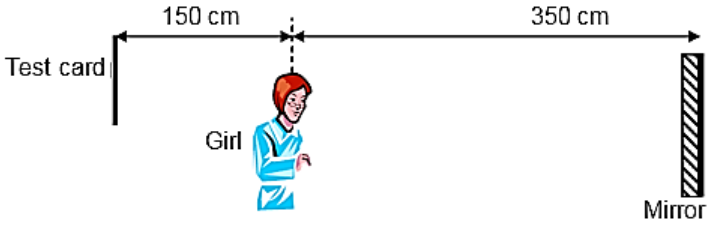
(ii) the two light rays to show how light from the wall CD can enter the man's eyes by the reflection of light at the edges of the mirror. [1]

(b) Determine the width of the wall CD that the man can see in the mirror.

width = ... [2]

Concept Builder *Exercise Questions*

4. The diagram below shows a plane mirror placed at a distance of 350 cm in front of a girl. Th
doctor's test card is fixed at 150 cm behind the eyes of the girl.



What is the distance between the girl and the image of the test card?

A 500 cm **B** 700 cm **C** 850 cm

5. An image is formed in a plane mirror as shown.

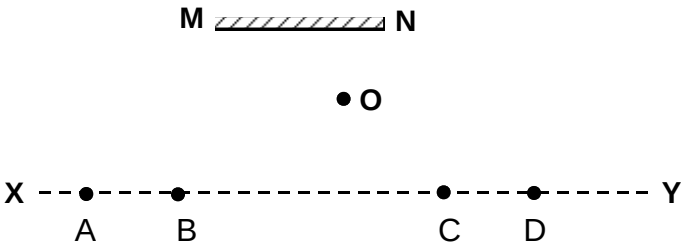
Which statement is correct? refl

A Angle w is equal to angle z.
B Distance d_i is more than distance d_o.
C The image formed is real.
D The sum of angle x and angle z is

6. In front of and to the right of a r
side, which position, A-D, ca

A

7. An object **O** is placed in front of a plane mirror **MN** as shown in the diagram.

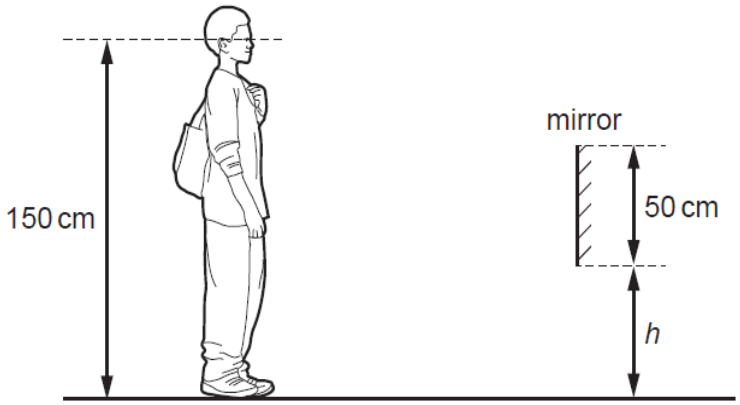


A student moves her eye along the line **XY** to observe the image of **O**
line **XY** will the student **not** see the image of **O** in the mirror?

8. A person stands at point X as shown in the diagram belo
Which of the point (1,2,3,4,5) will the person be able to
in the mirror?

A Pins 1 and 3
B Pins 2,3 and 5
C Pins 2 and 4
D Pins 2,4, and 5

9. A shoe shop puts a mirror on the wall so that customers can look at their shoes. The length of the mirror is 50 cm. A customer has eyes 150 cm above ground level.
The bottom of the mirror is at height *h* above the ground. What is the smallest value of *h* that allows the customer to see an image of his shoes in the mirror?



A 0 cm **B** 25 cm **C** 50 cm

10. A metre rule is held vertically in front of a plane m
a boy peeps through a hole at the 40 cm mark.

0 cm mark

40 cm

A between
B betwee
C betw
D be

The End

It is recommended that you continue to look at **Consolidation Worksheet Parts 1 and 2**.