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Unit II: Optics
Chapters 4, 5 & 6

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UNIT II: OPTICS

These are the key terms that you should know for the final exam

Chapter 4 Key Terms	Chapter 5 Key Terms	Chapter 6 Key Terms
<ul style="list-style-type: none">amplitudecrestenergyfrequencytroughwavewavelengthlightreflectionrefractionspectrumvisible lightwave model of lightelectromagnetic radiationgamma raysinfrared raysmicrowavesradio wavesultraviolet wavesX rays	<ul style="list-style-type: none">angle of incidenceangle of reflectionangle of refractionnormalopaquetranslucenttransparentconcaveconvergingconvexdivergingfocal pointconcave lensconvex lensfocal lengthlens	<ul style="list-style-type: none">astigmatismblind spotcorneairisoptic nervepupilretinascleralaser lightoptical fibresrefracting telescopereflecting telescopetotal internal reflection

These are the main ideas from this unit, fill-in-the-blanks to complete.

Chapter 4 Many properties of light can be understood using a wave model of light.

- Waves are disturbances that transmit ENERGY from one place to another. (4.1)
- Waves have AMPLITUDE, WAVELENGTH, and FREQUENCY. (4.1)
- As the wavelength DECREASES, the frequency INCREASES. (4.1) [+ VICE VERSA]
- Different colours of light have different WAVELENGTHS. (4.2)
- WHITE light is a mixture of many wavelengths of light. (4.2)
- A PRISM can separate and recombine different colours of light. (4.2)
- The ELECTROMAGNETIC spectrum is made up of waves that are similar to light waves that have much longer or shorter wavelengths. (4.3)
- Radio waves, microwaves, and infrared waves have LONGER wavelengths than visible light. (4.3)
- Ultraviolet waves, X rays, and gamma rays have SHORTER wavelengths than visible light. (4.3)

Chapter 5 Optical systems make use of mirrors and lenses.

- Ray diagrams help explain how beams of light travel in STRAIGHT LINES and how various materials can be opaque, translucent, or transparent. (5.1)
- Mirrors reflect light according to the law of REFLECTION, which states that the angle of incidence EQUALS the angle of reflection. (5.1)
- Light rays BEND when they pass between two materials of different DENSITY. (5.1)
- Simple mirrors can be PLANE (flat), CONVEX (curving out), or CONCAVE (curving in). (5.2)
- The image formed by a concave mirror depends on the DISTANCE of the object from the mirror. (5.2)
- Convex mirrors form images that are UPRIGHT and SMALLER than the object. (5.2)
- Concave lenses are thinner in the middle than at the edge and DIVERGE light rays. (5.3)
- Convex lenses are thicker in the middle than at the edge and CONVERGE light rays. (5.3)

Chapter 6 Human vision can be corrected and extended using optical systems.

- Light is detected by the eye using the CORNEA - LENS - RETINA system. (6.1)
- Rod cells detect DIM LIGHT but are not sensitive to colour. (6.1)
- Cone cells dominate in BRIGHT LIGHT and distinguish between colours. (6.1)
- Vision deficiencies include near-sightedness, far-sightedness, ASTIGMATISM and deficiencies in distinguishing between different COLOURS. (6.2)
- EYES, cameras, MICROSCOPES, and telescopes have some similarities in the way they operate. (6.3)
- Lasers and OPTICAL fibres are used to transmit data using light. (6.3)

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Ch.5

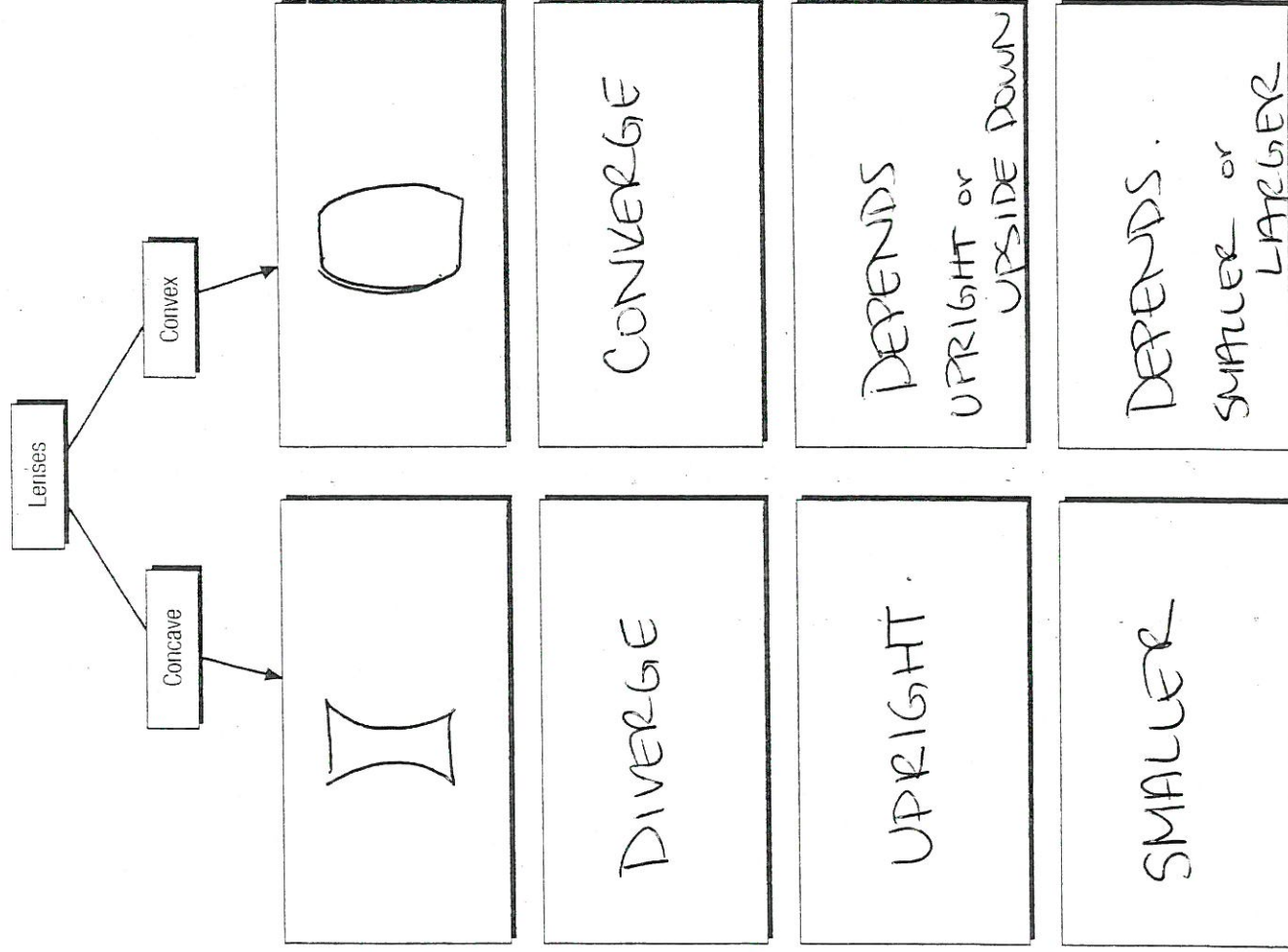
1. J angle of incidence
2. E angle of reflection
3. A angle of refraction
4. H normal
5. D opaque
6. B translucent
7. F transparent
8. L concave
9. G converging
10. K convex
11. N diverging
12. F focal point
13. M focal length
14. C lens

- A. formed by the refracted ray and the normal
- B. some light passes through, but is scattered
- C. A piece of transparent material
- D. light does not pass through
- E. formed by the reflected ray and the normal
- F. light easily passes through so image is clear
- G. light rays come together to a point
- H. makes a 90° imaginary line with the object
- I. the point where light rays meet
- J. formed by the incident ray and the normal
- K. curved outward
- L. curved inward
- M. the distance from the centre of the lens or mirror to the focal point
- N. light rays spread apart

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Concave lenses and convex lenses

Compare and contrast concave lenses and convex lenses.



Draw the lens.

Do light rays converge or diverge?

Is the image upright or upside down?

Is the image smaller or larger than the object?

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Ch.6

1. I astigmatism
 2. L blind spot
 3. A cornea
 4. E iris
 5. M optic nerve
 6. B pupil
 7. J retina
 8. C sclera
 9. F laser light
 10. D optical fibres
 11. G refracting telescope
 12. H reflecting telescope
 13. K total internal reflection
- A. clear tissue on the outermost part of the eye
 B. the hole in the eye where light enters
 C. the white of the eye
 D. glass fibre that transmits light from one place to another
 E. the coloured ring of muscle in the eye
 F. light with only one wavelength
 G. uses convex lenses to bend & focus light
 H. uses a concave mirror, plane mirror and a convex lens to collect & focus light
 I. blurred vision caused by an irregularly shaped cornea
 J. the inner lining of the eye that contains the rods and cones
 K. the complete reflection of light between two boundaries
 L. the area where there are no rods or cones
 M. connects the eye to the brain

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Parts of the eye

Use the vocabulary words in the box below to label the parts of the eye. Place the correct letter on the line next to each part of the eye.

<p>Vocabulary</p> <p>a. iris b. lens c. pupil d. sclera e. retina f. cornea g. optic nerve</p>	
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Use the same vocabulary words in the box above to fill in the blanks below. Each word can be used only once.

8. Light rays are first refracted by the CORNEA.
9. Surrounding the cornea is an opaque white tissue called the SCLEREA.
10. Light enters the eye through an opening in the centre called the PUPIL.
11. The IRIS is the coloured circle of muscle surrounding the pupil. It controls the amount of light entering the eye.
12. Light then passes through the flexible, convex LENS which can change its shape.
13. Once light is refracted by the lens, it is focussed on the RETINA at the back of the eye, where an image is formed.
14. Light-sensitive cells detect the image and an electric message is sent to the brain through the OPTIC NERVE.

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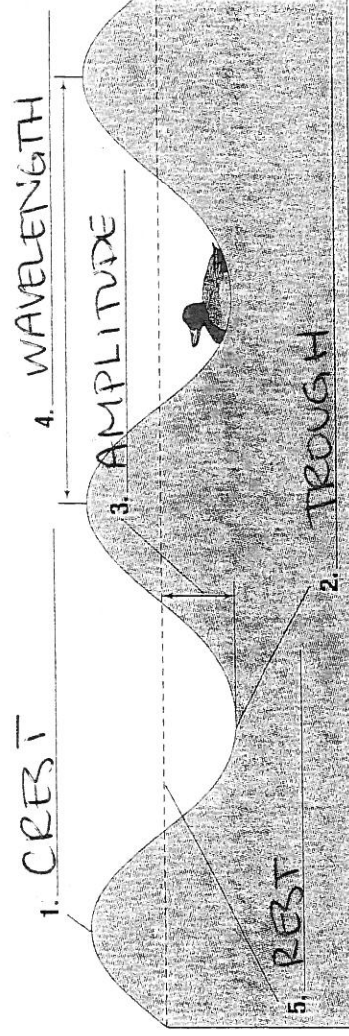
Unit 2 Optics Matching

Ch.4

1.	<u>J</u>	amplitude	A.	the ability to make things move
2.	<u>D</u>	crest	B.	a movement that transfers energy
3.	<u>A</u>	energy	C.	energy form we can see
4.	<u>N</u>	frequency	D.	the highest point of a wave
5.	<u>R</u>	trough	E.	represents light travelling as a wave
6.	<u>B</u>	wave	F.	type of electromagnetic waves that have long wavelengths
7.	<u>H</u>	wavelength	G.	electromagnetic radiation that has high energy and frequency and a short wavelength; can cause sunburns and skin cancers
8.	<u>C</u>	light	H.	the distance between crest to crest or trough to trough
9.	<u>T</u>	reflection	I.	has the shortest wavelength of all radio waves
10.	<u>O</u>	refraction	J.	the height of a wave crest or depth of a trough
11.	<u>Q</u>	spectrum	K.	includes waves from the longest radio waves to the shortest gamma rays
12.	<u>M</u>	visible spectrum	L.	have long wavelengths and lower energy and frequency than visible light
13.	<u>E</u>	wave model of light	M.	electromagnetic waves which can be seen
14.	<u>K</u>	electromagnetic radiation	N.	how often something occurs in a given length of time
15.	<u>P</u>	gamma rays	O.	the bending of light
16.	<u>L</u>	infrared rays	P.	have the highest energy and frequency and the shortest wavelengths; used in radiation therapy
17.	<u>F</u>	microwaves	Q.	a range of frequencies for a given type of radiation
18.	<u>F</u>	radio waves	R.	the lowest point of a wave
19.	<u>G</u>	ultraviolet waves	S.	have shorter wavelengths and higher energy and frequency than UV; used to photograph teeth and bones
20.	<u>S</u>	X rays	T.	occurs when light waves bounce off an object

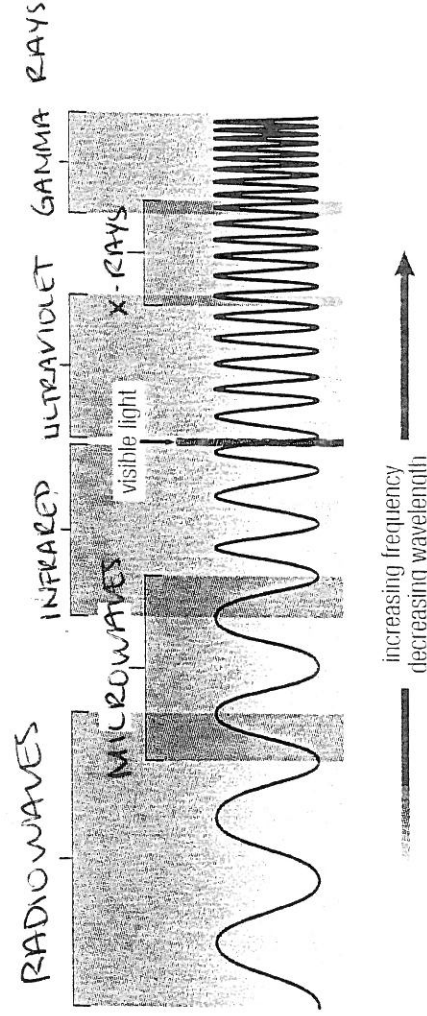
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Label the parts of the wave



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Label the parts of the electromagnetic spectrum



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