Syllabis
iDISCOVER

GRADE 3-6

Syllabis iDiscover is a free by-weekly educational supplement, which ties into the South African CAPS Curriculum.

Our mission is to grow the South African distance school industry as we work together with our competitors to bring affordable, quality and innovative education to South Africa. Making South Africa a better place for all citizens.

Syllabis Education iDiscover 1

Read the article and stop where you see the following keys. Don't forget to complete the quiz at the end!

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INSTRUCTIONS

As per the Grade Key below, an indication to learners, teachers, parents, and teachers on content guidance per grade.

	Grade 4 and 5
	Grade 6, 7 and 8
	Grade 9, 10, 11 and 12

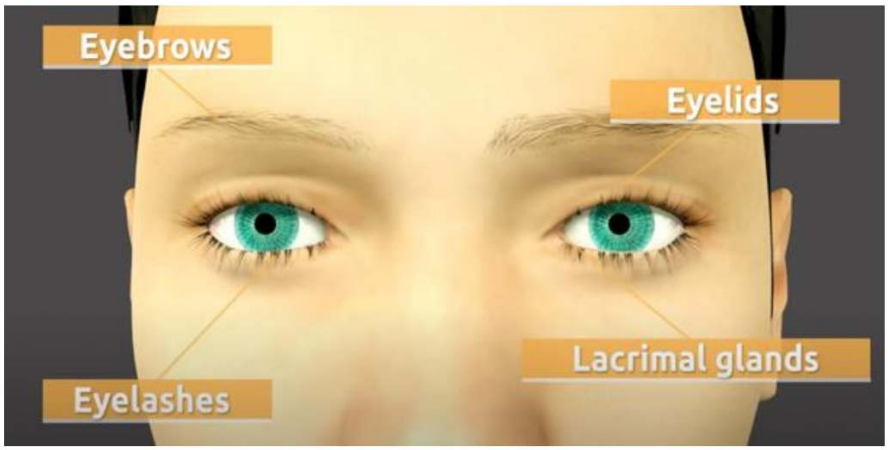
Assessment

Once students have completed the lesson, they are free to take an online assessment, which is marked instantly. Simply sign up for a free iWizard account at www.syllabisiwizard.com

Registration approval takes 24 hours.

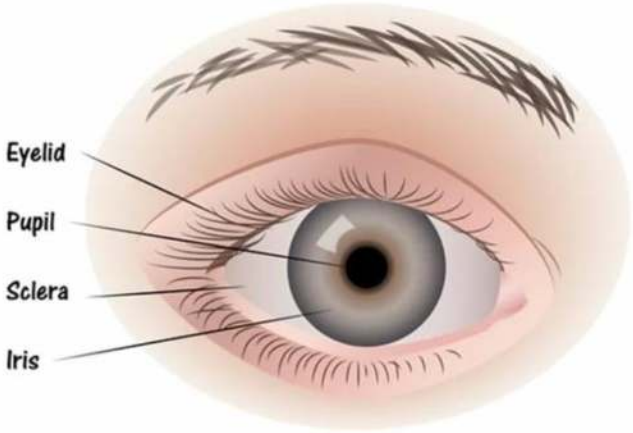
How can we see?

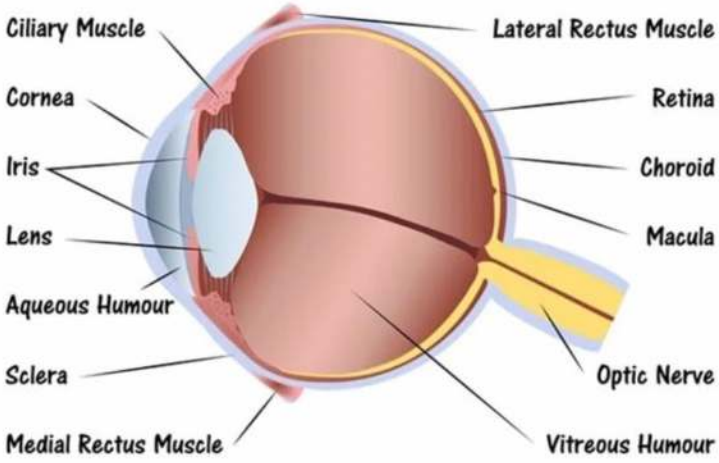
Close your eyes and imagine you have no eyes. Try and walk around and feel things as you go. Now open your eyes and look at all the different colors you see around you. We are lucky that we are able to see and read but, have you ever wondered what makes us see? Well, let's have a look. Firstly, our eyes are made up of different parts. Some parts protect the eye and other parts are in charge of the vision. The parts that protect the eyes are the eyebrows, eyelids, the eyelashes, and the lacrimal glands.



The fact that you see so many things have a process. This is the cornea. (Have a look at page 3) This is clear front surface of the eye. It acts as the camera lenses.
You can say that this is the window that allows the light to get in.

Next comes the iris, which is a thin, circular structure in the eye. This works like a camera shutter deciding what should be the amount of light entering the eye. It passes the light rays to the back of the eye called the pupil.
The pupil appears as a black hole at the center of the iris. It is the opening to which light enters the eye. Depending on the amount of light, the iris stretches and contracts the pupil, just how the aperture of a camera works. Then comes the lens of the eye which is just behind the pupil.

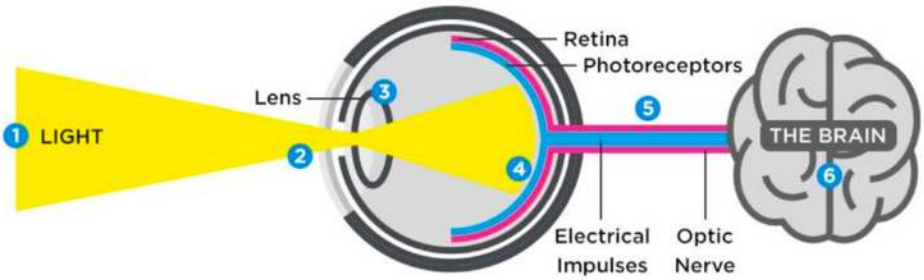


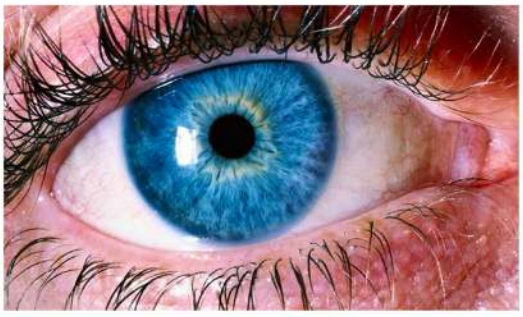


Experiment:

Close your one eye and bring a pencil close to your eye which is open. Make sure you can see it clearly. Now bring the pencil close to your eye. Now does it become blurry? This is the job of the lens of your eye. It focuses and defocuses, depending on how far the object is from your eye.

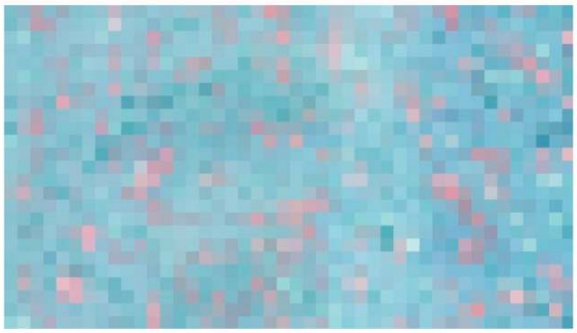
Now, the light reaches the retina. This acts as an image sensor of a digital camera. It converts the light that you take in into electronic signals. Then the optic nerve of the eye transmits the electronic signals to the brain which lets you finally see an object. The retina actually sees the world as upside down and it is the rain that flips the image back for you.





GRADE 4 AND 5 TO STOP READING HERE. GRADE 6-12 CONTINUE READING.

WHAT ARE PIXELS??



Pixel is short for picture element. Pixels are the smallest element in pictures. Pixels are small little dots that make our TV, computer and phone screens. The number of pixels used is called the resolution. The higher the pixels count the better the picture.
The original Pacman Game had a resolution of 224 x 288 pixels. Now we have screens with way more pixels. We have 4 main resolutions.
We have standard definition, high definition,
full high definition and Ultra High Definition.
When we talk about screens being 480p and
1080p we are talking about the pixels. In a 1080p screen, it is 1920p wide that means there is over 2 million pixels. (1080 x 1920 = 2,073,600)
Have you ever heard of megapixels? It is 1,000,000 pixels! The more pixels the better the picture. The human eye has a resolution of

576MP. The Eagles eye is one of the strongest in the animal kingdom (as well as other birds of prey), and it has been estimated that their average eyesight is 4 to 8 times higher than the human eye. That is a lot of megapixels!!

Pixels might be small but if you have enough of them, they can show amazing things.

GRADE 6-8 TO STOP READING HERE. GRADE 9 TO 12 TO CONTINUE READING.

What is the resolution of the human eye?

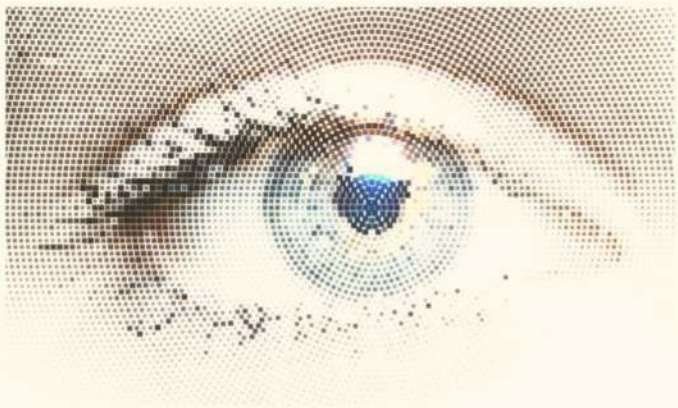
This text compares human vision to a digital image. However, rather than asking 'What is the resolution of the human eye?' It may be best to ask 'How many pixels would you need to make an image on a screen large enough to fill your entire visual field and make it look like real life without any detectable pixilation?'

What is Resolution?

Resolution is not the same as pixels; a pixel is the smallest part of an electronic image, whereas resolution refers to the quality of an image, which is made up of pixels. It is used to describe the fine detail of the image and depends on the amount of light, the size of the digital sensors and how far away one is when viewing it. Resolution is also determined by how many pixels are used in the construction of an image, this is called spatial resolution. If something on a screen goes out of focus, the number of pixels in the video frame stays the same but the image loses detail to the eye.

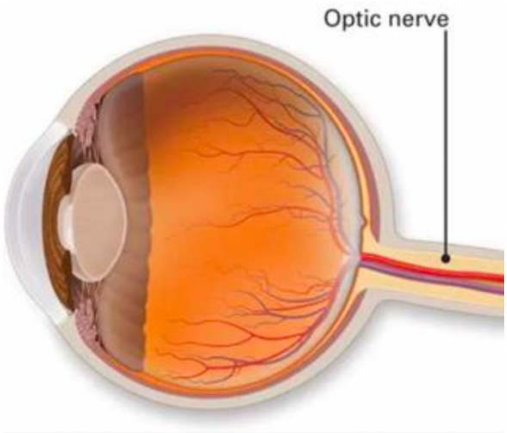
Problems with comparing human vision to a digital image

There are several problems with comparing human vision to a digital image. For example, a digital camera snaps a single image in one go whereas our eyes are constantly moving about, and the brain must make sense of a stream of information to form what we call vision. The image created by the eye alone during a single glance is not the image which we interpret.



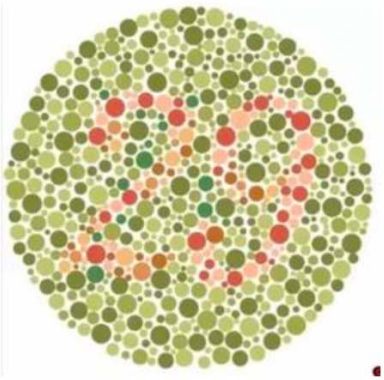
Unlike a camera, we've got stuff obstructing our field of vision; for example, we are always looking at our own nose. Luckily our brains process these factors out as they are not relevant and don't matter.

We also have blind spots; where the optic nerve meets up with the retina and no visual info is received due to no photoreceptors in this area; you wouldn't expect this from a camera.



In addition to this, humans can have refractive errors such as myopia and hyperopia. It's also possible for one to have tetrachromacywhich means that they are able to see more colour varieties than the average person.

Our fovea is another factor which makes it difficult to compare human vision to a digital image. The fovea is the part of your retina that provides the clearest vision. It receives light from the central two degrees of your field of view, which is roughly the area covered by both of your thumbs when held at arm's length away. Colour vision and 20/20 vision are only possible within that small area.



Our eyes are constantly moving, and our brains fills in details which merge together this visual information and makes guesses to form images which make sense, therefore, what we see is a processed image.

- According to scientist and photographer Roger M. Clark of

Clark Vision, a screen would have to have a density of 576 megapixels in order to encompass our entire field of view.

Nevertheless, there is a problem with this question because our eyes work differently to cameras. Our eyes move about rapidly, taking in lots of visual information which then gets processed into detailed images by the brain. The brain combines what your two eyes see to increase the resolution, assembling a higher resolution image than the photoreceptors in the retina can do alone.
Our eyes do not digest all visual information equally, we only digest the information in our fovea. Therefore, the image on a 576-pixel screen would be too detailed for us to interpret.
We can see about 7 mega pixels in our fovea range; it's been roughly estimated that rest of our field of view would only need 1 megapixel more information to render an image.
Conclusion
You simply cannot compare human vision to a digital image as the human eye does not contain pixels. Our visual system is different to that of a camera. As humans, what we see is a picture which we put together with our eyes and brain. This is not necessarily a reality.

Adapted from: https://www.feelgoodcontacts.com/blog/what-is-the-resolution-of-the-human-eye

GRADE 9-12 WELL DONE! COMPLETE THE QUIZ.

QUIZ

QUESTION 1

1.1. The different parts that our eyes are made up of:
   A. Eyebrows, eyelids, facial hair and lacrimal glands.
   B. Eyebrows, eyelids, eyelashes and lacrimal glands.
   C. Eyelids, eyebrows, tissue and eyelashes. (1)

1.2. Which part of the eye acts as a camera lens?
   A. Cornea
   B. Iris
   C. Retina (1)

1.3. Which part of the eye acts as a camera shutter which decides what the amount of light to enter the eye?
   A. Retina
   B. Iris
   C. Cornea (1)

1.4. This appears as a black hole at the centre of the iris.
   A. Cornea
   B. Retina
   C. Pupil (1)

1.5. Which part of your eye helps it to focus and defocus on objects depending how far or close they are?
   A. Retina
   B. Iris
   C. Lens (1)

QUESTION 2
TRUE OR FALSE QUESTIONS

2.1. Depending on the amount of light, the iris stretches and contracts the pupil. (1)

2.2. The lens converts the light that you take in into electronic signals. (1)

2.3. The retina actually sees the world as upside down and it is the rain that flips the image back for you. (1)

GRADE 4 AND 5 TO STOP THE QUIZ HERE.

2.4. PIXELS is short for pixel element. (1)

2.5. Pixels are small little dots that make our TV, computer and phone screens. The number of pixels used is called the resolution. (1)

QUESTION 3:
SHORT QUESTIONS

3.1. Name the 4 types of resolutions.

-
-
-
-

(4)

3.2. How many pixels is in a megapixel? (1)

3.3. The number of pixels used is called the _____. (1)

3.4. The human eye has a resolution of _____. (1)

3.5. What bird of prey has eyesight that has 4 to 8 times higher than the human eyesight? (1)

GRADE 6, 7 AND 8 TO STOP THE QUIZ HERE.

QUESTION 4

4.1. Is resolution the same as pixels? Explain your answer. (2)

4.2. Which part of the Retina provides the clearest vision? (1)

4.3. Explain how what we see is a processed image. (2)

4.4. In conclusion to the article, can you compare human vision to a digital image? Explain your answer. (3)

TOTAL: 26 MARKS

ANSWERS

QUESTION 1

1.1. B
1.2. A
1.3. B
1.4. C
1.5. C

QUESTION 2

2.1. TRUE
2.2. FLASE
2.3. TRUE
2.4. FALSE
2.5. TRUE

QUESTION 3

3.1.

- Standard definition,
- High definition,
- Full high definition,
- and Ultra High Definition

3.2. 1,000,000 pixels

3.4. 576MP.

3.5. The Eagle.

QUESTION 4

4.1. Resolution is not the same as pixels. A pixel is the smallest part of an electronic image, whereas resolution refers to the quality of an image, which is made up of pixels.

4.2. The fovea is the part of your retina that provides the clearest vision.

4.3. Our eyes are constantly moving, and our brains fills in details which merge together. This visual information and makes guesses to form images which make sense, therefore, what we see is a processed image.

4.4. You simply cannot compare human vision to a digital image as the human eye does not contain pixels. Our visual system is different to that of a camera. As humans, what we see is a picture which we put together with our eyes and brain. This is not necessarily a reality.