Ex. 1, p. 107

Charge-coupled device (CCD) – прибор с зарядовой связью (ПЗС).
Optical amplifier – оптический усилитель.
Optical waveguide technology – оптическая волноводная технология.
Pixel – пиксель.
Infrared light – инфракрасный свет.
Bubble memory – магнитоэлектронное запоминающее устройство.
Complementary Metal Oxide Semiconductor (CMOS) – комплементарная структура металл-оксид-полупроводник (КМОП).
Continuous red light laser – непрерывный лазер красного света.

Ex. 2, p. 107 (a–c)

a) Сформировать современные информационные технологии – to shape modern information technology.
   Цифровой датчик изображения – a digital image sensor.
   Мгновенно получать информацию – to instantly receive information.
   Принимать что-то как должное – to take something for granted.
   Необходимое условие необычайно быстрого развития в области коммуникаций – a prerequisite for the extremely rapid development in the field of communications.
   Изменить условия в области фотографирования – to alter the conditions for the field of photography.
   Зафиксировать изображение в электронной форме при помощи датчика изображения – to capture an image electronically with an image sensor.
   Цифровая передача изображений – digital transfer of images.
   Способный передавать большие объемы информации – capable of transferring large quantities of data.
   Требовать многочисленных изобретений – to require numerous inventions.
b) Бросить вызов воображению многих мужчин и женщин – to challenge the imagination of many men and women.
   Предоставить ответ – to provide the answer.
   Коэффициент преломления – a refractive index.
   Наметить путь промышленного производства медицинских инструментов – to pave the way for industrial manufacturing of medical instruments.
   Системы дальней связи – long distance communication.
   Удовлетворять растущие потребности в коммуникации – to cover the growing

communication needs.

Не принимать во внимание потенциал оптического света – to disregard the potential of optical light waves.

c) Решительный шаг вперед к волоконной оптике – a decisive stop forward for fiber optics.

Стабильный источник света – a stable source of light.

Испускать интенсивный и строго направленный луч света – to emit an intensive and highly focused beam of light.

Облегчить оптическую коммуникацию – to facilitate optical communication.

Скрупулезно изучать что-либо – to meticulously study something.

Представить свои заключения – to present one's conclusions.

Упростить процесс – to simplify the process.

Осуществимый, но крайне трудный – feasible but very difficult.

Ex. 3, p. 109

a) It [glass] becomes strong, light, and flexible, which is a *prerequisite* if the fiber is to be buried, drawn under water, or bent around corners.

b) When *voltage* is applied to the CCD array, the content of the wells can be progressively read out.

c) /.../ CCD *breached* the limit of 100 megapixels, and although the image quality is not dependent on the number of pixels, *surpassing* this limit is seen to have brought digital photography a further step into the future.

d) The electronic eye, the CCD, became the first truly successful technology for the *digital transfer of images*.

e) During the production of glass, different additives such as *soda* and *lime* are used to simplify the process.

f) *Notwithstanding* its bulky and primitive characteristics, when compared to contemporary cameras, it initiated a more commercially oriented digitization in the field of photography.

Ex. 4, p. 109

a) True.

b) False.

c) False according to the text but true when considering photoelectric effect in general (there could be any material as soon as the light beam has high enough frequency and thus energy).

d) False.

e) False.

f) False.

g) True.

3-minute talk

One of the characteristics that make people who they are is the ability to communicate. As humanity developed and spread across the planet, there appeared a need in extremely long-range communication solutions. To connect people in Europe with people in North America, a transatlantic telegraph cable was developed and laid in the 19th century. The line speed back then was pretty poor. Modern telecommunication cables connecting the two continents were developed in the late 20th century and make use of optical fiber, which has quite an interesting story that even led to Charles Kuen Kao's Nobel Prize in Physics.

The basics of optical fiber technology are in the refraction of light when it propagates from one medium to another. Because of different refractive indexes of materials and the fact that the optical path and the geometrical path are not the same, rays of light are bent on the surface. The basic equation describing how much light is bent equates the products of the refractive index and the falling angle sine, so there may be situations when for light to propagate to the other medium the value of sine has to be greater than unity. It means that the light does not propagate to the other medium and is entirely reflected back into the first one. This way the light can stay within a medium with a larger refractive index even when it is bent. It was first observed in water when rays of light followed its flow.

However, two problems emerge when we try to utilize this effect to develop long-range communication cables. The first is to find a material that can be bent as much as needed. And the second is to reduce intensity losses within the medium itself so that light can travel long distances.

The second problem is somewhat easier than it sounds since we can install intermediate amplifiers that would restore the signal strength and pass it further. But this increases the cost of cables and may also lead to data losses due to imperfections of amplification.

The first problem is also not impossible to solve since the first thing to think of when it comes to light and optics is glass. Indeed, glass can be manufactured thin enough to be able to be bent, and its refractive index is substantially larger than that of air.

Years of research and development conducted by Charles Kuen Kao have led to better understanding of technical problems and ultimately to the creation of optical fiber technology as we know it now.