Department of Physics  
University of Maryland, College Park  
Second Midterm Exam, Physics 106 — Fall 2000

Please first write your name and social security number (as identification number) on the answer sheet.

This exam consists of 100 statements which are either correct or wrong. For each statement, find the corresponding number on the answer sheet. If the statement is correct, fill in the circle A with a No. 2 pencil. If not, fill in the circle B.

- To focus a camera,
  1. you move the lens relative to the position of the film. +

- Compared with a standard lens, a telephoto lens
  2. has a longer focal length. +
  3. has a wider field of view. −

- Light intensity on a film
  4. increases by a factor of 2 when the focal length is increased by the same factor. −
  5. increases by a factor of 4 when the diameter of the stop’s hole is increased by a factor of 2. −

- The following pairs of f-stops and shutter speeds provide nearly the same exposure as f4 at 1/250 second:
  6. f5.6 at 1/125 sec. +
  7. f2.8 at 1/500 sec. +

- The speed of a film is determined by the following properties in an H & D curve:
  8. the steepness of the curve. −
  9. the exposure where the initial rise in the density of the developed silver grains occurs. +

- The retina has approximately the following number of rods:
  10. 7 million. −
  11. 120 million. +

- Cones and rods:
  12. Cones are distributed mostly in the fovea region. +
  13. Rods are insensitive to weak light. −
  14. Cones are used to see color. +

- In a classroom demo, a rod is moving rapidly in front of a picture of Einstein.
  15. You saw Einstein’s picture on the rod. +
  16. You saw Einstein’s picture was blurred by the rod. −
  17. The demo shows the persistence of cell response in the retina. +

- The threshold of detection in an eye is
  18. higher in cones than in rods. +
  19. the minimum amount of light for you to see something. +

- The near-point of a normal eye is about 25cm, which means the adjustable power of your eye lens is
(20) 4 diopters. +
(21) 25 diopters. –

• Suppose one of your eyes is myopic with a prescription of $-1D$. For a normal relaxed eye, the focusing power is 60D. Then the range of the focusing power of this eye is most likely
  (22) 60D to 64D. –
  (23) 61D to 65D. +
  (24) 59D to 63D. –

• A person is wearing eyeglasses of strength $-3$ diopters. The farthest he/she can see clearly without eyeglasses is
  (25) infinity. –
  (26) 25 cm. –
  (27) 1/3 m. +

• A magnifying glass has a focal length of 5 cm. The magnification power is
  (28) 5. +
  (29) 25. –

• In a classroom demo, we showed that a magnifying glass has the maximal magnifying power if you hold it
  (30) right on the object you are observing. –
  (31) 25 cm away from the object. –
  (32) right next to your eye. +

• A microscope has an eyepiece and an objective.
  (33) The objective provides magnification but not the eyepiece. –
  (34) The eyepiece provides magnification but not the objective. –
  (35) The eyepiece works as a magnifying glass. +

• If one uses two lenses with $f = 2.5$ cm and $f = 20$ cm to make a telescope, the magnification and length of the telescope is
  (36) 2.5 and 17.5 cm. –
  (37) 8 and 17.5 cm. –
  (38) $-8$ and 22.5 cm. +

• Brightness and lightness.
  (39) Brightness describes the light sources. +
  (40) Lightness describes the surfaces. +

• Lightness constancy refers to
  (41) one’s insensitivity to the brightness. –
  (42) the relative lightness of a surface staying the same under different lighting condition. +
  (43) the relative lightness of a surface staying the same under similar lighting condition. –

• The light reflected from region A has intensity 2, and that from region B has intensity 6. According to Weber’s law, the intensity of light reflected from region C must be the following to ensure that the difference in lightness between C and B is the same as that between A and B:
  (44) 10. –
  (45) 18. +

• The simultaneous lightness contrast refers to that
  (46) lightness is affected by the neighboring region. +
  (47) the same gray area appears darker when surrounded by white color. +
• To produce lateral inhibition, a region of retina must “vote” in the following way.
  (48) Light at the center produces a negative signal. –
  (49) Light at the center produces a positive signal. +
  (50) Light at the surrounding region produces a negative signal. +

• When your retina did not detect any edge
  (51) it assumes there is no change in light intensity. +
  (52) it will produce an edge. –

• If you look at a white cat surrounded by a black background for a while, you will see a black cat on a white piece of paper. This is called
  (53) positive afterimage. –
  (54) lateral inhibition. –

• Approximately how rapidly must a flashing image repeat for it to appear continuous?
  (55) 30. –
  (56) 60. +

• Television avoids flicker by
  (57) showing 30 different pictures per second. –
  (58) showing 60 different pictures per second. –
  (59) first scanning the odd lines and then the even lines of the same picture. +

• Under a stroboscope, a stream of water droplets appear frozen. If you increase the frequency of the light flashes slightly, the water droplets appear
  (60) again frozen. –
  (61) slowly moving downward. –
  (62) slowly moving upward. +

• Light in the wavelength region 500-550 nm appears as
  (63) red. –
  (64) blue. –
  (65) green. +

• The following light-sources have very low saturation:
  (66) sunlight in a sunny day. –
  (67) red light at a traffic stop. +

• The intensity distribution curve for a white light could be
  (68) a constant as a function of the wavelength. +
  (69) three peaks at red, green and blue. +
  (70) two peaks with one at red. –

• The primary colors for additive mixing are
  (71) red, green, and blue. +
  (72) red, yellow, and blue. –
  (73) cyan, magenta, and yellow.+ 

• The spectral complement of green is
  (74) magenta. +
  (75) red. –

• In a classroom demo, we showed the color mixing on a television screen. This mixing is done through
different color sources close to each other. +
flashing different colors in a fast sequence. −

- The three primary colors for subtractive mixing is
  red, yellow, and green. −
magenta, yellow, and green. −

- According to the rules of subtractive mixing,
  you get yellow when mixing red and green. −
you get green when mixing cyan and yellow. +
you get blue when mixing yellow and magenta. −

- Young and Helmholtz’s theory of trichromacy says
  there are three different types of cones. +
the response curves of the cones must overlap. +

- If the L and I types of cones are excited equally, and the S type of cones are silent, you will probably see
  blue. −
yellow. +

- According to the color opponent processing theory, if two light sources excite the L, I and S types of cones in the same proportion, the two lights have a different
  saturation. −
lightness. +

- The following is a set of psychological primaries:
  red, yellow, green. −
red, yellow, green, and blue. +

- According to the color opponent theory, the following colors are opposite of each other
  red and green. +
red and cyan. −
blue and yellow. +
blue and magenta. −

- In a classroom demo, the white and red lights are projected on a screen simultaneously; one of the shadows of my hand looks
  red. +
green. −

  The following demo was not shown in class.

- In a classroom demo (Bidwell’s illusion), as the black and white sectored disk rotates, its notch intermittently reveals a bright red light bulb, of which the apparent color depends on the direction of rotation.
  When the red light is followed by the white section of the disk, we saw blue color.
  When the red light is followed by the white section of the disk, we saw green color.
The demo showed the effect of negative afterimage.
The demo showed the effect of positive afterimage.