EXAM PREPARATION

FOR CONTACT LENS DISPENSERS

2: Basic Optical Principles

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Optical Training Institute

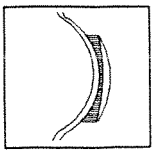
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Introduction

Before beginning part 2, be sure to listen to the Part 1 test review on side 1 of this tape. This will enable you to assess how well you've absorbed the information contained in Part 1. Review those sections of both on the tape and in the corresponding pages of the workbook which may require further study. It's to your advantage to understand each subject as thoroughly as possible before going on.

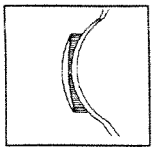
There are many reasons why a contact lens prescription can differ significantly from a spectacle prescription belonging to the same patient. By studying the principles of optics which need to be considered when fitting rigid and soft lenses, many of these reasons will be explained.

We'll begin with a review of the anatomical features of the human eye with a special emphasis on the tear film and the cornea. This will be followed by proper patient selection through the use of appropriate pre-fit testing and interviewing techniques. An attempt will be made to identify those contact lens candidates with the best prognosis as well as those with a reduced prognosis for successful fittting. Following this will be a discussion of vertex distance compensation, a subject which assumes added importance when fitting contact lenses. A prescription in excess of ±4.00D at the spectacle plane must be compensated for contact lenses which are fit at the corneal plane.

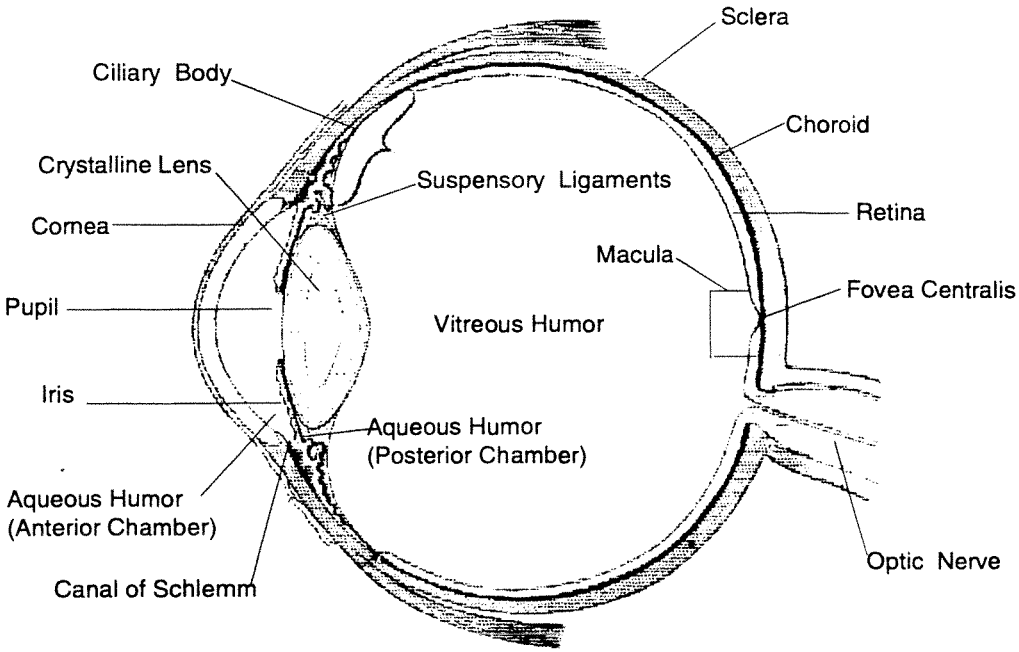
When a rigid contact lens is placed on the cornea, a tear layer is formed between the back surface of the lens and the front surface of the cornea. This liquid or lacrimal lens can sometimes assume the shape and power of a plus or minus lens. The added power must then be considered when determining the final power of the contact lens. Examples and practice exercises will be presented to cover instances of rigid lenses fit on K, steeper than K and flatter than K. Part 2 will also include a brief discussion of the keratometer.

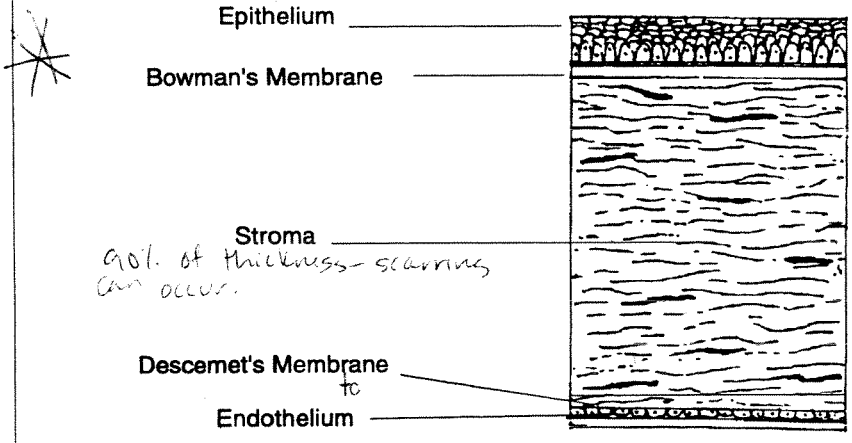
As usual, before attempting the practice test at the end of the workbook, be sure to complete the practice exercises and attempt to understand the material as thoroughly as possible.

2: Basic Optical Principles



Anatomy



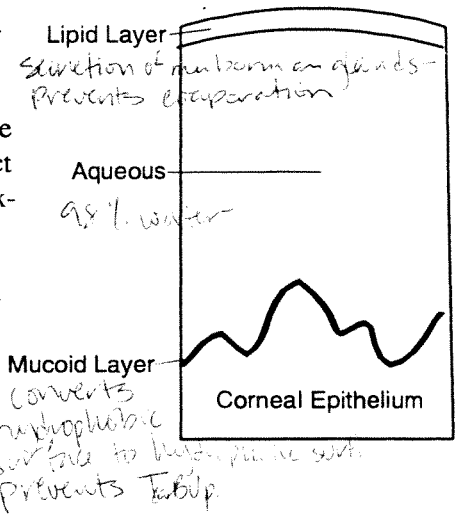


The taped portion for the first half of Part 2 is found on tape 2, side 2. Much of the information on the anatomical features of the cornea and tear film, as well as information on patient selection is augmented on the taped presentation.

The cornea consists of five distinct layers. These include the Epithelium, Bowman's Membrane, Stroma, Desemet's Membrane, Endothelium. The corneal epithelium is highly regenerative. The cells reproduce so rapidly that a mild scratch or abrasion of the cornea can heal itself within 24 hours. This is not true of the other corneal layers. Overall, the cornea is about 0.5mm thick at its center with the stroma comprising 90% of the total thickness. Knowledge of corneal physiology becomes especially important when fitting contact lenses.

Tear Film

General Functions of Tear Film: It is essential in maintaining the optical quality of the cornea as well as the health of the cornea and conjunctiva. It passes lysozyme, an antibacterial enzyme that inhibits bacterial proliferation. When contact lenses are worn, the tear film provides oxygen exchange as the lens is moved. As we'll see later in this section, the tear film can be shaped into a liquid lens with significant refractive power by the front surface of the cornea and the back surface of a rigid contact lens.

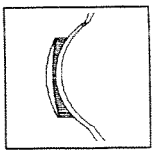


The precorneal tear film consists of three layers, the *lipid, aqueous,* and *mucoid* .

Lipid Layer: The top or outer layer of the tear film consisting of a fatty material lwhich forms a very thin layer over the whole surface of the tear film. It functions primarily to prevent evaporation of the tear film. Rapid tear evaporation would cause dry areas on the cornea resulting in discomfort and corneal damage. The lipid film is produced by the *meibomian* glands located in the upper and lower eyelids.

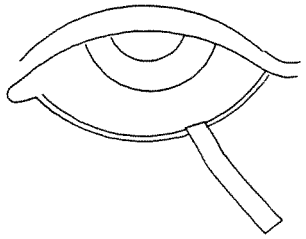
Aqueous Layer: The middle layer of the tear film which consists of 98% water and accounts for most of the thickness. It contains ions and other molecules such as sodium and potassium along with a concentration of protein. The aqueous is secreted by the lacrimal glands which are located in the palbebral conjunctiva or the temporal portion of the upper cul de sac.

Mucoid Layer: The bottom or innermost layer of the tear film located immediately against the corneal and conjunctival epithelial cells. It is produced by the goblet cells located in the conjunctiva.The mucoid layer functions primarily to convert the hydrophobic epithelial layer of the cornea to a hydrophillic surface.Without the mucoid layer the tear film would break up very rapidly, resulting in drying and corneal damage.

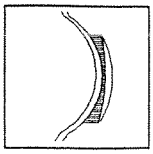


BUT: Stands for "break-up time" of tear film. Assesses the *quality* of the tear film and is performed with flouriscein and a slit lamp. A short break-up time may indicate a problem with the mucoid layer. The average break-up time is about 20 to 25 seconds and some patients may have a BUT of one minute or longer. A break-up time of less than 10 seconds presents a potential problem.

Schirmer Test: Assesses the *quantity* of tears normally produced. It is performed with a strip of filter paper placed under each lid and kept there for approximately five minutes. Normally there would be about 15 mm or more of moistened strip. Patients over 40 will find between 10mm and 15 mm of moistened strip.



Rose Bengal: Reddish-purple stain that colors degenerating and dead epithelial cells. May be used either as a paper strip or a unit dose.



Patient Selection

The cosmetic contact lens patient with an adequate, intact tear film and a healthy eye has about a 90% chance of being fit successfully with contact lenses. Those with the best prognosis for successful fitting will fit the criteria listed in the table below:

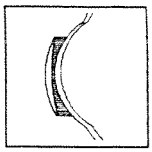
Best Prognosis
Best Age group 13 to 38 years of age
Woman > men
Refractive error > -1.50 D. > +1.50 D
K reading 41.00 to 46.00 D
BUT's > 15 seconds
Cornea with no siginficant sequential staining
Good tear flow by Schirmer test
Regular corneas– no scarring or distortion of corneal mires
Regular low astigmatism < +1.50 D
Good lid position with no scleral show.
Adequate manual dexterity

Medical Factors–Special Indications

Nystagmus: Patients whose eyes oscillate constantly may benefit from contact lenses because the lenses move with the eye.

Ocular Albinism: A darkly tinted cosmetic lens with a clear aperature may be useful against the glare from which an albino suffers.

Andridia: A congenital absence of the iris. These patients are sometimes more comfortable with tinted cosmetic lenses.



Patient Selection

Reduced Prognosis For Successful Fitting

Small refractive errors, less than ±1.25 diopters.

Those who are exposed to certain occupational hazards such as hair dressers or factory workers in chemical environments or those who live or work in an acid or alkaline fume environment .

Pre-presbyopes–myopes who are about to become presbyopic.

Those with excessive fears about having any foreign object touch their eyes.

Situations where adequate follow up visits are impractacle or impossible such when the patient is required to leave the area shortly after the initial fitting.

Poorly motivated patients.

Smokers of cigarettes, cigars, or pipes.

Those who are sloppy or careless.

Those who suffer from ocular allergies, chronic blepharitis, arthritus or exophthalmos.

Medical Factors–Reduced Prognosis

Skin disease

Systemic drugs which may reduce tear flow such as drugs for gastric ulers or birth control pills.

Handling problems such as arthritis or a parkinsonian-like tremor.

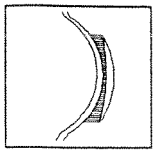
Corneal disease or allergies

Corneal warpage and corneal anesthesia

The monocular patient

Pregnancy and menopause could effect the quality of the tear film and integrity of the cornea

Unstable diabetes.

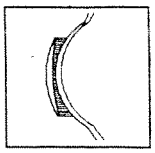


Vertex Distance

Only effects lens of more than ± 4.00D

Vertex Distance Conversion Table

Spectacle Prescription (Diopters)	Vertex Distance 8 mm Plus	8 mm Minus	10 mm Plus	10 mm Minus	12 mm Plus	12 mm Minus
4.00	4.13	3.88	4.17	3.85	4.20	3.82
4.25	4.40	4.11	4.44	4.08	4.48	4.04
4.50	4.67	4.34	4.71	4.31	4.76	4.27
4.75	4.94	4.58	4.99	4.53	5.04	4.49
5.00	5.21	4.81	5.26	4.76	5.32	4.72
5.25	5.48	5.04	5.54	4.99	5.60	4.94
5.50	5.75	5.27	5.82	5.21	5.89	5.16
5.75	6.03	5.50	6.10	5.44	6.18	5.38
6.00	6.30	5.73	6.38	5.66	6.47	5.60
6.25	6.58	5.95	6.67	5.88	6.76	5.81
6.50	6.86	6.18	6.95	6.10	7.05	6.03
6.75	7.14	6.40	7.24	6.32	7.34	6.24
7.00	7.42	6.63	7.53	6.54	7.64	6.46
7.25	7.70	6.85	7.82	6.76	7.94	6.67
7.50	7.98	7.08	8.11	6.98	8.24	6.88
7.75	8.26	7.30	8.40	7.19	8.54	7.09
8.00	8.55	7.52	8.70	7.41	8.85	7.30
8.25	8.83	7.74	8.99	7.62	9.16	7.51
8.50	9.12	7.96	9.29	7.83	9.47	7.71
8.75	9.41	8.18	9.59	8.05	9.78	7.92
9.00	9.70	8.40	9.89	8.26	10.09	8.12
9.25	9.99	8.61	10.19	8.47	10.40	8.33
9.50	10.28	8.83	10.50	8.69	10.72	8.53
9.75	10.57	9.04	10.80	8.88	11.04	8.73
10.00	10.87	9.26	11.11	9.09	11.36	8.93
10.25	11.17	9.47	11.42	9.30	11.69	9.13
10.50	11.46	9.69	11.73	9.50	12.01	9.33
10.75	11.76	9.90	12.04	9.71	12.34	9.52
11.00	12.06	10.11	12.36	9.91	12.67	9.72
11.25	12.36	10.32	12.68	10.11	13.01	9.91
11.50	12.67	10.53	12.99	10.31	13.34	10.11
11.75	12.97	10.74	13.31	10.51	13.68	10.30
12.00	13.27	10.95	13.64	10.71	14.02	10.49
12.25	13.58	11.16	13.96	10.91	14.36	10.68
12.50	13.89	11.36	14.29	11.11	14.71	10.87
12.75	14.20	11.57	14.61	11.31	15.05	11.06
13.00	14.51	11.78	14.94	11.50	15.40	11.25
13.25	14.82	11.98	15.27	11.70	15.76	11.43
13.50	15.13	12.18	15.61	11.89	16.11	11.62
14.00	15.77	12.59	16.28	12.28	16.83	11.99
14.50	16.40	12.66	16.96	12.66	17.55	12.35
15.00	17.05	13.39	17.65	13.04	18.29	12.71
15.50	17.69	13.59	18.34	13.42	19.04	13.07
16.00	18.35	14.18	19.05	13.79	19.80	13.42
16.50	19.01	14.58	19.76	14.16	20.57	13.77
17.00	19.68	14.96	20.48	14.53	21.36	14.12
17.50	20.35	15.35	21.21	14.89	22.15	14.46
18.00	21.03	15.73	21.95	15.25	22.96	14.80



Vertex Distance

Figure A: +10.00 D Lens
Vertex Distance = 13 mm
Light Focuses On Retina
Correct Power for this patient at this vertex distance

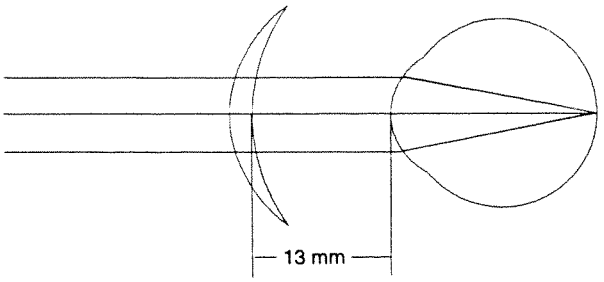


Figure B: + 10.00 D Lens
Vertex Distance = 18 mm
Effective Power = + 10.50
Compensated Power = +9.50

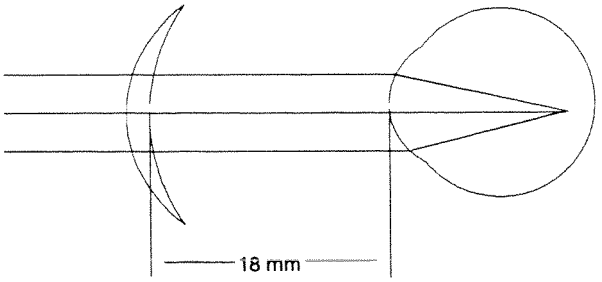
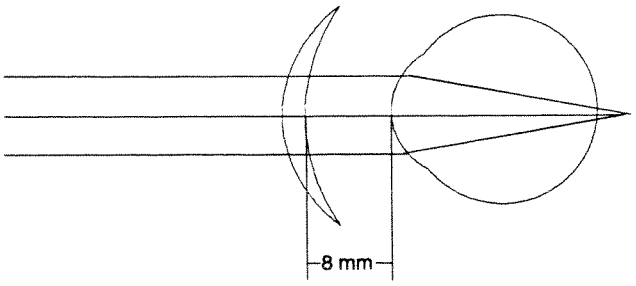
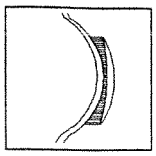


Figure C: + 10.00 D Lens
Vertex Distance = 8 mm
Effective Power = + 9.50



The distance from the front of the cornea to the ocular surface of the lens is called the *vertex distance*. As a spectacle lens with power is moved either closer to or farther away from the eye, the position of its focal point, relative to the eye, also changes. As the relative position of the focal point changes, *the effective power* of the lens is changed. As the effective power of the lens changes, its ability to correct any given ametropia is effected. Although the effective power of any lens with power will change with variations in vertex distance, *the changes only become significant for contact lenses when the lens powers exceed ± 4.00 diopters.*

Rule of Thumb: The effective power of a 10.00 diopter lens moved a distance of 5 mm will change by approximately 0.50 diopters. Whether the power changes by ±0.50 diopters will depend upon the sign of the lens as well as the direction it was moved. Please refer to the illustrations above along with the taped discussion.



CONTACT LENS SELECTION QUESTIONNAIRE

1. Environment You Live In

Clean Air (Rural) 1
Mildly Polluted (Surburban) 2
Pollluted (Urban) 3
Highly Polluted (Industrial) 4

2. Allergies

None ..... 0 Mild 2
Moderate ..... 3 Severe 5

3. Skin Type

Normal ..... 1 Dry or Oily..3
Sen sitive 5

4. Medications

Antihistamines
- Never Use 0
- Use occassionally, for cold 1
- Use more than once a month 3

Diuretics
- Never Use 0
- Une less than once a week 1
- Use frequently 3

Birth control pills
No ..... 0 Yes 3

5. Tearing

Normal ..... 0 Mild 1
Excessive ..... 3 Dry 5

6. Light Sensitivity

None .....0 Mild 1
Moderate .....3 Severe 5

7.

None .....0 Mild 1
Moderate .....3 Severe 5

8. Eye Infection

Never 0
Rare (Less than One Per Year) 1
Frequent (More tnan One Per Year) ... 3
Continual 5

9. Sensitivity To Smoke And Chemicals

None .....0 Mild 1
Moderate .....3 Severe 5

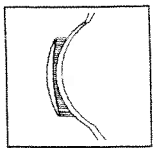
10. Anticipated Contact Lens Wearing Time

Casual Wear 1
Less than 8 hours 2
Over 8 hours 3
Extended Wear (More than 24 hours).5

Total Score_____

Key

Less than 13 points ..... Excellent potential for wearing contact lenses
14 to 24 points ..... Good potential for wearing contact lenses
25 to 29 points ..... Unlikely potential for wearing contact lenses
Over 30 points ..... Poor potential for wearing contact lenses



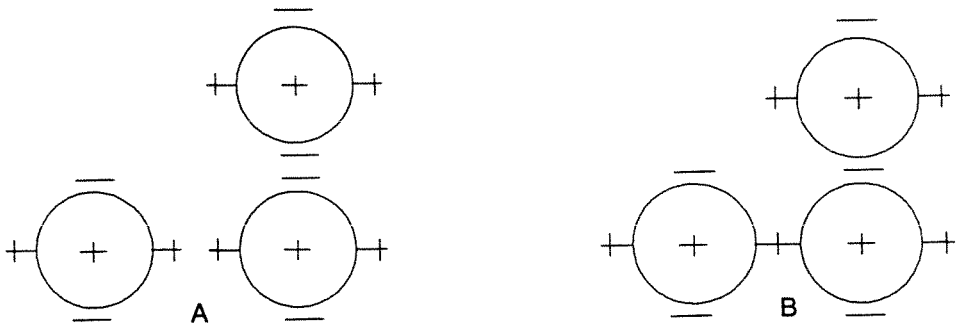
Keratometer

The keratometer is used primarily to measure the curvature of the cornea. Its measurements are limited to a circular area of about 2–4 mm of the corneal cap. The corneal cap itself generally measures 4–5 mm in diameter. Measurements of corneal curvature may be expressed either in diopters of power or radius of curvature. The various controls of the Bausch & Lomb Keratometer illustrated to the right serve to position it properly before the patient's eye. Power readings are taken from the scale imprinted on each knob. An attachment to the keratometer which is sometimes used in contact lens fitting is the *topogometer* which is a moveable light designed to pinpoint the specific location of the corneal cap to be measured by the keratometer.



Bausch & Lomb Keratometer

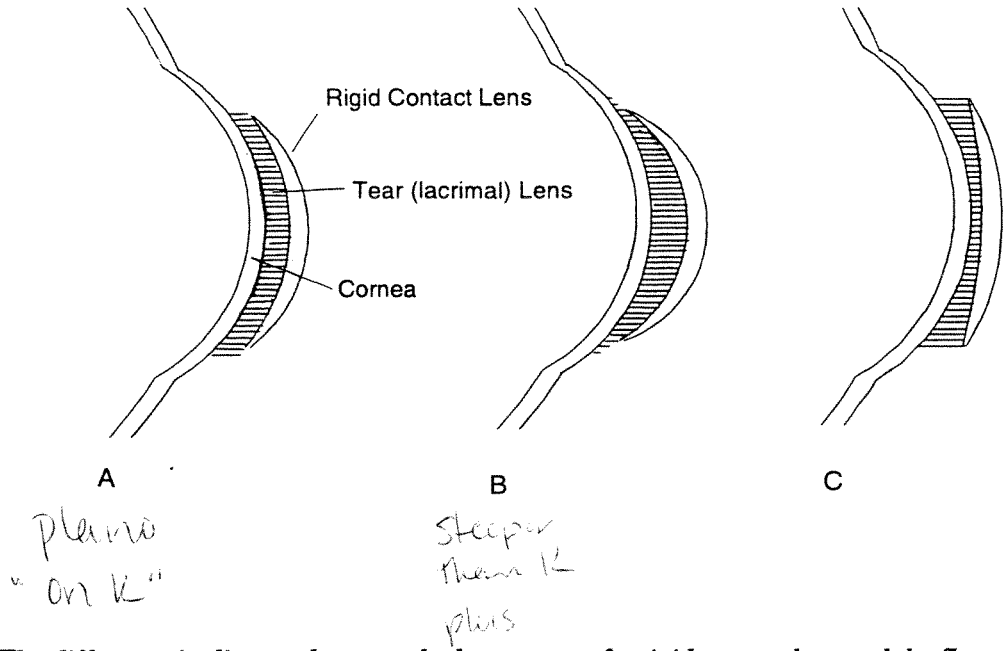
Another instrument which can be useful in helping to assess the regularity of the cornea is *placido's disc.* When this instrument is used the shape of the concentric circles which are reflected off the corneal surface can indicate the presence of corneal or irregular astigmatism.



The keratometer mires shown in Figure A above indicate the correct alignment of axis but the power is not yet correctly indicated. The mires in figure B indicate the correct setting for both the power and axis.

The taped portion for the second half of Part 2 is found on tape 3, side 1. It begins with a discussion of the keratometer and then continues with a presentation of the optical effect of the lacrimal lens in rigid contact lens fitting

Lacrimal Lens

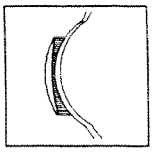


The difference in diopters between the base curve of a rigid contact lens and the flattest corneal meridian will equal the aproximate power of the tear lens in diopters.

A: Figure A illustrates rigid contact lens fit "on K" where the base curve of the lens parallels the curvature of the cornea. In this case the power of the tear lens is plano When there is corneal astigmatism, a lens fit "on K" parallels the flatter of the two corneal meridians.

B: Figure B shows a rigid contact lens which is fit steeper than K. Note that the shape of the resultant tear lens is thicker in the center and thinner on the edges which produces a lacrimal lens with plus power. The power of the lacrimal or liquid lens must be considered when determining the correct power the contact lens.

C: In figure C the rigid contact lens is fit flatter than K resulting in a tear lens which is thinner in the center and thicker on the edges. The lacrimal lens in this case will contain minus power.



Lens Power

When determining the power of a spherical rigid contact lens on a spherical cornea the first step is to compensate the power for vertex distance at the corneal plane if necessary. The resultant compensated power of the spectacle Rx at the corneal plane will be equal to the combined power of the rigid contact lens plus the tear lens.

comp power = Rigid CL + tear film

-3.25
Don't need to comp vertex dist.

Example 1:

Spectacle Rx: -3.25
K: 43.50 Vertex distance = 12 mm

Using the data above, what would be the power of a rigid the contact lens which is fit on K? 3 D of 43.50 fit on K

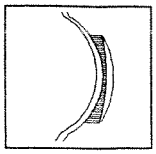
When a lens is fit "on K" it indicates that its base curve is designed to parallel the flattest corneal meridian. In this case we are presented with a "spherical" cornea. Therefore a lens fit on K would contain a base curve of 43.50 which is equal to the curvature of the flattest (in this case only) corneal meridian. As indicated in figure A on the previous page when the back curve of the contact lens parallels the front curve of the cornea the power of the tear lens produced or plano or zero.

The Rx in this example tells us that a spectacle lens with a power of -3.25 D is needed to correct this person's myopia. Since the power at the spectacle plane is less than -4.00, it is not necessary to compensate for vertex distance. The total power of the contact lens plus the power of the tear lens needs to equal -3.25. Since the tear lens is plano, the power of the contact lens would be -3.25.

Using the data above, what is the power of a rigid contact lens fit 0.50 D steeper than K?

In this example a lens fit 0.50 D steeper than K would contain a base curve of 44.00 diopters. Since it is steeper than K the shape of the tear lens would resemble the one in figure B on the opposite page, thicker in the center and thinner on the edges thereby creating a liquid lens of plus power. How much plus power? If it is 0.50 D steeper than K the power of the tear lens is aproximately equal to +0.50 D. As previously stated, the total power needed at the corneal plane is -3.25 D which will be the combined power of the contact lens plus the tear lens. If the tear lens contains a power of +0.50, therefore, the contact lens must contain a power of -3.75. So, -3.75 (contact lens power) plus +0.50 (tear lens power) results is the desired -3.25 diopters of power at the corneal plane.

-3.25 = +.50 + X
desired power = tear film + CL





Using the data in example one on the previous page, what is the power of a rigid contact lens which is fit 0.25 D flatter than K?

Lens Power

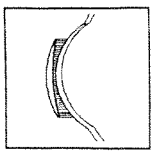
When the lens is fit flatter than K the shape of the tear lens will resemble firgure C on page12, thinner in the center and thicker on the edges thus creating a liquid lens containing minus power. How much minus power? When the contact lens is fit 0.25 diopter flatter than K the power of the tear lens is equal to approximately -0.25 diopter. Since the combined power of both the contact lens and tear lens needs to be -3.25 D, the contact lens would require a power of -3.00. So -3.00 (contact lens power) plus -0.25 (tear lens power) results in the needed -3.25 diopters at the corneal plane.

Example 2:

Spectacle Rx:	-6.75 - 1.00 x 180
K readings:	44.50\45.50
Vertex Distance:	12 mm

When presented with a spectacle prescription containing cylinder for the correction of astigmatism, it must first be determined how much of that astigmatism is the result of a toricity in the front surface of the cornea, ***corneal astigmatism,*** and how much of it may be ***residual astigmatism.*** Residual astigmatism may be caused by a toricity in the crystalline lens, a toricity in the posterior surface of the cornea, or by some other reason. We'll be discussing residual astigmatism in more detail later in the course when we cover toric contact lenses. For now we should simply observe the toricity of the cornea as indicated by the K readings and compare it to the amount of cylinder included in the refraction. In example 2 above it can be observed that one diopter of cylinder is included in the spectacle prescription. By analyzing the K readings we can also see that there is one diopter of toricity in the front surface of the cornea. Therefore, all the astigmatism is found in the cornea and no residual astigmatism is present. When this situation occurs it is often possible to completely correct the corneal astigmatism using a spherical rigid contact lens.

To achieve this, it is first necessary transpose the prescription to minus cylinder form and then drop the cylinder and axis. It is then possible to fit the lens as if it were a spherical perscription following the guidelines in discussed in example 1.



Lens Power

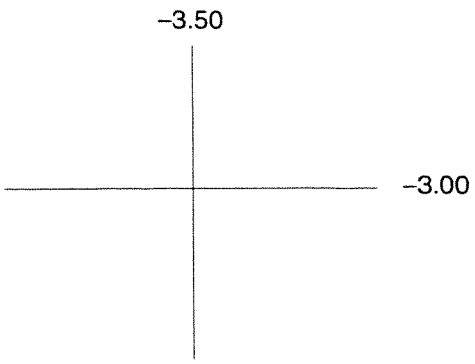
Looking at example 2 on the previous page we can observe that there is one diopter of cylinder in the spectacle prescription and one diopter of toricity on the front surface of the cornea. Therefore all the astigmatism is corneal. The Rx is already in minus cylinder form so by dropping the cylinder and axis and we are left with -6.75 at the spectacle plane. Since this power is greater than ±4.00 diopters it is necessary to compensate for vertex distance. By referring to the table on page 8, a -6.75 diopter spectacle lens at 12mm, would need to be compensated to -6.24 at the corneal plane. Rounding off to the nearest quarter diopter gives us -6.25. What this means is that the total power of the contact lens plus the tear lens at the corneal plane needs to equal -6.25 diopters.

We can now proceed as in example 1. If the lens is fit on K the tear lens is plano thus requiring a -6.25 diopter contact lens. If fit steeper than K the tear lens contains plus power which would then require more minus power in the contact lens. If the lens is fit flatter than K the tear lens would then contain minus power thereby requiring less minus (or more plus power) in the contact lens.

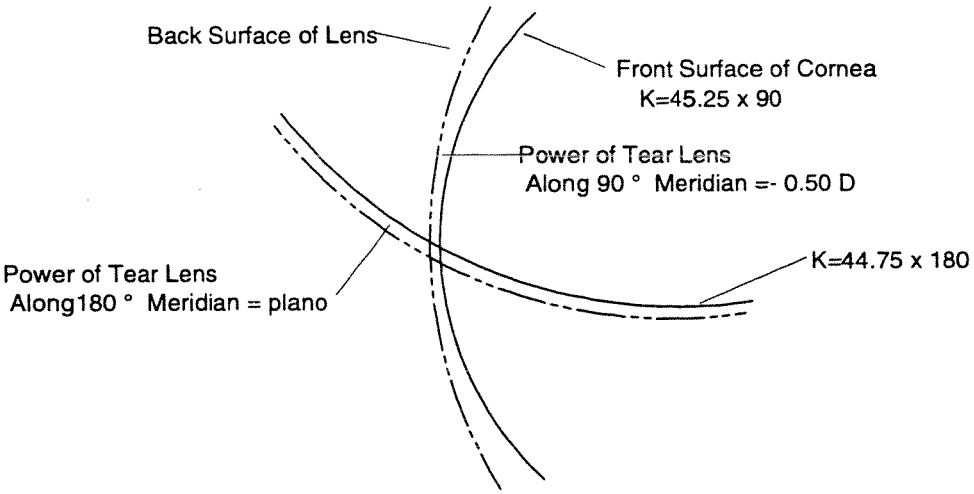
So if the lens in example 2 were fit on a 44.75 diopter base curve, what contact lens power would be required? Since 44.75 is 0.25 D steeper than K the tear lens contains a plus power of +0.25 diopter. Therefore the contact lens power must be -6.50 which, when combined with the tear lens power of +0.25 diopter, yields the desired -6.25 diopters.

Lens Power

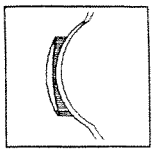
Rx:	-3.00 -0.50 x 180
Ks:	44.75 x 180/45.25 x 90
Base Curve:	44.75
Power of CL:	-3.00



Optical Cross



The illustration above demonstrates how a spherical rigid contact lens can correct for corneal astigmatism. By analyzing this prescription utilizing an optical cross we can see that the power of the lens along the 180° meridian is -3.00 D and the power in the 90° meridian is -3.50 D. If a -3.00 D rigid contact lens is fit on K, the power of the resultant tear lens along the 180° meridian is plano, so the power of the contact lens in that meridian needs to be -3.00 diopters. Since the corneal curvature is steeper along the 90° meridian, the tear layer forms a minus lens with a power of approximately -0.50 diopter. When combined with the -3.00 D contact lens, the total power of the two lenses in this meridian equals -3.50. Thus the combined power of the tear lens plus the contact lense in each principal meridian contains the power called for by the prescription—and this has been achieved through the use of a spherical rigid contact lens.



Practice Exercises

#1) Rx: -7.50 - 1.50 x 180
Ks: 44.00/ 45.50
VD: 10 mm

#2) Rx: -3.50 -0.75 x 05
Ks: 43.00/43.75
VD: 10mm

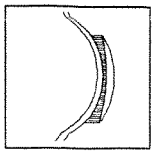
#3) Rx: +3.75 + 0.50 x 90
Ks: 46.75/47.25
VD: 8 mm

Fill in the following chart using the information given for the three examples above. In each case the lens is fit on K, 0.50 D steeper than K and 0.50 D flatter than K. The answers may be found on page 25.

Example #1	Base Curve	Power of Tear Lens	Power of Contact Lens
On K	44	~~+1.50~~ 0	~~-7.00~~ -7
0.50 D steeper than K	44.50	+.50	-7.50
0.50 D flatter than K	~~43~~ 43.50	-.50	-6.50

Example #2	Base Curve	Power of Tear Lens	Power of Contact Lens
On K	43	~~+1.00~~ 0	~~+4.50~~ -3.50
0.50 D steeper than K	43.5	+.50	~~+3.75~~ -4.00
0.50 D flatter than K	42.5	-.50	~~+4.75~~ -3.00

Example #3	Base Curve	Power of Tear Lens	Power of Contact Lens
On K	46.75	~~+.75~~	~~+3.50~~ 4.25
0.50 D steeper than K	47.25	+.50	~~+4.00~~ ~~-4.00~~ -3.75
0.50 D flatter than K	46.25	-.50	~~+3.00~~ 4.75



Practice Test



This practice test will be reviewed on Tape 3, side 2. Before taking the test be sure to understand the material as thoroughly as possible. Listen to the taped review only after having completed the test.

___1. The tear film consists of which the following?

1. aqueous layer
2. conjunctiva
3. lipid film
4. mucin film

a. 1 only
b. 1, 3, and 4
c. 2 and 4 only
d. 1, 2, 3, and 4

___2. The primary function of the mucin film is to:

a. prevent evaporation of the tear film
b. provide oxygen exchange
c. change the corneal epithelial surface from a hydrophobic surface to a hydrophillic surface
d. aid in the prevention of "dry eye" syndrome

___3. The lipid layer functions primarily to:

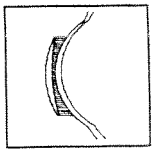
a. change the corneal epithelial surface from a hydrophobic surface to a hydrophillic surface
b. provide oxygen exchange
c. prevent evaporation of the tear film
d. supply nutrients to the cornea

___4. The test which assesses the quantity of tears normally produced is:

a. BUT
b. Rose bengal
c. Schirmer
d. stereopsis

___5. The test which asseses the quality of the tear film is:

a. BUT
b. Rose bengal
c. Schirmer
d. stereopsis



Practice Test

___6. Prospective patients who fall within the following age group generally provide the best prognosis for successful contact lens fitting:

a. 42 to 65
b. 13 to 38
c. 25 to 45
d. over 45

___7. Which of the following would indicate a good prognosis for successful contact lens fitting?

1. adequate manual dexterity
2. regular low astigmatism
3. refractive error less than ± 1.50 D.
4. BUTs longer than 15 seconds

a. 1 and 2 only
b. 2 and 4 only
c. 1, 2, and 4 only
d. 1, 2, 3, and 4

___8. The base curve of a certain contact lens is equal to 7.5 mm radius of curvature. The equivalent power in diopters is:

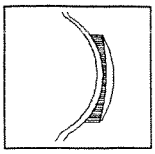
a. 42.00
b. 45.00
c. 48.00
d. 51.00

___9. The primary function of a keratometer is to:

a. measure the curvature of the cornea
b. test for visual acuity
c. measure intraocular pressure
d. evaluate degenerating corneal epithelial cells

___10. When moved 5mm from its original position the effective power of a 10.00 diopter lens will change:

a. 0.25 D
b. 0.50 D
c. 0.75 D
d. 1.00 D



Practice Test

___11. When a spectacle lens prescription exceeds _____diopters, vertex distance must be compensated for when determining the power of a contact lens.

a. ±2.00 D
b. ±4.00 D
c. ±6.00 D
d. ±8.00 D

___12. A spectacle lens is prescribed at -10.00 diopters provided that the lens is fit at a vertex distance of 10 mm. A rigid contact lens fit "on K" for this patient would require a power of:

a. -12.00 D
b. -11.00 D
c. -10.00 D
d. - 9.00 D

___13. Spectacle Rx = +10.00 D
Vertex distance = 10 mm
A rigid contact lens fit "on K" would require the following power:

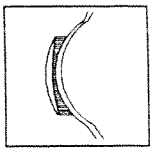
a. +12.00 D
b. +11.00 D
c. +10.00 D
d. +9.00 D

___14. Rx: -4.00 + 1.00 x90
K: 42.50 at 180/ 43.50 at 90
A rigid contact lens fit "on K" would require the following power:

a. -2.00 D
b. -3.00 D
c. -4.00 D
d. -5.00 D

___15. The power of the lacrimal lens in the previous question is:

a. plano
b. +0.50 D
c. -0.50 D
d. none of the above



Practice Test

___16. Rx: +11.00 +1.00 x 20 Vertex distance = 12 mm
Ks: 46.25/47.25
What would be the power of a rigid contact lens fit "on K?"

a. +11.00 D
b. +12.00 D
c. +13.00 D
d. +14.00 D

___17. The transition zone between the sclera and the cornea is called:

a. stroma
b. primary curve
c. limbal area
d. ciliary process

___18. Moderate to high myopes often provide a good prognosis for contact lens wear. This may be because:

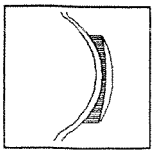
a. they are highly motivated
b. peripheral vision is improved
c. the image size is larger
d. all of the above

___19. Rx: -3.00 - 0.50 x 90 Vertex distance = 11 mm
What is the power of a rigid contact lens fit 0.50 D steeper than the flattest corneal meridian? Assume all the astigmatism is in the cornea.

a. -3.25 D
b. -3.50 D
c. -3.75 D
d. none of the above

___20. Rx: -2.50 +0.25 x 90 Vertex distance = 12mm
If a contact lens is to be fit 0.75 diopters steeper than the flattest corneal meridian, what would the power be? Assume all the astigmatism is in the cornea.

a. -3.25 D
b. -3.00 D
c. -2.75 D
d. -2.00 D



Practice Test

___21. The thickness and power of the lacrimal lens will vary with the:

a. lens thickness
b. "K" readings
c. lens-cornea relationship
d. refraction

___22. The precorneal tear film provides:

1. a lubricant to the cornea
2. a smooth optical surface for the cornea
3. nutrients to the cornea
4. carbon dioxide

a. 1 only
b. 1, and 2 only
c. 1, 2, and 3 only
d. 1, 2, 3, and 4

___23. The corneal curvature at the limbal area closely approximates the curvature of the:

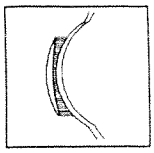
a. sclera
b. crystalline lens
c. corneal apex
d. macula

___24. The CPC of a trial contact lens is 44.00 diopters and contains a power equal to +14.87 D. The over refraction is equal to -1.62 D. What final lens power is required if the CPC to be ordered is 43.62 diopter.

a. +15.00 D
b. +13.87 D
c. +13.62 D
d. +12.62 D

___25. A -3.50 D lens with a base curve of 44.50 provides excellent visual acuity. If the CPC were changed to 45.00 D what power would be needed?

a. -3.00 D
b. -3.50 D
c. -4.00 D
d. -4.50 D



Practice Test

___26. A "dry eye" condition can be evaluated through which of the following tests?

a. artificial tears
b. rose bengal
c. Schirmer test
d. flourescein

___27. A new contact lens wearer should become familiar with the:

a. function of the retina
b. corneal vascular system
c. accomodative/convergence ratio
d. blinking mechanism

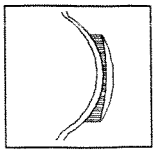
___28. The pre-corneal tear film provides:

1. an optical surface
2. metabolic nutrients
3. endothelial reflex
4. limbal hypermia

a. 1 and 3
b. 1 and 2
c. 2 and 3
d. 3 and 4

___29. The normal cornea is in a constant state of dehydration also known as detergence. The layer of the cornea most responsible for maintaining this function is:

a. the endothelium
b. the basal membrane
c. the epithelium
d. Bowman's membrane



Practice Test

DATA FOR QUESTIONS 30-33

Spectacle Rx: -3.25 - 1.00 x 180
K Readings: 44.25 x 180 / 45.25 x 90
Vertex Distance: 12 mm

___30. Using the data above, the correct design of the CPC and power of a contact lens fitting "on K" would be:

a. 45.25 - 4.25
b. 45.25 - 3.75
c. 44.25 - 3.25
d. 44.25 - 4.25

___31. Using the data above, the correct design of the CPC and power of a contact lens fitting 0.50 steeper than "K" would be:

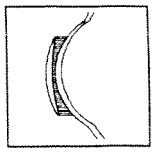
a. 45.75 - 3.25
b. 45.75 - 3.75
c. 44.75 - 3.25
d. 44.75 - 3.75

___32. Using the data above, the correct design of the CPC and power of a contact lens fitting 0.25 D flatter than "K" would be:

a. 44.00 -3.50
b. 44.00 -3.00
c. 45.00 -3.50
d. 45.00 -3.00

___33. Using the data above, the correct design of the CPC and power of a contact lens fitting 0.50 D flatter than "K" would be:

a. 43.75 - 2.75
b. 43.75 - 3.00
c. 44.50 - 2.75
d. 44.50 - 3.00

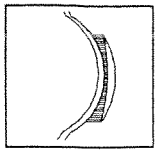


Answers to Practice Exercise, Page 17

Example #1	Base Curve	Power of Tear Lens	Power of Contact Lens
On K	44.00	plano	-7.00
0.50 D steeper than K	44.50	+0.50	-7.50
0.50 D flatter than K	43.50	-0.50	-6.50

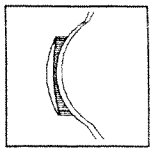
Example #2	Base Curve	Power of Tear Lens	Power of Contact Lens
On K	43.00	plano	-3.50
0.50 D steeper than K	43.50	+0.50	-4.00
0.50 D flatter than K	42.50	-0.50	-3.00

Example #3	Base Curve	Power of Tear Lens	Power of Contact Lens
On K	46.75	plano	+4.50
0.50 D steeper than K	47.25	+0.50	+4.00
0.50 D flatter than K	46.25	-0.50	+5.00



Notes

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