STUDY GUIDE

for

CLINICAL REFRACTION

(UNIT 1-9)

LEVEL: B.Sc

C.CODE: 2431 **CREDIT: HALF**

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Structure of the course

The course "Clinical Refraction" has been structured to make it as easy as possible for you to do the required work. Like a half credit course this course consists of nine units. One unit is study work of two weeks, thus the total study period will be of 18 weeks.

We have organized this course to enable you to acquire the skills of self-learning. For each unit, an introduction is given to help you to develop an objective analysis of the major and sub-themes, discussed in the prescribed reading material. Beside this, objectives of each unit are very specifically laid down to facilitate in developing a clear logical approach. We have also given you Self-Assessment Exercise, which are present at end of each unit. Questions in the Self Assessment Exercise are not only meant to facilitate you in understanding the required readings but to provide you an opportunity to assess yourself. Since the course work of one unit includes studying the prescribed reading material and carrying out the self-assessment questions, activities assignments and practicals, you are required to spend two weeks on each unit.

For this course "Fortnightly Tutorials" are arranged in the university's Selected Regional Study Centers. They provide you the facility of meeting with one another for discussion and mutual help & for group and individual discussion with fellows and tutors.

a) **How to use Reading Material:**

As this is a distance education course, we have organized the required course work in the following manner to help you in evolving a self-learning process in the absence of formal class room teaching.

1) A detailed course introduction
2) Introduction to each unit.
3) The major theme of the unit is listed along with readings. A list of suggested & prescribed reading in given at the end of each unit.
4) Self Assessment Exercise given in the reference text are not only meant to facilitate you in understanding but will also suggest a direction in which we expect you to think and analyze.

b) How to attend tutorials:

Tentative Tutorial & Practical schedule is provided to you in your study packs.& 70% attendance in the tutorials is compulsory in order to appear in the exam. Before attending the tutorial, you are required to prepare yourself by reading the topics to be taught in the next tutorial carefully and mark the points which you cant understand yourself in order to discuss them with your tutor and your colleagues.

Welcome From Course - Coordination

Dear students, now you are well equipped with the knowledge of the important concepts of physical, geometrical and visual optics. It is time to apply your knowledge to the clinical practice. Yes, this study guide is going to talk about clinical refraction. The knowledge that you have already acquired will serve as the backbone of the clinical refraction that you will perform in future and this in turn will identify you as a "refractionist.

Again the study guide is divided into 9 study units. Each unit focuses on individual topics and the objectives in the beginning of each unit guide you about your goals to be achieved. This time too, you are informed about what you should know in "Prescribed reading" and about what you can if you want to know in the Suggested reading". The self-assessment exercises at the end of each study unit will help you evaluate your level of knowledge and skill development. I hope that the study guide will cater for your teaching and training needs as a modern refractionist of the future.

Best of luck!

INTRODUCTION TO THE COURSE

This course is designed to introduce you to the working knowledge and skills involved in performing clinical refraction. It discusses retinoscopy in different types of refractive errors in detail. It also talks about the management of different refractive errors.

The course will also touch the surgical interventions used as the modern management options of the refractive errors.

OBJECTIVES

After going through this course, you should be able to:

1. Elaborate the importance of refraction in clinical ophthalmology.
2. Explain the principles of objective methods of refraction and perform these.
3. Explain the principles of subjective refraction and perform it.
4. Identify special considerations in refraction and apply their knowledge.
5. Correct different types of refractive error.
6. Identify anomalies of accommodation.
7. Assess and correct Presbyopia.
8. Define the optics and uses of prisms in ophthalmology.
9. Describe different management modalities for refractive errors.

UNIT NO 1: INTRODUCTION TO CLINICAL REFRACTION

INTRODUCTION

Clinical refraction is no doubt the most important skill to learn for a refractionist. It is the process by which one assesses the refractive state of the eye. The type and degree of the refractive error if present and finally the correction needed. This unit will highlight the importance of clinical refraction.

Assessing visual acuity is the first step in proceeding forward refraction. Therefore, this unit will address this important topic as well. However, you should already be well familiar with it.

OBJECTIVES:

After studying this unit, you should be able to:

1. Explain the importance of refraction in clinical ophthalmology.
2. Perform different tests for Visual acuity.

INDICATIVE CONTENT

1.1 Introduction

1.1.1 Clinical importance of refraction in ophthalmological examination

1.1.2 Assessment of VA

RECOMMENDED READING LIST:

PRESCRIBED READING

1. Duke Elder's. The place of refraction in general ophthalmological examination. Practice Of Refraction. Tenth edition, p143-144.

2. Duke Elder's. The clinical importance of refraction. Practice Of Refraction. Tenth edition, p 3-8.

3. Duke Elder's. Visual acuity. Practice Of Refraction. Tenth edition, p 145-153.

4. Harold A. Stein, Bernard J. Slatt,Raymond M. Stein. Preliminary examination. The Ophthalmic Assistant, A Guide for Ophthalmic Medical Personnel. Seventh Edition. p 129-139.

SUGGESTED READING

1 Theodore P. Grosvenor. Anomalies of refraction. Primary Care Optometry. Second edition, p 11-16.

2 Borish's Clinical refraction. Visual acuity. 1998, p 179-203.

SELF -ASSESSMENT QUESTIONS

1. what is the importance of refraction in Clinical Ophthalmology?
2. Name different types of tests available for measuring Visual Acuity?

UNIT 2: OBJECTIVE METHODS OF REFRACTION

INTRODUCTION

The refraction consists of two parts: objective and the subjective: The objective determination of the refractive error is done with a retinoscope and requires no subjective responses from the patient.

Retinoscopy becomes easier with practice, so you have to be patient. The objective measurement will help in decision-making regarding malingerers, media clarity, children's and non-verbals' refractive error, and unknown causes of reduced visual acuity.

This unit will discuss objective refraction in detail to make your concepts clear and skills sharp.

OBJECTIVES

After studying this unit, you should be able to:

1. Define what is retinoscopy.
2. Explain the optics of retinoscopy in emmetropia and ametropia.
3. Perform retinoscopy according to the standard methods and record the findings.

INDICATIVE CONTENT

2.1 Retinoscopy

- 2.1.1 Optics of retinoscopy
- 2.1.2 Optical principles and stages of retinoscopy
- 2.1.3 Optics of retinoscopy in emmetropia
- 2.1.4 Optics of retinoscopy in hypermetropia
- 2.1.5 Optics of retinoscopy in myopia

2.2 Methods of retinoscopy

2.3 Determination of cylinder axis and power

2.4 The sphero- cylindrical combination in retinoscopy

RECOMMENDED LIST OF READING

PRESCRIBED READING

1. Duke-Elder's Practice of Refraction. Objective methods of refraction. Tenth edition , p155-180.

2. Harold A. Stein, Bernard J. Slatt,Raymond M. Stein. Refractive errors and how to collect them. The Ophthalmic Assistant, A Guide for Ophthalmic Medical Personnel. Seventh Edition. p 217-220.

SUGGESTED READING

1. Theodore P. Grosvenor. Objective refraction. Primary Care Optometry. Second Edition, P 231-250.

2. Borish's Clinical refraction. Objective refraction. 1998, p 559-585.

SELF ASSESSMENT QUESTIONS

1. What is Retinoscopy?
2. How can you perform retinoscopy according to the standard methods?

UNIT 3 : SUBJECTIVE REFRACTION

INTRODUCTION

Subjective refraction is basically the comparing of one lens against another, using the changes in subject's vision as the criterion. This is done to arrive at the dioptric lens combination to have maximum visual acuity. It is obvious that it depends on the judgment of the subject. This unit will give all the relevant knowledge and explain the skills

OBJECTIVES

After studying this unit, you are expected to be able to:

1. Explain what is subjective refraction.
2. Perform subjective refraction in patients with different types of refractive errors.
3. Learn and perform refining techniques for cylinder.
4. Know and perform Duochrom test.

INDICATIVE CONTENTS

3.1 Subjective refraction

3.2 Following objective retinoscopy

3.3 Refining techniques for sphere

3.4 Refining techniques for cylinder and the use of Jackson's cross cylinder

3.5 Without objective refraction

- 3.5.1 Monocular subjective refraction
  - The Sphere check
  - Use of cross cylinder
  - The spherical equivalent
  - The astigmatic dial
  - Cylinder power and axis confirmation
- 3.5.2 Binocular subjective refraction

3.6 Duochrom test

PRESCRIBED READING

1. Duke-Elder's Practice of Refraction. Subjective verification of the refraction, annd testing of muscle balance. Tenth edition , p 181-186.

2. Harold A. Stein, Bernard J. Slatt,Raymond M. Stein. Refractive errors and how to correct them. The Ophthalmic Assistant, A Guide for Ophthalmic Medical Personnel. Seventh Edition. p 220-222.

SUGGESTED READING

1. Theodore P. Grosvenor. Subjective refraction. Primary Care Optometry.Second edition, p 259-278.

2. Borish,s Clinical refraction. Monocular and binocular subjective refraction, 1998, p 629-723.

SELF-EVALUATION QUESTIONS

1. What is subjective refraction?
2. How Duochrom test can be performed?

UNIT 4 : SPECIAL TECHNIQUES AND CONSIDERATIONS IN REFRACTION

INTRODUCTION

You have learnt the basic methods of objective and subjective refraction. Now, we need to study some special techniques and considerations in difficult and complicated cases. This unit will guide you into this discussion.

OBJECTIVES

After studying this unit, you are expected to be able to:

1. Perform transposition of lenses.
2. Perform Cycloplegic refraction.
3. Do automated refraction.
4. Calculate the spherical equvilant.
5. Explain static and dynamic refraction.
6. Perform refraction in special cases.
7. Calculate the final prescription and record retinoscopic findings.

INDICATIVE CONTENTS

4.1 Transposition of lenses - simple, toric
4.2 Cycloplegic refraction and automated refraction
  4.2.1 Indications
  4.2.2 Method
    Drugs used for cycloplegia , their dosage and side effects
4.3 Automated refraction
4.4 Static and dynamic refraction
4.5 Cutting the cylinder and the spherical equvilant
4.6 Special considerations for cases with
  4.6.1 Strabismus
  4.6.2 Refraction after cataract surgery
  4.6.3 Aphakic correction
  4.6.4 Anisometropia
  4.6.5 High hyperopia
  4.6.6 High myopia
4.7 Calculation of final refraction and recording of retinoscopic results

RECOMMENDED LIST OF READING

PRESCRIBED READING

1. Duke-Elder's Practice of Refraction. Objective methods of refraction. Tenth edition , p 166-172.
2. Duke-Elder's Practice of Refraction. Objective methods of refraction. Tenth edition , p 177-178.
3. Duke-Elder's Practice of Refraction.Making and fitting of spectacles. Tenth edition , p 219-221.
4. Duke-Elder's Practice of Refraction. Myopia. Tenth edition , p 60-62.
5. Duke-Elder's Practice of Refraction. Hypermetropia. Tenth edition , p 50-52.
6. Duke-Elder's Practice of Refraction. Accomodation. Tenth edition , p 87-88.
7. Harold A. Stein, Bernard J. Slatt,Raymond M. Stein. Refractive errors and how to correct them. The Ophthalmic Assistant, A Guide for Ophthalmic Medical Personnel. Seventh Edition. p 222-227.
8. Harold A. Stein, Bernard J. Slatt,Raymond M. Stein. Automated refractors. The Ophthalmic Assistant, A Guide for Ophthalmic Medical Personnel. Seventh Edition. p 234-240.

SUGGESTED READING

1. Theodore P. Grosvenor. Objective refreaction. Primary Care Optometry.Second edition, p 242-250.
2. Theodore P. Grosvenor. Subjective refraction. Primary Care Optometry.Second edition, p 272-278.
3. Borish,s Clinical refraction. Objective refraction., 1998, p 559-628.

SELF-EVALUATION QUESTIONS

1. What is Automated refraction?
2. How will you diffrentiate between static and dynamic retinoscopy
3. How would you calculate the spherical equivalent?

UNIT 5: ACCOMMODATION AND ITS ANOMALIES

INTRODUCTION

Accommodation is an important physiological process which brings a change in the curvature of the crystalline lens that inturn helps to focus images of objects close to eye. This unit gives details of this process, its assessment and anomalies.

OBJECTIVES

After studying this unit, you are expected to be able to:

1. Have the knowledge of the normal process of accommodation.
2. Assess accommodation in a subject.
3. Explain the anomalies of accommodation and Presbyopia.

INDICATIVE CONTENTS

5.1 Normal accommodation

- 5.1.1 Mechanisim
- 5.1.2 Innervation
- 5.1.3 Variation with age

5.2 Types of accommodation

5.3 Accommodative parameters

5.4 Range and amplitude of accommodation

5.5 Measurement of accommodation

5.6 Assessment of accommodative response

5.7 AC/A ratio

5.8 Anomalies of accommodation and presbyopia

RECOMMENDED LIST OF READING

PRESCRIBED READING

1. Duke-Elder's Practice of Refraction. Accommodation. Tenth edition , p 85-89.

2. Duke-Elder's Practice of Refraction. Presbyopia. Tenth edition , p 91-92.

3. Duke-Elder's Practice of Refraction.Anomalies of accommodation. Tenth edition , p95-101.

4. Harold A. Stein, Bernard J. Slatt,Raymond M. Stein. Physiology of the eye. The Ophthalmic Assistant, A Guide for Ophthalmic Medical Personnel. Seventh Edition. p 24-25.

5. Harold A. Stein, Bernard J. Slatt,Raymond M. Stein. Preliminary examination. The Ophthalmic Assistant, A Guide for Ophthalmic Medical Personnel. Seventh Edition. p 146,147.

SUGGESTED READING

1. Theodore P. Grosvenor. Tests of accommodative function. Primary Care Optometry.Second edition, p 288-293.

2. Theodore P. Grosvenor. Subjective retraction. Primary Care Optometry.Second edition, p 272-278.

3. Borish,s Clinical refraction. Accommodation, the pupil and presbyopia, 1998, p 77-120.

SELF-EVALUATION QUESTIONS

1. What is normal process of accommodation?
2. How would you assess accommodation in a subject?

UNIT 6: PRESBYOPIA

INTRODUCTION

Prsbyopia is a progressive loss of accommodative ability of lens due to the natural processes of aging. However, it needs correction, especially for the people who are involved frequently in close distance to eyes. This unit will explain presbyopia and its treatment.

OBJECTIVES

After studying this unit, you are expected to be able to:

1. Define Presbyopia.
2. Learn how to treat Presbyopia.

INDICATIVE CONTENTS

6.1 Presbyopia and its correction

RECOMMENDED LIST OF READING

PRESCRIBED READING

1. Duke-Elder's Practice of Refraction. Presbyopia. Tenth edition , p 91-94.

2. Harold A. Stein, Bernard J. Slatt,Raymond M. Stein. Refractive errors and how to correct them. The Ophthalmic Assistant, A Guide for Ophthalmic Medical Personnel. Seventh Edition. p 225-228.

SUGGESTED READING.

1. Theodore P. Grosvenor. Diagnosis and treatment of anomalies of refraction and binocular vision. Primary Care Optometry.Second edition, p 334-336.

2. Borish,s Clinical refraction. Analysis, interpretation, and prescription for the ametropias and heterophorias.ccommodation, the pupil and presbyopia, 1998, p 800-807.

SELF-EVALUATION QUESTIONS

1. What is Presbyopia?
2. How Presbyopia can be treated? Describe the methods.

UNIT 7: OPTICS OF PRISMS

INTRODUCTION

Prisms are frequently used in diagnostic and therapeutic ophthalmological procedures. It is therefore important for the students to understand their optical behaviour and their uses in ophthalmology. This unit deals with the relevant knowledge.

OBJECTIVES

After studying this unit, you are expected to be able to:

1. Explain optical properties of prisms.
2. Describe uses of prism in ophthalmology.
3. Define notation of prisms.
4. Identify Fresnel prisms.

INDICATIVE CONTENTS

7.1 Refraction by prisms

7.2 Detection and measurement of prisms

7.3 Nomenculature of prisms

7.4 Uses and types of prism in ophthalmology

- 7.4.1 Therapeutic
- 7.4.2 Diagnostic

7.5 Printice position and the position of minimum deviation

7.6 Notation of prisms

- 7.6.1 Prism dioptore

7.7 Fresnel prisms

RECOMMENDED LIST OF READING

PRESCRIBED READING

1. Duke-Elder's Practice of Refraction. General optics. Tenth edition , p 13,14.

2. Duke-Elder's Practice of Refraction. Visual aids. Tenth edition , p 277, 278.

3. Harold A. Stein, Bernard J. Slatt,Raymond M. Stein. General optics. The Ophthalmic Assistant, A Guide for Ophthalmic Medical Personnel. Seventh Edition. p 44,45.

4. Harold A. Stein, Bernard J. Slatt,Raymond M. Stein. Understanding ophthalmic instruments. The Ophthalmic Assistant, A Guide for Ophthalmic Medical Personnel. Seventh Edition. p 182-183, 193.
5. Harold A. Stein, Bernard J. Slatt,Raymond M. Stein. Facts about glasses. The Ophthalmic Assistant, A Guide for Ophthalmic Medical Personnel. Seventh Edition. p 268-270

SUGGESTED READING

1. Theodore P. Grosvenor. Prescribing ophthalmic lenses. Primary Care Optometry. Second edition, p 357-360.

2. Borish,s Clinical refraction. Correction with single vision spectacle lenses. 1998, p 840-849.

SELF-EVALUATION QUESTION

1. Describe Optical properties of prisms?
2. Describe uses of prisms in Ophthalmology?
3. How would you identify Fresnel Prisms?

UNIT 8: USES OF PRISMS IN OPHTHALMOLOGY

INTRODUCTION

We have already introduced basics about prisms and their uses in ophthalmology. This unit will give the details about the later owing to the wide use of prisms in modern ophthalmology.

OBJECTIVES

After studying this unit, you are expected to be able to:

1. Explain the uses of prisms in diagnostic ophthalmology.
2. Describe the uses of prisms in therapeutic ophthalmological procedures.

INDICATIVE CONTENTS

8.1 Diagnostic

- 8.1.1 For the assessment of hetrotropia and heterophoria
- 8.1.2 Prism adaptation test
- 8.1.3 For determination of suppression
- 8.1.4 For determination of Abnormal Retinal Corres Pondence (ARC)
- 8.1.5 For measurement of fusional reserve
- 8.1.6 For dioptre prism test
- 8.1.7 For malingerers

8.2 Therapeutic uses

- 8.2.1 Convergence insufficiency
- 8.2.2 To relieve diplopia
- 8.2.3 Paralytic squints (inoperable)

8.3 Uses of prisms in various ophthalmic instruments

- 8.3.1 Goldmann tonometer
- 8.3.2 Keratometer
- 8.3.3 In microscopes
- 8.3.4 Fiberoptics
- 8.3.5 In Low Vision Devices (LVD)

RECOMMENDED LIST OF READING

PRESCRIBED READING

1. Duke-Elder's Practice of Refraction. Please see the relevant chapters.

2. Harold A. Stein, Bernard J. Slatt,Raymond M. Stein. . The Ophthalmic Assistant, A Guide for Ophthalmic Medical Personnel. Seventh Edition. Please see the relevant chapters.

SUGGESTED READING

1. Theodore P. Grosvenor. Prescribing ophthalmic lenses. Primary Care Optometry. Second edition, see the relevant sections.

2. Borish,s Clinical refraction. Correction with single vision spectacle lenses. 1998, see the relevant chapters.

SELF-EVALUATION

1. What are the uses of prisms in diagnostic Ophthalmology?
2. What are the uses of prisms in Therapeutic Ophthalmological Procedure?

UNIT 9: OPTIONS FOR CORRECTING REFRACTIVE ERRORS

INTRODUCTION

Dear students, this unit will tell you about the different treatment options for the refractive errors that are available now a day.

OBJECTIVES

After studying this unit, you are expected to be able to:

1. Expalin the basic principles of the treatment of refractive errors by spectacles.
2. Describe how contact lenses can be used to treat refractive errors.
3. Identify different types of refractive surgeries.

INDICATIVE CONTENTS

9.1 Spectacles:

- 1.1.1 Far point correction
- 1.1.2 Effect of accommodation
- 1.1.3 Partial VS full correction

1.2 Contact lenses

1.3 Refractive surgery, RK, PRK, LASIK, and laser keratotomy

Preoperative evaluation, Procedures, Complications

RECOMMENDED LIST OF READING

PRESCRIBED READING

1. Duke-Elder's Practice of Refraction. Hypermyopia. Tenth edition, p 50-52.

2. Duke-Elder's Practice of Refraction. Myopia. Tenth edition, p 60-64.

3. Duke-Elder's Practice of Refraction. Astigmatism. Tenth edition, p 68-70.

4. Harold A. Stein, Bernard J. Slatt,Raymond M. Stein. . Refractive errors and how to correct them. The Ophthalmic Assistant, A Guide for Ophthalmic Medical Personnel. Seventh Edition. p 210,211, 222.

SUGGESTED READING

1. Theodore P. Grosvenor. Prescribing ophthalmic lenses. Primary Care Optometry. Management of Refractive anomalies. Second edition, p 331-337.

2. Borish,s Clinical refraction. Contact lenses. 1998.

SELF-EVALUATION QUESTIONS

1. Define basic principle for the treatment of the refractive errors.
2. Name different types of refractive surgeries.