The Worshipful Company of Spectacle Makers

# LEVEL 3 DIPLOMA

# IN

# MANUFACTURING SPECTACLES

## WORK-BASED ASSESSMENT

## JULY 2013

# Level 3 Diploma in Manufacturing Spectacles

*This* Level 3 Diploma in Manufacturing Spectacles qualification is targeted at senior optical technicians or optical manufacturing supervisors who work in optical practice or store, medium or large organisations who manufacture spectacles

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The qualification is designed as a progression step from the Level 2 qualifications in Spectacle Production. It focusses on the assurance of the products and the manufacturing processes rather than the detailed technical knowledge of spectacle manufacture. The syllabus structure and the knowledge requirements are set out unit by unit on the following pages.

This is a general technical qualification at level 3 for optical technicians without speciality in a particular manufacturing field.

## Units

Unit 1 Level 3 Process optical work instructions and provide technical service

Unit 2 Level 3 Set up precision optical manufacturing machinery

Unit 3 Level 3 Fundamental concepts of optical manufacturing

Unit 4 Level 3 The eye and optical correction

Unit 5 Level 2 Spectacle lens production methods

Unit 6 Level 3 Assure the quality of uncut spectacle lenses

Unit 7 Level 3 Assure the quality of spectacles

**Unit 1 Process optical work instructions and provide technical service**

| Title | Process optical work instructions and provide technical service |
|---|---|
| Level | 3 |
| Credit | 5 |

| Learning Outcomes<br><br>*The learner will:* | Assessment Criteria<br><br>*The learner can:* |
|---|---|
| 1. Be able to process orders and information accurately. | 1.1 Explain the significance of elements of a given spectacle order.<br>1.2 Use order information to be able to process an order.<br>1.3 Explain the technical terms used on optical orders.<br>1.4 Identify errors on a given order.<br>1.5 Correct errors on an order. |
| 2. Be able to demonstrate an understanding of the characteristics of lenses, their materials and their alternative forms. | 2.1 Transpose to an alternate sph/cyl for a given prescription.<br>2.2 Identify principal powers of a given prescription.<br>2.3 Identify different types of lenses by inspection. |
| 3. Be able to source the full range of manufacturing parameters and adjustments that are technically possible | 3.1 Select the correct uncut based on an order.<br>3.2 Explain the limitations of a given lens product based on prescription and measurements.<br>3.3 Make recommendations if an uncut is not available for a given order. |
| 4. Demonstrate the importance of record keeping. | 4.1 Source reports and explain their relevance.<br>4.2 Explain, interpret and evaluate report information.<br>4.3 Explain the benefits of good record keeping. |
| 5. Demonstrate the management of quality processes and the application of the relevant quality standards | 5.1 Explain the quality processes in place.<br>5.2 Identify tolerances for a given prescription order using current BSEN ISO standards.<br>5.3 Implement procedures when a given prescription does not meet the required standards. |

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| | 5.4 Show how the management of quality has been applied. |
| 6. Be able to answer technical questions from other staff and customers | 6.1 Liaise with colleagues regarding technical queries.<br>6.2 Communicate with customers regarding technical queries. |
| 7. Demonstrate the processes of stock control for optical products | 7.1 Deal with incoming and outgoing stock.<br>7.2 Record the movement of stock.<br>7.3 Monitor and maintain stock levels.<br>7.4 Explain the benefits of good stock control. |
| 8. Understand the manufacturing and administrative journey of an order. | 8.1 Describe the sequence of processes for manufacturing a given order.<br>8.2 Describe the administrative processes for manufacturing a given order. |

| Additional Information about the unit | | |
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| Unit Aim(s) | To be able to process customer instructions so as to be able complete an order or a job, and to be able to provide technical guidance to customers. | NOS Ref: |

## Unit 2 Set up precision optical manufacturing machinery

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| Title | Set up precision optical manufacturing machinery | |
| Level | 3 | |
| Credit | 3 | |
| Learning Outcomes<br><br>*The learner will:* | Assessment Criteria<br><br>*The learner can:* | |
| 1. Have a practical understanding of optical machinery. | 1.1 Explain the principals of optical machinery.<br>1.2 Explain the operation of optical machinery.<br>1.3 Set-up optical machinery for a full range of products. | |
| 2. Be able to calibrate precision optical manufacturing machinery | 2.1 Explain when to calibrate precision optical machinery.<br>2.2 Calibrate precision optical machinery.<br>2.3 Correct optical machinery with an error message or fault indication. | |
| 3. Have a practical understanding of 'first line' maintenance for optical machinery. | 3.1 Demonstrate completion of a maintenance schedule or services log.<br>3.2 Complete 'first line' maintenance on optical machinery.<br>3.3 Describe the consequences of not carrying out regular maintenance. | |
| Additional Information about the unit | | |
| Unit Aim(s) | To understand the principles of precision optical machinery and to be able to calibrate and maintain the equipment. | NOS Ref: |

## Unit 3

| Title | Fundamental concepts of optical manufacturing |
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| Level | 3 |
| Credit | 9 |

| Learning Outcomes<br><br>*The Learner will:* | Assessment Criteria<br><br>*The learner can:* |
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| 1. Be able to perform arithmetical calculations for optical manufacturing. | 1.1 Perform arithmetical operations using mathematical priorities.<br>1.3 Perform calculations involving reciprocals.<br>1.4 Perform calculations involving squares and square roots. |
| 2. Be able to apply the properties of circles and right-angled triangles to optical manufacturing | 2.1 Describe the properties of a circle using appropriate terminology.<br>2.2 Relate the properties of a circle to applications in optical manufacturing.<br>2.3 Explain the properties of a right-angled triangle.<br>2.4 Explain what is meant by sine, cosine and tangent.<br>2.5 Calculate the parameters of a right-angled triangle.<br>2.6 Relate the properties of right-angled triangles to optical manufacturing. |
| 3. Understand how values for lens properties are obtained using fundamental lens formulae | 3.1 Identify the standard symbols for fundamental lens parameters<br>3.2 Ascribe a value to fundamental formulae in optical manufacturing |
| 4. Be able to use graphs | 4.1 Draw a line graph from a table of data.<br>4.2 Extract graphical data.<br>4.3 Interpret graphical data.<br>4.4 Give examples of graphs used within optical manufacturing. |
| 5. Understand the nature of light and the importance of the electromagnetic spectrum to vision | 5.1 Describe the theories concerning the nature of light.<br>5.2 State how velocity, frequency and wavelength of light are related.<br>5.3 Perform calculations involving velocity, frequency and wavelength of light.<br>5.4 Explain what is meant by the 'Electromagnetic Spectrum'.<br>5.5 Describe the classification of wavelength ranges.<br>5.6 Describe the dispersion of light, using appropriate illustrations. |

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| 6. Understand the behaviour of light when incident on a plane surface | 6.1 Describe the properties of the reflection (image) of an object in a mirror.<br>6.2 Describe how reflection occurs at plane surfaces, using appropriate illustrations.<br>6.3 Describe refraction at a plane surface.<br>6.4 Explain what is meant by the refractive index of a material.<br>6.5 Calculate the angle of refraction from given data.<br>6.6 Explain why refractive index is fundamental to spectacle lens production. |
| 7. Understand the effect of a spectacle lens on incident light | 7.1 Describe the relationship between focal length, focal power and radius of curvature.<br>7.2 Calculate focal lengths and focal powers<br>7.3 Identify lens forms. |
| 8. Be able to calculate spectacle lens thickness | 8.1 Explain why knowledge of lens thickness is important to the optical technician.<br>8.2 Calculate the thicknesses of spherical single vision lenses.<br>8.3 Calculate the thicknesses of sphero-cylindrical lenses |

| Additional Information about the unit | | |
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| Unit Aim(s) | The learner will understand and use the principles upon which the manufacture of spectacle lenses is based | NOS Ref: |

## Unit 4 The eye and optical correction

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| Title | The eye and optical correction | |
| Level | 3 | |
| Credit | 6 | |
| Learning Outcomes<br><br>*The learner will:* | Assessment Criteria<br><br>*The learner can:* | |
| 1 Understand the anatomical structure of the eye | 1.1 Identify the anatomical structures of the eye.<br>1.2 Describe the functions of the non-refracting elements of the eye. | |
| 2 Understand the effect of a lens on light and how it relates to the correction of refractive error | 2.1 Describe the effect of a positive lens on incident light.<br>2.2 Describe the effect of a negative lens on incident light.<br>2.3 Describe the refracting elements of the eye.<br>2.4 Explain the causes of refractive errors in the eye.<br>2.5 Explain the classification of refractive errors in the eye.<br>2.6 Explain how spectacle lens power relates to refractive error.<br>2.7 Explain how a spectacle lens corrects a refractive error. | |
| 3 Know the range of spectacle lens types for vision correction | 3.1 Identify modern single vision lens types.<br>3.2 Identify modern multifocal lens types.<br>3.3 Explain the physical properties of specified lens types.<br>3.4 Explain the optical properties of specified lens types | |
| Additional Information about the unit | | |
| Unit Aim(s) | The learner will understand the structure of the eye and the principles upon which sight-correcting lenses are based. | NOS Ref: |

## Unit 5 – Spectacle Lens Production Methods

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| Title | Spectacle lens production methods |
| Level | 2 |
| Credit | 10 |

| Learning Outcomes<br><br>*The Learner will:* | Assessment Criteria<br><br>*The learner can:* |
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| 1. Understand how lens blanks are prepared | 1.1 Describe the process from raw materials to lens blanks suitable for uncut production.<br>1.2 Classify types of lens blanks.<br>1.3 Describe other uncut production methods. |
| 2. Know the types of production processes for spectacle lens uncuts | 2.1 Describe a range of mass production methods for uncut spectacle lenses.<br>2.2 Describe a range of small-scale/individual production methods for uncut spectacle lenses.<br>2.3 Identify typical production methods for given lens categories. |
| 3. Know the surface form of uncut lenses | 3.1 Define given surface shapes or identify shapes from a given description.<br>3.2 Determine an appropriate method of production for a given surface shape. |
| 4. Understand conventional '3-stage' surfacing | 4.1 Outline the sequence of operations from marking to de-blocking.<br>4.2 Describe pads and laps and their use<br>4.3 Describe how the surface is cut, smoothed and polished.<br>4.4 Explain where faults may occur in the production process, and how they would manifest in the finished uncut.<br>4.5 Explain the advantages and disadvantages of 3-stage surfacing. |
| 5. Understand digital surfacing | 5.1 Explain the terms 'digital surfacing' and 'CNC'.<br>5.2 Describe the essential components of a digital surfacing operation. |

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| | 5.3 Outline the sequence of operations from marking to de-blocking.<br>5.4 Give advantages of digital surfacing compared with 'conventional' surfacing. |
| 6. Understand quality control methods and the use of Standards | 6.1 Explain the importance of quality control.<br>6.2 Describe the procedure for quality inspection of a given uncut type before dispatch.<br>6.3 Compare and contrast quality inspection procedures in given lens production methods.<br>6.4 Explain how and why Standards are used in quality inspection and control. |

| Additional Information about the unit | |
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| Unit Aim(s) | Know the principles of lens production. |

## Unit 6 –Assure the quality of uncut spectacle lenses

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| Title | Assure the quality of uncut spectacle lenses | |
| Level | 3 | |
| Credit | 5 | |
| Learning Outcomes<br><br>*The learner will:* | Assessment Criteria<br><br>*The learner can:* | |
| 1. Understand production processes for uncut spectacle lenses. | 1.1 Describe processes to produce an uncut lens.<br>1.2 Compare and contrast uncut lens production methods. | |
| 2. Understand spectacle lens materials | 2.1 Describe the classification of lens materials.<br>2.2 Outline the properties of lens materials.<br>2.3 Describe how different lens materials are processed to create spectacle lenses. | |
| 3. Assure uncut spectacle lenses. | 3.1 Identify the features of uncut lenses.<br>3.2 Identify the types of surface and material defects.<br>3.3 Explain the problems associated with types of surface and material defects.<br>3.3 Assure uncut spectacle lenses to BS EN ISO standards.<br>3.4 Complete the required quality documentation. | |
| Additional Information about the unit | | |
| Unit Aim(s) | To assure uncut lenses are produced | NOS Ref: |

## Unit 7 Assure the quality of spectacles

| Title | Assure the quality of spectacles |
|---|---|
| Level | 3 |
| Credit | 8 |

| Learning Outcomes<br><br>*The learner will:* | Assessment Criteria<br><br>*The learner can:* |
|---|---|
| 1. Understand the processes for the range of lens treatments for spectacle lenses: | 1.1 Discuss the types of lens treatments.<br>1.2 Explain the purpose of tinting.<br>1.3 Explain the purpose of antireflection coatings.<br>1.4 Explain the purpose of hydrophobic coatings.<br>1.5 Outline the processes of lens tinting and coatings.<br>1.6 Explain the purpose of toughening lens materials<br>1.7 Explain lens toughening processes<br>1.8 Select suitable types of lens materials for specified lens treatments |
| 2. Ensure that frame components prior to glazing meet the required specifications | 2.1 Identify modern frame materials.<br>2.2 Describe the properties of modern frame materials.<br>2.3 State the BS EN ISO terms for frame components.<br>2.4 Demonstrate the measurement of spectacle frames.<br>2.5 Demonstrate the adjustment of spectacle frames to the order specification. |
| 3. Be able to layoff, edge and finish lenses | 3.1 Lay off spectacle lenses for glazing<br>3.2 Set up an automatic edger<br>3.3 Use an automatic edger<br>3.4 Hand edge spectacle lenses |
| 4 Be able to assure specialised spectacles and appliances | 4.1 Explain what is meant by specialised spectacles and appliances.<br>4.2 Describe the types of specialised spectacles and appliances.<br>4.3 Explain how a prescription is incorporated into specialised spectacles and appliances.<br>4.4 Identify BS EN ISO standards for specialised spectacles and appliances. |

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| 5.Be able to visually inspect lenses | 5.1 Identify defects and faults in lens uncuts.<br>5.2 Identify defects and faults in edged lenses.<br>5.3 Ensure the symmetry of lens shapes.<br>5.4 Judge the cosmetic appearance of the spectacles.<br>5.5 Use BS EN ISO standards to aid visual inspection of uncut and edged lenses. |
| 6. Be able to assure assembled spectacles. | 6.1 Explain the properties of lens and frame materials with regard to handling and cleaning.<br>6.2 Ensure that the prescription specifications match the order specification.<br>6.3 Verify that the form and positioning of the lenses match the order specification.<br>6.4 Verify that the all specifications match the order specification.<br>6.5 Use BS EN ISO standards to aid the verification of finished spectacles.<br>6.6 Take appropriate action if the spectacles do not match the order specification.<br>6.7 Demonstrate the use of two focimeter types that use different principles to measure lens power. |
| Additional Information about the unit<br>.<br>This unit includes higher powered lenses (over ± 10.00D and/or prisms over 5.00D).<br>Specialised spectacles and appliances are defined as – safety eye ware and special optical appliances. | |

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| Unit Aim(s) | To be able to assure the quality of glazed spectacles | NOS Ref: |