THE WORSHIPFUL COMPANY OF SPECTACLE MAKERS



LEVEL 4 DIPLOMA

FOR

OPTICAL TECHNICIANS

QUALIFICATION HANDBOOK

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WCSM Level 4 Diploma for Optical Technicians

Qualification Objective

This qualification has been developed for technicians employed in optical manufacturing to develop the skills and knowledge to carry out all functions associated with the job role.

Learners can choose between Surfacing or Glazing pathways.

Throughout this document, the term 'learner' is used to refer to the person seeking to gain the qualification.

Entry requirements

There are no specific entry requirements.

Customer Service Statement

See relevant sections of the Customer Service Statement at:

http://www.spectaclemakers.com/awardsandtraining/customer-service-statement.htm

for details of:

Equal opportunities policy Reasonable adjustments Special considerations Complaints and appeals procedures.

Progression

There are opportunities for the learner to progress to the ABDO Level 6 Diploma in Ophthalmic Dispensing.

Training

Training courses are provided by ABDO College and details can be found on their website@

www.abdocollege.org.uk

Other training providers may offer support for this qualification.

Learner registration

To register for the qualification contact info@abdocollege.org.uk

Tel: 01227 738829 option 1 to obtain details of scheduled training and examination dates

Assessment

To obtain the diploma, learners must pass each of four interrelated examinations; written papers for both Parts I & II, a practical project (Part II) and a practical examination (Part II).

Part I Examination at the end of year one

- Three-hour written paper on Units 1 and 2 (Split clearly between the units)
- Two and half hour written paper on Unit 3

Part II Examination at the end of year two

- Three-hour written paper on Units 4, 5 and 6 (Split clearly between the units)
- Three-hour written paper on Units 7, 10 and 11 (Split clearly between the units)
- Practical examination on Units 8 or 9 depending on the learner's chosen pathway made up of:

<u>Practical Project</u> – each learner will be assigned tasks, in the form of a project, to be completed by arrangement with the examiners.

(a) Unit 8 - Glazing or

(b) Unit 9 - Surfacing

Each task will be timed and supervised. Records of timing, etc. and completed tasks are to be submitted to the examiners.

Viva and Practical Examination to include

- (a) A viva examination (2 x 20 minutes) on
 - (i) Workshop practices and problem solving
- (b) A practical examination (60 minutes) on
 - (i) The measurement of frames
 - (ii) The description of frames
 - (iii) Repairs and setting up

(c) A practical examination (90 minutes) on the verification of completed spectacles, the use of the focimeter, recording lens power and laying off of lenses for glazing

The pass mark for each unit is 50%. If a candidate fails any unit, the unit can be retaken on its own, at specified times within five years.

Grading

Successful learners will be awarded a Pass for each unit. A pass in units is required to achieve the qualification. There are no grades.

Should all units not be achieved learners will be awarded credit certificates for the units passed.

Personal Learner Record and Unique Learner Number

The Personal Learner Record (PLR) logs achievement of units and qualifications provided that the learner has received a Unique Learner Number (ULN). The ULN enables learners to have access to their PLR and for them to give access to training providers and/or employers to enable them to view their records as evidence of achievement.

When a learner registers for a qualification with WCSM they will be asked to provide their ULN. Where learners do not possess a ULN we can assist them in obtaining one if they wish their subsequent achievements to be entered on to the PLR.

Level 4 Diploma for Optical Technicians

Structure

Learners must gain 98 credits by achieving all mandatory units and either of the pathway units.

Unit title	Level	Credit
Mandatory unit's year 1		
Mathematics for optical manufacturing	3	7
The eye and the principles of optics	3	9
The properties of ophthalmic lenses	4	12
Mandatory unit's year 2		
The theory of lens surfacing	4	10
The properties of ophthalmic lenses	5	12
Spectacle lens materials	4	9
The properties of spectacle frames and glazing	4	12
Spectacle lens treatments	4	10
The spectacle industry and standards	3	5
Pathway for surfacing		
Optical workshop tasks and surfacing spectacle lenses	5	12
Pathway for glazing		
Optical workshop tasks and glazing spectacle frames	5	12

Title	Mathematics for optical manufacturing		
Level	3		
Credit	7		
Learning Outcomes		Assessment Criteria	
The learner will:		The learner can:	
1. Understand how to arithmetical calculation	•	1.1 Perform arithmetical opera	ations
2. Know how to use a to solve mathematica manufacturing.	l problems in optical	 2.1 Perform arithmetical operative sequence using mathematical 2.2 Store stages of a calculation calculator memory 2.3 Change the sign of a number of a number	priorities on in the ber or function ving indices ines and ages. decimal form nds
3. Understand the principles of geometry		 3.1 Describe the properties of appropriate terminology 3.2 Calculate the parameters of 3.3 State the rationale for trial congruency 3.4 Define the parameters of t 3.5 Calculate the parameters of t 	of a circle ngle similarity or riangles
4. Know how to apply the principles of geometry		 4.1 Calculate or state with just in a plane figure 4.2 Calculate the volumes of three - dimensional geometric 	tification angles
5. Be able to extract information from line and bar graphs		5.1 Draw a line graph from a t 5.2 Draw a bar graph from a t 5.3 Extract graphical data 5.4 Interpret graphical data	table of data
6.Solve problems involving algebraic expressions		6.1 Solve linear equations6.2 Ascribe a value to algebraid using algebraic substitution	ic expressions
Additional Information Unit Aim(s)	In this unit the learn	ner will be able to understand ematical principles used in the	NOS Ref:

Title	The eye and the principles of optics	
Level	3	
Credit	9	
Learning Outcomes		Assessment Criteria
The learner will:		The learner can:
1. Understand the ana		1.1 Identify the anatomical structures of the
the eye and how it related errors	ates to refractive	eye 1.2 Describe the functions of the anatomical structures of the eye. 1.3 Describe refractive errors in the eye 1.4 Describe the correction of refractive errors in the eye 1.5 Illustrate the correction of refractive errors in the eye.
2. Understand the nation importance of the electron spectrum to vision	-	 2.1 Describe the theories concerning the nature of light. 2.2 State how velocity, frequency and wavelength of light are related 2.3 Perform calculations involving velocity, frequency and wavelength of light. 2.4 Explain what is meant by the 'Electromagnetic Spectrum'. 2.5 Describe the classification of wavelength ranges. 2.6 Describe the dispersion of light, using appropriate illustrations 2.7 Explain the formulae that demonstrates the behaviour of light when dispersed 2.8 Perform calculations concerning the behaviour of light when dispersed
3. Understand the refle incident at plane and o	-	 3.1 State the laws of reflection 3.2 Describe reflection at plane surfaces, using appropriate illustrations 3.3 Use formulae to demonstrate the behaviour of light when reflected at plane surfaces 3.4 Perform calculations concerning reflected light at plane surfaces. 3.5 Describe reflection at curved surfaces, using appropriate illustrations 3.6 Use formulae to demonstrate the

		behaviour of light when reflect surfaces 3.7 Perform calculations conce light at curved surfaces.	
4. Understand the refr when incident at plane surfaces	-	 4.1 State the laws of refraction 4.2 Define refractive index 4.3 Describe refraction at planusing appropriate illustrations 4.4 Use formulae to demonstribehaviour of light when refracts 4.5 Perform calculations concollight at plane surfaces. 4.6 Describe refraction at curvusing appropriate illustrations 4.7 Use formulae to demonstribehaviour of light when refracts 4.8 Perform calculations concollight at curved surfaces. 	ne surfaces, rate the cted at plane erning refracted ved surfaces, rate the cted at curved
Additional Information	about the unit		
Unit Aim(s)	In this unit the learner will understand the structure of the eye and the principles upon which sight-correcting lenses are based		NOS Ref:

Title	The properties of ophthalmic lenses	
Level	4	
Credit	12	
Learning Outcomes	1	Assessment Criteria
The learner will:		The learner can:
1. Understand spheric	al lenses	 1.1 Describe the properties of spherical lens surfaces 1.2 Perform calculations concerning spherical lens surfaces 1.3 Analyse the characteristics of spherical lenses, using the appropriate sign convention, illustrations and formulae. 1.4 Perform calculations concerning the characteristics of spherical lenses
2. Understand astigma	atic lenses	 2.1 Describe the properties of astigmatic lens surfaces 2.2 Perform calculations concerning astigmatic lens surfaces 2.3 Describe characteristics of astigmatic lenses, using the appropriate sign convention, illustrations and formulae. 2.4 Perform calculations concerning the characteristics of astigmatic lenses
3. Understand prisms lenses	in single vision	 3.1 Define an ophthalmic prism 3.2 Define the terms relating to ophthalmic prisms. 3.3 Analyse the properties of ophthalmic prisms, using illustrations and formulae 3.4 Perform calculations concerning ophthalmic prisms.
4. Understand prismat vision lenses	ic effects in single	 4.1 Analyse the relationship between decentration and prismatic effect in spherical single vision lenses, using illustrations, formulae 4.2 Perform calculations concerning prismatic effects in spherical single vision lenses. 4.3 Analyse the relationship between decentration and prismatic effect in toric single vision lenses, using illustrations, formulae. 4.4 Perform calculations concerning prismatic

		effects in astigmatic single vis	ion lenses.
5. Understand lens thi	ckness	 5.1 Calculate the thicknesses lenses. 5.2 Calculate the thicknesses 5.3 Explain the principles of h instruments used to measure 5.4 Explain the principles of h instruments used to measure 	of plano-prisms andheld lens power. andheld
Additional Information	about the unit		
Unit Aim(s)	The learner will understand the properties of spherical, astigmatic lenses and prisms and prismatic effects.		NOS Ref:

Title	The Theory of Lens Surfacing		
Level	4		
Credit	10		
Learning Outcomes	1	Assessment Criteria	
<i>The learner will:</i> 1. Understand the pringeneration	ciples of surface	<i>The learner can:</i> 1.1 Describe the principles of generation of spherical surface 1.2 Describe the principles of generation of toroidal surface 1.3 List the sequence of proce the finished lens. 1.4 Describe the importance of	the surface s esses leading to of each step in
2. Know how prescript progressed through a process.	lens production	the processes of surface gene 2.1 Describe the progression through a lens production pro 2.2 Describe the inputs (proce requirements before the start manufacturing process 2.3 Describe the outputs (pro requirements at the end) of the manufacturing process	of a lens order ocess. ess) of the lens cess he lens
3. Know the standards used to surface ophthalmic lenses.		 3.1 Describe the finishing of surfaced lenses. 3.2 Describe the verification of surfaced lenses, using calculations and illustrations where relevant. 3.3 Describe the quality inspection procedures used to verify surfaced lenses. 3.4 Describe the types of faults in surface generation 3.5 Analyse how to correct faults in surface generation 	
	ditional Information about the unit		
Unit Aim(s)	In this unit the learner will gain an understanding of the surface generation of spherical and toric lenses and the processes and standards involved.		NOS Ref:

Title	The properties of ophthalmic lenses	
Level	5	
Credit	12	
Learning Outcomes		Assessment Criteria
The learner will:		The learner can:
1. Understand the imp distance in the comput power		 1.1 Define vertex distance 1.2 Explain the relevance of 'vertex power' to the 'far point'. 1.3 Explain, with illustrations, the relationship between focal power and vertex distance. 1.4 Perform calculations involving focal length and vertex distance 1.5 Explain how vertex distance impacts the computation of spectacle lenses
2. Understand the relationship of vertex power to lens thickness		2.1 Explain what is meant by 'vertex power allowance'.2.2. Explain what is meant by 'accurate transposition'.2.3 Explain the influence of lens thickness upon power
3. Know the optical and physical properties of single vision and complex lenses.		3.1 Compare and contrast the physical properties of single vision lenses, using illustrations where relevant.3.2 Compare and contrast the optical properties of complex lenses, using illustrations where relevant.
4. Know the optical and physical properties of multifocal lenses.		 4.1 Explain the terms relating to multifocal lenses. 4.2 Describe multifocal lens designs. 4.3 Compare and contrast the manufacturing processes of multifocals. 4.4 Compare and contrast the optical and physical performance of multifocal lenses. 4.5 Calculate prismatic effects in the reading portion of bifocals and trifocals 4.6 Describe prism controlled bifocals, using calculations and illustrations where appropriate.
5. Demonstrate the rel between prismatic effe decentration.	•	5.1 Calculate prismatic effect at a point on a single vision, bifocal or trifocal lens.5.2 Find decentration to produce prism.

6. Perform thickness a calculations from given specifications.	-	6.1 Calculate the thicknessspectacle lens from a given6.2 Perform the calculationsstage of spectacle lens man	specification. s required at any
7. Understand the prindesign.	iciples of lens	 7.1 Use the history and deprogressive power lens (Pdescription of current PPL 7.2 Describe the aberration the image formed by a spector of the implications lens design. 7.4 Explain the importance on lens design 7.5 Explain the importance rotation of the eye' on lens 7.6 Explain the use of asphrosurfaces on lens design 7.7 Explain the purpose of oprescription 	PL) to inform a designs. s which can affect ctacle lens s of aberrations for of 'far point sphere' of 'centre of design erical and atoroidal
Additional Information	about the unit		
Unit Aim(s)	essential design p	arner will understand the rinciples of spectacle lenses ate to processes used in nufacture.	NOS Ref:

Title	Spectacle lens materials		
Level	4		
Credit	9		
Learning Outcomes		Assessment Criteria	
The learner will:		The learner can:	
1. Know the range of s materials	spectacle lens	1.1 List the materials that are of for manufacturing spectacle length of the second se	-
2. Know the properties materials	s of spectacle lens	2.1 Describe the physical propersion of the physical propersion of the spectacle lens materials2.2 Describe the optical properspectacle lens materials	
3. Understand the rele lens materials in spect		 3.1 Compare and contrast the spectacle lens materials for a sprescription. 3.2 Analyse the practical consecusing different materials for a sprescription. 3.3 Analyse the optical implications spectacle wearer of using materials for a given prescription. 3.4 Analyse the mechanical implications and the spectacle wearer of using rescription. 	equences of spectacle tions to the erials with spectacle plications to materials with
Additional Information	about the unit		
Unit Aim(s)	To understand the properties of spectacle lens materials and what makes them suitable for manufacture and the wearer.NOS Ref:		NOS Ref:

Title	The Properties of Spe	The Properties of Spectacle Frames and Glazing	
Level	4	4	
Credit	12		
Learning Outcor	nes	Assessment Criteria	
The learner will.	,	The learner can:	
1. Understand the spectacle frames	5 T	 1.1 Describe the construction of spectacle frames using annotated illustrations. 1.2 Define the terms used to classify frame types. 1.3 Describe the applications of the different types of spectacle frames including the appropriateness in special situations. 	
2. Be able to me		 2.1 Define frame component measurements using annotated illustrations where appropriate. 2.2 Describe the taking of measurements of spectacle frame designs. 2.3 Analyse the importance of accurate measurements 2.4 Describe how the lens shape influences frame design 	
3. Understand th frame materials		 3.1 List metal frame materials 3.2 Describe the properties of metal frame materials 3.3 List non-metal frame materials 3.4 Describe the properties of non-metal frame materials 	
4. Understand the limitations of spectacle frame materials		 4.1 Describe the limitations of metal frame materials 4.2 Describe the limitations of non-metal frame materials 4.3 Specify the precautions when manipulating and glazing spectacle frames. 4.4 Evaluate frame materials for use in specialised appliances 4.5 Describe the polishing processes for non metal spectacle frames 4.6 Analyse the options for repairing metal frames 4.7 Analyse the options for repairing non-metal frames 	

5. Understand the tech	niques of glazing	 5.1 Describe the glazing meth frames. 5.2 Describe the glazing meth metal frames. 5.3 Describe the glazing meth frames. 5.4 Describe the glazing meth ophthalmic appliances. 	nods for non- nods for rimless
6. Understand spectacle frame manufacture		 6.1 Describe the manufacturing process of metal spectacle frames 6.2 Describe the manufacturing process of non-metal spectacle frames 6.3 Analyse the advantages and disadvantages of the frame material to the manufacturing process. 6.4 Describe the importance of CE marking of frames 	
7. Understand the types and applications of optical appliances		 7.1 Describe the construction of optical appliances using annotated illustrations. 7.2 Define the terms used to classify optical appliances. 7.3 Describe the applications of the different types of optical appliances including the appropriateness in special situations. 	
Additional Information	about the unit	I	
Unit Aim(s)	properties, applicati	ner will understand the ions and the process of the ctacle frames and the glazing e to the technician.	NOS Ref:

Title	Optical workshop tasks and glazing spectacle frames		
Level	5		
Credit	12		
Learning Outcomes	I	Assessment Criteria	
The learner will:		The learner can:	
1. Be able to adjust spectacle frames.		1.1 Identify the material(s) from which a given spectacle frame is made.1.2 Measure existing parameters of a spectacle frame1.3 Adjust a spectacle frame to a given specification	
2. Be able to perform work on a spectacle frame		2.1 Carry out a specified repair to a spectacle frame to a given specification2.2 Carry out a specified amendment to a spectacle frame	
3. Be able to edge and glaze a pair of lenses into a spectacle frame		 3.1 Lay off lenses for glazing to a given specification 3.2 Prepare glazing machinery to edge lenses 3.3 Edge the lenses using glazing machinery 3.4 Hand edge the lenses to fit the spectacle frame 3.5 Set up finished spectacles ready for verification and dispatch 3.6 Inspect the finished spectacles 3.7 Provide a report on the finished spectacles 3.8 Lay off a pair of non-standard lenses for glazing 	
4. Will be able to verify spectacles against a written order, referring to British and European Standards.		 4.1 Use ophthalmic instruments to verify the ordered parameters of finished spectacles against the specifications. 4.2 Compare frame specifications with the measured frame parameters to ensure within British and European Standard tolerances 4.3 Take appropriate action if the frame is outside British and European tolerances. 4.4 Compare lens specifications with the measured lens parameters to ensure within British and European Standard tolerances. 4.5 Take appropriate action if the lenses are outside British and European tolerances. 	

5. Know how to replica spectacles.	ate complex	 5.1 Write out the prescription lenses 5.2 Identify the form of any g lens 5.3 Identify the type of any g lens 5.4 Measure the parameters of complex lens 5.5 Identify the type of any g frame. 5.6 Identify the specifications spectacle frame. 5.7 Identify (type and manufa given progressive power lens 5.8 Restore the markings of a progressive power lens. 	iven complex iven complex of any given iven spectacle of any given acturer) of any
Additional Information	about the unit		
Unit Aim(s)	In this unit the learner will be able to complete a full range of tasks in an optical workshop, and perform non-routine glazing.		NOS Ref:

Title	Optical workshop tasks and surfacing spectacle lenses		
Level	5		
Credit	12		
Learning Outcomes		Assessment Criteria	
<i>The learner will:</i> 1. Be able to adjust spectacle frames.		<i>The learner can:</i> 1.1 Identify the material(s) from which a given spectacle frame is made. 1.2 Measure existing parameters of a spectacle frame 1.3 Adjust a spectacle frame to a given specification	
2. Be able to perform work on a spectacle frame		2.1 Carry out a specified repair to a spectacle frame to a given specification2.2 Carry out a specified amendment to a spectacle frame	
3. Be able to lay-off (n lens for glazing	nark-up) a complex	3.1 Lay off complex lenses for glazing	
4. Be able to surface a complex spectacle lens		 4.1 Select and mark up a semi-finished blank appropriate to specified spectacle prescription 4.2 Mount selected blank ('block') for surfacing 4.3 Develop surfacing instructions from calculations. 4.4 Prepare surfacing machinery 4.5 Manufacture the lens to given tolerances. 4.6 Inspect the surfaced lens for faults 4.7 Provide an inspection report 	
5. Be able to verify spectacles against a written order, referring to British and European Standards.		 5.1 Use ophthalmic instruments to verify the ordered parameters of finished spectacles against the specifications. 5.2 Compare frame specifications with the measured frame parameters to ensure within British and European Standard tolerances 5.3 Take appropriate action if the frame is outside British and European tolerances. 5.4 Compare lens specifications with the measured lens parameters to ensure within British and European Standard tolerances. 	

		outside British and European	tolerances.
6. Be able to replicate spectacles.	complex	 6.1 Write out the prescription lenses 6.2 Identify the form of any g lens 6.3 Identify the type of any g lens 6.4 Measure the parameters of complex lens 6.5 Identify the type of any g frame. 6.6 Identify the specifications spectacle frame. 6.7 Identify (type and manufa given progressive power lens 6.8 Restore the markings of a progressive power lens. 	iven complex iven complex of any given iven spectacle of any given acturer) of any
Additional Information about the unit			
Unit Aim(s)	In this unit the learner will be able to complete a full range of tasks in an optical workshop, and perform non-routine surfacing.		NOS Ref:

Title	Spectacle Lens Treatments		
Level	4		
Credit	10		
Learning Outcomes		Assessment Criteria	
<i>The learner will:</i> 1. Know the reasons for coating a spectacle lens		<i>The learner can:</i> 1.1 List the coatings which might be found on a spectacle lens 1.2 Explain the reason(s) a lens might	
		require a coating. 1.3 Analyse the uses of different lens coatings	
2. Understand reflectance and its consequences for the spectacle wearer.		2.1 Define reflectance2.2 Describe the relationship between reflectance and refractive index2.3 Use calculations to show how refractive index impacts reflectance.	
3. Understand the principles, action and manufacture of lens coatings.		 3.1 Explain the principles of single anti- reflection coatings. 3.2 Explain the purpose of multi-layer anti- reflection coatings. 3.3 Detail the composition of each layer of a stacked coating 3.4 Detail the function of each layer of a stacked coating 3.5 Describe the lens coating process 3.6 Describe the manufacturing conditions required in the lens coating process. 	
4. Understand the principles, action and manufacture of tinted lenses and filters.		 4.1 Define luminous transmittance. 4.2 Describe the types of spectacle tints and filters, 4.3 Describe the classification of reflective or absorptive filters. 4.4 Explain the principles of tinted lenses and filters 4.5 Use calculations to demonstrate the effect of tinted lenses and filters 4.6 Outline the ISO standards for tinted lenses. 4.7 Describe the manufacture of tinted spectacle lenses and filters. 	

Additional Information about the unit			
Unit Aim(s)	In this unit the learner will gain an understanding of the theory, advantages and practical application of spectacle coating and tinting and ISO Standards.	NOS Ref:	

Title	The spectacle industry and standards		
Level	3		
Credit	5		
Learning Outcomes		Assessment Criteria	
<i>The learner will:</i> 1. Understand the structure of the ophthalmic profession.		<i>The learner can:</i> 1.1 Outline the roles of clinical ophthalmic professionals. 1.2 Outline the qualification pathways for ophthalmic professionals 1.3 Outline the roles of personnel within ophthalmic manufacturing.	
2. Understand the types and structures of ophthalmic manufacturing organisations and the key elements and processes for success.		 2.1 Classify the range of optical manufacturing organisations 2.2 Describe the key inputs of a manufacturing process 2.3 Describe the key outputs of a manufacturing process 2.4 Construct a generic flowchart of the progress of orders through a spectacle manufacturing process. 	
3. Know the agencies, British and European Standards which influence and regulate the ophthalmic profession and industry		 3.1 Describe the regulatory bodies within optics. 3.2 Describe the trade associations within optics. 3.3 Describe the professional associations within optics. 3.4 Describe the Standards to which optical manufacturing must adhere. 	
4. Be able to demonstrate knowledge of British and European standards relating to spectacle prescriptions and manufacture.		 4.1 Interpret a spectacle prescription written in British Standard notation. 4.2 Quote Standard numbers which govern key procedures and products in spectacle lens manufacturing 4.3 Explain the significance of the standards that govern the key procedures and products in spectacle lens manufacturing 	
5. Understand the importance of protective eyewear.		5.1 Describe the ISO standards relating to protective eyewear5.2 Explain the situations when protective eyewear is required	

		5.3 Describe the types of prot	ective eyewear
Additional Information	about the unit		
Unit Aim(s)	and profession, the	UK optical industry, standards organizations involved and work to produce high K consumer	NOS Ref: