

Brief Table of Contents

Preface.....	vii
Introduction.....	viii
General Course Information.....	x
Acknowledgements.....	xii
Chapter One: The Nature of Glass.....	1
Chapter Two: Tools of the Glassblower.....	11
Chapter Three: Basic Operations.....	25
Chapter Four: Flameworking with Solid Rod...	42
Chapter Five: Lace Techniques.....	90
Chapter Six: Glass Tubing-Artistic.....	116
Chapter Seven: Scientific Glassblowing.....	138
Appendices.....	193
Index.....	225
About The Author.....	229

Table of Contents

Preface.....	vii
Introduction.....	viii
General Course Information.....	x
Acknowledgements.....	xii
Chapter One: The Nature of Glass.....	1
Brief History.....	1
Composition and Properties of Glass.....	3
Purchase and Storage of Glass.....	6
Colored Glass.....	7
Types of Glassblowing.....	8
Chapter Two: Tools of the Glassblower.....	11
The Glass Laboratory.....	11
Glassworking Torches.....	12
Glassblowing Goggles.....	15
Small Tools & Glassworking Items.....	16
Special Larger Equipment.....	21
Chapter Three: Basic Operations.....	25
Operation of The Hand Torch.....	25
Exercise No. 1	
Using The Hand Torch.....	25
Cutting Glass Rod and Tubing.....	26
Exercise No. 2	
Cutting.....	32
Fire Polishing.....	32
Rotation Techniques.....	33
Exercise No. 3	
Fire Polishing and Rotation.....	33

Annealing	34
Removing Excess Glass.....	37
Cleaning Glass.....	37
Identification of Borosilicate Glasses.....	39
Chapter Four: Flameworking with Solid Rod.....	42
Surface Tension and Gravity.....	42
Rotation and Slope of Glass.....	42
Exercise No. 4	
Surface Tension, Gravity, Rotation, and Slope....	43
Marias.....	44
Exercise No. 5	
Construction of End Marias.....	45
Exercise No. 6	
Construction of Intermediate Marias.....	46
Flame Cuts, Constrictions, and Drawing Out.....	47
Exercise No. 7	
Flame Cutting.....	47
Exercise No. 8	
Constrictions and Pulling a Point.....	49
Exercise No. 9	
Drawing Out Rods and Making Scroll Shapes....	50
Exercise No. 10	
Thickening A Rod.....	52
Use of Tools for Shaping.....	53
Joining Glass Rod.....	54
Exercise No. 11	
Joining Glass Rod by the Spot Welding Method..	55
Exercise No. 12	
Joining Glass Rod by the In-Flame Method.....	56
Joining Different Diameter Rods.....	56
Exercise No. 13	
Joining Different Diameter Rods.....	57
Project Art-1	
Construction of a Simple Flower.....	58
Project Art-2	
Small Decorative Birds.....	62
Project Art-3	
Dogs.....	66

Project Art-4	
Cats.....	71
Project Art-5	
Panthers.....	73
Project Art-6	
Decorative Hand Pumps.....	74
Project Art-7	
Snowflake Christmas Ornaments.....	80
Project Art-8	
Glass Icicle Christmas Ornaments.....	83
Project Art-9	
Decorative Tree Branches for Planters.....	85
More Ideas for Items Made Entirely From Rod.....	88
Chapter Five: Lace Techniques.....	90
Exercise No. 14	
The Circular Running Stitch (Circular Bases).....	91
Project Art-10	
Hand Pump with Lace Base.....	94
Project Art-11	
Lace Teapot.....	95
Project Art-12	
Bird in a Bird Cage.....	98
Project Art-13	
Bird with Lace Body.....	101
Project Art-14	
Angel Ornaments.....	103
Project Art-15	
Lace Bells.....	107
Project Art-16	
Lace Christmas Tree.....	110
More Ideas for Lace Items.....	112
Chapter Six: Glass Tubing- Artistic.....	116
An Introduction to Tubing.....	116
Points.....	117
Exercise No. 15	
Pulling Points.....	117
Blowing Glass Shapes.....	120

Exercise No. 16	
Blowing Your First Bulbs from Tubing.....	121
Exercise No. 17	
Blowing Bulbs from Points.....	122
Exercise No. 18	
Blowing Spherical Bulbs from a One-Sided	
Point.....	123
Sealing Rod to Blown Glass.....	124
Exercise No. 19	
Sealing Rod to Blown Glass.....	125
Blowing Rod into Hollow Forms.....	125
Exercise No. 20	
Blowing Rod into a Hollow Form.....	125
Project Art-17	
Blown Glass Mouse.....	127
Project Art-18	
Blown Glass Vase.....	130
Project Art-19	
Swan Barometers.....	133
Additional Examples That Involve Blowing.....	137

Chapter Seven: Scientific Glassblowing.....138

Techniques and Principles.....	138
Making Straight Seals (Butt Joints).....	141
Exercise No. 21	
Butt Joints (Spot Welding).....	142
Exercise No. 22	
Butt Joints (Hot Seal Technique).....	143
Constrictions.....	144
Exercise No. 23	
Constrictions.....	144
Exercise No. 24	
Constrictions (Heavy Wall).....	145
Round Bottom (Test Tube) Ends.....	146
Exercise No. 25	
Forming Round Bottom Ends.....	146
Joining Tubing of Different Diameters.....	148
Exercise No. 26	
Making Seals between Tubing of Different	

Diameters.....	149
T-Seals.....	151
Exercise No. 27	
T-Seals (Tubing-In-Hands Method).....	151
Exercise No. 28	
T-Seals (Torch-In-Hand Method).....	153
T-Seals Involving Large Diameter Tubing.....	155
Repairing Cracks and Holes.....	155
Flares.....	156
Exercise No. 29	
Flares (In-Hand Technique).....	158
Forming Rims on Tubing Ends.....	158
Through-Seals (Ring and Insertion Seals).....	159
Exercise No. 30	
Through-Seals (Ring Seal Method).....	159
Exercise No. 31	
Through-Seals (Insertion Method).....	162
Inside Seals.....	163
Exercise No. 32	
Inside Seals.....	164
Bending Glass Tubing.....	165
Exercise No. 33	
Bending Glass Tubing Using the Fisher	
Burner.....	166
Side Seals.....	167
Exercise No. 34	
Side Seals.....	168
Closed Circuit Seals.....	170
Exercise No. 35	
Closed Circuit Seals.....	170
Forming Hose Connector Tubes.....	172
Exercise No. 36	
Hose Connector Tubes.....	172
Flame Cuts and Blown Out Ends.....	174
Exercise No. 37	
Flame Cutting of Tubing.....	174
Flat Bottom Ends.....	174
Exercise No. 38	
Flat Bottom Ends.....	175
Blowing Small Bulbs from Tubing.....	175

Exercise No. 39	
Blowing a Small Bulb.....	176
Joining different Types of Glasses.....	177
Project Sci-1	
Simple Vacuum Trap.....	178
Project Sci-2	
Gas Bubbler Tube.....	180
Project Sci-3	
Simple Liebig Condenser.....	182
Project Sci-4	
Simple Liebig Condenser (Alternate Approach).....	184
Exercise No. 40	
Analysis of Complex Scientific Glassware.....	187
Exercise No. 41	
Analysis of Complex Scientific Glassware	
(Part 2).....	188
Project Sci-5	
Design, Analysis, and Construction of	
Scientific Glassware.....	189
Repair of Scientific Glassware.....	191
Exercise No. 42	
Analysis of Scientific Glassware.....	192
Exercise No. 43	
Repair of Scientific Glassware.....	192

Appendicies

Appendix A	
Safety Precautions.....	193
Appendix B	
Glossary of Terms.....	196
Appendix C	
Standard Joints.....	201
Appendix D	
Stopcocks.....	204
Appendix E	
Scientific Glassware.....	206
Appendix F	
Glassblowing References.....	213
Appendix G	

List of Suppliers.....	216
Appendix H	
Notes to Instructors.....	219
Index.....	225
About The Author.....	229