
CONTENTS

Acknowledgements *iii*

Introduction **1**

- Background *1*
- Goals for Canadian Science Education *1*
- Vision for Scientific Literacy *2*
- Beliefs about Learning, Teaching, and Assessing Science *3*
- Conceptual Learning in Science *4*
- Integrating the Sciences *5*
- Instructional Design: Promoting Changing Emphases *6*

Section 1: Manitoba Foundations for Scientific Literacy **1**

- The Five Foundations *3*
- Nature of Science and Technology *4*
- Science, Technology, Society, and the Environment (STSE) *6*
- Scientific and Technological Skills and Attitudes *9*
- Essential Science Knowledge *12*
- Unifying Concepts *13*
- Senior 3 Current Topics in the Sciences *13*

Section 2: Implementation of Senior 3 Current Topics in the Sciences **1**

- The Senior 3 Student and the Science Learning Environment *3*
 - Characteristics of Senior 3 Learners *3*
 - Fostering a Will to Learn *6*
 - Creating a Stimulating Learning Environment *9*
 - Language Learning Connected to Science *9*
- The Nature of Science, Scientific Theories, and Science Education Today *11*
 - Ethical Issues and the Nature of Scientific Theories *11*
- Instructional Philosophy in Science *12*
 - Result-Based Learning *13*
 - Varied Instructional Approaches *13*
 - Linking Instructional Approaches with Specific Instructional Strategies *16*
 - Phases of Learning *18*
 - Differentiating Instruction *19*
 - Promoting Strategic Learning *20*
 - Learning Resources *21*
- Implementing the Curriculum *22*
 - Unit Development *22*
 - Choosing a Current Topic *22*

Section 3: Assessment in Senior 3 Current Topics in the Sciences 1

Classroom Assessment	3
Planning for Assessment	3
Characteristics of Effective Assessment	4
Managing Classroom Assessment	9
Changing Emphases in Assessment	10
Types of Assessment	11
Assessment Strategies	11

Section 4: Document Organization 1

Document Organization and Format	3
Guide to Reading the Specific Learning Outcomes and the Document Format	3

Senior 3 Current Topics in the Sciences: Suggestions for Instruction and Assessment 1

Linking General and Specific Learning Outcomes to Suggestions for Instruction and Assessment	3
General and Specific Learning Outcomes for Senior 3 Current Topics in the Sciences	4
General Learning Outcome A: Nature of Science and Technology	5
General Learning Outcome B: Science, Technology, Society, and the Environment (STSE)	15
General Learning Outcome C: Scientific and Technological Skills and Attitudes	25
General Learning Outcome D: Essential Concepts	59

Appendices 1

Contents	3
Appendix 1: Unit Development in Senior 3 Current Topics in the Sciences	7
Appendix 2: Activating Prior Knowledge	19
Appendix 3: Vocabulary Building	23
Appendix 4: Research	25
Appendix 5: Analysis	31
Appendix 6: Scientific Communication	33
Appendix 7: Assessment	41
Appendix 8: Developing Assessment Rubrics in Science	47
Appendix 9: Assessment Rubrics	53

Forensic Sciences: A Crime Scene Investigation Unit for Senior 3 Current Topics in the Sciences	1
Contents	3
Introduction	5
Rationale	5
Integrating the Sciences	6
Planning the Forensic Sciences Unit	7
Linking to Specific Learning Outcomes (SLOs)	11
Establishing a Crime Scene	16
Instructional Overview	19
Assessment	21
Crime Scene Kit	22
Crime Lab Equipment	22
Essential Understanding 1: Blood Analysis	23
Activity 1a: Blood Typing Analysis	25
Activity 1b: Blood Spatter Analysis	29
Essential Understanding 2: Forensic Anthropology—Bone Analysis	33
Activity 2a: Height Analysis	35
Activity 2b: Searching for the Romanovs	39
Essential Understanding 3: Chromatography	45
Activity 3: The Colour of Guilt—Chromatography	47
Essential Understanding 4: Decomposition	53
Activity 4a: Forensic Entomology Research Assignment	55
Activity 4b: A Bug’s Tale	59
Essential Understanding 5: DNA Profiling	65
Activity 5a: Extracting DNA from Onion Cells	69
Activity 5b: DNA Fingerprinting—Bar Code Simulation	73
Activity 5c: DNA Fingerprinting—Electrophoresis	79
Essential Understanding 6: Fingerprinting (Dactyloscopy)	83
Activity 6: Fingerprinting	85
Essential Understanding 7: Physical Evidence—Fibre, Stain, and Hair Analysis	89
Activity 7a: Fibre and Stain Analysis	91
Activity 7b: Hair Analysis	95
Essential Understanding 8: Handwriting Analysis	99
Activity 8: The Science of Handwriting Analysis?	101

Essential Understanding 9: Chemical Detection	105
Activity 9: Chemical Detection	107
Essential Understanding 10: Soil Analysis	113
Activity 10: The Dirty Truth	115
Essential Understanding 11: Urine Analysis	121
Activity 11: Urine Analysis	123
Essential Understanding 12: Enrichment and Extensions—Further Analyses	131
Final Forensic Sciences Performance Task: Sample Crime Scene	133
Student Self-Reflection on the Forensic Sciences Unit	140
Resources	141
Print Resources	141
Online Resources	142
Bibliography	1