

Table of contents

Figure Acknowledgements xi

1 Essential Mathematics and Physics 1

Matter, energy, power and heat 1

Units and prefixes used in radiography 3

Radiological units 4

Useful mathematics 7

Proportions and the inverse square law 7

2 The Principles of Physics Used in Radiography 11

Electrostatics – the electric charge 12

Conductors and insulators 14

Electricity 14

Measuring electricity 14

Types of current 15

Laws of an electric current 16

Resistance 16

Making a circuit – the options 17

Magnetism 17

The function and composition of a magnet 19

Magnetic laws 20

Electromagnetism – electricity and magnetism in union 21

Laws of electromagnetic induction 22

Further reading 23

3 Inside the Atom 25

Atoms, elements and other definitions 26

The 'Make-Up' of an atom – atomic structure 27

Shells and energy 28

The periodic table 28

Radioactivity 30

The effects of an electron changing orbits 30

Electromagnetic radiation 31

Frequency and wavelength 32

Further reading 33

4 The X-ray Tube 35

The tube housing 37

The cathode 39

The anode 42

The line focus principle 44

The anode-heel effect 45

The stator assembly 45

Tube rating 46

How to look after your X-ray tube 47

Further reading 47

5 Diagnostic Equipment 49

The X-ray circuit 50

What is seen from the outside? 51

High-voltage generators 51

Rectification 51

Mains supply switch 52

Primary circuit 52

Operating console 53

Filament circuit – control of the mA 54

High-tension circuit – provision of kV 55

Making an exposure – switches, timers and interlocks 55

Types of X-ray machines 56

Health and safety requirements 59

Power rating 59

Further reading 59

6 Production of X-rays 61

Electron production 62

Target interactions 63

X-ray emission spectrum 64

Altering the emission spectrum 65

X-ray quantity 68

X-ray quality 68

Altering exposure factors 68

Exposure charts 70

Further reading 70

7 The Effects of Radiation 71

The effect of the X-ray beam striking another atom 72

Absorption 75

Attenuation 75

The effects of ionising radiation on the body 76

Luminescence 77

Further reading 78

8 Control of the Primary Beam and Scatter 79

Light beam diaphragm 80

Factors affecting scattered radiation 81

Function of grids 81

Construction of a grid 82

Types of grid 84

Choosing a grid 85

Problems with using a grid 85

Air gap technique 86

Further reading 86

9 Radiographic Film 89

Film construction 90

Types of film 93

Formation of the latent image 94

Care and storage of films 95

Film sensitivity 96

Further reading 98

10 Intensifying Screens and Cassettes 99

The construction of intensifying screens 100

Film–screen combinations 101

Film–screen contact 104

Care of intensifying screens 104

Construction of cassettes 105

Care and use of cassettes 106

Further reading 106

11 Processing the Radiographic Film 107

The stages of processing 108

Developer 111

Fixer 112

Parts of the automatic processor 114

Replenishment 116

Silver recovery 117

The darkroom 118

Control of substances hazardous to health (COSHH) regulations 121

Other methods of processing 121

Further reading 122

12 Digital Radiography 125

Computed radiography 127

Care of the imaging plate and cassette 129

Computerised radiography process 129

Digital radiography 131

Image storage 133

Image display 134

Image quality 135

Further reading 135

13 Radiographic Image Quality 137

Sensitometry 138

Densitometry 138

Characteristic curve 139

Latitude 140

Density 141

Contrast 141

Magnification 144

Distortion 144

Movement 145

Producing a high-quality radiograph 146

Commonly seen film faults 147

Further reading 152

14 Radiation Protection 153

The effects of ionising radiation on the body 154

The basics to remember 154

Ionising Radiation Regulations 1999 155

Radiation safety in the veterinary practice 155

Classifying the areas around an X-ray machine 156

Dose limits 157

Monitoring devices 158

Lead shielding 159

Quality assurance 160

Further reading 161

15 Radiography Principles 163

General principles 164

Restraint 164

Positioning aids 165

Markers and legends 165

Assessing the radiograph 166

Terminology 166

BVA/KC hip dysplasia and elbow scoring scheme 168

Further reading 169

16 Contrast Media 171

Negative contrast medium 172

Positive contrast medium 172

Contrast examination procedures 175

Myelography 182

Other contrast examinations 184

Further reading 186

17 Small Animal Radiography Techniques 189

Chest 189

Abdomen 191

Head and neck 192

Distal extremities 196

Shoulder 198

Pelvis 200

Spine 201

Small mammals 202

Birds 203

Reptiles 204

18 Large Animal Radiography Techniques 205

Foot 205

Fetlock 207

Metacarpus and metatarsus (cannon and splint) 209

Carpus 209

Elbow 211

Shoulder 212

Tarsus 213

Stifle 214

Head 216

Spine 216

Chest 217

19 Introduction to Ultrasound 219

Sound waves 220

Ultrasound 220

How ultrasound works 220

Types of ultrasound scan 222

Doppler ultrasound 223

Effects on tissue 224

Ultrasound machines and transducers 224

Patient preparation 225

Areas suitable for examination 225

Further reading 226

20 Advance Imaging Techniques 227

Fluoroscopy 228

Computerised tomography (CT) 230

Magnetic resonance imaging (MRI) 232

Nuclear scintigraphy 234

Further reading 238

Index