

151344

BOARD  
REVIEW  
SERIES

INCLUDES  
Online Access  
to Full Text and  
Questions from  
the Book!

# EMBRYOLOGY

4TH EDITION

*Ronald W. Dudek*

*James D. Fix*

- Access to fully searchable online text included with purchase!
- All questions provided both in print and online!
- Approximately 200 USMLE-type questions with explanations
- Numerous tables and illustrations
- Easy-to-follow outline covering all USMLE-tested topics

 Wolters Kluwer | Lippincott  
Health Williams & Wilkins

thePoint 

Preface vii

<b>1. Prefertilization Events</b> .....	<b>1</b>
<b>I.</b> Sexual Reproduction	1
<b>II.</b> Chromosomes	1
<b>III.</b> Meiosis	2
<b>IV.</b> Oogenesis: Female Gametogenesis	2
<b>V.</b> Spermatogenesis	4
<b>VI.</b> Clinical Considerations	4
<b>Study Questions for Chapter 1</b>	<b>7</b>
<b>Answers and Explanations</b>	<b>9</b>
<b>2. Week 1 of Human Development (Days 1–7)</b> .....	<b>11</b>
<b>I.</b> Fertilization	11
<b>II.</b> Cleavage and Blastocyst Formation	12
<b>III.</b> Implantation	12
<b>IV.</b> Clinical Considerations	12
<b>Study Questions for Chapter 2</b>	<b>14</b>
<b>Answers and Explanations</b>	<b>16</b>
<b>3. Week 2 of Human Development (Days 8–14)</b> .....	<b>17</b>
<b>I.</b> Further Development of the Embryoblast	17
<b>II.</b> Further Development of the Trophoblast	17
<b>III.</b> Development of Extraembryonic Mesoderm	17
<b>IV.</b> Clinical Considerations	18
<b>Study Questions for Chapter 3</b>	<b>21</b>
<b>Answers and Explanations</b>	<b>23</b>
<b>4. Embryonic Period (Weeks 3–8)</b> .....	<b>25</b>
<b>I.</b> General Considerations	25
<b>II.</b> Further Development of the Embryoblast	25
<b>III.</b> Vasculogenesis	29
<b>IV.</b> Hematopoiesis	29
<b>V.</b> Clinical Considerations	30
<b>Study Questions for Chapter 4</b>	<b>32</b>
<b>Answers and Explanations</b>	<b>34</b>

**5. Cardiovascular System .....36**

- I.** Formation of Heart Tube 36
- II.** Primitive Heart Tube Dilatations 37
- III.** Dextral Looping 37
- IV.** The Aorticopulmonary (AP) Septum 38
- V.** The Atrial Septum 38
- VI.** The Atrioventricular (AV) Septum 39
- VII.** The Interventricular (IV) Septum 39
- VIII.** The Conduction System of the Heart 40
- IX.** Coronary Arteries 40
- X.** Development of the Arterial System 40
- XI.** Development of the Venous System 45

**Study Questions for Chapter 5 48****Answers and Explanations 51****6. Placenta and Amniotic Fluid .....53**

- I.** Formation of the Placenta 53
- II.** Placental Components: Decidua Basalis and Villous Chorion 53
- III.** Placental Membrane 53
- IV.** Placenta as Endocrine Organ 56
- V.** Umbilical Cord 56
- VI.** Circulatory System of the Fetus 56
- VII.** Amniotic Fluid 58
- VIII.** Twinning 58
- IX.** Clinical Considerations 61

**Study Questions for Chapter 6 64****Answers and Explanations 65****7. Nervous System .....67**

- I.** Overview 67
- II.** Development of the Neural Tube 67
- III.** Neural Crest Cells 68
- IV.** Placodes 70
- V.** Vesicle Development of the Neural Tube 70
- VI.** Histogenesis of the Neural Tube 70
- VII.** Layers of the Early Neural Tube 72
- VIII.** Development of the Spinal Cord 72
- IX.** Development of Myelencephalon 73
- X.** Development of Metencephalon 73
- XI.** Development of Mesencephalon 74
- XII.** Development of Diencephalon, Optic Structures, and Hypophysis 74
- XIII.** Development of Telencephalon 75
- XIV.** Development of Sympathetic Nervous System 79
- XV.** Development of Parasympathetic Nervous System 79
- XVI.** Development of Cranial Nerves 80
- XVII.** Development of Choroid Plexus 80
- XVIII.** Congenital Malformations of the Central Nervous System 81
- XIX.** Selected Photographs, Sonograms, and Radiographs of Various Congenital Malformations 83

**Study Questions for Chapter 7 88****Answers and Explanations 90**

<b>8. Ear</b> .....	<b>92</b>
<b>I.</b> Overview	92
<b>II.</b> The Internal Ear	92
<b>III.</b> The Membranous and Bony Labyrinth	92
<b>IV.</b> Middle Ear	94
<b>V.</b> External Ear	94
<b>VI.</b> Congenital Malformations of the Ear	94
<b>Study Questions for Chapter 8</b>	<b>97</b>
<b>Answers and Explanations</b>	<b>98</b>
<b>9. Eye</b> .....	<b>99</b>
<b>I.</b> Development of Optic Vesicle	99
<b>II.</b> Development of Other Eye Structures	101
<b>III.</b> Congenital Malformations of the Eye	102
<b>Study Questions for Chapter 9</b>	<b>105</b>
<b>Answers and Explanations</b>	<b>106</b>
<b>10. Digestive System</b> .....	<b>107</b>
<b>I.</b> Overview	107
<b>II.</b> Derivatives of the Foregut	107
<b>III.</b> Derivatives of the Midgut	116
<b>IV.</b> Derivatives of the Hindgut	119
<b>V.</b> Anal Canal	119
<b>VI.</b> Mesenteries	121
<b>Study Questions for Chapter 10</b>	<b>122</b>
<b>Answers and Explanations</b>	<b>124</b>
<b>11. Respiratory System</b> .....	<b>125</b>
<b>I.</b> Upper Respiratory System	125
<b>II.</b> Lower Respiratory System	125
<b>Study Questions for Chapter 11</b>	<b>133</b>
<b>Answers and Explanations</b>	<b>134</b>
<b>12. Head and Neck</b> .....	<b>135</b>
<b>I.</b> Pharyngeal Apparatus	135
<b>II.</b> Development of the Thyroid Gland	138
<b>III.</b> Development of the Tongue	138
<b>IV.</b> Development of the Face	138
<b>V.</b> Development of the Palate	140
<b>VI.</b> Development of the Mouth	140
<b>VII.</b> Development of the Nasal Cavities	140
<b>VIII.</b> Clinical Considerations	140
<b>Study Questions for Chapter 12</b>	<b>144</b>
<b>Answers and Explanations</b>	<b>145</b>
<b>13. Urinary System</b> .....	<b>146</b>
<b>I.</b> Overview	146
<b>II.</b> Development of the Metanephros	146
<b>III.</b> Relative Ascent of the Kidneys	147
<b>IV.</b> Blood Supply of the Kidneys	147

V. Development of the Urinary Bladder 147  
 VI. Development of the Female Urethra 147  
 VII. Development of the Male Urethra 149  
 VIII. Clinical Considerations 149  
 IX. Development of the Suprarenal Gland 153  
**Study Questions for Chapter 13 156**  
**Answers and Explanations 157**

**14. Female Reproductive System .....158**

I. The Indifferent Embryo 158  
 II. Development of the Gonads 158  
 III. Development of the Genital Ducts 160  
 IV. Development of the Primordia of the External Genitalia 160  
 V. Clinical Considerations 162  
**Study Questions for Chapter 14 165**  
**Answers and Explanations 166**

**15. Male Reproductive System .....167**

I. The Indifferent Embryo 167  
 II. Development of the Gonads 167  
 III. Development of the Genital Ducts 168  
 IV. Development of the Primordia of the External Genitalia 169  
 V. Clinical Considerations 169  
 VI. Summary 174  
**Study Questions for Chapter 15 175**  
**Answers and Explanations 176**

**16. Integumentary System .....177**

I. Skin 177  
 II. Hair and Nails 180  
 III. Mammary, Sweat, and Sebaceous Glands 182  
 IV. Teeth 182  
**Study Questions for Chapter 16 185**  
**Answers and Explanations 185**

**17. Skeletal System .....186**

I. Skull 186  
 II. Vertebral Column 187  
 III. Ribs 191  
 IV. Sternum 191  
 V. Bones of the Limbs and Limb Girdles 191  
 VI. Osteogenesis 192  
 VII. General Skeletal Abnormalities 192  
**Study Questions for Chapter 17 195**  
**Answers and Explanations 195**

**18. Muscular System .....196**

I. Skeletal Muscle 196  
 II. Smooth Muscle 197  
 III. Cardiac Muscle 197  
 IV. Clinical Considerations 197

<b>Study Questions for Chapter 18</b>	<b>199</b>
<b>Answers and Explanations</b>	<b>199</b>
<b>19. Upper Limb</b> .....	<b>200</b>
<b>I.</b> Overview of Development	200
<b>II.</b> Vasculature	200
<b>III.</b> Musculature	201
<b>IV.</b> Nerves (Brachial Plexus)	201
<b>V.</b> Rotation of the Upper Limb	201
<b>VI.</b> Skeletal	202
<b>Study Questions for Chapter 19</b>	<b>206</b>
<b>Answers and Explanations</b>	<b>207</b>
<b>20. Lower Limb</b> .....	<b>208</b>
<b>I.</b> Overview of Development	208
<b>II.</b> Vasculature	208
<b>III.</b> Musculature	209
<b>IV.</b> Nerves (Lumbosacral Plexus)	209
<b>V.</b> Rotation of the Lower Limb	209
<b>VI.</b> Skeletal	210
<b>Study Questions for Chapter 20</b>	<b>214</b>
<b>Answers and Explanations</b>	<b>215</b>
<b>21. Body Cavities</b> .....	<b>216</b>
<b>I.</b> Formation of the Intraembryonic Coelom	216
<b>II.</b> Partitioning of the Intraembryonic Coelom	216
<b>III.</b> Positional Changes of the Diaphragm	216
<b>IV.</b> Clinical Considerations	217
<b>Study Questions for Chapter 21</b>	<b>219</b>
<b>Answers and Explanations</b>	<b>220</b>
<b>22. Pregnancy</b> .....	<b>221</b>
<b>I.</b> Endocrinology of Pregnancy	221
<b>II.</b> Pregnancy Dating	222
<b>III.</b> Pregnancy Milestones	222
<b>IV.</b> Prenatal Diagnostic Procedures	223
<b>V.</b> Fetal Distress During Labor (Intrapartum)	224
<b>VI.</b> The APGAR Score	224
<b>VII.</b> Puerperium	224
<b>VIII.</b> Lactation	225
<b>IX.</b> Small for Gestational Age Infant (SGA)	225
<b>X.</b> Collection and Storage of Umbilical Cord Blood	225
<b>Study Questions for Chapter 22</b>	<b>227</b>
<b>Answers and Explanations</b>	<b>227</b>
<b>23. Numerical Chromosomal Anomalies</b> .....	<b>228</b>
<b>I.</b> Polyploidy	228
<b>II.</b> Aneuploidy	228
<b>III.</b> Selected Photographs	230
<b>Study Questions for Chapter 23</b>	<b>232</b>
<b>Answers and Explanations</b>	<b>232</b>

<b>24. Structural Chromosomal Abnormalities</b> .....	<b>233</b>
<b>I.</b> Deletions	233
<b>II.</b> Microdeletions	233
<b>III.</b> Translocations	234
<b>IV.</b> Unstable Expanding Repeat Mutations (Dynamic Mutations)	235
<b>V.</b> Isochromosomes	238
<b>VI.</b> Inversions	238
<b>VII.</b> Breakage	238
<b>VIII.</b> Selected Photographs	240
<b>Study Questions for Chapter 24</b>	<b>244</b>
<b>Answers and Explanations</b>	<b>245</b>
<b>25. Single-Gene Inherited Diseases</b> .....	<b>246</b>
<b>I.</b> Autosomal Dominant Inheritance	246
<b>II.</b> Autosomal Recessive Inheritance	246
<b>III.</b> X-Linked Dominant Inheritance	247
<b>IV.</b> X-Linked Recessive Inheritance	247
<b>V.</b> Mitochondrial Inheritance	247
<b>VI.</b> The Family Pedigree in Various Inherited Diseases	248
<b>Study Questions for Chapter 25</b>	<b>250</b>
<b>Answers and Explanations</b>	<b>250</b>
<b>26. Multifactorial Inherited Diseases</b> .....	<b>251</b>
<b>I.</b> Introduction	251
<b>II.</b> Type 1 Diabetes	251
<b>Study Questions for Chapter 26</b>	<b>252</b>
<b>Answers and Explanations</b>	<b>252</b>
<b>27. Teratology</b> .....	<b>253</b>
<b>I.</b> Introduction	253
<b>II.</b> Infectious Agents	253
<b>III.</b> TORCH Infections	256
<b>IV.</b> Childhood Vaccinations	256
<b>V.</b> Category X Drugs	257
<b>VI.</b> Category D Drugs	258
<b>VII.</b> Chemical Agents	258
<b>VIII.</b> Recreational Drugs	259
<b>IX.</b> Ionizing Radiation	259
<b>X.</b> Selected Photographs	259
<b>Study Questions for Chapter 27</b>	<b>262</b>
<b>Answers and Explanations</b>	<b>262</b>
<b>Appendix</b> .....	<b>263</b>
<b>Comprehensive Examination</b> .....	<b>265</b>
<b>Figure and Table Credits</b> .....	<b>280</b>
<b>Index</b> .....	<b>291</b>