Clinical Obstetrics The Fetus & Mother, Third Edition
E. Albert Reece, John C. Hobbins

QUESTIONS AND ANSWERS

Clinical Obstetrics

The Fetus & Mother

Dedication

To Sharon, Kelie, Brynne, and Sharon-Andrea with greatest love and gratitude.

~E. Albert Reece MD, PhD, MBA

To the memory of my father, who was the best role model anyone could have had, and my mother, who always gave me love and support (despite her never quite understanding what I did for a living).

~John C. Hobbins MD

QUESTIONS AND ANSWERS

Clinical Obstetrics

The Fetus & Mother

E. Albert Reece MD, PhD, MBA
Vice President for Medical Affairs, University of Maryland, and
John Z. & Akiko K. Bowers Distinguished Professor and
Dean, School of Medicine,
Baltimore, Maryland

John C. Hobbins MD
Professor of Obstetrics and Gynecology
University of Colorado School of Medicine
University of Colorado Health Sciences Center
Denver, Colorado

FOREWORD BY

Norman F. Gant Jr. MD
Professor and Chairman Emeritus
University of Texas Southwestern Medical School
Executive Director, The American Board of Obstetrics and Gynecology
Dallas, Texas

THIRD EDITION

Blackwell
Publishing

Blackwell Publishing, Inc., 350 Main Street, Malden, Massachusetts 02148-5020, USA
Blackwell Publishing Ltd, 9600 Garsington Road, Oxford OX4 2DQ, UK
Blackwell Publishing Asia Pty Ltd, 550 Swanston Street, Carlton, Victoria 3053, Australia

First published 1992 © J.B. Lippincott Company
Second edition 2007

1 2007

Library of Congress Cataloging-in-Publication Data

Clinical obstetrics : the fetus & mother / [edited by] E. Albert Reece, John C. Hobbins. – 3rd ed.
p. ; cm.
Rev. ed. of: Medicine of the fetus and mother. 2nd ed. c1999.
Includes bibliographical references and index.
ISBN-13: 978-1-4051-3216-9 (alk. paper)
ISBN-10: 1-4051-3216-7 (alk. paper)
1. Pregnancy. 2. Obstetrics. 3. Pregnancy–Complications. 4. Prenatal diagnosis. 5. Maternal-fetal exchange. I. Reece, E. Albert. II. Hobbins, John C., 1936– . III. Medicine of the fetus and mother.
[DNLM: 1. Fetal Diseases. 2. Embryonic Development. 3. Fetal Development. 4. Maternal-Fetal Exchange. 5. Pregnancy–physiology. 6. Pregnancy Complications. 7. Prenatal Diagnosis.
WQ 211 C641 2006]
RG551.M43 2006
618.3–dc22

A catalogue record for this title is available from the British Library

Set in Sabon 9/12 pt by SNP Best-set Typesetter Ltd., Hong Kong
Printed and bound by Replika Press Pvt. Ltd, India

Commissioning Editor: Stuart Taylor
Development Editor: Rebecca Huxley
Production Controller: Kate Charman
Production Editor: Karin Skeet

For further information on Blackwell Publishing, visit our website:
http://www.blackwellpublishing.com

The publisher's policy is to use permanent paper from mills that operate a sustainable forestry policy, and which has been manufactured from pulp processed using acid-free and elementary chlorine-free practices. Furthermore, the publisher ensures that the text paper and cover board used have met acceptable environmental accreditation standards.

Blackwell Publishing makes no representation, express or implied, that the drug dosages in this book are correct. Readers must therefore always check that any product mentioned in this publication is used in accordance with the prescribing information prepared by the manufacturers. The author and the publishers do not accept responsibility or legal liability for any errors in the text or for the misuse or misapplication of material in this book.

Contents

Contributors

Kjersti Aagaard-Tillery MD, PhD
MFM Fellow, Division of Maternal–Fetal Medicine, University of Utah, Salt Lake City, UT, USA

Eli Y. Adashi MD
Dean of Medicine and Biological Sciences, Brown Medical School, Providence, RI, USA

Erol Amon
Professor and Director, Department of Obstetrics, Gynecology, and Women's Health, Division of Maternal–Fetal Medicine, St Louis University, St Louis, MI, USA

Janet I. Andrews MD
Associate Maternal–Fetal Medicine, Department of Obstetrics and Gynecology, University of Iowa, Iowa City, IA, USA

Teresita L. Angtuaco MD, FACR, FAIUM, FSRU
Professor of Radiology, Obstetrics, and Gynecology, Director, Division of Imaging and Chief of Ultrasound, Department of Radiology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

R. Lee Archer MD, FAAN
Associate Professor, Department of Neurology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Masoud Azodi MD
Assistant Professor, Department of Obstetrics and Gynecology, Yale University School of Medicine, New Haven, CT, USA

Ray Bahado-Singh MD
Professor, Department of Obstetrics and Gynecology, Division of Maternal–Fetal Medicine, Wayne State University/Hutzel Women's Hospital, Detroit, MI, USA

Robert H. Ball MD
Associate Professor, Department of Obstetrics, Gynecology, and Reproductive Sciences and Radiology, UCSF Fetal Treatment Center, San Francisco, CA, USA

Frederick C. Battaglia MD
Professor Emeritus, Departments of Pediatrics and Obstetrics–Gynecology, University of Colorado School of Medicine, University of Colorado at Denver and Health Sciences Center, Perinatal Research Center, Aurora, CO, USA

Pamela D. Berens MD
Associate Professor, Department of Obstetrics, Gynecology, and Reproductive Sciences, University of Texas Medical School – Houston, Houston, TX, USA

Matthew J. Bizzarro MD
Assistant Professor, Department of Pediatrics, Yale University School of Medicine, New Haven, CT, USA

D. Ware Branch MD
Professor and H.A. & Edna Benning Presidential Endowed Chair, Department of Obstetrics and Gynecology, University of Utah Health Sciences Center, Salt Lake City, UT, USA

Robert L. Brent MD, PhD, DSc
Distinguished Professor, Departments of Pediatrics, Radiology, and Pathology, Thomas Jefferson University and Alfred I. duPont Hospital for Children, Wilmington, DE, USA

Stephen R. Carr MD
Associate Professor, Department of Obstetrics–Gynecology, Division of Maternal–Fetal Medicine, Brown University, Women and Infants' Hospital, Providence, RI, USA

Véronique Cayol MD
Assistante, Institut de Puériculture et de Périnatalogie, Paris, France

Tim Chard MD, FRCOG
Professor of Obstetrics and Gynaecology, St Bartholomew's Hospital and the Royal London School of Medicine and Dentistry, West Smithfield, London, UK

Frank A. Chervenak MD
Professor and Chairman, Department of Obstetrics and Gynecology, Weill Medical College of Cornell University, New York, NY, USA

Judith L. Chervenak MD, JD
Of Counsel, Heidell, Pittoni, Murphy & Bach, LLP, New York, NY, USA

Edward K.S. Chien MD, FACOG
Assistant Professor, Department of Obstetrics and Gynecology, Women and Infants' Hospital of Rhode Island, Brown University, Providence, RI, USA

Erin A.S. Clark MD
Chief Resident, Department of Obstetrics and Gynecology, University of Utah Hospital, Salt Lake City, UT, USA

Steven L. Clark MD
Director of Perinatal Medicine, Hospital Corporation of America, St. Marks Hospital, Salt Lake City, UT, USA

Richard B. Clark BSM, MD
Professor Emeritus, Departments of Anesthesiology and Obstetrics and Gynecology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Wayne R. Cohen MD
Chairman, Department of Obstetrics and Gynecology, Jamaica Hospital Medical Center, Professor of Clinical Obstetrics and Gynecology, Weill–Cornell Medical College, Jamaica, NY, USA

Donald R. Coustan MD
Chace/Joukowsky Professor and Chair, Department of Obstetrics and Gynecology, Brown Medical School, Chief Obstetrician and Gynecologist, Women and Infants' Hospital of Rhode Island, Providence, RI, USA

Fernand Daffos MD
Head of the Fetal Medicine Department, Insitut de Puériculture de Paris, CDPMF, Paris, France

Alan H. DeCherney MD
Chief, Reproductive Biology and Medicine Branch, National Institute of Child Health and Human Development, National Institutes of Health, Bethesda, MD, USA

Luis E. De Las Casas MD
Staff Pathologist, Pathology Professional Services, El Paso, TX, USA

Patricia L. Devers MS, CGC
Perinatology Research Branch, National Institute of Child Health and Human Development, National Institutes of Health, Department of Health and Human Services, Wayne State University School of Medicine, Detroit, MI, USA

Gary A. Dildy MD
Associate Professor, Division of Maternal–Fetal Medicine, Department of Obstetrics and Gynecology, University of Utah School of Medicine, UT, USA

Offer Erez MD
Research Associate, Perinatology Research Branch, National Institute of Child Health and Human Development, National Institutes of Health, Department of Health and Human Services, Wayne State University School of Medicine, Detroit, MI, USA

Frederick U. Eruo MD, MPH
Instructor, Department of Obstetrics and Gynecology, University of Cincinnati, Cincinnati, OH, USA

Jimmy Espinoza MSc MD
Assistant Professor, Department Obstetrics and Gynecology, Wayne State University/Hutzel Women's Hospital, and Perinatology Research Branch, National Institute of Child Health and Human Development, National Institutes of Health, Department of Health and Human Services, Detroit, MI, USA

Mark I. Evans MD
President, Fetal Medicine Foundation of America, Director, Comprehensive Genetics, Professor of Obstetrics and Gynecology, Mt. Sinai School of Medicine, New York, NY, USA

Fred H. Faas MD
Staff Physician, VA Hospital, Professor of Medicine, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Lynda B. Fawcett PhD
Assistant Professor, Department of Pediatrics, Alfred I. duPont Hospital for Children, Wilmington, DE, USA

Helen Feltovich MD, MS
Minnesota Perinatal Physicians, Abbott Northwestern Hospital, Minneapolis, MN, USA

Alan W. Flake MD
Professor, Departments of Surgery and Obstetrics and Gynecology, University of Pennsylvania School of Medicine, Ruth and Tristram C. Colket Jr. Chair of Pediatric Surgery, and Director, Children's Institute of Surgical Science, Children's Hospital of Philadelphia, Philadelphia, PA, USA

Alfred D. Fleming MD, FACOG
Professor and Chairman, Department of Obstetrics and Gynecology, Creighton University School of Medicine, Omaha, NE, USA

Jean-Claude Fouron MD, FRCP
Professor, Department of Pediatrics, Université de Montréal, Director of the Fetal Cardiology Unit, Division of Pediatric Cardiology, Hôpital Sainte-Justine, Montréal, QC, Canada

Lara A. Friel MD, PhD
Fellow, Division of Maternal–Fetal Medicine, Department of Obstetrics and Gynecology, Wayne State University/Hutzel Women's Hospital, Detroit, MI, USA

Sandro Gabrielli MD
Attending Physician, Prenatal Medicine, S. Orsola-Malpighi University Hospital, Bologna, Italy

Henry L. Galan MD
Associate Professor, Department of Obstetrics–Gynecology, Division of Maternal–Fetal Medicine, University of Colorado Health Sciences Center, Denver, CO, USA

Norman F. Gant Jr. MD
Professor and Chairman Emeritus, University of Texas Southwestern Medical School, Executive Director, American Board of Obstetrics and Gynecology, Dallas, TX, USA

Ronald S. Gibbs MD
Professor and Chairman, E. Stewart Taylor Chair in Obstetrics and Gynecology, Department of Obstetrics–Gynecology, University of Colorado School of Medicine, Denver, CO, USA

Luís F. Gonçalves MD
Director of Prenatal Diagnosis, Perinatology Research Branch, National Institute of Child Health and Human Development, National Institutes of Health, Department of Health and Human Services, Bethesda, MD, and Detroit, MI, Assistant Professor, Department of Obstetrics and Gynecology, Wayne State University/Hutzel Women's Hospital, Detroit, MI, USA

Ian Gross MD
Professor of Pediatrics, Department of Pediatrics, Yale University School of Medicine, New Haven, CT, USA

Andrée Gruslin MD, FRCS
Associate Professor, Division of Maternal–Fetal Medicine, Department of Obstetrics and Gynecology, University of Ottawa, Ottawa, ON, Canada

James E. Haddow MD
Vice President and Medical Director, Foundation for Blood Research, Scarborough, ME, USA

Zion J. Hagay MD
Professor and Chairman, Department of Obstetrics and Gynecology, Kaplan Medical Center, Rehovot, Israel

Michael R. Harrison MD
Professor of Surgery and Pediatrics, Director, Fetal Treatment Center, Department of Surgery, University of California, San Francisco School of Medicine, San Francisco, CA, USA

Jean C. Hay BSc(Hons), MSc
Associate Professor of Anatomy (retired), Department of Human Anatomy and Cell Science, University of Manitoba, Winnipeg, MB, Canada

Alan Hill MD, PhD
Professor, Department of Pediatrics, University of British Columbia, Consultant Pediatric Neurologist, British Columbia's Children's Hospital, Vancouver, BC, Canada

Washington Clark Hill MD, FACOG
Chairman, Department of Obstetrics and Gynecology, Director, Maternal–Fetal Medicine, Sarasota Memorial Hospital, Sarasota, Clinical Professor, Department of Obstetrics and Gynecology, University of South Florida, College of Medicine, Tampa, Clinical Professor, Department of Clinical Sciences, OB-GYN Clerkship Director-Sarasota, Florida State University College of Medicine, Tallahassee, FL, USA

John C. Hobbins MD
Professor, Department of Obstetrics and Gynecology, University of Colorado School of Medicine, Health Sciences Center, Denver, CO, USA

Calla Holmgren MD
Fellow, Maternal–Fetal Medicine, Department of Obstetrics and Gynecology, University of Utah, Salt Lake City, UT, USA

Carol J. Homko PhD, RN
Assistant Professor, Department of Obstetrics, Gynecology, and Reproductive Sciences, Temple University Hospital, Philadelphia, PA, USA

Judy M. Hopkinson PhD, IBCLC
Associate Professor, Department of Pediatrics, Baylor College of Medicine, Houston, TX, USA

Thomas D. Horn MD, MBA
Chairman, Department of Dermatology, Professor, Departments of Dermatology and Pathology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Jerri L. Hoskyn MD
Assistant Professor, Department of Dermatology, University of Arkansas for Medical Sciences College of Medicine, Staff Physician, Central Arkansas Veterans' Hospital Administration, Little Rock, AR, USA

Karen A. Hutchinson MD
Director of Medical Education, Bridgeport Hospital, Bridgeport, CT, USA

Philippe Jeanty MD, PhD
Tennessee Women's Care, PC, Nashville, TN, USA

Helen H. Kay MD
Professor and Chair, Department of Obstetrics and Gynecology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Maureen Keller-Wood PhD
Professor and Chair, Department of Pharmacodynamics, College of Pharmacy, University of Florida, Gainesville, FL, USA

Charles S. Kleinman MD
Professor of Clinical Pediatrics in Obstetrics and Gynecology, Columbia University College of Physicians and Surgeons/Weill Medical College of Cornell University, Chief, Pediatric Cardiac Imaging, New York – Presbyterian Hospital, Division of Pediatric Cardiology, Babies Hospital, New York, NY, USA

Soheila Korourian MD
Associate Professor, Department of Pathology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Michelle W. Krause MD, MPH
Assistant Professor of Medicine, Division of Nephrology, Department of Internal Medicine, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Juan Pedro Kusanovic MD
Research Associate, Perinatology Research Branch, National Institute of Child Health and Human Development, National Institutes of Health, Department of Health and Human Services, Wayne State University School of Medicine, Detroit, MI, USA

Matthew Laughon MD, MPH
Assistant Professor, Department of Pediatrics, Division of Neonatal/Perinatal Medicine, The University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Gustavo F. Leguizamón MD
Assistant Professor, Chief, High Risk Pregnancy Unit, Department of Obstetrics and Gynecology, CEMIC University, Buenos Aires, Argentina

Juliana M.B. Leite MD
Nashville, TN, USA

Charles J. Lockwood MD
The Anita O'Keefe Young Professor and Chair, Department of Obstetrics, Gynecology, and Reproductive Sciences, Yale University School of Medicine, New Haven, CT, USA

Curtis L. Lowery MD
Professor and Director, Maternal–Fetal Medicine, Department of Obstetrics and Gynecology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Barbara Luke ScD, MPH, RN, RD
Professor of Nursing, Obstetrics, and Pediatrics, School of Nursing and Health Studies, University of Miami, Coral Gables, FL, USA

Laurence B. McCullough PhD
Professor of Medicine and Medical Ethics, Center for Medical Ethics and Health Policy, Baylor College of Medicine, Houston, TX, USA

Maurice J. Mahoney MD, JD
Professor, Departments of Genetics, Pediatrics, and Obstetrics, Gynecology and Reproductive Sciences, Department of Genetics, Yale University School of Medicine, New Haven, CT, USA

Anita C. Manogura MD
Fellow, Maternal–Fetal Medicine, Department of Obstetrics and Gynecology, University of Maryland, Baltimore, MD, USA

Jennifer L. Melville MD, MPH
Assistant Professor, Department of Obstetrics and Gynecology, University of Washington School of Medicine, Seattle, WA, USA

Howard Minkoff MD
Chairman, Obstetrics and Gynecology, Maimonides Medical Center, Distinguished Professor, Obstetrics and Gynecology, SUNY Downstate, Brooklyn, NY, USA

Fernando R. Moya MD
Director of Neonatology, Coastal AHEC, Wilmington, Professor, Department of Pediatrics, University of North Carolina, Chapel Hill, NC, USA

Thomas D. Myles MD
St. Louis University, Richmond Heights, MO, USA

Jennifer R. Niebyl MD
Professor and Head, Department of Obstetrics and Gynecology, University of Iowa Roy J. and Lucille A. Carver College of Medicine, Iowa City, IA, USA

Jyh Kae Nien MD
Fellow, Perinatology Research Branch, National Institute of Child Health and Human Development, National Institutes of Health, Department of Health and Human Services, Bethesda, MD, and Detroit, MI, USA

The late Carl A. Nimrod MB, BS, FRCS(C)
Formerly Professor and Chair, Department of Obstetrics and Gynecology, University of Ottawa, Ottawa, ON, Canada

Chien Oh MD
Fellow of Maternal–Fetal Medicine, Department of Obstetrics, Gynecology, and Reproductive Sciences, University of Maryland, Baltimore, MD, USA

Lawrence W. Oppenheimer MB, FRCOG, FRCS(UK), FRCS(C)
Associate Professor, Division of Maternal–Fetal Medicine, Department of Obstetrics and Gynecology, University of Ottawa, Ottawa, ON, Canada

Michael J. Paidas MD
Associate Professor, Department of Obstetrics, Gynecology, and Reproductive Sciences, Co-Director, Yale Blood Center for Women and Children, Yale University School of Medicine, New Haven, CT, USA

Glenn E. Palomaki
Director of Biometry, Foundation for Blood Research, Scarborough, MA, USA

Santosh Pandipati MD
Instructor-Fellow, Maternal–Fetal Medicine, University of Colorado Health Sciences Center, Denver, CO, USA

Trivedi Vidhya N. Persaud MD, PhD, DSc, FRCPath(Lond)
Professor Emeritus, Department of Human Anatomy and Cell Science, University of Manitoba, Winnipeg, MB, Canada

Christian M. Pettker MD
Instructor and Clinical Fellow, Division of Maternal–Fetal Medicine, Department of Obstetrics, Gynecology, and Reproductive Sciences, Yale University School of Medicine, New Haven, CT, USA

Gianluigi Pilu MD
Associate Professor, Department of Obstetrics and Gynecology, Prenatal Medicine, S. Orsola-Malpighi University Hospital, Bologna, Italy

Mladen Predanic MSc, MD
Fellow, Division of Maternal–Fetal Medicine, Department of Obstetrics and Gynecology, Weill Medical College of Cornell University, New York, NY, USA

Vivek Raj MB, BS, MD, MRCP(UK)
Associate Professor Interim Director, Division of Gastroenterology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

E. Albert Reece MD, PhD, MBA
Vice President for Medical Affairs, University of Maryland, and John Z. & Akiko K. Bowers Distinguished Professor and Dean, School of Medicine, and
Professor, Departments of OB/GYN and Reproductive Sciences; Medicine; and Biochemistry and Molecular Biology; Baltimore, MD, USA

Nicola Rizzo MD
Professor of Obstetrics and Gynecology, Prenatal Medicine, S. Orsola-Malpighi University Hospital, Bologna, Italy

Paula K. Roberson PhD
Professor and Chair, Biostatistics, Colleges of Medicine and Public Health, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Roberto Romero MD
Chief, Perinatology Research Branch, Intramural Division, National Institute of Child Health and Human Development, National Institutes of Health, Department of Health and Human Services, Bethesda, MD, and Detroit, MI, USA

Michael G. Ross MD, MPH
Professor and Chairman, Department of Obstetrics and Gynecology, Harbor–UCLA Medical Center, Torrance, CA, USA

Stacy A. Rudnicki MD
Associate Professor of Neurology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Benjamin P. Sachs MB, BS, DPH, FACOG
Obstetrician-Gynecologist-in-Chief, Harold H. Rosenfield Professor of Obstetrics, Gynecology, and Reproductive Biology, Harvard Medical School, Department of Obstetrics/Gynecology, Beth Israel Deaconess Medical Center, Boston, MA, USA

Joaquin Santolaya-Forgas MD, PhD
Professor, Wayne State University/Hutzel Women's Hospital, Department of Obstetrics and Gynecology, Perinatology Research Branch, National Institute of Child Health and Human Development, National Institutes of Health, Department of Health and Human Services, Detroit, MI, USA

Peter E. Schwartz MD
John Slade Ely Professor of Gynecology, Yale University School of Medicine, New Haven, CT, USA

Sudhir V. Shah MD, FACP
Professor of Medicine, Division Director of Nephrology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Eyal Sheiner MD
Attending Physician, Department of Obstetrics–Gynecology, Soroka University Medical Center, Faculty of Health Sciences, Ben-Gurion University, Beer-Sheva, Israel

Bashir S. Shihabuddin MD
Assistant Professor, Department of Neurology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Baha M. Sibai MD
Professor, Department of Obstetrics and Gynecology, University of Cincinnati College of Medicine, Cincinnati, OH, USA

Robert M. Silver MD
Professor, Department of Obstetrics–Gynecology, Division Chief, Maternal–Fetal Medicine, University of Utah, Salt Lake City, UT, USA

Joe Leigh Simpson MD
Ernst W. Bertner Chairman and Professor, Department of Obstetrics and Gynecology, Professor, Department of Molecular and Human Genetics, Baylor College of Medicine, Houston, TX, USA

Antonio V. Sison
Chairman, Department of Obstetrics and Gynecology, Robert Wood Johnson University Hospital at Hamilton, Medical Director, Robert Wood Johnson OB/GYN Group, Hamilton, NJ, USA

Amanda Skoll MD, FRCSC
Associate Professor, Division of Maternal–Fetal Medicine, Department of Obstetrics and Gynecology, University of British Columbia, Vancouver, BC, Canada

Daniel W. Skupski MD
Associate Professor, Obstetrics and Gynecology, Weill Medical College of Cornell University, New York, NY, USA

Michelle Smith-Levitin MD
Director, High Risk Pregnancy Center, North Shore University Hospital, Manhasset, NY, USA

Jessica Spencer MD
Fellow in Reproductive Endocrinology and Infertility, Department of Gynecology and Obstetrics, Emory University, Atlanta, GA, USA

Richard L. Sweet MD
Professor and Vice Chair, Director, Women's Center for Health, University of California, Davis Medical Center, Sacramento, CA, USA

Kirsten von Sydow PhD
Clinical Psychologist, University of Hamburg, Psychological Institute, Private Psychotherapy Practice, Hamburg, Germany

Brian J. Trudinger MB, BS, MD, FRANZCOG, FRCOG, FRCS(Ed)
Professor of Obstetrics and Gynecology, University of Sydney at Westmead Hospital, Sydney, NSW, Australia

Anthony M. Vintzileos
Professor and Chair, Department of Obstetrics, Gynecology, and Reproductive Sciences, University of Medicine and Dentistry of New Jersey–Robert Wood Johnson Medical School, New Brunswick, NJ, USA

Ronald J. Wapner MD
Professor, Department of Obstetrics and Gynecology, Drexel University College of Medicine, Philadelphia, PA, USA

Carl P. Weiner MD, MBA, FACOG
K.E. Krantz Professor and Chair, Department of Obstetrics and Gynecology, University of Kansas School of Medicine, Kansas City, KS, USA

Paul J. Wendel MD
Associate Professor, Medical Director of Labor and Delivery, Division of Maternal–Fetal Medicine, Department of Obstetrics and Gynecology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Danny Wilkerson MD
Assistant Professor, Departments of Anesthesiology and Obstetrics and Gynecology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Arnon Wiznitzer MD
Professor and Chairman, Department of Obstetrics and Gynecology, Soroka University Medical Center, Faculty of Health Sciences, Ben-Gurion University, Beer-Sheva, Israel

Kenneth H.H. Wong MD, MBA
Physician, Division of Reproductive Endocrinology and Infertility, Kaiser Permanente, Fontana, CA, USA

Charles E. Wood PhD
Professor and Chair, Department of Physiology and Functional Genomics, University of Florida, Gainesville, FL, USA

Linda L.M. Worley MD
Associate Professor, Departments of Psychiatry and Obstetrics and Gynecology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR, USA

Yuval Yaron MD
Director, Prenatal Genetic Diagnosis Unit, Genetic Institute, Tel Aviv Sourasky Medical Center, affiliated to Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

Lami Yeo MD
Associate Professor of Obstetrics and Gynecology, Director of Perinatal Ultrasound, Director of Fetal Cardiovascular Unit, Department of Obstetrics, Gynecology, and Reproductive Sciences, Division of Maternal–Fetal Medicine, University of Medicine and Dentistry of New Jersey–Robert Wood Johnson Medical School, New Brunswick, NJ, USA

Edward R. Yeomans MD
Associate Professor, Department of Obstetrics, Gynecology, and Reproductive Sciences, University of Texas-Houston Health Science Center, Lyndon B. Johnson General Hospital, Houston, TX, USA

Foreword

When asked to write the foreword to the third edition of *Clinical Obstetrics—The Fetus & Mother*, I had two immediate thoughts, the first being that I liked the new title better than the former title, *Medicine of the Fetus & Mother*. The second was that those already acquainted with the former title might not recognize the new one. As I had no control over either, I was pleased that I at least could remind readers of the importance of this current work.

When considering a new or forward-thinking idea, concept, or treatise, it is often a good idea to consider where we have been and where we are going. This is especially true when considering clinical obstetrics, which today means both fetus and mother.

Although the fetus could be evaluated prior to the early 1960s, the methods were crude when considered retrospectively. Auscultation and radiography were the primary tools and little could be accomplished to alter fetal outcome other than by delivery. This changed in 1961 with Lily's pioneering work with the use of amniocentesis to manage Rh-isoimmunization.

In less than one professional lifetime, the fetus has become our patient, not just the mother. This rapid evolution has been helped by pioneers in electronic fetal heart rate monitoring, such as Edward Hon, and of course by the use of ultrasound and Doppler evaluations of the fetus. In this last field it is important to acknowledge individuals such as Ian Donald in the United Kingdom. He struggled in the 1960s to develop ultrasound as a useful clinical tool when many of our colleagues in radiology considered such machines to be toys. Certainly, as is obvious in the current textbook, the authors' efforts over the past two decades have proven Dr. Donald right. Many of their own studies have formed the basis for maternal and actual fetal therapy.

It is critically important to recognize in the current textbook that maternal–fetal medicine now encompasses the areas of conception and fetal growth, extending into the neonatal time period. It is now apparent that the basic fundamental biology of conception likely will lead to a better understanding of stem cell biology and basic immunology. Finally, an entire new field of study is developing in understanding how fetal/neonatal illness may result in adult disease(s) many years after birth.

Both the student of obstetrics and the practitioner should read this third edition of what is becoming an essential update of maternal–fetal knowledge. Today's practice is founded upon the principles and practices so clearly presented in this book. This third edition provides the proof that learning can be fun!

Norman F. Gant Jr. MD
2006

Preface

The field of clinical obstetrics and maternal–fetal medicine is undergoing major advances, with rapid strides being made.

The third edition of the textbook *Clinical Obstetrics—The Fetus & Mother* is not only entirely revised, but now has a strong clinical emphasis, while maintaining a scholarly orientation that is expected to be appealing to both clinicians and academicians. The new book title, *Clinical Obstetrics—The Fetus & Mother*, reflects the new orientation of this edition of the textbook. This text is a treatise in obstetrics and maternal–fetal medicine. It discusses subjects from the time of conception to delivery, including the normal processes and disease states of the fetus, as well as diagnostic and therapeutic measures that can be used to effect fetal well-being. The fetal medicine section includes prenatal diagnosis and places a strong emphasis on the biology of early pregnancy and the fetal–placental unit, fetal development, and variations in normal embryonic and fetal growth. The influence of teratogens, infections, and fetal diseases on outcome is also discussed. Extensive coverage is given to the prenatal diagnosis of congenital malformations using a variety of modalities, both noninvasive and invasive. The various biophysical and biochemical means of evaluation of fetal well-being are also discussed in great detail. The application of fetal therapy, both surgical and medical, is presented, with limited coverage on the evolving field of gene and cell therapy. In addition, maternal medical complications of pregnancy are thoroughly covered.

This question and answer book is designed to complement the textbook. For each chapter of the textbook (except where indicated) questions have been provided by the authors to help the reader assess his/her understanding of the material in the book. The answers can be found in the *Answers* section at the end of this book. The overall balance, scope, content, and design fully serve the needs of academic subspecialists, obstetricians, and house staff physicians, as well as other keen students of medicine.

E. Albert Reece MD, PhD, MBA
John C. Hobbins MD
2006

Preface to the first edition

In the past, specialized medical care was provided primarily to the mother with the hope that improving the maternal condition would benefit the fetus. In recent years, the fetus has become accessible through various technologic advances, permitting fetal disease to be diagnosed by various methods including genetic testing, sonographic imaging, or direct in utero testing. Treatment can now be administered either medically or surgically. The field of maternal–fetal medicine has widened to include other areas of medicine, including teratology, diagnostic imaging, fetal and maternal physiology and endocrinology.

This review and self-assessment book has been designed to compliment the textbook, *MEDICINE OF THE FETUS AND MOTHER*. For each chapter, in the text, the authors and editors have written questions designed to help the reader assess his or her understanding of the material in the book. All the questions have been derived from chapters in *MEDICINE OF THE FETUS AND MOTHER*. Questions relate to both the fetus and the mother with topics ranging from conception to delivery, and including normal processes and disease states of the fetus, as well as diagnostic and therapeutic measures. The correct responses to the questions appear at the end of the book, in the *Answers* section.

The Editors would like to thank all those contributors to *MEDICINE OF THE FETUS AND MOTHER* who devoted considerable time and energy to writing these questions.

We invite all readers, students and practitioners, to use this review book to challenge their understanding of the many facets of maternal–fetal medicine.

The Editors

Acknowledgments

The editors are deeply indebted to all of the contributors, who have invested an enormous amount of time and energy in this project. We count ourselves extremely fortunate to have colleagues and friends who are willing to make this type of investment. The collective efforts have resulted in an entirely revised and most up-to-date book series.

We truly appreciate the invaluable efforts of Ms. Veronika Guttenberger, project specialist in the College of Medicine at the University of Arkansas for Medical Sciences, who assisted in coordinating this entire project. We remain grateful and indebted to her. Carol Homko, PhD, from Temple University School of Medicine made invaluable editorial contributions to this project and we are most appreciative of her assistance.

Finally, we are greatly appreciative of the editors at Blackwell Publishing Ltd., especially Ms. Rebecca Huxley and Dr. Stuart Taylor, for their wise counsel and enduring patience.

The collective efforts of all who contributed to this project are a true testimony of scholarship, commitment, and selflessness. Our lives have been touched by the willingness of everyone to be so generous in sharing their time and talents. Thank you very kindly.

We want to especially acknowledge and thank our good friend and colleague the late Dr. Carl Nimrod, MB, BS, FRCS(C), who contributed so generously to this book series and prior editions. His untimely death saddens us all, but his life and scholarly contributions will brighten our memories.

E. Albert Reece MD, PhD, MBA
John C. Hobbins MD
2006

Clinical Obstetrics The Fetus & Mother, Third Edition
E. Albert Reece, John C. Hobbins

1 Early conceptus growth and immunobiologic adaptations of pregnancy

Kenneth H.H. Wong and Eli Y. Adashi

Questions 1–20: true or false

1 During meiosis, the primary oocyte gives rise to four daughter cells, each receiving 22 autosomes and an X or Y chromosome.

2 Prior to sperm–egg interaction, capacitation of the spermatozoa must occur.

3 Capacitation is characterized by the acrosome reaction, fusion between the sperm's plasma and acrosomal membrane with endocytosis of the enzyme contents.

4 The zona pellucida is an acellular glycoprotein coat covering the ovum and consists of four principal proteins: ZP1, ZP2, ZP3, and ZP5.

5 The cortical and zona reactions are triggered after egg–sperm fusion.

6 The oocyte will resume the second meiotic division and extrude the second polar body prior to fertilization.

7 The embryo begins implantation approximately 10 days after fertilization.

8 Human chorionic gonadotropin is essential in stimulating the corpus luteum to produce progesterone.

9 Three cytokines appear to be involved in implantation, colony-stimulating factor 1, leukemia inhibitory factor, and interleukin 1.

10 The adherence of the blastocyst to the endometrial epithelium is mediated through ligand–receptor complexes.

11 HLA-G protein is expressed by cytotrophoblasts and syncytiotrophoblasts.

12 Only fetal leukocytes can enter the maternal blood in early pregnancy.

13 First-trimester pregnancy decidua is composed predominantly of immune cells.

14 HLA-G stimulates the proliferation of CD4+ T lymphocytes and increases decidual cell production of IFN-γ and TNF-α.

15 HLA-G serves a dual role in protecting the trophoblast from both cytotoxic T cells and NK cells.

16 In the placenta, class I antigen expression occurs in the mesenchyme of the chorionic villi as early as 14 weeks.

17 There is more suppression of immune function during pregnancy.

18 The placenta can release factors that suppress T-cell and NK-cell activity.

19 Type 1 CD4+ Th cells (Th1) control cell-mediated responses.

20 Type 2 CD4+ Th cells (Th2) produce IL-4.

Further reading

Adashi EY, Rock JA, Rosenwaks Z, eds. *Reproductive endocrinology, surgery and technology*. Philadelphia, PA: Lippincott-Raven, 1996.
Creasy RK, Resnik R, Iams J, eds. *Maternal–fetal medicine*, 5th edn. Philadelphia, PA: W.B. Saunders, 2004.
Knobil E, Neill JD, eds. *The physiology of reproduction*, 2nd edn. New York: Raven Press, 1994.

2 Normal embryonic and fetal development

Trivedi Vidhya N. Persaud and Jean C. Hay

Questions 1–20: choose
A If 1, 2, and 3 are correct
B If 1 and 3 are correct
C If 2 and 4 are correct
D If only 4 is correct
E If all are correct

1 The ligamentum teres represents the obliterated:
1 Ductus arteriosus
2 Ductus venosus
3 Umbilical artery
4 Umbilical vein

2 Paramesonephric ducts:
1 Develop in males and in females
2 Give rise to the paradidymis
3 Give rise to the uterovaginal primordium
4 Form vestigial metanephric tubules

3 The permanent kidney (metanephros) is derived from:
1 Nephrogenic cord
2 Paraxial mesoderm
3 Ureteric bud
4 Mesonephric tubules

4 The hindbrain vesicle (rhombencephalon) gives rise to:
1 Pons
2 Cerebellum
3 Medulla oblongata
4 Part of the fourth ventricle

5 The interventricular septum is derived from:
1 Muscular ridge from the apex of the primitive ventricle
2 Right bulbar ridge
3 Left bulbar ridge
4 Fused endocardial cushions

6 Derivatives of the midgut include:
1 All of the small intestine
2 Ascending colon
3 All of the transverse colon
4 The cecum and appendix

7 During the first week of development:
1 There is cleavage of the zygote
2 A morula forms
3 The zona pellucida degenerates
4 There is formation of a blastocyst

8 In the third week of development:
1 Somites begin to differentiate from the lateral mesoderm
2 The notochord develops in the midline between the cloacal membrane and the primitive node
3 The intraembryonic coelom develops in the paraxial mesoderm
4 Blood and blood vessel formation begins

9 Folding of the embryonic disk:
1 Incorporates part of the amniotic cavity into the embryo
2 Results in the splanchnopleure forming the lateral and ventral body walls
3 Occurs during the third week of development
4 Incorporates the dorsal part of the yolk sac into the embryo to form the primitive gut

10 Derivatives of the pharyngeal apparatus include:
1 The external auditory meatus
2 The maxilla
3 The ossicles of the ear
4 The palate

11 The lateral palatine processes:
1 Are derived from the maxillary prominences
2 Encounter the tongue and grow vertically downward
3 Elevate and fuse slightly later in female embryos
4 Normally complete their fusion in the embryonic period

12 Concerning the development of the respiratory system:
1 The nasal and oral cavities initially communicate just posterior to the primary palate
2 Except for the epiglottis, the laryngeal cartilages are derived from the pharyngeal arch cartilages
3 The laryngotracheal diverticulum is a foregut derivative
4 The developing lungs grow into the medial aspects of the pleural canals

13 With reference to the developing face:
1 The nasal placodes are thickenings of surface ectoderm on the inferior aspect of the frontonasal prominence
2 The nasolacrimal duct will develop along the groove separating the medial and lateral nasal prominences
3 Much of the mesenchyme of the facial region is considered to be of neural crest origin
4 The muscles of facial expression are derived from the first pharyngeal arches

14 Gartner's cysts are embryological remnants of the:
1 Ureteric diverticulum
2 Sinovaginal bulb
3 Paramesonephric duct
4 Mesonephric duct

15 The labioscrotal folds in the embryo give rise to the:
1 Clitoris
2 Labia minora
3 Round ligament of the uterus
4 Labia majora

16 Paramesonephric ducts:
1 Give rise to the uterovaginal primordium
2 Form metanephric tubules
3 Develop in males and in females
4 Give rise to the paradidymis

17 The urinary bladder is derived from the:
1 Allantois
2 Metanephros
3 Ureteric diverticulum
4 Urogenital sinus

18 Which of the following is or are associated with the development of lymphoid organs?
1 The dorsal portions of the third pair of pharyngeal pouches
2 The second pair of pharyngeal pouches
3 The ultimobranchial bodies
4 The ventral portions of the third pair of pharyngeal pouches

19 With reference to the blastocyst:
1 The trophoblast will form part of the chorion
2 The inner cell mass will form the embryo
3 It develops during the first week after fertilization
4 It is normally found in the uterine tube

20 Which of the following is or are lined by epithelium of endodermal origin?
1 The pharyngotympanic tube
2 The esophagus
3 The laryngotracheal tube
4 The stomodeum

Questions 21–32: choose the correct answer

21 The external auditory canal develops from the:
A First pharyngeal groove or cleft
B Second pharyngeal groove
C First pharyngeal pouch
D Second pharyngeal pouch
E Pharyngotympanic tube

22 The philtrum develops from the:
A Lateral nasal prominences
B Medial nasal prominences
C Maxillary prominences
D Primary palate
E Tuberculum impar

23 At birth, the ductus arteriosus of the fetal circulation becomes which of the following adult derivative?
A Ligamentum teres
B Ligamentum arteriosum
C Lateral umbilical ligament
D Truncus arteriosus
E Proximal part of the left pulmonary artery

24 The common carotid arteries are derived from which of the following pairs of branchial arch arteries?
A First
B Second
C Third
D Fourth
E Sixth

25 The following embryonic structures contribute to the formation of the anterior two-thirds of the tongue:
- A Myotomes of the occipital somites
- B Distal tongue buds (lateral lingual swellings)
- C First pharyngeal arch
- D Median tongue bud (tuberculum impar)
- E All of the above

26 The following structures are derivatives of the second pharyngeal arch:
- A Muscles of facial expression
- B Pharyngeal muscles
- C Incus
- D Sphenomandibular ligament
- E Tensor tympani

27 Concerning the thyroid gland, all of the following are correct, except:
- A It develops from the floor of the pharynx
- B The thyroid primordium is located between the tuberculum impar and the copula
- C It is functional at the end of the third month of gestation
- D Persistence of the thyroglossal duct leads to branchial cervical cysts
- E The inferior part of the thyroglossal duct may give rise to a pyramidal lobe

28 Important features of the second week of development in the human embryo are:
- A Formation of intraembryonic mesoderm
- B Formation of the trilaminar embryonic disk
- C Proliferation and differentiation of the trophoblast
- D Formation of the notochord
- E Formation of chorionic villi

29 The primitive streak:
- A Extends from the primitive node to the oropharyngeal membrane
- B Is caudal to the notochord
- C Will give rise to the spinal cord
- D Is a thickening of embryonic endoderm
- E Induces the formation of the neural tube

30 Regarding implantation, which of the following is correct?
- A The trophoblast differentiates into cytotrophoblast and syncytiotrophoblast as it contacts and penetrates the endometrium
- B It begins at the end of the first week after fertilization
- C The zona pellucida degenerates prior to implantation
- D It is completed before the end of the second week after fertilization
- E All of the above

31 Skeletal structures that are derived from the second pharyngeal arch include:
- A Incus
- B Stapes
- C Laryngeal cartilages
- D Malleus
- E Mandible

32 The membranous part of the interventricular septum of the developing heart is derived from the:
- A Endocardial cushions
- B Right bulbar ridge
- C Left bulbar ridge
- D Aorticopulmonary septum
- E All of the above

Further reading

Carlson BM. *Human embryology and developmental biology*, 3rd edn. Philadelphia, PA: Mosby, 2004.

Cochard LR. *Netter's atlas of human embryology*. Teterboro, NJ: Icon, 2002.

Drews V. *Color atlas of embryology*. New York: Thieme Medical Publishers, 1995.

England MA. *Color atlas of life before birth*. Chicago, IL: Year Book Medical, 1983.

Hinrichsen KV, ed. *Human embryologie*. Berlin: Springer Verlag, 1995.

Larsen WJ. *Human embryology*, 3rd edn. New York: Churchill Livingstone, 2001.

Moore KL, Persaud TVN. *The developing human. Clinically oriented embryology*, 7th edn. Philadelphia, PA: W.B. Saunders, 2003.

Moore KL, Persaud TVN, Shiota K. *Color atlas of clinical embryology*, 2nd edn. Philadelphia, PA: W.B. Saunders, 2000.

O'Rahilly R, Müller F. *Human embryology and teratology*, 3rd edn. New York: Wiley-Liss, 2001.

Sadler TW. *Langman's medical embryology*, 9th edn. Baltimore, MD: Lippincott Williams & Wilkins, 2004.

3 Normal and abnormal placentation

Soheila Korourian and Luis De Las Casas

Questions 1–15: choose the correct answer

1 Fetoplacental circulation is established at or during the:
- A Tenth week of gestation
- B Fifth week of gestation
- C Third week of gestation
- D Third month of gestation
- E Fourth month of gestation

2 The neural tube starts to fuse from:
- A Days 30–35
- B Days 26–31
- C Days 19–23
- D Days 10–15
- E Days 43–46

3 Which of the following factors is crucial for implantation?
- A A surge in estrogen secretion
- B A surge of follicle-stimulating hormone
- C A surge of luteinizing hormone
- D A surge of human chorionic gonadotropin
- E A surge of angiotensin hormone

4 In this condition, the placental villi implant on uterine smooth muscle without intervening decidua:
- A Superficial implantation
- B Placenta accreta
- C Placenta previa
- D Placenta membranacea
- E Placenta circumvallate

5 Each of the following statements about the placenta is true, except:
- A Retroplacental hematoma is related to, but not synonymous with, placental abruption
- B Trauma can cause retroplacental hematoma
- C Preeclampsia can cause retroplacental hematoma
- D Placental abruption can cause consumption coagulopathy
- E Placental hydrops is associated with retroplacental hematoma

6 Chronic villitis is most commonly caused by:
- A Toxoplasmosis
- B Herpes
- C Rubella
- D Cytomegalovirus
- E Unknown organisms

7 Toxic damage to the placenta:
- A May be secondary to smoking
- B May be secondary to alcohol use
- C May be secondary to cocaine use
- D All of the above
- E None of the above

8 Which of the following factors is *not* linked to increased zygosity:
- A Advancing maternal age
- B Familial predisposition
- C Assisted reproductive technology
- D Geographical location
- E Maternal diabetes

9 Which of the following is associated with the highest number of cord complications?
- A Monoamniotic monochorionic twin placenta
- B Placenta previa
- C Diamniotic dichorionic twin placenta
- D Placenta accreta
- E Placenta circumvallate

10 Each of the following complications can be seen in premature babies, except:
- A Paraventricular hemorrhage
- B Necrotizing enterocolitis
- C Hemolytic anemia
- D Retinopathy
- E Hyaline membrane disease

11 Which of the following conditions is commonly associated with an increased risk of recurrent spontaneous abortion?
- A Diabetes mellitus
- B Presence of antiphospholipid antibodies
- C Maternal preeclampsia
- D Factor V deficiency
- E Smoking

12 Premature labor is most likely due to:
- A Group B strepotococcal infection
- B Toxoplasmosis
- C Cytomegalovirus infection
- D Rubella infection
- E Herpesvirus infection

13 Which of the following conditions is associated with the highest β-hCG level?
- A Smoking
- B Diabetes
- C Twin pregnancy
- D Complete hydatidiform mole
- E Partial hydatidiform mole

14 Which of the following conditions shows 69,XXY trisomy?
- A Hydrops fetalis
- B Partial hydatidiform mole
- C Choriocarcinoma
- D Down syndrome
- E Kleinfelter syndrome

15 Which of the following conditions is *not* associated with hydramnios?
- A Esophageal atresia
- B Spina bifida
- C Anencephaly
- D Twin–twin transfusion
- E Renal agenesis

Questions 16–20: choose
- **A** If 1, 2, and 3 are correct
- **B** If 1 and 3 are correct
- **C** If 2 and 4 are correct
- **D** If only 4 is correct
- **E** If all are correct

16 Which of the following statements are correct?
1. Maternal floor infarction is characterized by heavy deposition of fibrin in the region of basal villi
2. In maternal floor infarction, the fibrin extends to the intervillous space
3. Maternal floor infarction is associated with a high mortality rate
4. Maternal floor infarction does not recur in successive pregnancies

17 Acute chorioamnionitis is caused by:
1. *Toxoplasma gondii*
2. β-Hemolytic streptococci
3. Cytomegalovirus
4. *Mycoplasma hominis*

18 Which of the following can cause hydrops fetalis?
1. Antibodies to Rh blood group
2. Parvovirus infection
3. Homozygous α-thalassemia
4. Antibodies to Kell antigen

19 Chorangioma is:
1. Excessive capillary growth affecting scattered secondary and tertiary stem villi
2. Single or multiple nodular lesions composed of capillary channels
3. Seen in congenital anomalies
4. Usually an incidental finding

20 Preeclampsia is associated with:
1. Superficial implantation
2. Low fetoplacental blood flow
3. Retention of the musculoelastic media of spiral arteries
4. Placental infarction

Further reading

Andres RL, Kuyper W, Resnik R. The association of maternal floor infarction of the placenta with adverse perinatal outcome. *Am J Obstet Gynecol* 1990;163:935–938.

Baergen RN, Chacko SA, Edersheim T, et al. The placenta in thrombophilias: a clinicopathological study. *Mod Pathol* 2001;14: 213A.

Barron SD, Pass RF. Infectious causes of hydrops fetalis. *Semin Perinatol* 1995;19:493–501.

Benirschke K, Kaufmann P. Pathology of the human placenta, 4th edn. New York, NY: Springer, 2000.

Charnock-Jones DS, Burton GJ. Placental vascular morphogenesis. *Best Pract Res Clin Obstet Gynecol* 2000;14:953–968.

Cross JC, Werb Z, Fisher SJ. Implantation and the placenta: key pieces of the development puzzle. *Science* 1994;266:1508–1518.

Goldenberg RL, Hauth JC, Andrews WW. Intrauterine infection and preterm delivery. *N Engl J Med* 2000;342:1500–1507.

Kraus FT, Redline RW, Gersell DJ, et al. AFIP Atlas of non tumor pathology: Placental pathology. Washington DC: American Registry of Pathology, 2004.

Rand JH, Wu XX, Andree HA, et al. Pregnancy loss in the antiphospholipid antibody syndrome: a possible thrombogenic mechanism. *N Engl J Med* 1997;337:154–160.

Shih IM, Mazur MT, Kurman R. Gestational trophoblastic disease and related lesions. In: *Blaustein's pathology of the female genital tract*, 5th edn. New York, NY: Springer-Verlag, 2002.

4 Fetoplacental perfusion and transfer of nutrients

Henry L. Galan and Frederick C. Battaglia

Questions 1–13: choose the correct answer

1 Which site represents the most oxygenated blood in the fetus?
- A The fetal aorta
- B The umbilical vein
- C The fetal carotid artery

2 If a mother is given O_2 to inhale, which site in the maternal circulation represents the upper limit that the fetal PO_2 can attain?
- A The uterine vein
- B The maternal artery
- C The maternal pulmonary artery

3 Choose which of the following statement(s) is/are true:
- A Velocimetry = speed, without regard to size
- B Flow = speed × cross-sectional area
- C Velocimetry is more important in determining oxygenation

4 In intrauterine growth retardation (IUGR) pregnancies, does umbilical blood flow decrease in:
- A mL/min
- B mL/min/kg fetal weight
- C Both A and B

5 In the fetus, essential amino acids are used for:
- A Oxidation
- B Growth
- C Both A and B

6 Which measurement represents the amount of a nutrient delivered to the fetus?
- A Umbilical blood flow
- B Umbilical uptake
- C Fetal arterial concentration

7 If uterine blood flow decreases by 10%, which of the following will show a decreased delivery to the fetus?
- A Oxygen
- B Essential amino acids
- C Glucose
- D None

8 Are all 20 amino acids in the genetic code delivered to the fetal circulation from the mother?
- A Yes
- B No

9 The metabolic rate of the placenta is:
- A Higher than that of the fetus
- B Lower than that of the fetus
- C The same as that of the fetus

10 If the placenta is one-half of the normal size, is the fetus *always* growth retarded?
- A No
- B Yes

11 Determinants of umbilical vein floor calculations include:
- A Mean velocity of blood
- B Uterine blood flow
- C Vessel cross-sectional area

12 Which of the following abnormal Doppler changes are seen early in IUGR?
- A Increased S/D ratio in the umbilical artery
- B Decreased S/D ratio in the middle cerebral artery
- C Absent end-diastolic flow in the umbilical artery
- D Both A and B

13 Which fetal vessel may be important in determining the timing of delivery and thus decreased morbidity?
- A Umbilical vein
- B Umbilical artery
- C Ductus venosus
- D Middle cerebral artery (MCA)

Questions 14–20: true or false

14 Fetal growth disturbances in abdominal circumference precede fetal Doppler velocity changes.

15 Generally, the umbilical artery develops abnormal Doppler changes prior to the middle cerebral artery.

16 Reverse end-diastolic flow is a late Doppler finding in a fetus decompensating for IUGR.

17 The placenta grows in a linear fashion across gestation.

18 Maturation of the placenta continues, although its surface area decreases at term.

19 Fetal heart rate monitoring is an accurate predictor of chronic placental insufficiency and chronic hypoxia.

20 A decrease in umbilical vein blood flow (mL/min) is a late finding in IUGR.

Further reading

Battaglia FC, Makowski EL, Meschia G. Physiologic study of the uterine venous drainage of the pregnant rhesus monkey. *Yale J Biol Med* 1970;42:218–228.

Baur R. Morphometry of the placental exchange area. Advances in anatomy, embryology and cell biology. Berlin: Springer-Verlag, 1977.

Bozzetti P, Buscaglia M, Cetin I, et al. Respiratory gases, acid-base balance and lactate concentrations in the mid-term human fetus. *Biol Neonate* 1987;51:188–197.

Ferrazzi E, Bozzo M, Rigano S, et al. Temporal sequence of abnormal Doppler changes in the peripheral and central circulatory systems of the severely growth restricted fetuses. *Ultrasound Obstet Gynecol* 2002;19:140–146.

Karlesdrop VHM, van Vugt JMG, van Geijn HP, et al. Clinical significance of absent or reversed end-diastolic velocity waveforms in umbilical artery. *Lancet* 1994;344:1664–1668.

Kulhanek JF, Meschia G, Makowski EL, et al. Changes in DNA content and urea permeability of the sheep placenta. *Am J Physiol* 1974;226:1257–1263.

Marconi A, Battaglia FC, Meschia G, et al. A comparison of amino acid arteriovenous differences across the placenta and liver in the fetal lamb. *Am J Physiol* 1989;257:E909–E915.

Meschia G, Battaglia FC, Hay WW, et al. Utilization of substrates by the ovine placenta in vivo. *Fed Proc* 1980;39:245–249.

Pardi G, Cetin I, Marconi AM, et al. The venous drainage of the human uterus: respiratory gas studies in normal and fetal growth retarded pregnancies. *Am J Obstet Gynecol* 1992;166:699–706.

Regnault TRH, de Vrijer B, Battaglia FC. Transport and metabolism of amino acids in placenta. *Endocrine* 2002;19:23–41.

Rigano S, Bozzo M, Ferrazzi E, et al. Early and persistent reduction in umbilical vein blood flow in the growth-restricted fetus: a longitudinal study. *Am J Obstet Gynecol* 2001;185:834–838.

Wilkening RB, Meschia G. Fetal oxygen uptake, oxygenation, and acid-base balance as a function of uterine blood flow. *Am J Physiol* 1983;244:H749–H755.

5 Endocrinology of pregnancy and the placenta

Alan DeCherney, Jessica Spencer, Tim Chard, and Karen A. Hutchinson

Questions 1–9: choose the correct answer

1 Which of the following is a *true* statement about the corpus luteum?
- A It involutes soon after embryo implantation
- B β-Human chorionic gonadotropin (β-hCG) inhibits the corpus luteum's production of metalloproteases, which can cause luteolysis
- C It is the primary source of dehydroepiandrosterone sulfate (DHEAS) in the mother
- D If pregnancy does not occur the average lifespan is 7 days

2 All of the following are true about estrogens *except*:
- A All three estrogens increase in pregnancy
- B All three estrogens share the same 18-carbon estrone nucleus
- C Estrone (E_1) is the primary estrogen after menopause
- D Estriol (E_3) is produced by the maternal ovaries during pregnancy

3 Multiple immunological changes are believed to occur to accommodate the fetal allograft including:
- A Maternal type 2 T helper (Th2) to type 1 T helper (Th1) deviation
- B Low levels of Fas ligand expression in fetal cells and deciduas
- C A characteristic natural killer (NK) cell depeletion in the uterine deciduas
- D Human leukocyte antigen (HLA)-G and -E expression in the placenta

4 All of the following are true about the cardiovascular changes in pregnancy *except*:
- A Blood volume increases by 40%
- B The absolute red blood cell count is the same
- C Angiotensin II resistance causes a characteristic hyponatremia
- D Blood pressure decreases by 10–20 mmHg

5 Which of the following is a *true* statement about fetal glucose metabolism?
- A The fetal glucose level is 10–20 mg/mL lower than that of the mother
- B The fetal glucose level is 10–20 mg/mL higher than that of the mother
- C Maternal insulin crosses the placenta
- D The glucose requirements of the fetus decrease in the third trimester

6 Which of the following hormones is secreted by the anterior pituitary:
- A Gonadotropin-releasing hormone (GnRH)
- B β-hCG
- C Adrenocorticotropic hormone (ACTH)
- D Antidiuretic hormone (ADH)

7 All of the following are true about the neonatal brain *except*:
- A The hypothalamus is derived from the ventral portion of the diencephalons
- B The portal system is not fully developed until mid-gestation
- C The posterior pituitary is derived from oral ectoderm (Rathke's pouch)
- D Pituitary-like hormones are also secreted by the syncytiotrophoblast

8 Which of the following is a *true* statement about neonatal testes?
- A Leydig cells produce testosterone and müllerian-inhibiting substance (MIS)
- B Leydig cells produce testosterone but not MIS
- C Sertoli cells produce testosterone and MIS
- D Sertoli cells produce testosterone but not MIS

9 All of the following are true about cortisol *except*:
- A It stimulates the production of surfactant by type 2 pneumocytes
- B It may be involved in the initiation of labor
- C It is produced by the fetal zone
- D It is synthesized from low-density lipoprotein (LDL) cholesterol

10 The precursor of dehydroepiandrosterone (DHEA) is:
- A Testosterone
- B Pregnenolone
- C Androstenedione
- D LDL cholesterol
- E DHEAS

11 The precursor of progesterone is:
- A Testosterone
- B Pregnenolone
- C Androstenedione
- D LDL cholesterol
- E DHEAS

12 The precursor of dihydroxytestosterone (DHT) is:
- A Testosterone
- B Pregnenolone
- C Androstenedione
- D LDL cholesterol
- E DHEAS

13 The precursor of E_3 is:
- A Testosterone
- B Pregnenolone
- C Androstenedione
- D LDL cholesterol
- E DHEAS

Questions 14–17: true or false

14 The placenta takes over steroid synthesis from the corpus luteum by the seventh gestational week.

15 The outer or definitive zone of the fetal adrenal cortex involutes shortly after birth.

16 The fetal adrenal cortex is functionally deficient in 3β-hydroxysteroid dehydrogenase, an enzyme necessary for the conversion of pregnenolone to progesterone, and DHEA to androstenedione.

17 Binding globulins such as albumin- and thyroxine-binding globulin are increased in pregnancy.

Further reading

Carr and Blackwell. The endocrinology of pregnancy. Textbook of reproductive medicine, 2nd edn. Appelton & Lange, 1998.

Cunningham et al. The placental hormones. Williams obstetrics, 21st edn. McGraw-Hill, 2001.

Han. The ontogeny of growth hormone, insulin-like growth factors and sex steroids: molecular aspects. *Horm Res* 1996.

Kaplan SL, Grumbach MM, Aubert ML. The ontogenesis of pituitary hormones and hypothalamic factors in the human fetus: maturation of central nervous system regulation of anterior pituitary function. *Recent Prog Horm Res* 1976;32:161.

Koch C, Platt J. Natural mechanisms for evading graft rejection: the fetus as an allograft. *Springer Semin Immunopathol* 2003;25:95.

Linné, Y. Effects of obesity on women's reproduction and complications during pregnancy. *Obes Rev* 2004;5:137.

Speroff. Clinical gynecologic endocrinology and infertility, 7th edn. Lippencott, Williams and Wilkens, 2004.

Wilson M, Morganti AG, Zervoudakis I, et al. Blood pressure, the renin aldosterone system and sex steroids throughout normal pregnancy. *Am J Med* 1980;68:97.

6 Fetal lung development and amniotic fluid analysis

Ian Gross and Matthew J. Bizzarro

Questions 1–20: choose the correct answer

1 The lung cells responsible for surfactant synthesis are:
- A Type 1 pneumocytes
- B Bronchial epithelium
- C Type 2 pneumocytes
- D Endothelial cells

2 Surfactant synthesis is stimulated by the following hormones and growth factors:
- A Glucocorticoids
- B Thyroid hormones
- C Epidermal growth factor
- D All of the above

3 Which of the following does *not* influence fetal lung maturity?
- A Presence or absence of labor
- B Induced versus noninduced labor
- C Fetal gender
- D Maternal hypertension
- E Maternal diabetes

4 Class F/R diabetes:
- A Accelerates lung maturation
- B Delays lung maturation
- C Neither accelerates nor delays lung maturation

5 Maternal hypertension:
- A Accelerates lung maturation
- B Delays lung maturation
- C Neither accelerates nor delays lung maturation

6 Class A diabetes:
- A Accelerates lung maturation
- B Delays lung maturation
- C Neither accelerates nor delays lung maturation

7 Maternal infection:
- A Accelerates lung maturation
- B Delays lung maturation
- C Neither accelerates nor delays lung maturation

8 Maternal glucocorticoid administration during preterm labor:
- A Is more effective after 34 weeks' gestation
- B Is more effective before 34 weeks' gestation
- C Has no impact on respiratory distress syndrome (RDS) at any gestational age

9 Antenatal steroids are most effective at preventing RDS if given:
- A In the first 6 h after the onset of preterm labor
- B For at least 24 h
- C More than 1 week before delivery

10 Use of antenatal steroids in prolonged rupture of membranes (PROM):
- A Is contraindicated
- B Markedly increases the risk of neonatal infection
- C Reduces the incidence of RDS

11 The lecithin–sphingomyelin (L/S) ratio generally becomes greater than 2:1 at:
- A 31 weeks' gestation
- B 33 weeks' gestation
- C 35 weeks' gestation
- D 37 weeks' gestation

12 Delayed appearance of phosphatidylglycerol (PG) is associated with:
- A Class F diabetes
- B Class A diabetes
- C Pregnancy-induced hypertension

13 Which of the following gives the best estimate of lung maturity?
- A L/S ratio
- B Shake test
- C Fluorescent polarization
- D L/S + PG

14 The glucocorticoid of choice for antenatal therapy is:
- A Betamethasone
- B Dexamethasone
- C Hydrocortisone

15 Surfactant protein A (SP-A) is believed to play a role in:
- A The innate immune system of the lung
- B Type 2 cell hyperplasia
- C Alveolar development
- D Type 2 cell function

16 SP-B and SP-C:
- A Have molecular weights of approximately 35 kDa
- B Play a role in the surface tension-reducing properties of surfactant
- C Regulate surfactant secretion

17 The most abundant component of surfactant is:
- A SP-A
- B PG
- C Lecithin (phosphatidylcholine)
- D Sphingomyelin

18 Antenatal steroid therapy results in a reduction in which of these major complications of prematurity:
- A Intraventricular hemorrhage (IVH) and necrotizing enterocolitis (NEC)
- B IVH and jaundice
- C IVH and pneumonia
- D IVH and gastroinestinal reflux

19 There is a synergistic interaction between antenatal steroids and postnatal surfactant with respect to a lower incidence of:
- A Respiratory disease
- B IVH
- C Periventricular leukomalacia (PVL)
- D All of the above

20 The American College of Obstetricians and Gynecologists (ACOG) recommends that repeat courses of glucocorticoids should:
- A Be given weekly after threatened premature delivery
- B Not be used routinely during pregnancy
- C Only be used before 32 weeks

Further reading

American College of Obstetricians and Gynecologists. Antenatal corticosteroid therapy for fetal maturation. *Committee Opin* 2002;273:9–11.

Ballard PL, Ballard RA. Scientific basis and therapeutic regimens for use of antenatal glucocorticoids. *Am J Obstet Gynecol* 1995;173: 254–262.

Crowley P. Antenatal corticosteroid therapy: a meta-analysis of the randomized trials, 1972 to 1994. *Am J Obstet Gynecol* 1995;173: 322–335.

Crowther CA, Harding J. Repeat doses of prenatal corticosteroids for women at risk of preterm birth for preventing neonatal respiratory disease. *Cochrane Database Syst Rev* 2004;2.

National Institutes of Health Consensus Development Panel. The effect of corticosteroids for fetal maturation on perinatal outcomes. *JAMA* 1995;273:413–418.

Gross I, Ballard PL. Hormonal therapy for prevention of respiratory distress syndrome. In: Polin RA, Fox WW, Abman SH, eds. Fetal and neonatal physiology, 3rd edn. Philadelphia, PA: Elsevier; 2003:1069–1074.

Kulovich M, Gluck L. The lung profile. II: complicated pregnancy. *Am J Obstet Gynecol* 1979;135:64–70.

Kulovich M, Hallman M, Gluck L. The lung profile. I: normal pregnancy. *Am J Obstet Gynecol* 1979;135:57–63.

7 Fetal cardiovascular physiology and response to stress conditions

Jean-Claude Fouron and Amanda Skoll

1 Describe three significant differences between fetal and adult cardiomyocytes.

2 What are the factors that determine LV preload?

3 What are the determinants of RV preload?

4 What is the prime determinant of LV afterload?

5 Which vascular bed is the most important factor in RV afterload?

6 Describe and explain the pattern of flow through the A-V valves during fetal life and contrast it with that seen in extrauterine life.

7 What are the hemodynamic implications of the parallel arrangement of the ventricles *in utero*?

8 What are the hemodynamic characteristics of the pulmonary circulation *in utero*?

9 Name four pulmonary vasoconstrictors.

10 Name four pulmonary vasodilators.

11 What is the normal pattern of blood flow in the umbilical artery?

12 What is the role of the ductus venosus?

13 The majority of right ventricular ejection travels through which vascular segment?

14 What is the site of the only true arterial shunt providing a connection between the two ventricular outlets?

15 What are the determinants of blood flow through the isthmus during systole and what are their respective influences?

16 What are the determinants of blood flow through the isthmus during diastole?

17 Name three clinical examples associated with abnormal loading condition of the fetal heart.

18 Describe the specific cardiocirculatory impact of a cerebral arteriovenous fistula.

19 What happens to cardiac preload and afterload during fetal anaemia? Why?

20 What are the cardiocirculatory effects of acute hypoxic hypoxia?

21 By what mechanism is the fetus capable of selectively adjusting arterial oxygen content?

22 What are the blood gas consequences of hypoxia due to placental insufficiency/increased placental resistance?

23 What are the hemodynamic consequences of increased placental resistance?

24 What happens to the Doppler flow patterns in the umbilical arteries as placental resistance increases?

25 What is the pattern of Doppler flow in the aortic isthmus as placental resistance increases?

Further reading

Bonnin P, Fouron JC, Teyssier G, et al. Quantitative assessment of circulatory changes in the fetal aortic isthmus during progressive

increase of resistance to umbilical blood flow. *Circulation* 1993;88:216–222.

Dawes GS. The fetal circulation. In: Dawes GS, ed. *Fetal and neonatal physiology*. Chicago, IL: Year Book Medical Publishers; 1968: 91–105.

Farine D, Kelly EN, Ryan G, et al. Absent and reversed umbilical artery end-diastolic velocity. In: Copel JA, Reed KL, eds. *Doppler ultrasound in obstetrics and gynecology*. New York: Raven Press; 1995:187–197.

Fouron JC. The unrecognized physiological and clinical significance of the fetal aortic isthmus. *Ultrasound Obstet Gynecol* 2003;22: 441–447.

Fouron JC, Drblik SP. Fetal cardiovascular dynamics in intrauterine growth retardation. In: Copel JA, Reed KL, eds. *Doppler ultrasound in obstetrics and gynecology*. New York: Raven Press; 1995: 281–290.

Fouron JC, Gosselin J, Raboisson MJ, et al. The relationship between an aortic isthmus blood flow velocity index and the postnatal neurodevelopment status of fetuses with placental circulatory insufficiency. *Am J Obstet Gynecol* 2005;192:497–503.

Long WA. Developmental pulmonary circulatory physiology. In: Long WA, ed. *Fetal and neonatal cardiology*. Philadelphia, PA: W.B. Saunders; 1990:76–96.

Muijsers GJJM, Hasaart THM, van Huisseling H, de Haan J. The response of the umbilical artery pulsatility index in fetal sheep to acute and prolonged hypoxaemia and acidaemia induced by embolization of the uterine microcirculation. *J Dev Physiol* 1990; 13:231–236.

Rychik J. Fetal cardiovascular physiology. *Pediatr Cardiol* 2004;25:201–209.

Trudinger BJ, Stevens D, Connely A. Umbilical artery flow velocity waveforms and placental resistance: the effects of embolization of the umbilical circulation. *Am J Obstet Gynecol* 1987;157: 1443–1448.

Please note that there is no question/answer section for Chapter 8 of the textbook.

9 Fetal endocrinology

Charles E. Wood and Maureen Keller-Wood

Questions 1–10: choose the correct answer

1 The surge in testosterone secretion from the fetal gonad occurs at which stage of gestation?
A 0–10% gestation
B 20–30% gestation
C 30–40% gestation
D 50–60% gestation
E 90–100% gestation

2 The major source of estrogens in the human fetus is:
A The fetal ovary
B The fetal testis
C The *fetal zone* of the fetal adrenal cortex
D The *definitive zone* of the fetal adrenal cortex
E The placenta

3 Cortisol is primarily secreted by:
A The fetal ovary
B The fetal testis
C The fetal zone of the fetal adrenal cortex
D The definitive zone of the fetal adrenal cortex
E The placenta

4 Proopiomelanocortin (POMC) is synthesized and released from:
A Zona glomerulosa cells
B Gonadotropes
C Thyrotropes
D Pulmonary neuroendocrine bodies
E Erythrocytes

5 Which of the following hormones are corticotropin-releasing factors?
A Corticotropin-releasing hormone (CRH)
B Arginine vasopressin (AVP)
C Renin
D A and B
E A, B, and C

6 The neurointermediate lobe of the pituitary synthesizes which of the following hormones?
A POMC
B α-Melanocyte-stimulating hormone
C γ-Melanocyte-stimulating hormone
D All of the above
E None of the above

7 The placental expression of which enzyme is thought to protect the fetus from maternal cortisol?
A Aldosterone synthase
B 11β-Hydroxysteroid dehydrogenase (HSD)-1
C 11β-HSD-2
D 17α-Hydroxylase
E 11α-Hydroxylase

8 The vasopressor activity of AVP is mediated by which receptors?
A V_{1a}
B V_{1b}
C V_2
D Angiotensin II receptor, AT1
E Angiotensin II receptor, AT2

9 Fetal plasma concentrations of reverse triiodothyronine (rT_3) are highest at which time?
A 10–20% gestation
B 20–30% gestation
C 40–60% gestation
D 60–80% gestation
E 80–100% gestation

10 Fetal plasma concentrations of triiodothyronine (T_3) are highest at which time?
A 10–20% gestation
B 20–30% gestation
C 40–60% gestation
D 60–80% gestation
E 80–100% gestation

Questions 11–20: true or false

11 Type 3 deiodinase converts thyroxine to triiodothyronine.

12 Cortisol negative feedback inhibition of fetal adrenocorticotropic hormone (ACTH) secretion becomes most sensitive at the end of gestation.

13 β-Lipotropin, ACTH, and thyrotropin (TSH) are all products cleaved from POMC.

14 The human placenta expresses biologically active CYP17α.

15 β-hCG secretion from the human placenta increases steadily throughout gestation.

16 AVP increases renal free water clearance in the fetus.

17 At the end of gestation, the mass of the adrenal cortex increases disproportionately relative to body weight.

18 Fetal plasma is devoid of steroid binding proteins.

19 CRH is synthesized and secreted by the human placenta.

20 Innervation of the adrenal medulla occurs in late gestation.

Further reading

Albrecht ED, Pepe GJ. Placental steroid hormone biosynthesis in primate pregnancy. *Endocr Rev* 1990;11:124–150.

Challis JR, Lye SJ, Gibb W. Prostaglandins and parturition. *Ann NY Acad Sci* 1997;828:254–267.

Gunn TR, Gluckman PD. Perinatal thermogenesis. *Early Hum Dev* 1995;42:169–183.

Jenkin G, Young IR. Mechanisms responsible for parturition; the use of experimental models. *Anim Reprod Sci* 2004;82–83:567–581.

McGrath W, Smith R. Corticotrophin-releasing hormone and parturition. *Clin Endocrinol* 2002;55:593–595.

McMillen IC, Phillips ID, Ross JT, et al. Chronic stress: the key to parturition? *Reprod Fertil Dev* 1995;7:499–507.

Pepe GJ, Albrecht ED. Regulation of the primate fetal adrenal cortex. *Endocr Rev* 1990;11:151–176.

Pepe GJ, Albrecht ED. Actions of placental and fetal adrenal steroid hormones in primate pregnancy. *Endocr Rev* 1995;16:608–648.

Polk DH. Thyroid hormone metabolism during development. *Reprod Fertil Dev* 1995;7:469–477.

Thorburn GD, Hollingworth SA, Hooper SB. The trigger for parturition in sheep: fetal hypothalamus or placenta? *J Dev Physiol* 1991;2:71–79.

Wood CE. Baroreflex and chemoreflex control of fetal hormone secretion. *Reprod Fertil Dev* 1995;7:479–489.

Wood CE, Cudd TA. Development of the hypothalamus-pituitary-adrenal axis of the equine fetus: a comparative review. *Equine Vet J* 1997;24(Suppl.):74–82.

10 Fetal hematology

Véronique Cayol and Fernand Daffos

1 Does fetal haemoglobin increase during fetal life?

2 What are the three stages of fetal hematopoiesis?

3 Is the fetal platelet count increasing during the second and third trimester of pregnancy?

4 Does white blood cell count increase during pregnancy?

5 What happens to fetal TQ and fetal TCA during pregnancy?

6 What are the three major differences that distinguish fetal from maternal blood?

7 What kind of leukocytes are found in fetus blood?

8 When 40% neutrophils are found in fetal blood, does it mean that the fetus is infected?

9 Does MCV increase or decrease during pregnancy?

10 What are the consequences of contamination of a fetal blood sample by amniotic fluid?

11 What is the ratio of βhCG in fetal blood to amniotic fluid to maternal blood?

12 Which is the most sensitive method for determining whether the fetal blood sample is contaminated?

13 What happens to the red cell count during pregnancy?

14 Does hematopoiesis become extravascular early during pregnancy?

15 Does medullary hematopoiesis begin at the ninth week of pregnancy?

16 Are lymphocytes increased in fetal infection (toxoplasmosis or cytomegalovirus)?

17 From the third to the fifth month of pregnancy, the erythrocytic precursors represent approximately 50% of the liver's nucleated cells. True or false?

18 Visceral hematopoiesis is still observed during the first week of postnatal life. True or false?

19 Fetal haemoglobin is mainly β and γ chains of globin. True or false?

20 Glycoprotein of platelet membranes is present in the first trimester of pregnancy, which explains the risk of fetal anti-PLA alloimmunization as early as the first trimester of pregnancy. True or false?

Further reading

Daffos F, Forestier F. Biologie du sang foetal. In: *Medecine et biologie du foetus humain*. Paris: Maloine; 1988:100.

Forestier F, Cox W, Daffos F, et al. The assessment of fetal blood samples. *Am J Obstet Gynecol* 1988;158:1184.

Forestier F, Daffos F, Catherine N, et al. Developmental hematopoiesis in normal human fetal blood. *Blood* 1991;77(11): 2360–2363.

Gruel Y, Boizard B, Daffos P, et al. Determination of platelet antigens and glycoproteins in the human fetus. *Blood* 1986;68(2):488–492.

Iscove NN, Till JE, McCulloch EA. The proliferative states of mouse granulopoietic progenitor cells. *Proc Soc Exp Biol Med* 1970; 134(1):33–36.

Jacquemard F, Daffos F. *Medecine prénatale; grossesses pathologiques pour raisons foetales*. Paris: Elsevier; 2003.

Kelemen E, Calvo W, Fliedner TM. *Atlas of human haemopoietic development*. Berlin: Springer-Verlag; 1979:1.

Mibashan RS, Peake IR, Rodeck CH, et al. Dual diagnosis of prenatal hemophilia A by measurement of fetal factor VIIIC and VIIIC antigen (VIIICAg). *Lancet* 1980;ii:994.

Moore MAS, Metcalf D. Ontogeny of the hematopoietic system. Yolk sac origin of *in vivo* and *in vitro* colony forming cells in the developing mouse embryo. *Br J Haematol* 1970;18(3):279–296.

11 Sporadic and recurrent pregnancy loss

Robert M. Silver and D. Ware Branch

Questions 1–23: choose the correct answer

1 XX% of couples attempting to become pregnant will experience at least one pregnancy loss:
A 5%
B 10%
C 15%
D 25%
E 50%

2 XX% of clinically recognized pregnancies end in pregnancy loss:
A 1–2%
B 4–5%
C 10–12%
D 18–20%
E 24–26%

3 The term anembryonic loss is synonymous with all of the following except:
A Blighted ovum
B Empty gestational sac
C Pregnancy loss prior to 6 weeks' gestation
D Spontaneous abortion

4 The embryonic period lasts from:
A 4–6 weeks' gestation
B 6–10 weeks' gestation
C 10–14 weeks' gestation
D 10–20 weeks' gestation

5 The risk of pregnancy loss is higher in women:
A With two or more prior pregnancy losses
B Under the age of 35
C With prior live births
D With one prior pregnancy loss

6 The most common time in gestation for pregnancy loss to occur is:
A <10 weeks' gestation
B 10–14 weeks' gestation
C 14–20 weeks' gestation
D 20–37 weeks' gestation
E 37–42 weeks' gestation

7 The most common cause of sporadic pregnancy loss in the first trimester is:
A Infection
B Tobacco exposure
C Genetic abnormalities
D Diabetes
E Thyroid disease

8 The most common karyotypic abnormality in spontaneous abortion is:
A Monosomy X
B Triploidy
C Tetraploidy
D Trisomy

9 The most common trisomy in spontaneous abortion is:
A Trisomy 21
B Trisomy 18
C Trisomy 13
D Trisomy 16
E Trisomy 1

10 Suggested evaluation for fetal death includes all of the following except:
A Antithyroid antibodies
B Anticardiolipin antibodies
C Karyotype
D Autopsy
E Kleihauer–Betke

11 Reliable sonographic indicators of pregnancy loss include:
- A Mean sac diameter minus crown–rump length of 20 mm or less (prior to 9 weeks' gestation)
- B Mean yolk sac diameter of 3 mm or greater
- C Mean sac diameter of 8 mm or more without a demonstrable yolk sac using high-resolution ultrasound
- D Mean sac diameter of 8 mm or more without a demonstrable embryo using high-resolution ultrasound

12 Three or more pregnancy losses (recurrent pregnancy loss, RPL) occur in XX% of couples:
- A 0.5–1.0%
- B 1.0–2.0%
- C 3–5%
- D 8–10%

13 Generally accepted causes of RPL include all of the following except:
- A Balanced paternal chromosomal abnormalities
- B Antiphospholipid syndrome
- C Alloimmune thrombocytopenia
- D Uterine abnormalities

14 Parental structural abnormalities occur in XX% of couples with RPL:
- A 1–2%
- B 3–5%
- C 6–8%
- D 10–12%

15 All of the following are true about luteal phase defect (LPD) except:
- A It is often present in women with normal pregnancy
- B It is reported in 25–40% of women with RPL
- C It may be diagnosed with endometrial biopsy or serum progesterone determination
- D Testing is consistent from month to month in a given individual

16 The following is true regarding treatment for luteal phase defect:
- A Efficacy is proven in randomized trials
- B Progesterone supplementation is taken daily until confirmation of pregnancy
- C Progesterone supplementation is started upon diagnosis of pregnancy
- D Progesterone supplementation is started 3 days after ovulation, through menses, or at 10 weeks' pregnancy

17 The following is not true regarding uterine malformation and RPL:
- A Uterine malformation is present in 10–15% of women with RPL
- B Corrective surgery is proven to improve outcome in women with uterine malformation and RPL
- C Uterine septum is the malformation most likely to be associated with RPL
- D Obstetric outcome is generally good in unselected women with uterine malformation

18 Which of the following is not a clinical criterion for antiphospholipid syndrome (APS)?
- A Thrombosis
- B Hypertension
- C Recurrent spontaneous abortion
- D Fetal death

19 The two antiphospholipid antibodies that are best characterized include:
- A Lupus anticoagulant and anticardiolipin antibodies
- B Lupus anticoagulant and antinuclear antibodies
- C Antinuclear and anticardiolipin antibodies
- D Antiphosphatidylinositol and antiethanolamine antibodies

20 First-line therapy for APS during pregnancy includes:
- A High-dose prednisone and low-dose aspirin
- B High-dose prednisone and thromboprophylactic doses of heparin
- C Thromboprophylactic doses of heparin and low-dose aspirin
- D Intravenous immunoglobulin (IVIG) and low-dose aspirin

21 Which of the following is not a heritable thrombophilia?
- A Factor V Leiden mutation
- B Homocysteine deficiency
- C Antithrombin III deficiency
- D G20210A prothrombin gene mutation
- E Protein S deficiency

22 The following statement is not true regarding heritable thrombophilias and pregnancy:
- A Heritable thrombophilias are associated with RPL
- B Heritable thrombophilias are associated with fetal death
- C Heritable thrombophilias are associated with venous thromboembolism
- D Most women with heritable thrombophilias suffer pregnancy loss

23 The following statement is not true regarding the use of leukocyte immunization and IVIG to treat RPL:
- A These are two therapies aimed at treating alloimmune pregnancy loss
- B These therapies are expensive and have meaningful side-effects
- C These therapies have been proven to improve outcome in women with RPL in randomized clinical trials
- D These therapies are not recommended for the treatment of RPL

Further reading

Acien P. Uterine anomalies and recurrent miscarriage. *Infertil Reprod Med Clin North Am* 1996;7:689–719.

Boue J, Boue A, Lazar P. Retrospective and prospective epidemiological studies of 1500 karyotyped spontaneous human abortions. *Teratology* 1975;12:11–26.

DeBrackeller M, Dao TN. Cytogenetic studies in couples experiencing repeated pregnancy losses. *Hum Reprod* 1990;5:519–528.

Frias AE, Jr, Luikenaar RA, Sullivan AE, et al. Poor obstetric outcome in subsequent pregnancies in women with prior fetal death. *Obstet Gynecol* 2004;104:521–526.

Geraedts JPM. Chromosomal anomalies and recurrent miscarriage. *Infertil Reprod Med Clin North Am* 1996;7:677–688.

Goldstein P, Berrier J, Rosen S, et al. A meta-analysis of randomized control trials of progestational agents in pregnancy. *Br J Obstet Gynaecol* 1989;96:265–274.

Goldstein SR. Embryonic death in early pregnancy: a new look at the first trimester. *Obstet Gynecol* 1994;84:294–297.

Harger JH, Archer DF, Marchese SO, et al. Etiology of recurrent pregnancy loss and outcome of subsequent pregnancies. *Obstet Gynecol* 1983;62:574–581.

Kline J, Stein Z. Epidemiology of chromosomal anomalies in spontaneous abortion: prevalence, manifestation and determinants. In: Bennett MI, Edmonds DK, eds. *Spontaneous and recurrent abortion.* Oxford, UK: Blackwell Scientific Publications; 1987:29–50.

Kujovich JL. Thrombophilia and pregnancy complications. *Am J Obstet Gynecol* 2004;191:412–424.

Mantoni M. Ultrasound signs in threatened abortion and their prognostic significance. *Obstet Gynecol* 1985;65:471–475.

Naylor AF, Warburton D. Sequential analysis of spontaneous abortion. II. Collaborative study data show that gravidity determines a very substantial increase in risk. *Fertil Steril* 1979;31:282–286.

Ober C, Karrison T, Odem RR, et al. Mononuclear-cell immunization in prevention of recurrent miscarriages: a randomized trial. *Lancet* 1999;354:365–369.

Seligsohn U, Lubetsky A. Genetic susceptibility to venous thrombosis. *N Engl J Med* 2001;344:1222–1231.

Warburton D, Fraser FC. Spontaneous abortion risks in man: data from reproductive histories collected in a medical genetics unit. *Am J Hum Genet* 1964;16:1–25.

Wilcox AI, Weinberg CR, O'Connor JF, et al. Incidence of early loss of pregnancy. *N Engl J Med* 1988;319:189–194.

12 Ectopic and heterotopic pregnancies

Arnon Wiznitzer and Eyal Sheiner

Questions 1–22: choose the correct answer

1 What is the major risk factor for ectopic pregnancy?
- A The use of an intrauterine contraceptive device
- B Previous pelvic inflammatory disease
- C Cigarette smoking
- D Medical abortion
- E Salpingitis isthmica nodosa

2 Which of the following is *not* considered to be a risk factor for ectopic pregnancy?
- A Prior ectopic pregnancy
- B A history of infertility
- C Prior tubal surgery
- D A maternal age of 16–19 years
- E All are common risk factors for ectopic pregnancy

3 What is the classic symptom triad of ectopic pregnancy?
- A Amenorrhea, irregular bleeding, and lower abdominal pain
- B Shock, uterine tenderness, and abdominal pain
- C Abdominal tenderness, pelvic tenderness, and irregular vaginal bleeding
- D Amenorrhea, shock, and uterine tenderness
- E Abdominal pain, shock, and vaginal bleeding

4 The risk of an ectopic pregnancy increases by how many fold after a previous ectopic pregnancy?
- A 1
- B 2
- C 5
- D 10
- E 20

5 What is the first stage in the laboratory evaluation of women with a suspected ectopic pregnancy?
- A Abdominal ultrasound
- B Vaginal ultrasound
- C Pregnancy test (β-hCG enzyme immunoassay)
- D Serum progesterone measurements
- E Dilation and curettage

6 What is the mean doubling time for β-hCG during early pregnancy?
- A 12 h
- B 24 h
- C 48 h
- D 72 h
- E 96 h

7 At what level of β-hCG should a viable intrauterine pregnancy be seen by vaginal ultrasound?
- A 100 mIU/mL
- B 1000 mIU/mL
- C 1300 mIU/mL
- D 2000 mIU/mL
- E 20 000 mIU/mL

8 What are the benefits of laparoscopic treatment over laparotomy?
- A Less blood loss
- B Less analgesia
- C Less postoperative pain
- D Decreased hospital costs
- E All of the above are correct

9 What is the only absolute contraindication for laparoscopic treatment of ectopic pregnancy?
- A Hypovolemic shock
- B Sudden severe abdominal pain
- C Severe vaginal bleeding
- D Previous laparotomy
- E Severe abdominal adhesions

10 What is the preferred surgical treatment for an unruptured tubal pregnancy?
- A Salpingectomy
- B Salpingotomy
- C Salpingostomy
- D Milking
- E Segmental resection with reanastomosis

11 What is the most cost-effective treatment for ectopic pregnancy?
- A Laparotomy
- B Laparoscopy
- C Systemic methotrexate treatment
- D Direct injection of methotrexate
- E Expectant management

12 Which of the following is *not* an absolute contraindication for methotrexate treatment?
- A Hemodynamic instability
- B Breastfeeding
- C Immunodeficiency
- D Embryonic cardiac activity
- E All are contraindications for methotrexate treatment

13 Which of the following is *not* considered to be a risk factor for methotrexate failure?
- A Gestational sac of 3.5 cm or more
- B A history of a previous ectopic pregnancy
- C Fetal cardiac activity
- D Initial high levels of β-hCG
- E All of the above

14 What is the approximate overall success rate of methotrexate treatments?
- A 50%
- B 60%
- C 70%
- D 90%
- E 100%

15 Which of the following is *not* considered to be a possible side-effect of methotrexate?
- A Bone marrow suppression
- B Hepatotoxicity
- C Stomatitis
- D Pulmonary fibrosis
- E All of the above

16 Which of the following is *not* a good candidate for expectant management?
- A Asymptomatic patient
- B Declining levels of β-hCG
- C Adnexal mass of 5 cm
- D Initial β-hCG < 200 mIU/mL
- E All of the above

17 What is the frequency of heterotopic pregnancy following assisted reproductive technology?
- A 1 in 30 000
- B 1 in 10 000
- C 1 in 1000
- D 1 in 100
- E 5 in 100

18 What is the most common presenting symptom associated with heterotopic pregnancy?
- A Vaginal bleeding
- B Abdominal pain
- C Adnexal mass
- D Peritoneal irritation
- E An enlarged uterus

19 What is the rarest site for ectopic pregnancy?
- A Cornual (interstitial)
- B Abdominal
- C Fimbrial
- D Ovarian
- E Tubal

20 What is the best treatment for a hemodynamically stable patient with a cervical pregnancy?
- A Hysterectomy
- B Methotrexate
- C Embolization
- D Dilation and curettage
- E Cervical tamponade

21 What is the most common tubal implantation site for an ectopic pregnancy?
- A Ampulla
- B Interstitial part
- C Fimbria
- D Isthmus
- E Cornua

22 What is the best diagnostic tool for abdominal pregnancy?
- A Physical examination
- B Level of β-hCG
- C Ultrasound
- D Radiograph
- E Progesterone levels

13 Multifetal pregnancies: epidemiology, cultural characteristics, and management

Michelle Smith-Levitin, Daniel W. Skupski, and Frank A. Chervenak

Questions 1–3: choose the correct answer

1 There is an increased risk of multifetal pregnancies in each of the following settings *except*:
- A The use of assisted reproductive technologies (ART)
- B Women with collagen vascular diseases
- C Women of advanced maternal age
- D The use of ovulation-inducing agents
- E Higher baseline levels of gonadotropins

2 Which of the following is primarily responsible for the recent increase in the rate of multifetal pregnancies?
- A Influx of immigrants to the USA
- B Higher proportion of black women giving birth recently
- C Increase in delayed childbirth
- D Use of assisted reproductive technologies (ART)

3 Which of the following statements about zygosity is most correct?
- A The rate of zygotic splitting is increased following all ART procedures
- B Early zygotic splitting will always result in conjoined twins
- C The highest risk for perinatal morbidity and mortality occurs in dizygotic as opposed to monozygotic twins
- D Monozygotic twins will always have a monochorionic placenta

Questions 4–8: choose the most appropriate association

4 Conjoined twins:
- A Monozygotic twins
- B Dizygotic twins
- C Both
- D Neither

5 Monoamniotic, dichorionic placenta:
- A Monozygotic twins
- B Dizygotic twins
- C Both
- D Neither

6 Diamniotic, monochorionic placenta:
- A Monozygotic twins
- B Dizygotic twins
- C Both
- D Neither

7 Twin-to-twin transfusion syndrome:
- A Monozygotic twins
- B Dizygotic twins
- C Both
- D Neither

8 Diamniotic, dichorionic placenta:
- A Monozygotic twins
- B Dizygotic twins
- C Both
- D Neither

Questions 9–18: choose the correct answer

9 Monochorionicity in a twin pregnancy can be suspected by the presence of all of the following ultrasound features *except*:
- A Separate placental disks
- B T-shaped junction of amnion into chorion
- C Fetuses of the same gender
- D Very thin intertwin membrane

10 Which of the following procedures provides some additional risk of fetal bowel atresia when performed in a twin pregnancy?
- A Chorionic villous sampling
- B Cordocentesis
- C Amniocentesis with the use of indigo carmine dye
- D Intravascular transfusion

11 The single most important factor leading to the increased perinatal mortality rate in multifetal pregnancies is:
- A Multifetal pregnancy reduction
- B Intravenous tocolysis
- C Premature delivery
- D Monozygosity

12 Which of the following statements about prematurity is most correct?
- A Preterm labor occurs more frequently in twins than in triplets
- B Preterm labor in triplet gestations occurs more frequently than fetal anomalies
- C Tocolysis is contraindicated for preterm labor in triplets because of a uniform maternal contraindication
- D Preterm labor in multifetal gestations is commonly associated with acute fatty liver of pregnancy
- E Preterm labor in multifetal gestations is commonly due to anemia

13 Which of the following statements about anomalies in twins is most correct?
- A Acardiac twins are dizygotic
- B Conjoined twins are dizygotic
- C Conjoined twins are the most common anomaly in multifetal gestations
- D The rate of anomalies in twin pregnancies is the same as in singleton pregnancies
- E Anomalies occur more frequently in monozygotic twins than in dizygotic twins

14 The etiology of chronic twin-to-twin transfusion syndrome:
- A Is based on the dizygotic nature of the conceptuses
- B Is undoubtedly due to the associated reversed arterial perfusion sequence in the acardiac twin
- C Produces hypovolemia and anemia in the recipient and hypervolemia and polycythemia in the donor
- D Is based on unbalanced arterial to venous anastomotic connections between the twins in the placenta

15 Fetal demise:
- A Complicates 4–8% of twin pregnancies
- B Complicates 11–17% of triplet pregnancies
- C Is associated with an increased risk of preterm delivery in the survivor
- D Is seen at least twice the rate in monozygotic twins as in dizygotic twins
- E All of the above

16 Maternal medical complications that are increased in frequency in multifetal pregnancies include:
- A Anemia
- B Thrombophilias
- C Pneumonia
- D Appendicitis

17 Acute fatty liver of pregnancy:
- A Is associated with NO increase in the prenatal mortality rate
- B Is associated with an increased white blood count, an increased serum ammonia level, and a markedly decreased serum glucose
- C Has not been reported to result in maternal death
- D Presents with nausea and resolves quickly

18 Maternal complications that are increased in multifetal gestations include all of the following *except*:
- A Hyperemesis gravidarum
- B Preeclampsia
- C Cholestasis of pregnancy
- D Uterine rupture
- E Gestational diabetes

Questions 19–21: for each set of twins choose the most appropriate association

19 Interlocking twins:
- A Twin A vertex, twin B vertex
- B Twin A vertex, twin B nonvertex
- C Twin A nonvertex

20 Vaginal delivery of both twins is most widely accepted:
- A Twin A vertex, twin B vertex
- B Twin A vertex, twin B nonvertex
- C Twin A nonvertex

21 Intrapartum external cephalic version may be appropriate:
- A Twin A vertex, twin B vertex
- B Twin A vertex, twin B nonvertex
- C Twin A nonvertex

14 Biology of normal and deviant fetal growth

Andrée Gruslin and the late Carl A. Nimrod

1 Define genetic imprinting and provide a clinical example of the role of this mechanism in human fetal growth.

2 Define what is meant by uniparental disomy and explain how this mechanism plays a role in the regulation of fetal growth.

3 Which is the most common maternal medical condition worldwide that is associated with reduced fetal growth and what are the mechanisms involved?

4 List five micronutrients involved in the control of fetal growth.

5 What are the main functions of insulin-like growth factor (IGF)-2 in the context of fetal growth?

6 What factors regulate IGFs?

7 How is placental glucose transfer regulated?

8 What changes in amino acid transfer are observed in intrauterine growth restriction (IUGR)?

9 What is the role of placental growth hormone (GH-v) in the regulation of fetal growth?

10 Describe the adult-onset consequences of abnormal fetal growth.

Further reading

Barker DJP. In utero programming of chronic disease. *Clin Sci* 1998;95:115–128.

Baumann MU, Deborde S, Illsley NP. Placental glucose transfer and fetal growth. *Endocrine* 2002;19:13–22.

Cetin I. Placental transport of amino acids in normal and growth-restricted pregnancies. *Eur J Obstet Gynecol Reprod Biol* 2003; 110:S50–S54.

Chellakooty M, Skibsted L, Skouby SO, et al. Longitudinal study of serum placental GH in 455 normal pregnancies: correlation to gestational age, fetal gender, and weight. *J Clin Endocrinol Metab* 2002;87:2734–2739.

Constancia M, Hemberger M, Hughes J, et al. Placental-specific IGF-II is a major modulator of placental and fetal growth. *Nature* 2002;417:945–948.

Devriendt K. Genetic control of intra-uterine growth. *Eur J Obstet Gynecol Reprod Biol* 2000;92:29–34.

Lone FW, Qureshi RN, Emanuel F. Maternal anaemia and its impact on perinatal outcome. *Trop Med Int Health* 2004;9:486–490.

Osgerby JC, Wathes DC, Howard D, Gadd TS. The effect of maternal undernutrition on the placental growth trajectory and the uterine insulin-like growth factor axis in the pregnant ewe. *J Endocrinol* 2004;182:89–103.

Regnault TRH, de Vrijer B, Battaglia FC. Transport and metabolism of amino acids in placenta. *Endocrine* 2002;19:23–41.

Reik W, Constancia M, Dean W, et al. Igf2 imprinting in development and disease. *Int J Dev Biol* 2000;44:145–150.

Sacks D. Determinants of fetal growth. *Curr Diabetes Rep* 2004; 4:281–287.

Steegers-Theunissen RPM, Steegers EAP. Nutrient–gene interactions in early pregnancy: a vascular hypothesis. *Eur J Obstet Gynecol Reprod Biol* 2003;106:115–117.

Wutz A, Theussl HC, Dausman J, et al. Non-imprinted Igf2r expression decreases growth and rescues the Tme mutation in mice. *Development* 2001;128:1881–1887.

15 Developmental toxicology, drugs, and fetal teratogenesis

Robert L. Brent and Lynda B. Fawcett

Questions 1–15: choose the correct answer

1 What is the most common known cause of congenital malformations?
- A Multifactorial
- B Genetic
- C Drugs and chemicals
- D Maternal conditions: alcoholism, diabetes, etc.
- E Infectious agents

2 What basic principle should be kept in mind when evaluating the allegation that a particular drug caused a child's malformation?
- A All malformations caused by environmental agents are produced in the first trimester
- B Major malformations are readily produced by environmental agents from conception to birth
- C Dosages of known teratogens that are several orders of magnitude below the known teratogenic dose are unlikely to cause congenital malformations
- D It is impossible to confuse an environmentally produced malformation with a hereditary malformation
- E A teratogenic agent produces the same spectrum of malformations in each affected patient

3 Although detrimental effects can be induced at any time during pregnancy, most major malformations that are due to interference with organogenesis result from exposures during days 18–40 of gestation in the human. Which structures can be affected at later stages of development?
- A Limbs
- B Palate
- C Central nervous system
- D Aural
- E External genitalia
- F A, B, and C
- G B, C, and E
- H C and D

4 All of the following characteristics are shared by methyltestosterone, diethylstilbestrol, and 17α-ethinyl-17-hydroxy-5(10)-estren-3-one (Enovid-R), *except*:
- A They can exert transplacental carcinogenic effects
- B They have been reported to produce masculinization of external genitalia
- C They are converted to metabolites that have biological activity
- D They require tissue-specific receptors to exert effects
- E They induce specific malformations only when the susceptible embryonic tissues are in a restricted stage of development

5 Most drugs and chemicals cross the placenta, *except*:
- A Low-molecular-weight compounds
- B Compounds with low lipid affinity
- C Compounds with a molecular weight of 1000 kDa or greater
- D Species-specific proteins
- E B and C
- F C and D
- G B, C, and D

6 The following are proven human teratogens, *except*:
- A Streptomycin
- B Doxylamine succinate (Bendectin)
- C Ethanol
- D Diphenylhydantoin

7 Isotretinoin is a proven human teratogen in the usual therapeutic dose but does not produce:
- A Genital malformations
- B Ear malformations
- C Cleft palate
- D Congenital heart disease
- E Neural tube defects

8 Animal studies can be useful for assessing the potential human risk of developmental toxicants, but have the following limitations:
- A Doses based on mg/kg may not correlate pharmacokinetically across species
- B Genetic differences may alter the way a drug is metabolized
- C Genetic differences may alter the method of action (MOA) of a drug
- D Negative results in animal studies do not guarantee lack of developmental toxicity in the human
- E B and C
- F All of A–D
- G None of the above

9 The best methodology for determining the human risk of developmental toxicants is:
- A Animal studies
- B *In vitro* studies
- C Case reports
- D Epidemiology studies

10 Which of the following is true regarding the dose–response relationship of reproductive toxins and teratogens?
- A There is an increased risk of malformation, toxicity, or death at any exposure
- B A dose of a teratogen that is known to produce malformations early in gestation has a high likelihood of producing malformations throughout pregnancy
- C Exogenous teratogens have a no-effect dose below which the incidence of developmental toxicity and congenital malformation is not statistically greater than control subjects
- D The threshold concept stems from the principle that teratogens exert "no effect" on cellular processes below a certain dose

11 During pregnancy the major site of bioconversion of compounds is likely to be:
- A The placenta
- B The fetal liver
- C The maternal liver
- D The amniotic fluid
- E A and C
- F None of the above

12 Which of the following is a characteristic of the effects of external X-ray irradiation on embryonic development?
- A The central nervous system is the tissue most often affected
- B A single diagnostic radiograph can increase the risk of major central nervous system malformation if it occurs in early organogenesis
- C A preconception exposure of the ovaries to as little as 0.05 Gy (5 rad) can increase the risk of major malformations
- D Even when the embryo is not irradiated directly, low doses of X-rays can damage the developing embryo by affecting the mother

13 The distribution of radiation from a medically administered radioisotope is determined by:
- A Placental exchange
- B Tissue affinity
- C Nature of the radiation(s) emitted
- D All of the above

14 All of the following agents can cause congenital malformations in the human; each has been postulated to exert its teratogenic effect through one or more of its metabolites, *except*:
- A Diethylstilbestrol
- B Diphenylhydantoin
- C Ethanol
- D Cyclophosphamide

15 A full understanding of the mechanism of action of drugs that can produce congenital malformations in the human is not known, *except for*:
- A Lithium carbonate
- B Coumarin
- C Thalidomide
- D Carbamazapine
- E Ethanol
- F None of the above
- G C and E
- H C and D

Questions 16–21: match the suspected etiologies of human malformations with the appropriate percentage of total malformations (A–F)

- **A** 15–25
- **B** < 1
- **C** 4
- **D** 3
- **E** 65–75
- **F** 10

16 Genetic.

17 Maternal conditions.

18 Unknown.

19 Environmental.

20 Chemicals, drugs, radiation, hyperthermia.

21 Infectious agents.

Further reading

Brent RL. Bendectin: review of the medical literature of a comprehensively studied human nonteratogen and the most prevalent tortigen-litigen. *Reprod Toxicol* 1995;9:337–349.

Brent RL. Utilization of developmental basic science principles in the evaluation of reproductive risks from pre- and postconception environmental radiation exposures. *Teratology* 1999;59:182–204.

Brent RL. Environmental causes of human congenital malformations: the pediatrician's role in dealing with these complex clinical problems caused by a multiplicity of environmental and genetic factors. *Pediatrics* 2004;113:957–968.

Friedman JM, Polifka JE. *TERIS: The teratogen information system*. Seattle, WA: University of Washington Press, 1999.

Online Mendelian Inheritance in Man, OMIM™. McKusick-Nathans Institute for Genetic Medicine, Johns Hopkins University (Baltimore, MD) and National Center for Biotechnology Information, National Library of Medicine (Bethesda, MD), 2000. World Wide Web URL: http://www.ncbi.nlm.nih.gov/omim/

Schardein JL. *Chemically induced birth defects*. New York: Marcel Dekker; 2002:1109.

Scialli AR, Lione A, Padget GKB. *Reproductive effects of chemical, physical and biologic agents*. Baltimore, MD: Johns Hopkins University Press, 1995

Sever JL, Brent RL. *Teratogen update: environmentally induced birth defect risks*. New York: Alan R Liss, 1986.

Shepard TH, Lemire RJ. *Catalog of teratogenic agents*, 11th edn. Baltimore, MD: Johns Hopkins University Press, 2004.

16 Drugs, alcohol abuse, and effects in pregnancy

Stephen R. Carr and Donald R. Coustan

1 What are the factors that determine the toxic effect of a drug or agent on a fetus during pregnancy?

2 Give an example of how a particular type of fetal malformation gives a clue about the timing of drug/agent exposure during pregnancy.

3 Give an example of how genetic predisposition may affect the expression of the toxic capacity of a drug or chemical.

4 What are the categories that define fetal alcohol syndrome?

5 Is there a level of alcohol consumption during pregnancy below which fetal alcohol effects do not occur?

6 What are some mechanisms by which alcohol use during pregnancy may exert its toxic effect?

7 Name three questionnaires by which a pregnant woman's risk for problem drinking might be identified.

8 How does cocaine exert its effects?

9 What are the medical complications seen in pregnant cocaine users?

10 How might cocaine exert its teratogenic potential?

11 What is the data to support the concept of the "crack baby"?

12 What are the obstetric/neonatal morbidities associated with heroin use during pregnancy?

13 What kind of teratogenicity has been seen in neonates exposed to heroin as fetuses?

14 What are the features of the neonatal abstinence syndrome?

15 What are the obstetric/fetal morbidities associated with maternal smoking during pregnancy?

16 What is the impact and mechanism of impact of maternal smoking on fetal growth?

17 What is the effect and the extent of the effect of maternal smoking on perinatal/neonatal mortality?

18 Of the more than 3000 substances identified in cigarette smoke, which two are the most potent?

19 What is the teratogenic effect of cigarette smoking during pregnancy, and how might it be modulated?

20 What instrument might be used to assist pregnant women to cease smoking?

21 What is the caffeine content of the following common beverages: coffee, tea, cola, cocoa?

22 What is the teratogenic potential of caffeine during pregnancy?

Further reading

Archibald SL, Gamst A, Riley EP, et al. Brain dysmorphology in individuals with severe prenatal alcohol exposure. *Dev Med Child Neurol* 2001;43:148.

Bush PG, Mayhew TM, Abramovich DR et al. A quantitative study on the effects of maternal smoking on placental morphology and cadmium concentration. *Placenta* 2000;21:247.

Chasnoff U. Perinatal addiction: consequences of intrauterine exposure to opiate and nonopiate drugs. In: Chasnoff U, ed. *Drug use in pregnancy: mother and child*. Boston, MA: MTP Press; 1986:52.

Chiriboga CA. Fetal alcohol and drug effects. *Neurologist* 2003;9:267.

Davies DP, Gray OP, Ellwood PC, et al. Cigarette smoking in pregnancy: associations with maternal weight gain and fetal growth. *Lancet* 1976;1:385.

Ewing JA. Detecting alcoholism: the CAGE questionnaire. *JAMA* 1984;252:1905.

Fantel AG, Barber CV, Mackkler B. Ischemial reperfusion: a new hypothesis for the developmental toxicity of cocaine. *Teratology* 1992;46:285.

Finnegan LP, Connoughton IF, Kron RE, et al. Neonatal abstinence syndrome: assessment and management. In: Harbison RD, ed. *Perinatal addiction*. New York: Spectrum; 1975:141.

Fiore MC, Bailey WC, Cohen SJ, et al. *Treating tobacco use and dependence*. Clinical Practice Guideline. Rockville, MD: US Department of Health and Human Service, June 2000.

Fisher SE. Selective fetal malnutrition: the fetal alcohol syndrome. *Am Coll Nutr* 1988;7:101.

Frank DA, Augustyn M, Knight WG, et al. Growth, development and behavior in early childhood following prenatal cocaine exposure: a systematic review. *JAMA* 2001;285:1613.

Furuhashi N, Sato S, Suzuki M, et al. Effects of caffeine ingestion during pregnancy. *Gynecol Obstet Invest* 1985;19:187.

Ikonomidou C, Bittigau P, Ishimaru J, et al. Ethanol-induced apoptotic neurodegeneration and fetal alcohol syndrome. *Science* 2000; 287:1056.

Jacobson MF, Goldman AS, Syme RH. Coffee and birth defects. *Lancet* 1981;1:1415.

Jones KL, Smith DW. Recognition of the fetal alcohol syndrome in early infancy. *Lancet* 1973;1:999.

Jones KL, Smith DW, Uelland CN, et al. Pattern of malformation in offspring of chronic alcoholic mothers. *Lancet* 1973;1:1267.

Koren G, Pastuszak A, Ito S. Drugs in pregnancy. *N Engl J Med* 1998;338:1128.

Lammer EJ, Shaw GM, Iovannisci DM, et al. Maternal smoking and the risk of orofacial clefts: Susceptibility with NAT1 and NAT2 polymorphisms. *Epidemiology* 2004;15:150.

Lieber C. Biochemical and molecular basis of alcohol-induced injury to liver and other tissues. *N Engl J Med* 1988;319:1639.

Linn S, Schoenbaum SC, Monson RR, et al. No association between coffee consumption and adverse outcomes of pregnancy. *N Engl J Med* 1982;306:141.

Lutiger B, Graham K, Einarson TR, et al. Relationship between gestational cocaine use and pregnancy outcome: a meta-analysis. *Teratology* 1991;44:405.

Martinez-Frias ML, Bermejo E, Rodriguez-Pinilla E, et al. Risk for congenital anomalies associated with different sporadic and daily doses of alcohol consumption: a case–control study. *Birth Defects Res (Part A)* 2004;70:194.

Meyer KA, Williams P, Hernandez-Diaz S, et al. Smoking and oral clefts: exploring the impact of study designs. *Epidemiology* 2004; 15:671.

Miller MW. Effects of alcohol on the generation and migration of cerebral cortical neurons. *Science* 1986;233:1308.

Nehlig A, Debry G. Potential teratogenic and neurodevelopmental consequences of coffee and caffeine exposure: a review on human and animal data. *Neurotoxicol Teratol* 1994;16:531.

Papoz L, Eschwege E, Pequignot G, et al. Maternal smoking and birth weight in relation to dietary habits. *Am J Obstet Gynecol* 1982;142:870.

Penn U, Laufer EM, Land H. C-myc: evidence for multiple regulatory functions. *Semin Cancer Biol* 1990;1:69.

Rosenberg L, Mitchell AA, Shapiro S, et al. Selected birth defects in relation to caffeine-containing beverages. *JAMA* 1982; 247:1429.

Russell M, Martier SS, Sokol R, et al. Screening for pregnancy risk-drinking. *Alcohol Clin Exp Res* 1994;18:1156.

Saunders DE, Hannigan H, Zajac CS, et al. Reversal of alcohol's effects on neurite extension and on neuronal GAP43/B50, N-myc, and c-myc protein levels by retinoic acid. *Brain Res Dev Brain Res* 1995;86:16.

Sokol RJ, Martier SS, Ager JW. The T-ACE questions: practical prenatal detection of risk drinking. *Am J Obstet Gynecol* 1989; 160:863.

Walsh RA. Effects of maternal smoking on adverse pregnancy outcomes: examination of the criteria of causation. *Hum Biol* 1994;66:1059.

Woods JR, Jr, Plessinger MA, Clark KE. Effect of cocaine on uterine blood flow and fetal oxygenation. *JAMA* 1987;157:957.

17 Teratogenic viruses

Antonio V. Sison

Question 1: give the correct answer

1 The most common congenital infection is caused by which etiological agent?

Questions 2–6: choose the correct answer

2 The following statements about congenital cytomegalovirus (CMV) infection are true, *except*:
- A Most congenital infections with CMV are asymptomatic at the time of birth
- B The most common finding of congenital CMV is microcephaly
- C Mothers with serological evidence of previous immunity to CMV can still transmit the virus perinatally
- D Cytomegalic inclusion disease (CID) occurs at a rate of approximately 1 in 10 000 live births

3 The following vaccines are safe to use in pregnancy, *except*:
- A Hepatitis B virus vaccine (Recombivax)
- B Hepatitis A virus vaccine (Havrix)
- C Tetanus toxoid
- D Varicella zoster virus (VZV) vaccine

4 The following statements are part of the current recommendations of the Centers for Disease Control on rubella virus, *except for*:
- A All children from 12 to 15 months of age or older should be vaccinated against rubella
- B All prenatal patients should be tested for rubella IgG as part of their prenatal care
- C Female patients who receive the rubella vaccine should be advised not to get pregnant for 1 month after administration of the vaccine
- D All newborns should be vaccinated against rubella

5 Varicella zoster virus immunoglobulin (VZIG) has been shown to have reasonable efficacy in preventing chickenpox in which of the following clinical scenarios?
- A Pregnant mothers with acute varicella pneumonia
- B Postpartum patients with acute shingles
- C Serosusceptible pregnant women exposed to a child with active chickenpox 3 days previously
- D Serosusceptible pregnant women exposed to a child with active chickenpox 7 days previously
- E Seroimmune pregnant women exposed to a child with active chickenpox 3 days previously

6 The incidence and prevalence of herpes simplex virus (HSV) infection in women is inversely related to:
- A Decreased sexual activity
- B Early age of sexual contact
- C Increased number of sexual contacts
- D Increased number of pregnancies

Question 7: true or false

7 Both HSV1 and HSV2 can cause genital infections.

Questions 8–16: choose the correct answer

8 The following statements are true about acyclovir *except*:
- A Acyclovir is a synthetic thymidine analog
- B Acyclovir is a competitive inhibitor of HSV1 and HSV2 DNA polymerase
- C HSV thymidine kinase phosphorylates acyclovir
- D The drug penciclovir is converted to acyclovir *in vivo*

9 An immediate Cesarean section is the unequivocal management option for which clinical scenario?
- A Active genital HSV in a patient with premature rupture of the membranes at 28 weeks
- B Active labor at term in a patient with acute primary HSV
- C Active labor at term in a patient with recurrent HSV in the buttocks
- D Active labor at term in a patient with shingles

10 A woman who is 31 weeks' pregnant presents with a multiple, unilateral, maculopapular, nonpruritic rash on the back, which is exquisitely painful and lasts several days; there is accompanying fever, malaise, and fatigue. Which is the least likely etiological agent?
- A VZV
- B Parvovirus B19
- C Rubella virus
- D HSV

11 Which infectious agent is least considered to be a teratogen?
- A Rubella virus
- B CMV
- C Venezuelan equine encephalitis (VEE) virus
- D Human immunodeficiency virus (HIV) type 1

12 Which infectious agent has been most implicated in perinatal transmission through exposure of the infant to the virus in the birth canal?
- A Rubella virus
- B HSV
- C Parvovirus B19
- D CMV
- E VZV

13 Which infectious agent has *not* been associated with chorioretinitis in the newborn?
- A Parvovirus B19
- B VZV
- C CMV
- D HSV

14 A newborn presents with congenital cataracts and cicatricial scarring of the left lower limb with hypoplasia. The most likely diagnosis is congenital infection with:
- A Parvovirus B19
- B VEE virus
- C Rubella virus
- D VZV

15 At present, the single most important source of individuals serosusceptible to rubella in the USA is:
- A Healthcare providers
- B Women of reproductive age
- C Foreign-born immigrants from Latin America
- D Inner-city populations

16 Horizontal transmission of German measles occurs primarily through:
- A Sexual transmission of infectious virus
- B Parenteral exposure from infected individuals
- C Nasopharyngeal inoculation of infectious respiratory droplets in the host
- D Physical contact of the skin with the macular rash

Question 17: true or false

17 Breastfeeding is contraindicated in postpartum women who have received the rubella virus vaccine.

Questions 18–20: choose the correct answer

18 What percentage of individuals who have had chickenpox will develop shingles later on in life?
- A 20%
- B 40%
- C 60%
- D 80%

19 Which clinical scenario is most likely to result in fetal infection?
- A A mother who develops chickenpox on the first postpartum day following vaginal delivery
- B A mother with active shingles who undergoes an emergency Cesarean delivery for a bleeding placenta previa
- C A pregnant woman with varicella pneumonia at 20 weeks, who undergoes a Cesarean delivery at term because of a breech presentation
- D A mother who develops chickenpox 2 weeks after delivery

20 In the USA, approximately what percentage of women are susceptible to rubella despite routine vaccination programs in children?
- A 10%
- B 30%
- C 50%
- D 70%

Further reading

American College of Obstetricians and Gynecologists Committee Opinion No. 281. Rubella vaccination. December 2002, No. 281.

Bar-Oz B, Levicheck Z, Moretti ME, et al. Pregnancy outcome following rubella vaccination: a prospective controlled study. *Am J Med Genet* 2004;130:52.

Castillo-Solorzano C, Carracso P, Tambini G, et al. New horizons in the control of rubella and prevention of congenital rubella syndrome in the Americas. *J Infect Dis* 2003;187(Suppl.1):146.

Cutts FT, Robertson SE, Diaz-Ortega JL, et al. The burden of disease from CRS: control of rubella and congenital rubella syndrome (CRS) in developing countries. Geneva: Department of Vaccines and Biologicals, World Health Organization; 2000:2–15.

Enders M, Wediner A, Zoellner I, et al. Fetal morbidity and mortality after human parvovirus B19 infection in pregnancy: prospective evaluation of 1018 cases. *Prenat Diagn* 2004;24:513.

Fleming DT, McQuillan GM, Johnson RE, et al. Herpes simplex virus type 2 in the United States, 1976 to 1994. *N Engl J Med* 1997;337:1105.

Forrest JM, Turnbull FM, Sholler GF, et al. Gregg's congenital rubella patients 60 years later. *Med J Aust* 2002;177:664.

Nyman M, Tolfvenstam T, Peterson K, et al. Detection of human parvovirus B-19 infection in first-trimester loss. *Obstet Gynecol* 2002;99:795.

Sheffield JS, Hollier LM, Hill JB, et al. Aciclovir prophylaxis to prevent herpes simplex virus recurrence at delivery: a systematic review. *Obstet Gynecol* 2003;102:1396.

Tang JW, Aarons E, Hesketh LM, et al. Prenatal diagnosis of congenital rubella infection in the second trimester of pregnancy. *Prenat Diagn* 2003;23:509.

18 Transplacentally acquired microbial infections in the fetus

Santosh Pandipati and Ronald S. Gibbs

Questions 1–5: choose the correct answer

1 Each of the following statements about toxoplasmosis is true except:
- A The likelihood of transmission of infection increases with gestational age
- B Most infants with congenital toxoplasmosis are asymptomatic in the newborn period
- C Toxoplasmosis-specific IgG detected preconceptionally indicates protection from subsequent fetal infection
- D The severity of congenital infection increases with gestational age
- E With an acute infection, toxoplasmosis-specific IgM may be present for up to 8 months with an ELISA test

2 Congenital abnormalities typical of rubella infection include all of the following except:
- A Cataracts
- B Blueberry muffin rash
- C Valvular pulmonic stenosis
- D Sensorineural deafness

3 The incidence of congenital rubella syndrome per 100 000 lives births is approximately:
- A 1
- B 0.5
- C 0.05
- D 0.01

4 Which of the following medications has been shown to be effective in the treatment of cytomegalovirus (CMV) infection?
- A Acyclovir
- B Leukocyte interferon
- C Adenosine arabinoside
- D Idoxuridine
- E None of the above

5 Herpes simplex virus (HSV) infection may be transmitted to a neonate at which of the following times?
- A Intrapartum
- B Transplacental
- C Postnatal, nonvenereal
- D All of the above

Questions 6–10: choose
- **A** If 1, 2, and 3 are correct
- **B** If only 1 and 3 are correct
- **C** If only 2 and 4 are correct
- **D** If only 4 is correct
- **E** If all are correct

6 Medications used in the treatment/prevention of congenital toxoplasmosis include:
- 1 Pyrimethamine
- 2 Spiramycin
- 3 Sulfadiazine
- 4 Triple sulfonamides

7 Late manifestations of rubella include:
- 1 Diabetes mellitus
- 2 Subacute sclerosing panencephalitis
- 3 Late-onset deafness
- 4 Abnormal dentition

8 Prenatal confirmation of rubella infection has been reported using which of the following?
- 1 Chorionic villus biopsy
- 2 Rubella virus RNA detection
- 3 Fetal blood sampling
- 4 Ultrasound

9 Fetal clinical manifestations of CMV include:
- 1 Nonimmune hydrops
- 2 Fetal heart block
- 3 Microcephaly
- 4 Renal dysplasia

10 Intracranial calcifications have been identified in congenital infections caused by the following organisms:
1 CMV
2 HSV
3 Toxoplasmosis
4 Rubella

Questions 11–14: match the finding with the organism for which it is most typical

A *Toxoplasma gondii*
B Rubella virus
C CMV
D HSV
E Epstein–Barr virus (EBV)

11 Vesicular eruption.

12 Cysts in the placenta.

13 Deafness.

14 Fetal arrythmia.

Questions 15–18: match the statements with the appropriate organism

A *Toxoplasma gondii*
B Rubella virus
C CMV
D HSV
E EBV

15 Is usually associated with intrapartum transmission.

16 Is carried in an animal reservoir.

17 Is an RNA virus.

18 Is the most common viral cause of congenital infection.

Questions 19–23: true or false

19 Intrapartum transmission of HSV occurs only during symptomatic episodes.

20 The risk of acquisition and severity of neonatal HSV may be decreased by the transplacental passage of maternal antibody.

21 HSV serotypes 1 and 2 account for equal proportions of neonatal disease.

22 There have been no cases of congenital malformation associated with EBV.

23 Approximately 40% of pregnant women are seropositive for EBV antigen.

Questions 24–26: choose the appropriate matching term

A Condylomata acuminata of the genitalia
B Herpes virus infection
C Human parvovirus infection (B19)
D Hepatitis B infection
E Varicella infection

24 When clinical manifestations occur in the fetus, hydrops fetalis has recently been recognized.

25 An indication for Cesarean section if present on the genitalia at the time of delivery.

26 Maternal pneumonia is a major complication.

Question 27: choose the correct answer

27 After hepatitis B infection, what percentage of adults have persistence of infection?
A 10%
B 25%
C 50%
D 75%
E 90%

Questions 28 and 29: choose the correct answer/s

28 Transmission of hepatitis B infection from the mother to the fetus/infant occurs in 80–90% of cases when:
A Mother is HBsAg positive but HBeAg negative
B Mother is HBeAg positive
C Mother's infection was in the third trimester
D Mother has persistent asymptomatic disease

29 Which groups of women are considered at high risk for hepatitis B infection?
A Women of Asian descent
B Workers in a hemodialysis unit
C Women with multiple episodes of venereal diseases
D Women who use percutaneous illicit drugs

Questions 30–35: choose the correct answer

30 Infants born to women who are HBsAg positive should be:
A Observed for development of hepatitis
B Given hepatitis B immune globulin (HBIG) only
C Vaccinated with hepatitis B vaccine only
D Tested for HBeAg status only
E Given both HBIG and vaccine

31 A congenital syndrome of limb hypoplasia, atrophic digits, and skin scars suggests which of the following congenital infections?
A Rubella
B Toxoplasmosis
C Varicella
D AIDS
E CMV

32 Erythema infectiosum is characterized by a facial rash called "the slapped cheek" appearance. What virus causes this?
A CMV
B Herpes virus type II
C Herpes virus type I
D Human parvovirus (B19)
E Measles

33 The risk of juvenile respiratory papillomatosis at vaginal delivery through a birth canal with condylomata acuminata may best be estimated as approximately:
A 1% or less
B 5%
C 10%
D 15%
E 20%

34 The histologic hallmark of transplacental fetal infections is:
A Chorioamnionitis
B Acute umbilical angiitis
C Villous inflammation
D Deciduitis
E Cerebritis

35 A 21-year-old primigravid woman presents with fever, back pain, preterm labor, and brown-stained amniotic fluid. Which of the following organisms should be suspected as a potential cause of fetal infection?
A *Escherichia coli*
B *Listeria monocytogenes*
C Group B streptococci
D *Trypanosoma cruzi*
E *Campylobacter fetus*

19 Antibiotics and other antimicrobial agents in pregnancy and during lactation

Janet I. Andrews and Jennifer R. Niebyl

Questions 1–20: choose the correct answer

1 Which of the following drugs may increase the risk of birth defects when used in the first trimester?
A Ampicillin
B Penicillin
C Acyclovir
D Trimethoprim
E Erythromycin

2 Serum levels of penicillin are lower in pregnant women than in nonpregnant women after equivalent dosing because of increases in all of the following, *except for*:
A Renal blood flow
B Glomerular filtration rate
C Hepatic metabolism
D Maternal intravascular volume

3 Which of the following drugs has the lowest level in breast milk when administered to mothers?
A Ampicillin
B Penicillin
C Amoxicillin
D Dicloxacillin

4 Sulfonamides given to newborn infants increase the risk of:
A Respiratory distress
B Intraventricular hemorrhage
C Kernicterus
D Anemia
E Necrotizing enterocolitis

5 Which of the following drugs should not be used for the therapy of acute pyelonephritis?
A Ampicillin
B Cephalosporins
C Gentamicin
D Nitrofurantoin

6 Tetracyclines inhibit the growth of fetal:
A Heart muscle
B Bones and teeth
C Neural tube
D Lip and palate

7 All of the following drugs are known to be compatible with breast feeding, *except for*:
A Penicillins
B Cephalosporins
C Tetracyclines
D Aminoglycosides
E Amantidine

8 Exposure of the fetus to gentamicin has been associated with:
A Congenital heart disease
B Ototoxicity
C Cleft lip and palate
D Limb reduction defects

9 The treatment of syphilis in pregnancy in penicillin-allergic patients should consist of the administration of:
A Penicillin (after desensitization)
B Erythromycin
C Tetracycline
D Clindamycin

10 Once-a-day dosing of gentamicin increases the:
A Cost
B Efficacy
C Toxicity
D Frequency of nursing administration

11 Fluoroquinolones may affect the development of:
A Heart muscle
B Bone and cartilage
C Neural tube
D Lip and palate

12 Metronidazole increases the risk of which of the following birth defects when used in the first trimester?
- A Cleft lip and/or palate
- B Neural tube defect
- C Congenital heart disease
- D Limb reduction defects
- E None of the above

13 In pregnancy, acyclovir should be used to treat all of the following conditions, *except for*:
- A Recurrent genital herpes
- B Varicella pneumonia
- C Herpetic hepatitis
- D Influenza

14 In HIV-positive women, combination antiretroviral therapy should be administered:
- A During pregnancy
- B Intrapartum
- C To the newborn
- D All of the above

15 Treatment with isoniazid (INH) for a positive purified protein derivative (PPD) conversion during pregnancy may be associated with maternal:
- A Renal failure
- B Liver toxicity
- C Seizures
- D Congestive heart failure

16 The treatment of active tuberculosis during pregnancy should include all of the following drugs, *except for*:
- A INH
- B Ethambutol
- C Rifampin
- D Pyrazinamide

17 Which of the following drugs is listed by the American Academy of Pediatrics as having unknown effects in nursing infants, but which may be of concern?
- A Metronidazole
- B Gentamicin
- C Sulfonamides
- D Tetracycline

18 Which of the following antiretroviral drugs should be avoided during pregnancy?
- A Stavudine
- B Zidovudine
- C Efavirenz
- D Lamivudine

19 Which of the following combination of drugs is contraindicated during pregnancy?
- A Zidovudine and nelfinavir
- B Stavudine and didanosine
- C Lamivudine and zidovudine
- D Nevaripine and lamivudine

20 Which of the following drugs has not been prescribed for either the prevention or treatment of influenza?
- A Tenofovir
- B Amantidine
- C Zanamivir
- D Oseltamivir

Further reading

Briggs GG, Freeman RK, Yaffe SJ. *Drugs in pregnancy and lactation*, 6th edn. Baltimore, MD; Williams and Wilkins, 2002.

Committee on Drugs. American Academy of Pediatrics. The transfer of drugs and other chemicals into human milk. *Pediatrics* 2001; 108:776.

Culnane M, Fowler MG, Lee SS, et al. Lack of long-term effects of *in utero* exposure to zidovudine among uninfected children born to HIV-infected women. *JAMA* 1999;281:151.

Hernandez-Diaz S, Werler MM, Walker AM, et al. Folic acid antagonists during pregnancy and the risk of birth defects. *N Engl J Med* 2000;343:1608.

Kline AH, Blattner RJ, Lunin M. Transplacental effects of tetracycline on teeth. *JAMA* 1964;118:178.

Mitra AG, Whitten K, Laurent SL, et al. A randomized, prospective study comparing once-daily gentamicin versus thrice-daily gentamicin in the treatment of puerperal infection. *Am J Obstet Gynecol* 1997;177:786.

Pastuszak A, Andreou R, Schick B, et al. New postmarketing surveillance data supports a lack of association between quinolone use in pregnancy and fetal and neonatal complications. *Reprod Toxicol* 1995;9:584.

Robinson GC, Cambon KG. Hearing loss in infants of tuberculous mothers treated with streptomycin during pregnancy. *N Engl J Med* 1964;271:949.

South MA, Short DH, Knox JM. Failure of erythromycin estolate therapy in *in utero* syphilis. *JAMA* 1964;190:70.

Watts HD, Brown ZA, Money D, et al. A double-blind, randomized, placebo-controlled trial of aciclovir in late pregnancy for the reduction of herpes simplex virus shedding and cesarean delivery. *Am J Obstet Gynecol* 2003;188:836.

20 Principles of human genetics: chromosomal and single-gene disorders

Joe Leigh Simpson and Maurice J. Mahoney

Questions 1–20: true or false

1 The frequency of chromosomal abnormalities at birth is 1 per 1000 liveborns.

2 Autosomal trisomy is associated with increased maternal age, with the risk beginning at 35 years of age.

3 Fluorescence *in situ* hybridization (FISH) using chromosome-specific probes can generate results within hours.

4 Paternal meiosis I is the most common cytological origin of autosomal trisomy.

5 Among couples in which either parent shows a reciprocal translocation, the risk of unbalanced fetuses is 10–15%.

6 In autosomal recessive disorders, both mutant alleles must have the same molecular perturbation (i.e., altered nucleotides) in order for a disorder to be manifested.

7 In a family in which an X-linked recessive mutant allele is segregating, individuals at risk include male siblings, maternal aunts and uncles, and first cousins of either sex.

8 The products of genes are proteins (peptides).

9 Diagnosis of a mendelian disorder can usually be accomplished by studying its gene (i.e., DNA) *per se*.

10 Most common anomalies limited to a single organ system show recurrent risks of 1–5% for first-degree relatives.

11 Family-based linkage analysis in prenatal diagnosis depends on assaying fetal DNA for the mutation found in the proband.

12 Screening programs that detect carriers of recessive genes are available for cystic fibrosis and hemoglobinopathies, but not for type 1 diabetes.

13 Tests for uniparental disomy (UPD) in a fetus require parental DNA as well as fetal DNA.

14 Multifactorial disorders, such as neural tube defects, are diagnosed by analyzing the two or three most important genes that cause the disorder.

15 Single-gene disorders can be diagnosed by analyzing DNA (genes) or gene products but not by imaging methods such as sonography or magnetic resonance imaging (MRI).

16 Microarray analysis of chromosomes, using DNA hybridization techniques, is useful for diagnosis of chromosome microdeletions.

17 Fetal blood, obtained by cordocentesis, is the usual source of fetal DNA for gene-based diagnoses.

18 Recognition that a couple has a high risk of having a child with a single-gene disorder can come from either family histories of the couple or recessive gene screening programs.

19 In the diagnosis of fetal inborn errors of metabolism, abnormal metabolite concentrations are more likely to be found in amniotic fluid than in maternal blood.

20 Family history is more important in identifying pregnancies at risk for fetal mendelian disorders than those at risk for chromosomal disorders.

Please note that there is no question/answer section for Chapter 21 of the textbook.

22 Basic principles of ultrasound

Mladen Predanic, Frank A. Chervenak, and E. Albert Reece

Questions 1–4: true or false

1 The ultrasound frequency is measured in cycles per second or hertz (Hz); 1 MHz (mega Hz) corresponds to 10 000 cycles per second.

2 The frequency of the diagnostic ultrasound used in medicine for fetal imaging is in the range 10–15 MHz.

3 The *piezoelectric phenomenon* describes the generation of ultrasound waves by high-frequency oscillations of certain materials ("crystals"), which are induced with electrical impulses.

4 The quality of the ultrasound image is categorized by azimuthal, lateral, and axial resolution that corresponds to the width, depth, and thickness of the generated ultrasound beam respectively.

Questions 5–7: choose the correct answer

5 Ultrasound resolution has been dramatically improved in newer ultrasound machines by:
- A An increase in the number of ultrasound crystals
- B Decrease in array aperture
- C Implementation of analog instead of digital algorithms for focusing on the received ultrasound beam
- D Implementation of a single focus over multiple ultrasound beam focuses

6 The two major ultrasonically produced biological effects observed in insonated tissues are:
- A Thermal changes and tissue swelling
- B Microcavitation and thermal changes
- C Microcavitation and tissue swelling
- D Tissue swelling and fluid vaporization

7 The application of high-energy output ultrasound on live tissue may cause the following effect:
- A Chromosomal changes
- B DNA disruption
- C Cell membrane disruption
- D Arrest of cell division

Question 8: true or false

8 The application of two-dimensional real-time diagnostic sonography with low-energy outputs used in current diagnostic ultrasound machines is considered safe and not harmful to the fetus?

Question 9: choose the correct answer

9 Some recent studies which dealt with prenatal ultrasound safety reported the following findings that questioned ultrasound safety:
- A Presence of neonatal growth deficiency caused by prenatal serial ultrasound
- B Higher prevalence of male neonates with nonright-handedness (ambiguity)
- C Higher prevalence of visual and hearing impairment caused by single prenatal ultrasound examination
- D Higher prevalence of suboptimal speech developmental milestones in children exposed to the third-trimester ultrasound examination

Questions 10–13: true or false

10 The implementation of pulsed Doppler for the assessment of the embryo's heart rate for more than 20 minutes is considered safe.

11 The endorsed ALARA principle during the ultrasound fetal examination stands for: "As little as required assessment."

12 The current recommendation of the American College of Obstetrics and Gynecology is that ultrasound in pregnancy should be performed only when there is a valid medical indication, although if a patient requests an ultrasonographic examination it is reasonable to honor the request.

13 More than 60% of infants with congenital anomalies are born to women with no risk factors.

Questions 14–16: choose the correct answer

14 Which one of the following indications is not endorsed by either the American Institute of Ultrasound in Medicine or the American College of Obstetrics and Gynecology?
- A Estimation of gestational age
- B Vaginal bleeding
- C Pelvic mass in pregnancy
- D Adjunct to external cephalic version
- E Routine second-trimester fetal anatomy survey

15 Essential elements of the fetal anatomic ultrasound survey are all of the following *except*:
- A Cisterna magna
- B Cavum septi pellucidi
- C Four-chamber heart view
- D Fetal hands
- E Umbilical cord insertion site into the fetal abdomen

16 Indications for ultrasound examination in the first trimester of pregnancy are all of the following *except*:
- A To confirm the presence of an intrauterine pregnancy
- B To evaluate pelvic pain
- C To estimate gestational age in a patient who had an embryo transfer (IVF)
- D To confirm cardiac activity
- E To evaluate suspected hydatidiform mole

Questions 17–20: true or false

17 During evaluation of the posterior fossa of the fetal brain, information regarding the cerebellar diameter, presence of vermis, size of cisterna magna, and thickness of the nuchal fold is revealed.

18 Fetal heart outflow tract anomalies (e.g., transposition of the great vessels) can be easily missed if "long-" and "short"-axis heart views are not performed.

19 The normal appearance of the umbilical cord insertion site into the fetal abdomen effectively rules out the presence of omphalocele or gastroschisis.

20 There is almost no inter- or intraobserver variation in the assessment of fetal weight at extremes of fetal age (e.g., less than 24 or beyond 36 weeks of gestation).

Further reading

Abramowicz JS, Kossoff G, Marsal K, ter Haar G. International Society of Ultrasound in Obstetrics and Gynecology (ISUOG) Safety and Bioeffects Committee: safety statement. *Ultrasound Obstet Gynecol* 2000;16:594–596.

American College of Obstetricians and Gynecologists. Clinical management guidelines for obstetrician–gynecologists, no. 58, December 2004.

American Institute of Ultrasound in Medicine (AIUM). Mechanical bioeffects from diagnostic ultrasound: AIUM consensus statements. *J Ultrasound Med* 2000;19:69–168.

American Institute of Ultrasound in Medicine. Practice guideline for the performance of an antepartum obstetric ultrasound examination. *J Ultrasound Med* 2003;22:1116–1125.

Dalecki D. Mechanical bioeffects of ultrasound. *Annu Rev Biomed Eng* 2004;6:229–248.

Duck FA. Is it safe to use diagnostic ultrasound during the first trimester (Editorial)? *Ultrasound Obstet Gynecol* 1999;13:385–388.

Kremkau FW. *Diagnostic ultrasound: Principles and instruments*, 6th edn. Philadelphia, PA; WB Saunders, 2002.

23 Prenatal diagnosis of central nervous system malformations

Gianluigi Pilu and Sandro Gabrielli

Questions 1–20: choose the correct answer

1 Ventral induction is:
- A Closure of the neural tube, completed by 24 weeks, with the exception of two openings at the extremities, the anterior and the posterior neuropores
- B Subdivision of the prosencephalon into the telencephalon and diencephalon, and of the rhombencephalon into the metencephalon and myelencephalon
- C Division of the cavity within the telencephalon into two distinct cavities that will give rise to the lateral ventricles
- D Cleavage of the primitive cerebrum along four horizontal planes leading to the formation of the five primary cerebral vesicles

2 Which is the last component of the lateral ventricle to undergo a modification of its shape?
- A Frontal horns
- B Occipital horns
- C Atria
- D Body

3 The cavum septi pellucidi:
- A Is an empty space
- B Is a fluid-filled cavity
- C Lies between the leaves of the septum pellucidum
- D Increases progressively in size during gestation
- E All of the above

4 The cisterna magna:
- A Is situated in the angle between the superior surface of the cerebellum and the mesencephalon
- B Is rarely demonstrable by ultrasound
- C Decreases steadily in size with progressing gestation
- D Is quite generous in size up to the third trimester

5 The term mild ventriculomegaly is commonly used to indicate cases with an atrial width of:
- A 10–12 mm
- B 10–15 mm
- C 10–18 mm
- D 15–20 mm

6 The etiology of aqueductal stenosis includes:
- A Infections
- B True malformations
- C Congenital tumors
- D All of the above

7 Communicating hydrocephalus:
- A Results from failure of reabsorption of cerebrospinal fluid
- B Is characterized in the early stages by enlarged subarachnoid channels overlying the cerebral hemispheres only
- C Has a multifactorial etiology with a recurrence risk of 1–2%
- D Is never associated with a choroid plexus papilloma

8 Ventriculomegaly in Dandy–Walker syndrome:
- A Is almost invariably present at ultrasound *in utero*
- B Is absent in 80% of cases at birth

9 The term Dandy–Walker variant refers to:
- A An enlarged cisterna magna with a depth greater than 10 mm
- B A thin communication between the fourth ventricle and the cisterna magna
- C An inferior vermian agenesis
- D B and C

10 Which method is most reliable for the prenatal diagnosis of hydrocephalus?
- A Head ultrasound measurements
- B Measurement of the lateral ventricular ratio
- C Qualitative evaluation of the intracranial structures
- D Measurements of the internal diameter of the atria of the lateral ventricle

11 In case of severe isolated ventriculomegaly, the probability of severe neurologic sequelae in the survivors is in the range of:
- A 10%
- B 20%
- C 30%
- D 50%

12 In cases of spina bifida:
- A The sensitivity of cranial signs is close to 100%
- B Ventriculomegaly is present in less than 70% of cases at midtrimester
- C The defect is mostly isolated
- D All of the above

13 Cephaloceles and polycystic kidneys are classically features of:
- A Arnold–Chiari syndrome, type II
- B Beckwith–Wiedemann syndrome
- C Meckel syndrome
- D Amniotic band syndrome

14 Microcephaly is:
- A Head circumference below –2 SD from the mean
- B Head circumference below –3 SD from the mean
- C Mental retardation associated with a small head
- D All of the above

15 Detection of a choroid plexus cyst occurs most frequently in cases of aneuploidy such as:
- A Trisomy 13
- B Trisomy 18
- C Trisomy 21
- D 45,X

16 Cyclopia is a feature of:
- A Alobar holoprosencephaly
- B Semilobar holoprosencephaly
- C Lobar holoprosencephaly
- D All of the above

17 The most constant ultrasound finding in our series of agenesis of the corpus callosum was:
- A Widening of the interhemispheric fissure
- B Upward displacement of the third ventricle
- C Direct demonstration of the absence of the corpus callosum
- D Colpocephaly

18 Pseudoporencephaly:
- A Is a developmental form of porencephaly
- B Is a bilateral and symmetrical lesion
- C Is a unilateral lesion
- D Has a better prognosis than true porencephaly

19 Falx cerebrii is absent or incomplete in the vast majority of cases of:
- A Alobar holoprosencephaly
- B Hydranencephaly
- C Severe hydrocephalus
- D All of the above

20 Demonstration of the bulb-like brain stem bulging inside the fluid-filled intracranial cavity is typical of:
- A Alobar holoprosencephaly
- B Porencephaly
- C Hydranencephaly
- D None of the above

Further reading

Adamsbaum C, Moutard ML, Andre C, et al. MRI of the fetal posterior fossa. *Pediatr Radiol* 2005;35(2):124–140.

Blaas HG, Eriksson AG, Salvesen KA, et al. Brains and faces in holoprosencephaly: pre- and postnatal description of 30 cases. *Ultrasound Obstet Gynecol* 2002;19(1):24–38.

Filly RA, Cardoza JD, Goldstein RB, Barkovich AJ. Detection of fetal central nervous system anomalies: a practical level of effort for a routine sonogram. *Radiology* 1989;172(2):403–408.

Filly RA, Callen PW, Goldstein RB. Alpha-fetoprotein screening programs: what every obstetric sonologist should know. *Radiology* 1993;188(1):1–9.

Ghi T, Simonazzi G, Perolo A, et al. Outcome of antenatally diagnosed intracranial hemorrhage: case series and review of the literature. *Ultrasound Obstet Gynecol* 2003;22(2):121–130.

Johnson SP, Sebire NJ, Snijders RJ, et al. Ultrasound screening for anencephaly at 10–14 weeks of gestation. *Ultrasound Obstet Gynecol* 1997;9(1):14–16.

Malinger G, Lerman-Sagie T, Watemberg N, et al. A normal second-trimester ultrasound does not exclude intracranial structural pathology. *Ultrasound Obstet Gynecol* 2002;20(1):51–56.

Pilu G, Sandri F, Perolo A, et al. Sonography of fetal agenesis of the corpus callosum: a survey of 35 cases. *Ultrasound Obstet Gynecol* 1993;3(5):318–329.

Pilu G, Falco P, Gabrielli S, et al. The clinical significance of fetal isolated cerebral borderline ventriculomegaly: report of 31 cases and review of the literature. *Ultrasound Obstet Gynecol* 1999;14(5):320–326.

Snijders RJ, Shawa L, Nicolaides KH. Fetal choroid plexus cysts and trisomy 18: assessment of risk based on ultrasound findings and maternal age. *Prenat Diagn* 1994;14(12):1119–1127.

24 Prenatal diagnosis of thoracic and cardiac abnormalities

Gianluigi Pilu, Philippe Jeanty, and Juliana M.B. Leite

Questions 1–10: choose the correct answer

1 The frequency of congenital heart disease at birth is:
- A 1:1000
- B 2:1000
- C 5:1000
- D 2:100
- E 1:50

2 Which of the following cardiac defects is more frequent?
- A Ventricular septal defects
- B Aortic stenosis
- C Pulmonic stenosis
- D Aortic coarctation
- E Hypoplastic left heart

3 Which of the following cardiac defects is more frequently associated with trisomy 21?
- A Complete heart block
- B Complete atrioventricular septal defects
- C Interrupted aortic arch
- D Hypoplastic left heart
- E Tachycardia

4 Microdeletion of chromosome 22 is more frequently associated with:
- A Complete heart block
- B Complete atrioventricular septal defects
- C Interrupted aortic arch
- D Hypoplastic left heart
- E Tachycardia

5 Which of the following cardiac defects is more frequently associated with intrauterine heart failure?
- A Ebstein's anomaly of the tricuspid valve with atrioventricular insufficiency
- B Hypoplastic left heart
- C Transposition of the great arteries
- D Ventricular septal defect
- E Univentricular heart

6 Which of the following cardiac defects is usually a neonatal emergency?
- A Complete transposition of the great vessels
- B Tetralogy of Fallot
- C Pulmonic stenosis
- D Aortic stenosis
- E Double-inlet single ventricle

7 Which of the following fetal cardiac defects may be the consequence of maternal autoimmune antibodies?
- A Heterotaxy
- B Atrial flutter
- C Complete atrioventricular block
- D Cardiomyopathy
- E Corrected transposition

8 Prenatal diagnosis may improve the prognosis of which of the following cardiac anomalies?
- A Ebstein's anomaly of the tricuspid valve with atrioventricular insufficiency
- B Corrected transposition of the great arteries
- C Complete transposition of the great arteries
- D Ventricular septal defect
- E Univentricular heart

9 Which of the following anomalies does not result in echogenic lungs?
- A Bronchial obstruction
- B Lung sequestration
- C Cystic adenomatoid malformation
- D Diaphragmatic hernia
- E Tracheal atresia

10 Which of the following anomalies is amenable to antenatal treatment?
- A Pleural effusion
- B Fetal tachycardia
- C Complete atrioventricular block
- D Diaphragmatic hernia
- E All of the above

25 Gastrointestinal and genitourinary anomalies

Sandro Gabrielli, Nicola Rizzo, and E. Albert Reece

Questions 1–20: choose the correct answer

1 Esophageal atresia:
- A Can be diagnosed in the first trimester
- B Is frequently associated with increased volume of amniotic fluid
- C Is not associated with a normal appearing stomach
- D Should be delivered by Cesarean section

2 Duodenal obstruction:
- A Is rarely associated with chromosomal anomalies
- B Is frequently associated with oligohydramnios
- C Should be differentiated from choledocal or hepatic cysts
- D Has a poor prognosis when isolated

3 With duodenal obstruction:
- A Neonatal pneumonia may be a complication
- B Postdate gastric distress should be expected
- C Obstetrical management is influenced by prenatal diagnosis
- D Dystocia is common

4 Intestinal obstruction as an atresia or stenosis below the duodenum:
- A Is frequently associated with trisomy 21
- B Is frequently associated with other anomalies
- C Is frequently associated with polyhydramnios
- D May be associated with impaired blood supply

5 Omphalocele is mostly associated with:
- A Hydrocephaly
- B Encephalocele
- C Cardiac anomalies
- D Intracranial cysts

6 If omphalocele has been diagnosed prenatally:
- A Delivery should be by Cesarean section
- B Delivery should be vaginal
- C Delivery may be influenced by the size of the lesion
- D Planned delivery with anticipated surgical attention may be of benefit

7 Which of the following is not a feature of the Beckwith–Wiedemann syndrome?
- A Macrosomia
- B Omphalocele
- C Neonatal hyperglycemia
- D Mental retardation

8 Which syndrome does not include omphalocele?
- A Pentalogy of Cantrell
- B Beckwith–Wiedemann syndrome
- C Amniotic band syndrome
- D OEIS complex

9 In case of gastroschisis:
- A Chromosomal abnormalities are frequent
- B Growth restriction is frequently associated
- C Polyhydramnios is a common finding
- D Survival is approximately 50%

10 When a fetus affected by intestinal obstruction suddenly shows the presence of ascites or generalized hydrops, one should suspect:
- A An abdominal teratoma
- B Gallbladder calcifications
- C Meconium peritonitis
- D Intestinal infarction

11 Bilateral renal agenesis may be associated with:
- A Pulmonary hypoplasia
- B Low-set ears
- C Intrauterine growth retardation
- D All of the above
- E None of the above

12 In delivery of the fetus with bilateral renal agenesis at term:
- A Care should be individualized
- B Care should generally follow standard obstetric indications
- C Regional anesthesia is acceptable for labor
- D All the above

13 Autosomal-recessive cystic kidney may be associated with:
- A Periportal hepatic fibrosis
- B Biliary ductal ectasia
- C Large cysts in the cortical region
- D A 50% risk of recurrence

14 Autosomal-dominant cystic kidney:
- A May have an associated genetic abnormality
- B May manifest problems at any age or never
- C Is not necessarily associated with a poor prognosis
- D All of the above
- E None of the above

15 Mild hydronephrosis is defined by the presence of:
- A An anteroposterior diameter of the pelvis greater than 7 mm at mid-gestation
- B An anteroposterior diameter of the pelvis greater than 5 mm at mid-gestation
- C An anteroposterior diameter of the pelvis greater than 4 mm at mid-gestation
- D An anteroposterior diameter of the pelvis greater than 10 mm at mid-gestation

16 In urethral level obstruction:
- A Obstruction may have a genetic association
- B Obstruction may be caused by two semicircular membranous plicae
- C Urethral valves cannot be detected by ultrasound
- D All of the above
- E None of the above

17 Management of urethral valve obstruction:
- A May need early delivery
- B Is usually surgical
- C May be complicated by pulmonary hypoplasia
- D All of the above
- E None of the above

18 Megacystis–microcolon–intestinal hypoperistalsis syndrome is characterized by:
- A Marked male preponderance
- B Autosomal-dominant pattern of inheritance
- C Normal or increased volume of amniotic fluid
- D Good prognosis

19 Which of these features suggest compromised renal function in a fetus affected by posterior urethral valves?
- A Oligohydramnios
- B Cortical renal cysts
- C Osmolality of the fetal urine > 200 mg/dL
- D All of the above

20 In cases of suspected fetal ovarian cyst:
- A The correct management is based on sonographic follow-up of the patient
- B Preterm delivery is indicated to surgically remove the cyst
- C Consider the relatively frequent cystic neoplasm of the fetal ovary
- D The mass is located in the pelvis

26 Fetal skeletal anomalies

Luís F. Gonçalves, Patricia L. Devers, Jimmy Espinoza, and Roberto Romero

Questions 1–20: choose the correct answer

1 The estimated prevalence of skeletal dysplasias at birth ranges from:
- A 0.5% to 5%
- B 1 in 1000 to 10 in 1000
- C 1 in 10 000 to 10 in 10 000
- D 1 in 100 000 to 10 in 100 000
- E None of the above

2 Which of the following skeletal dysplasias *is not* lethal?
- A Achondroplasia
- B Thanatophoric dysplasia
- C Osteogenesis imperfecta type II
- D Achondrogenesis
- E Short rib–polydactyly syndrome

3 Regarding molecular testing for skeletal dysplasias:
- A Molecular testing is available for *all* skeletal dysplasias
- B Molecular testing is available for *most* skeletal dysplasias
- C Only about one-third of the skeletal dysplasias can be diagnosed using molecular testing
- D Molecular testing is available *only* for research purposes
- E None of the above

4 Thanatophoric dysplasia, hypochondroplasia, and achondroplasia are caused by mutations in which gene:
- A *COMP* (cartilage oligomeric matrix protein)
- B *FGFR3* (fibroblast growth factor receptor 3)
- C *COL1A1*
- D *MATN3* (matrilin-3)
- E *CDMP1* (cartilage-derived morphogenetic protein 1)

5 The primary imaging modality that can be used for prenatal evaluation of a fetus suspected to have a skeletal dysplasia is:
- A Three-dimensional helical computed tomography (3DHCT)
- B Radiography
- C Xerography
- D Ultrasonography
- E None of the above

6 The best rendering algorithm (mode) to be used to obtain three-dimensional images of the fetal skeleton is the:
- A Minimum projection mode
- B Surface mode
- C Gradient light
- D Surface smooth mode
- E Maximum intensity projection mode

7 Examination of the fetus at risk for skeletal dysplasias includes:
- A Measurements of all long bones
- B Evaluation of the degree of bone mineralization
- C Evaluation of the degree of long bone curvature
- D Evaluation of fractures
- E All of the above

8 Please identify the *best* parameter to detect pulmonary hypoplasia in fetuses at risk for pulmonary hypoplasia:
- A Lung volume measurements by three-dimensional ultrasound
- B Femur length–abdominal circumference ratio
- C Lung area
- D Thoracic circumference
- E Several parameters can be measured to detect pulmonary hypoplasia in the fetus; none of them, however, has been proved to detect pulmonary hypoplasia with 100% sensitivity and specificity

9 Frontal bossing is a feature of the following skeletal dysplasias:
- A Osteogenesis imperfecta type II
- B Thanatophoric dysplasia
- C Achondroplasia
- D Thanatophoric dysplasia and achondroplasia
- E Osteogenesis imperfecta type II, thanatophoric dysplasia, and achondroplasia

10 Cloverleaf skull:
- A Is present in thanatophoric dysplasia type I
- B Is present in thanatophoric dysplasia type II
- C Is present in thanatophoric dysplasia types I and II
- D Is not a feature of thanatophoric dysplasia
- E Is a feature of both thanatophoric dysplasia and achondroplasia

11 The following condition(s) is (are) associated with clefting of the vertebral bodies:
- A Fibrochondrogenesis
- B Thanatophoric dysplasia
- C Osteogenesis imperfecta
- D Diastrophic dysplasia
- E Thrombocytopenia with absent radius

12 The femur length–foot length ratio:
- A Can be used to diagnose thanatophoric dysplasia
- B Increases with advancing gestational age
- C Is nearly constant from 14 to 40 weeks of gestation
- D Is considered abnormal when below 0.87
- E Is nearly constant from 14 to 40 weeks of gestation and is considered abnormal when below 0.87

13 Lack of vertebral ossification is a feature of:
- A Achondroplasia
- B Hypochondroplasia
- C Achondrogenesis
- D Osteogenesis imperfecta type II
- E Hypophosphatasia

14 Bone fractures and skull demineralization can be observed in:
- A Hypophosphatasia
- B Osteogenesis imperfecta type II
- C Achondrogenesis
- D Hypophosphatasia and osteogenesis imperfecta type II
- E Hypophosphatasia, osteogenesis imperfecta type II, and achondrogenesis

15 The "hitchhiker thumb" is a sign of:
- A Thrombocytopenia and absent radius
- B Diastrophic dysplasia
- C Holt–Oram syndrome
- D Thrombocytopenia and absent radius, and diastrophic dysplasia
- E Thrombocytopenia and absent radius, diastrophic dysplasia, and Holt–Oram syndrome

16 Severe disorganization of the spine can be observed in the following conditions
- A Dyssegmental dysplasia
- B Jarcho–Levin syndrome
- C Mesomelic dysplasia
- D Dyssegmental dysplasia and Jarcho–Levin syndrome
- E Dyssegmental dysplasia and Jarcho–Levin syndrome, and mesomelic dysplasia

17 Bowing of the femur, sex reversal, and hypoplastic scapulae are features of:
- A Campomelic dysplasia
- B Diastrophic dysplasia
- C Thanatophoric dysplasia
- D Kniest syndrome
- E Achondrogenesis

18 Asphyxiating thoracic dysplasia:
- A Is also known as Jeune syndrome
- B Is an autosomal recessive disorder
- C Is associated with short and horizontal ribs
- D May have polydactyly as a feature
- E All of the above

19 The differential diagnosis of phocomelia include(s):
- A Roberts syndrome
- B Holt–Oram syndrome
- C Thrombocytopenia with absent radius syndrome
- D Grebe syndrome
- E Roberts syndrome, thrombocytopenia with absent radius syndrome, and Grebe syndrome

20 The association of aplasia or hypoplasia of the radius, triphalangeal or absent thumbs, and congenital heart disease is characteristic of:
- A Thrombocytopenia with absent radius syndrome
- B Goldenhar syndrome
- C Holt–Oram syndrome
- D Thrombocytopenia with absent radius syndrome and Goldenhar syndrome
- E Thrombocytopenia with absent radius syndrome, Goldenhar syndrome, and Holt–Oram syndrome

Further reading

Bahlmann F, Merz E, Hallermann C, et al. Congenital diaphragmatic hernia: ultrasonic measurement of fetal lungs to predict pulmonary hypoplasia. *Ultrasound Obstet Gynecol* 1999;14:162–168.

Benoit B. The value of three-dimensional ultrasonography in the screening of the fetal skeleton. *Childs Nerv Syst* 2003;19:403–409.

Doray B, Favre R, Viville B, et al. Prenatal sonographic diagnosis of skeletal dysplasias. A report of 47 cases. *Ann Genet* 2000;43:163–169.

Gaffney G, Manning N, Boyd PA, et al. Prenatal sonographic diagnosis of skeletal dysplasias—a report of the diagnostic and prognostic accuracy in 35 cases. *Prenat Diagn* 1998;18:357–362.

Gordienko IY, Grechanina EY, Sopko NI, et al. Prenatal diagnosis of osteochondrodysplasias in high risk pregnancy. *Am J Med Genet* 1996;63:90–97.

Hall CM. International nosology and classification of constitutional disorders of bone (2001). *Am J Med Genet* 2002;113:65–77.

Merz E, Miric-Tesanic D, Bahlmann F, et al. Prenatal sonographic chest and lung measurements for predicting severe pulmonary hypoplasia. *Prenat Diagn* 1999;19:614–619.

Parilla BV, Leeth EA, Kambich MP, et al. Antenatal detection of skeletal dysplasias. *J Ultrasound Med* 2003;22:255–258.

Superti-Furga A, Bonafe L, Rimoin DL. Molecular–pathogenetic classification of genetic disorders of the skeleton. *Am J Med Genet* 2001;106:282–293.

Tretter AE, Saunders RC, Meyers CM, et al. Antenatal diagnosis of lethal skeletal dysplasias. *Am J Med Genet* 1998;75:518–522.

Unger S. A genetic approach to the diagnosis of skeletal dysplasia. *Clin Orthop* 2002;401:32–38.

27 First- and second-trimester prenatal diagnosis

John C. Hobbins

Question 1: choose the correct answer

1 What percentage of pregnant patients are now aged over 34 years?
A 5%
B 10%
C 15%
D 20%

Question 2: true or false

2 Over the last 10 years, the amount of amniocenteses has dropped while the number of detected Down syndrome cases has risen.

Question 3: choose the correct answer

3 From the available published literature, the procedure-related loss rate from amniocentesis is approximately:
A 0.1%
B 0.5%
C 1.5%
D 2.0%

Questions 4 and 5: true or false

4 Chorionic villus sampling (CVS) performed before 10 weeks of gestation carries an unacceptable risk of transverse limb defects.

5 The procedure-related risk of CVS after 9 weeks of gestation is three times higher than the procedure-related risk of amniocentesis.

Question 6: choose the correct answer

6 Which of the following complications have been noted with early amniocentesis (prior to 14 weeks)?
A Leakage of amniotic fluid in up to 4% of cases
B A higher fetal loss rate than with standard amniocentesis or CVS
C A higher rate of clubfeet
D All of the above

Question 7: true or false

7 Surprisingly, studies show that operator experience plays little role in fetal loss rates in amniocentesis and CVS.

Questions 8–10: choose the correct answer

8 The major reason that percutaneous umbilical blood sampling has diminished over the last 10 years is because:
A Fewer people are being trained in the procedure
B Noninvasive techniques have diminished the need for this type of invasive sampling
C Official medical bodies have issued a moratorium on this procedure because of its risk
D Patients are refusing to have a needle placed into the umbilical cord of their fetuses

9 Which of the following is not a component of a standard nuchal translucency (NT) assessment in the first trimester?
- A Crown–rump length
- B Assessment of the NT thickness in the midsagittal plane
- C Assessment of the nasal bone
- D Color Doppler evaluation of the ductus venosus

10 All but one of the following are integral components of the algorithm for first-trimester risk of Down syndrome:
- A The patient's age
- B The crown–rump length of the fetus
- C The fetal heart rate
- D The NT thickness in millimeters

Questions 11–13: true or false

11 The sensitivity of NT measurements alone in the detection of Down syndrome is over 70%.

12 In Down syndrome, pregnancy-associated plasma protein A (PAPP-A) levels tend to be low and beta subunit of human chorionic gonadotropin (βhCG) levels are generally high.

13 With combinations of first-trimester ultrasound, first-trimester biochemistry, and second-trimester biochemistry, it is possible to attain a sensitivity for Down syndrome of 95% at a 5% false-positive rate.

Questions 14 and 15: choose the correct answer

14 The standard genetic sonogram consists of all but one of the following components:
- A Assessment of limb length
- B A detailed fetal survey to search for fetal abnormalities
- C A modified fetal echocardiogram
- D A search for markers for Down syndrome

15 Thus far, the literature suggests that all but one of the following are the best performers in the second-trimester genetic sonogram:
- A Nuchal skinfold thickness
- B Nasal bone length
- C Long bone length
- D Middle bone of the fifth digit

Questions 16–18: true or false

16 In experienced centers, the sensitivity of a genetic sonogram for Down syndrome should exceed 60%.

17 A reassuring genetic sonogram should allow the clinician to drop the risk for fetal Down syndrome for a given patient by at least 50%.

18 Trisomy 18 is more difficult to identify with ultrasound than Down syndrome because the finding of choroid plexus cysts is more difficult to interpret.

Questions 19 and 20: choose the correct answer

19 The RADIUS study has shown:
- A A three times higher rate of diagnosis of fetal anomalies with routine ultrasound
- B An ability to diagnose more than 50% of fetal anomalies
- C A surprisingly high diagnostic rate of cardiac anomalies
- D None of the above

20 Which of the following represent the difficulties encountered thus far in using fetal cells in the maternal circulation for the diagnosis of aneuploidy?
- A Technical difficulties involved in the identification of the one cell per 10 million maternal cells that are fetal in origin
- B Instances in which fetal cells remain from previous pregnancies
- C In general, the cost of the analysis
- D All of the above

Further reading

Benn PA, Kaminsky LM, Ying J, et al. Combined second-trimester biochemical and ultrasound screening for Down syndrome. *Obstet Gynecol* 2002;100:1168–1176.

Benn PA, Egan JFX, Fang M, et al. Changes in the utilization of prenatal diagnosis. *Obstet Gynecol* 2004;103:1255–1260.

Froster UG, Jackson L. Limb defects and chorionic villus sampling: results from an international registry, 1992–94. *Lancet* 1996; 347:489–494.

Hobbins JC, Lezotte DC, Persutte WH, et al. An 8-center study to evaluate the utility of midterm genetic sonograms among high-risk pregnancies. *J Ultrasound Med* 2003;22:33–38.

Malone FD, D'Alton ME. First-trimester sonographic screening for Down syndrome. *Obstet Gynecol* 2003;102:1066–1079.

NIFTY Study: Bianchi DW, Simpson JL, Jackson LG, et al. Fetal gender and aneuploidy detection using fetal cells in maternal blood: analysis of NIFTY I data. National Institute of Child Health and Development Fetal Cell Isolation Study. *Prenat Diagn* 2002;22: 609–615.

Platt LD, Greene N, Johnson A, et al. for the First Trimester Maternal Serum Biochemistry and Fetal Nuchal Translucency Screening (BUN) Study Group. Sequential pathways of testing after first-trimester screening for trisomy 21. *Obstet Gynecol* 2004;104: 661–666.

Seeds JW. Diagnostic mid-trimester amniocentesis: how safe? *Am J Obstet Gynecol* 2004;191:608–616.

Snijders RJ, Nobel P, Sebire N, et al. UK multicentre project on assessment of risk of trisomy 21 by maternal age and fetal nuchal-translucency thickness at 10–14 weeks of gestation. Fetal Medicine Foundation First Trimester Screening Group. *Lancet* 1998;352: 343–346.

Sundberg K, Bang J, Smidt-Jensen S, et al. Randomised study of risk of fetal loss related to early amniocentesis versus chorionic villus sampling. *Lancet* 1997;350:697–703.

28 First- and second-trimester screening for open neural tube defects and Down syndrome

James E. Haddow, Glenn E. Palomaki, and Ronald J. Wapner

Questions 1–5: choose the answer that is *incorrect*

1 Alpha-fetoprotein (AFP):
- A Is a fetal-specific protein
- B Is immunologically similar to albumin
- C Is elevated in maternal serum when the pregnancy is affected with Down syndrome
- D Is elevated in amniotic fluid when the pregnancy is affected with open spina bifida
- E Was discovered in 1956 by Bergstrand and Czar

2 Elevated amniotic fluid AFP measurements:
- A Are nearly always found when the pregnancy is affected with an open neural tube defect (NTD)
- B Have been routinely used in the past as a screening test for open NTDs
- C May be falsely positive if the fluid sample is contaminated with fetal blood
- D Can be combined with amniotic fluid acetylcholinesterase (AChE) to form a diagnostic test
- E Are also associated with open ventral wall defects and Finnish nephrosis

3 Maternal serum AFP measurements:
- A Are routinely converted to multiples of the median (MoM) to account for gestational age and other covariates
- B Are used to identify pregnancies that warrant the offer of diagnostic testing
- C Are best interpreted for open NTD risk when gestational age is estimated by biparietal diameter (BPD)
- D Can be used to derive a patient-specific risk for open spina bifida
- E Discriminate better between unaffected and open NTD pregnancies than amniotic fluid AFP measurements

4 Second-trimester ultrasound can be used to:
- A Reliably date pregnancies as part of the screening process
- B Scan the spine to locate the position of the open defect
- C Scan the fetal head to look for the "lemon" and "banana" signs
- D Easily diagnose open spina bifida pregnancies in primary care offices
- E Identify other disorders associated with elevated AFP measurements in serum or amniotic fluid

5 Setting a rational open NTD screening policy involves:
- A Offering amniotic fluid AFP testing to all pregnant women
- B Evaluating the trade-offs between false-positive rates and detection rates
- C Ensuring that information about maternal weight and race are taken into account
- D Monitoring the assay to ensure reliable and consistent results
- E Coordinating the offer of ultrasound/diagnostic testing for screen-positive women

Question 6–10: true or false

6 Second-trimester maternal serum AFP levels are reduced by about 25% in pregnancies affected with Down syndrome.

7 Based only on maternal serum AFP measurements in the second trimester, Down syndrome screening performance is better than screening for open NTDs.

8 When combining multiple second-trimester measurements, Down syndrome risk becomes the screening variable.

9 Multiple-marker screening (the quadruple test) is currently the best second-trimester screening test for Down syndrome.

10 Second-trimester maternal serum levels of AFP, uE_3, and hCG are all high when the pregnancy is affected with trisomy 18.

Questions 11–15: provide an appropriate answer

11 What is the best first-trimester serum marker for Down syndrome?

12 Nuchal translucency (NT) measurements are best performed between 11 and how many completed weeks' gestation?

13 Rather than using serum markers or ultrasound markers alone, what is the most efficient screening method?

14 Reliable NT measurements require sonographer training, adherence to established protocols, and participation in what else?

15 What is the main advantage of first-trimester screening for Down syndrome in terms of the offer of diagnostic testing?

Questions 16–20: choose the correct answer

16 Which of these is not a characteristic of integrated screening?
- A Combines both first- and second-trimester Down syndrome markers
- B Results in the highest detection rate for the lowest false-positive rate
- C Routinely provides a risk estimate to women in the first trimester
- D Was suggested by Wald and colleagues in 1999
- E Waits to provide a risk until all information is available in the second trimester

17 The selection of a screening protocol involves considering all of the following except for:
- A The detection and false-positive rates
- B The timing and availability of diagnostic tests
- C Financial and medical costs
- D Second-trimester testing for open NTDs
- E The ability of the test to reliably identify complications, such as premature labor

18 Sequential screening differs from integrated mainly because:
- A Some (or all) of the women receive a first-trimester risk estimate
- B The screening markers used are different
- C No second-trimester markers are used
- D Second-trimester ultrasound markers for Down syndrome are always included
- E It is significantly less costly

19 Contingent screening differs from sequential *and* integrated screening in that:
- A All women receive serum screening for open NTDs
- B Most women have screening completed in the first trimester
- C There is an opportunity for first-trimester diagnostic testing
- D The detection rates for a given false-positive rate are higher
- E None of the women require ultrasound measurements of NT

20 Other methods of screening that are being considered and/or implemented include:
- A Serum-integrated screening
- B Fetal DNA in maternal serum
- C Repeated measures screening
- D Multiple contingent methods
- E All of the above

Further reading

Haddow JE, Palomaki GE, Knight GJ, et al. Reducing the need for amniocentesis in women 35 years of age or older with serum markers for screening. *N Engl J Med* 1994;330:1114.

Malone FD, Canick JA, Ball RH, et al. First-trimester or second-trimester screening, or both, for Down's syndrome. *N Engl J Med* 2005;353:2001.

Palomaki GE, Kloza EM, Haddow JE, et al. Patient and health professional acceptance of integrated serum screening for Down syndrome. *Semin Perinatol* 2005;29:247–251.

Palomaki GE, Steinort K, Knight GJ, Haddow JE Comparing three screening strategies for combining first- and second-trimester Down syndrome markers. *Obstet Gynecol* 2006;107:367–375.

Van den Hof MC, Nicolaides KH, Campbell J, Campbell S Evaluation of the lemon and banana signs in one hundred thirty fetuses with open spina bifida. *Am J Obstet Gynecol* 1990;162:322.

Wald NJ, Cuckle H, Brock DJH, et al. Maternal serum-alpha-fetoprotein measurement in antenatal screening for anencephaly and spina bifida in early pregnancy. Report of the UK collaborative study on alpha-fetoprotein in relation to neural tube defects. *Lancet* 1977;1:1323.

Wald NJ, Watt HC, Hackshaw AK. Integrated screening for Down's syndrome on the basis of tests performed during the first and second trimesters. *N Engl J Med* 1999;341:461.

Wald NJ, Rodeck C, Hackshaw AK, et al. First and second trimester antenatal screening for Down's syndrome: the results of the Serum, Urine, and Ultrasound Screening Study (SURUSS). *J Med Screen* 2003;10:56.

29 Prenatal diagnosis of deviant fetal growth

E. Albert Reece and Zion J. Hagay

Questions 1–20: choose the correct answer

1 What is the most commonly used definition of IUGR?
- A An infant whose birthweight is below the third percentile
- B An infant whose birthweight is below the fifth percentile
- C An infant whose birthweight is below the tenth percentile
- D An infant whose birthweight is below the 15th percentile

2 What is the characteristic of embryonic–fetal development from 4 to 20 weeks' gestation?
- A Hyperplastic stage
- B Hypertrophic stage
- C Acceleration stage
- D Inhibition of mitosis stage

3 What is the incidence of IUGR?
- A 1%
- B 7%
- C 15%
- D 20%

4 What is the incidence of symmetric IUGR among growth-retarded fetuses?
- A 8–10%
- B 12–15%
- C 20–30%
- D 40%

5 How many g/day will the fetus gain at 32–34 weeks of gestation?
- A 10–15 g
- B 20–25 g
- C 30–35 g
- D 40–45 g

6 Which sonographic parameter provides reliable estimates of gestational age between 12 and 24 weeks' gestation?
- A CRL (crown–rump length)
- B BPD (biparietal diameter)
- C AC (abdominal circumference)
- D FL (femur length)

7 What is the most sensitive sonographic biometric parameter that correlates with IUGR detection?
- A CRL
- B BPD
- C AC
- D FL

8 Which of the following chromosomal disorders is not associated with significant growth restriction?
- A Trisomy 18
- B Trisomy 16
- C Trisomy 13
- D Klinefelter syndrome

9 Which of the following fetal infections is not associated with significant growth restriction?
- A Cytomegalovirus
- B Rubella
- C Listeriosis
- D Human papillomavirus

10 Which of the following complications is not associated with fetal growth restriction?
- A Birth asphyxia
- B Hypoglycemia
- C Meconium aspiration
- D Sepsis

11 Which of the following conditions is not associated with fetal growth restriction?
- A Abnormal fetal heart rate pattern during labor
- B Oligohydramnios
- C Post date
- D Low Apgar score

12 What is the best sonographic biometric parameter that correlates with crown–heel length of a newborn?
- A CRL
- B BPD
- C AC
- D FL

13 Fetal assessment in managing IUGR cases includes any of the following except:
- A Cordocentesis
- B Fetal karyotyping
- C Maternal serum studies for evidence of seroconversion when there is suspicion of viral infection
- D Careful observation for early detection of preeclampsia

14 All the following statements about Doppler study in IUGR fetuses are correct except:
- A Use of Doppler velocimetry can significantly reduce perinatal death
- B Absence or reversal of end-diastolic flow in the umbilical artery is suggestive of poor fetal condition
- C Use of Doppler velocimetry can significantly increase induction of labor in the preterm IUGR fetus
- D Normal umbilical Doppler flow is rarely associated with significant morbidity

15 Which of the following conditions is associated with asymmetric fetal growth restriction?
- A Breech presentation
- B Chronic hypertension
- C Gestational diabetes mellitus
- D Chromosomal abnormalities

16 Which placental maturity grading value at term most accurately correlates with IUGR?
- A Grade 2
- B Grade 3
- C Grade 4
- D No correlation

17 What is a definition of fetal macrosomia?
- A Estimated fetal weight > 90% for gestational age
- B Estimated fetal weight > 92% for gestational age
- C Estimated fetal weight > 95% for gestational age
- D Estimated fetal weight > 97% for gestational age

18 Which of the following is a risk factor for macrosomia?
- A Diabetes mellitus
- B Female fetus
- C Preeclampsia
- D Oligohydramnios

19 The best method for prediction of shoulder dystocia in macrosomic fetuses is:
- A Accurate ultrasound evaluation
- B Normal progress in labor
- C Leopold maneuvers
- D Cannot be predicted

20 At what estimated fetal weight in diabetic women is Cesarean section advisable?
- A > 4000 g
- B > 4250 g
- C > 4500 g
- D > 4750 g

Further reading

ACOG. Intrauterine growth restriction. *ACOG Pract Bull* 2000;12.

Leveno K, Cunningham G, Gant NF et al. Fetal growth disorders. In: Cunningham et al., eds. *Williams manual of obstetrics*, 21st edn. McGraw-Hill Medical Publishing Division; 2002: 743.

Reece EA, Hobbins JC (eds) Prenatal diagnosis of deviant fetal growth. In: Reece EA, Hobbins JC, eds. *Medicine of the fetus and mother*, 2nd edn. Philadelphia, PA: Lippincott-Raven Publishers; 1999: 709.

Resnik R. Intrauterine growth restriction. *Obstet Gynecol* 2002;99: 490–496.

30 Three- and four-dimensional ultrasound and magnetic resonance imaging in pregnancy

Teresita L. Angtuaco

Questions 1–25: true or false

1 Four-dimensional (4D) ultrasound is real-time three-dimensional (3D) ultrasound.

2 The use of 3D ultrasound for purposes of entertainment has been officially sanctioned by the American Institute of Ultrasound in Medicine.

3 Three-dimensional ultrasound has proven use in the demonstration of complex facial abnormalities.

4 Skeletal dysplasias are among the indications for 3D ultrasound.

5 Abdominal wall defects are not seen well on 3D ultrasound due to electronic artifacts.

6 Digital data of 3D volumes can be stored and reviewed repeatedly after the ultrasound examination has terminated.

7 Artifacts caused by oligohydramnios can be remedied by electronically manipulating the acquired data with an "electronic scalpel."

8 Three-dimensional display has been proven to be effective in the diagnosis of first-trimester abnormalities.

9 Four-dimensional fetal echocardiography can now be effectively performed using the spatiotemporal image correlation (STIC) method.

10 With 3D/4D cardiac evaluation, anomalies that used to be difficult to diagnose on 3D ultrasound can be visualized.

11 Data storage in 3D/4D ultrasound averages no more than 3MB per volume acquisition.

12 Magnetic resonance imaging (MRI) is indicated in the first trimester.

13 Fetal immobilization with pancuronium should be performed to diminish motion artifacts.

14 Maternal breathing motion does not interfere with MRI image acquisition.

15 HASTE, SSFSE, and T1-weighted images are all currently used in obstetric MRI.

16 MRI can effectively differentiate between severe hydrocephalus and hydranencephaly.

17 Gadolinium contrast agent is necessary when making a diagnosis of masses in the fetus and the mother.

18 Cystic masses in the brain are better differentiated on MRI than on ultrasound.

19 MRI has been used in the precise localization of masses in the fetal neck prior to the performance of *ex utero* intrapartum treatment (EXIT).

20 It is possible to obtain images using breath-holding sequences to avoid maternal motion artifacts.

21 In cases of uterine masses associated with pregnancy, MRI cannot reliably distinguish leiomyomas from adnexal masses.

22 A teratoma has classic MRI characteristics that can distinguish it from other cystic adnexal masses.

23 MRI is indicated in abdominal pregnancies to localize the uterus and demonstrate its relationship to the fetus.

24 Ultrasound examination performed prior to an MRI examination can facilitate the performance of the examination.

25 MRI or ultrasound is more accurate in making independent fetal diagnosis than the two imaging techniques combined.

Further reading

Angtuaco TL, Shah HR, Mattison DR, Quirk JG. Magnetic resonance imaging in high-risk obstetric patients: a valuable complement to ultrasound. *Radiographics* 1992;12:91.

Dyson RL, Pretorius DH, Budorick NE, et al. Three-dimensional ultrasound in the evaluation of fetal anomalies. *Ultrasound Obstet Gynecol* 2000;16:321.

Ertl-Wagner B, Lienemann A, Strauss A, Reiser MF. Fetal magnetic resonance imaging: indications, technique, anatomical considerations, and a review of fetal abnormalities. *Eur Radiol* 2002;12: 1931.

Golja AM, Estroff JA, Robertson RL. Fetal imaging of central nervous system abnormalities. *Neuroimag Clin North Am* 2004;14:293.

Goncalves LF, Romero R, Espinoza J, et al. Four-dimensional ultrasonography of the fetal heart using color Doppler spatiotemporal image correlation. *J Ultrasound Med* 2004;23:473.

Krakow D, Williams J, III, Poehl M, et al. Use of three-dimensional ultrasound imaging in the diagnosis of prenatal-onset skeletal dysplasia. *Ultrasound Obstet Gynecol* 2003;21:467.

Kurjak A, Hafner T, Kos M, et al. Three-dimensional sonography in prenatal diagnosis: a luxury or a necessity? *J Perinat Med* 2000; 28:194.

Levine D, Smith AS, McKenzie C. Tips and tricks of fetal MR imaging. *Radiol Clin North Am* 2003;41:729.

Merz E. 3-D Ultrasound in prenatal diagnosis. In: *Ultrasound in obstetrics and gynecology*, 2nd edn. New York: Thieme; 1970: 515–528.

Xu HX, Zang QP, Lu MD, Xiao XT. Comparison of two-dimensional and three-dimensional sonography in evaluating fetal malformations. *J Clin Ultrasound* 2002;30:515.

31 Doppler ultrasonography and fetal well-being

Brian J. Trudinger

Questions 1–20: true or false

1 The maximum velocity envelope of the umbilical flow velocity waveform (FVW) provides a measure of volume flow.

2 The shape of the FVW envelope recorded by Doppler ultrasound is the same in all arteries.

3 Throughout pregnancy, there is a decrease in resistance to blood flow in the umbilical placental circulation.

4 A high-resistance pattern in the umbilical artery FVW indicates reduced blood flow.

5 The high-resistance umbilical FVW pattern is a measure of the number of "resistance" small arteries and arterioles downstream.

6 The umbilical artery FVW pattern predicts fetal growth restriction.

7 Serial studies of the umbilical artery FVW have no value over a single study.

8 Umbilical artery Doppler does not help in managing the diabetic fetus.

9 Umbilical artery Doppler does not predict adverse outcome in twin transfusion syndrome.

10 Umbilical artery Doppler is useful for fetal surveillance in postdate pregnancy.

11 Absent diastolic flow velocities are seen in the aorta in normal fetuses.

12 A high-resistance pattern is seen in the middle cerebral artery FVW in fetal compromise.

13 FVWs recorded from the coronary arteries show low resistance in profound fetal compromise.

14 The ductus venous FVW reflects central venous pressure.

15 A high end-diastolic pressure in the right heart in fetal compromise is reflected in the ductus venous FVW.

16 In rhesus alloimmunization, fetal anemia is associated with a low-resistance waveform pattern in the middle cerebral artery FVW.

17 The use of umbilical artery Doppler in high-risk pregnancy reduces perinatal mortality.

18 Recording uterine artery FVW in early pregnancy predicts maternal preeclampsia.

19 A high-resistance pattern in the uterine artery predicts first-trimester miscarriage.

20 An early diastolic notch in the uterine artery FVW is a feature of a high-resistance uterine artery FVW pattern.

32 Antepartum and intrapartum surveillance of the fetus and the amniotic fluid

Lami Yeo, Michael G. Ross, and Anthony M. Vintzileos

Questions 1–20: choose the correct answer

1 Which of the following is *not* an indication for antepartum fetal surveillance?
- A Maternal medical complications (e.g., diabetes, hypertensive disorders, renal disease, collagen vascular disorders, etc.)
- B Prior unexplained fetal demise
- C Multiple gestation
- D Premature rupture of membranes
- E Fetal macrosomia

2 Regarding the near-term fetus, which of the following statements is *false*?
- A They possess four behavioral states (quiet sleep, active sleep, quiet awake, active awake), which closely resemble neonatal behavioral states
- B The fetus spends its time predominantly in either a quiet or an active awake state
- C Quiet sleep is characterized by reduced fetal heart rate (FHR) variability and no accelerations
- D Active sleep is characterized by infrequent gross body movements, but rapid eye movements and breathing
- E Both B and D

3 Which of the following statements about fetal movement monitoring is *false*?
- A A decrease in fetal movements often (but not invariably) precedes fetal death, in some cases by several days
- B Patients perceive about 95% of ultrasonographically visualized fetal movements
- C Factors that may influence maternally perceived fetal movements include placental location, gestational age, and congenital anomalies
- D While fetal movement monitoring is beneficial in high-risk pregnancies, it may also be useful in low-risk populations in reducing fetal mortality
- E While several protocols have been utilized, neither the ideal duration for counting movements nor the optimal number of movements has been defined

4 Which of the following statements regarding the contraction stress test (CST) is appropriate?
- A A CST is considered *unsatisfactory* if there is an insufficient FHR tracing or inability to achieve appropriate uterine contractions
- B A CST is considered *suspicious* if there are persistent late decelerations
- C An important advantage of CST testing is its very low incidence of false-positive results
- D A CST is considered *positive* when any late deceleration is seen, regardless of contraction frequency, in the absence of uterine hyperstimulation
- E It is impossible to see a simultaneously positive and yet reactive CST tracing

5 The CST should be avoided in the following circumstances:
- A History of prior myomectomy or classical Cesarean section scar
- B Multiple gestations
- C Placenta previa or placental abruption
- D Incompetent cervix
- E All of the above

6 The implications of a positive and nonreactive CST include which of the following?
- A Corrected perinatal mortality rate has been found to be as high as 17% in this group
- B This CST finding has the same implications as a suspicious CST
- C Nonreassuring FHR patterns have been found to occur during labor
- D Both A and C
- E This type of CST result necessitates further forms of fetal surveillance, such as biophysical profile (BPP) evaluation

7 The nonstress test (NST) has which of the following characteristics?
- A Low false-positive rate (with nonreactive NST)
- B Low positive predictive value
- C Low specificity (with reactive NST)
- D FHR reactivity depends on normal cardiac development
- E On initial testing, almost 70% of high-risk patients show a reactive NST, and the remaining 30% are nonreactive

8 All of these factors can lead to a nonreactive NST *except*:
- A Fetal hypoxia and asphyxia
- B Smoking
- C Stimulants
- D Gestational age
- E Behavioral states

9 All of the following statements regarding vibroacoustic stimulation (VAS) in antepartum testing are true *except*:
- A As VAS produces increases in intrauterine sound and because these sound pressure levels are elevated, in some cases, they can be harmful to the fetus
- B Utilizing VAS on the nonacidemic fetus may elicit accelerations that appear to be valid in predicting fetal well-being
- C The normal fetal response to VAS includes FHR accelerations, increases in long-term FHR variability, and gross body movements
- D VAS has been conclusively demonstrated to be effective in achieving fetal arousal, is reasonably safe, and improves the efficiency of antepartum FHR testing
- E VAS may decrease the time needed to perform NSTs, as well as the number of false-positive results, accomplished without changing the predictive reliability of a reactive NST

10 In order to perform BPP testing as an antepartum surveillance technique on the fetus, which of the following is *not* required?
- A Real-time ultrasonography
- B Evaluation of amniotic fluid volume
- C Fetal Doppler velocimetry
- D An understanding of the fetal biophysical response to hypoxemia and acidemia
- E Evaluation of fetal breathing movements, fetal movements, and fetal tone

11 Which of the following statements best explains the "gradual hypoxia concept" in relationship to the BPP?
- A When fetuses become hypoxic, this is always a gradual process rather than an acute one
- B Biophysical profile assessments of the fetus are only valid when the fetus becomes hypoxic on a gradual basis
- C The biophysical activities developed *first in utero* are also the first to become abnormal in the presence of fetal acidemia or infection
- D The loss of a particular BPP variable is always due to fetal hypoxia
- E The biophysical activities developed *last in utero* are also the first to become abnormal in the presence of fetal acidemia or infection

12 Which of the following statements regarding the BPP is true?
- A Absence of a particular BPP activity may be due to many reasons, such as diurnal variation, maternal drugs, acute fetal asphyxia, or fetal infection
- B Application of the BPP to the high-risk pregnant population results in a dramatic improvement in perinatal mortality
- C The advantage of using the modified BPP is that the perinatal morbidity/mortality rates using this scheme compare favorably with prior studies (which use the entire BPP)
- D The BPP has been useful as a method of assessing fetal well-being and predicting the development of infectious complications in patients with premature rupture of the membranes
- E All of the above

13 All of the following can potentially cause polyhydramnios *except*:
- A Maternal diabetes
- B Placental dysfunction
- C Twin–twin transfusion
- D Impairment of fetal swallowing
- E Fetal gastrointestinal obstruction

14 Which of the following pairs, matching the pathophysiologic process with the maternal–fetal condition, is *correct*?
- A Decreased gas exchange – intra-amniotic infection
- B Metabolic abnormalities – insulin-dependent diabetes
- C Decreased uteroplacental blood flow – erythroblastosis fetalis
- D Fetal anemia – velamentous cord insertion
- E Fetal heart failure – hypertensive disorders

15 FHR variability can be decreased in all of the following situations, *except*:
- A Excessive fetal movement
- B Fetal asphyxia
- C Narcotics
- D Fetal behavioral states
- E Fetal anomalies

16 Which of the following pairs, matching the FHR pattern with its definition, is *correct*?
- A Prolonged acceleration – acceleration of ≥ 10 min
- B Baseline FHR variability – fluctuations in the baseline FHR of ≥ 3 cycles/min
- C Sinusoidal pattern – smooth, sine wave-like pattern of regular frequency and amplitude
- D Bradycardia – baseline FHR < 100 b.p.m.
- E Variable deceleration – visually apparent abrupt decrease (onset of deceleration to beginning of nadir > 30 s) in FHR below baseline

17 What is the advantage of fetal stimulation techniques (versus scalp sampling)?
- A It is a noninvasive technique
- B It can be performed in the earlier stages of labor
- C It is not technically difficult
- D A, B, and C
- E Scalp and acoustic stimulation techniques rarely have falsely nonreassuring results

18 With fetal pulse oximetry (FPO), fetal acidemia is rare when the fetal arterial oxygen saturation is continually greater than what value (critical threshold)?
- A 30%
- B 20%
- C 15%
- D 10%
- E 5%

19 All of the following statements regarding fetal electrocardiogram (ECG) ST segment automated analysis (STAN) are true *except*?
- A Some have found that, by adding fetal ECG STAN to standard FHR monitoring, this improved FHR tracing interpretation
- B The fetal ECG STAN analyzes the repolarization segment of the ECG (ST) waveform, which is altered by intramyocardial bicarbonate release, resulting from metabolic acidemia
- C Animal and human studies have shown that fetal hypoxemia during labor can alter the shape of the fetal ECG waveform (notably the elevation or depression of the ST segment)
- D A recent Cochrane review of the addition of fetal ECG monitoring reported a nonsignificant trend toward reducing the overall Cesarean rate, when compared with electronic FHR monitoring only
- E Another Cochrane review of randomized controlled trials assessing the use of fetal ECG as an adjunct to continuous electronic FHR monitoring during labor found that using ST waveform analysis was associated with fewer babies with severe metabolic acidosis at birth

20 What are some of the currently available methods of antepartum and/or intrapartum surveillance of the fetus and amniotic fluid?
- A Vibroacoustic stimulation
- B Fetal acid–base evaluation
- C BPP
- D Fetal movement monitoring
- E All of the above

Further reading

Freeman RK, Anderson G, Dorchester W. A prospective multi-institutional study of antepartum fetal heart rate monitoring: risk of perinatal mortality and morbidity according to antepartum fetal heart rate test results. *Am J Obstet Gynecol* 1982;143:771–777.

Garite TJ, Dildy GA, McNamara H, et al. A multicenter controlled trial of fetal pulse oximetry in the intrapartum management of nonreassuring fetal heart rate patterns. *Am J Obstet Gynecol* 2000;183:1049–1058.

Hill L, Breckle R, Thomas ML, Fries JK. Polyhydramnios: ultrasonically detected prevalence and neonatal outcome. *Obstet Gynecol* 1987;69:21–25.

Neilson JP. Fetal electrocardiogram (ECG) for fetal monitoring during labour. *Cochrane Database Syst Rev* 2003; CD000116.

Neilson JP. Fetal electrocardiogram (ECG) for fetal monitoring during labour (Cochrane Review). *The Cochrane Library*, 2004.

Phelan JP. The nonstress test: a review of 3000 tests. *Am J Obstet Gynecol* 1981;139:7–10.

Smith CV, Phelan JP, Platt LD, et al. Fetal acoustic stimulation testing: a randomized clinical comparison with the non-stress test. *Am J Obstet Gynecol* 1986;155:131–134.

Smith CV, Nguyen HN, Phelan JP, Paul RH. Intrapartum assessment of fetal well-being: a comparison of fetal acoustic stimulation with acid base determinations. *Am J Obstet Gynecol* 1986;155:726–728.

Van Woerdan EE, Van Geijn. Heart-rate patterns and fetal movements. In: Nijhuis JG, ed. *Fetal behavior: developmental and perinatal aspects*. New York: Oxford University Press; 1992:41–56.

Vintzileos AM, Campbell WA, Ingardia CJ, Nochimson DJ. The fetal biophysical profile and its predictive value. *Obstet Gynecol* 1983;62:271–278.

Vintzileos AM, Gaffney SE, Salinger LM, et al. The relationship between fetal biophysical profile and cord pH in patients undergoing cesarean section before the onset of labor. *Obstet Gynecol* 1987;70:196–201.

33 The fetus at surgery

Robert H. Ball and Michael R. Harrison

1 When and where was the field of fetal surgery created?

2 What were the initial fetal surgical procedures?

3 What are the three basic surgical approaches for fetal surgery?

4 What are the indications for open hysterotomy?

5 What are the most common indications for FETENDO?

6 What are the most common indications for FIGS?

7 What are some of the fetal risks of any fetal surgical intervention?

8 What are some of the pregnancy risks of any fetal surgical procedure?

9 What are the main maternal risks of any fetal surgical procedure?

10 Why is fetal surgery performed for spina bifida?

11 Why is fetal surgery performed for lung masses resulting in hydrops?

12 Why is fetal surgery performed for diaphragmatic hernias?

13 Why is fetal surgery performed for twin–twin transfusion syndrome?

14 Why is fetal surgery performed for twin-reversed arterial perfusion?

15 What tocolytics are used following open hysterotomy?

16 What is the historical rate of pulmonary edema following hysterotomy at UCSF?

17 What is the mean time from procedure to delivery at UCSF for hysterotomy?

18 What is the rate of uterine rupture/dehiscence in subsequent pregnancies after open hysterotomy?

19 What is the most common fetal surgical procedure performed currently?

20 What access procedure is used for fetal cardiac interventions?

34 Fetal medical treatment

Mark I. Evans, Yuval Yaron, Charles S. Kleinman, and Alan W. Flake

Question 1: choose the correct answer

1 Prenatal diagnosis of structural congenital anomalies has been possible by ultrasound since the beginning of the:
A 1960s
B 1970s
C 1980s
D 1990s

Questions 2–9: true or false

2 The first successful *in utero* treatment was performed with ultrasound guidance.

3 Metabolic therapies are generally reserved for structural abnormalities.

4 The neural tube closes at a gestational age before most patients present for prenatal care.

5 Folic acid therapy requires the same dose for recurrence and primary prevention.

6 Folic acid therapy for recurrence is more successful in higher risk populations than in low-risk ones.

7 Folic acid supplementation of breads and grains has reduced the primary incidence of neural tube defects (NTDs) more than the recurrence risk.

8 Congenital adrenal hyperplasia produces male pseudohermaphroditism.

9 Prevention of external genital masculinization can begin after diagnosis by amniocentesis.

Questions 10–13: choose the correct answer

10 Even with diagnosis by chorionic villus sampling (CVS), what percentage of fetuses have to be treated unnecessarily before an "unaffected" diagnosis is made?
A 32%
B 58%
C 87%
D 95%

11 Cardiac valvoplasties have been used in the treatment of:
A Mitral valve prolapse
B Pulmonary stenosis
C Cardiomyopathy
D Marfan syndrome

12 Which medicine has to be directly injected into the fetus?
A Digoxin
B Propranolol
C Flecanide
D Amiodarone

13 Advantages of stem cell transplants over postnatal bone marrow include:
A Cheaper
B Less potential for rejection
C Larger dose possible
D Easier to administer

Questions 14–20: true or false

14 A child with sickle cell disease treated with bone marrow or stem cells successfully would clinically be the same as a sickle cell trait individual.

15 *In utero* stem cell transplants have been successful for severe combined immunodeficiency (SCID) syndrome and sickle cell disease.

16 The dose possible for stem cell transplantation is gestational age dependent.

17 In X-linked SCID syndrome, B cells are absent.

18 In X-linked SCID syndrome, T cells are absent.

19 In the treatment of X-linked SCID syndrome, a pattern of mixed chimerism is seen.

20 The principal advantage of *in utero* treatment for methylmalonic aciduria is prevention of fetal brain damage.

Further reading

Clayton PE, Miller WL, Oberfield SE, et al. ESPE/LWPES CAH Working Group. Consensus statement on 21-hydroxylase deficiency from the European Society for Paediatric Endocrinology and the Lawson Wilkins Pediatric Endocrine Society. *Horm Res* 2002;58: 188–195.

Evans MI, Duquette DA, Rinaldo P, et al. Modulation of B12 dosage and response in fetal treatment of methylmalonic aciduria (MMA): titration of treatment dose to serum and urine MMA. *Fetal Diagn Ther* 1997;12:21–23.

Evans MI, Llurba E, Landsberger EJ, et al. Impact of folic acid supplementation in the United States: markedly diminished high maternal serum AFPs. *Obstet Gynecol* 2004;103:474–479.

Flake AW, Roncarolo MG, Puck JM, et al. Treatment of X-linked severe combined immunodeficiency by *in utero* transplantation of paternal bone marrow. *N Engl J Med* 1996;335:1806–1810.

Harrison MR, Evans MI, Adzick NS, Holzgreve W. *The unborn patient*. Philadelphia, PA: W.B. Saunders, 2002.

Honein MA, Paulozzi LJ, Mathews TJ, et al. Impact of folic acid fortification of the US food supply on the occurrence of neural tube defects. *JAMA* 2001;285:2981–2986.

Kleinman CS, Copel JA, Nehgme RA. The fetus with cardiac arrhythmia. In: Harrison MR, Evans MI, Adzick NS, Holzgreve W, eds. *The unborn patient: the art and science of fetal therapy*. Philadelphia, PA: W.B. Saunders; 2001:417–441.

Westgren M, Ringden O, Bartmann P, et al. Prenatal T-cell reconstitution after in utero transplantation with fetal liver cells in a patient with X-linked severe combined immunodeficiency. *Am J Obstet Gynecol* 2002;187:475–482.

35 Maternal biological, biomechanical, and biochemical changes in pregnancy

Edward K.S. Chien and Helen Feltovich

Questions 1–15: choose the correct answer

1 The cardiac silhouette on a normal chest radiograph during pregnancy can be expected to have the following changes:
- A Cardiac hypertrophy
- B Prominence of the left cardiac border
- C Prominence of the pulmonary artery
- D All of the above

2 Splitting of the first heart sound during pregnancy:
- A Indicates volume overload
- B Is due to the increased intravascular volume of pregnancy
- C Only occurs with inspiration
- D Is due to delayed closure of the mitral valve

3 Blood pressure changes during pregnancy are associated with all of the following except:
- A A greater decrease in diastolic than in systolic pressure
- B A decrease in systemic vascular resistance
- C An increase in pulmonary vascular resistance
- D A decrease in responsiveness to vasoconstrictors

4 The increase in cardiac output during pregnancy is due to:
- A An increase in heart rate
- B An increase in stroke volume
- C A decrease in systemic vascular resistance
- D All of the above

5 The FEV_1 (forced expiratory volume at 1 s) in normal pregnancy is:
- A Increased
- B Decreased
- C Unchanged
- D Variable

6 Increased minute ventilation during pregnancy is due to:
- A Increased respiratory rate
- B Increased vital capacity
- C Increased pulmonary perfusion
- D Increased tidal volume

7 Red blood cell indices during pregnancy:
- A Are unchanged from nonpregnant values
- B Exhibit a decreased mean corpuscular volume (MCV)
- C Exhibit an increased mean corpuscular hemoglobin concentration (MCHC)
- D Exhibit a decreased reticulocyte count

8 A mildly elevated white blood cell count during pregnancy:
- A Is suggestive of an acute inflammatory process
- B Is due to an increase in lymphocytes
- C Is due to an increase in granulocytes
- D Indicates acute leukemia

9 Dilation of the ureters during pregnancy:
- A Is usually greater on the left than on the right side
- B Is associated with an increase in circulating estrogen
- C Is due to increased smooth muscle activity
- D None of the above

10 Increased glomerular filtration rate during pregnancy is associated with which of the following?
- A Decreased glucosuria
- B Decreased serum sodium
- C Elevated serum creatinine
- D Decreased serum albumin

11 Increased gastroesophageal reflux is caused by which of the following?
- A Decreased tone of the pyloric sphincter
- B Decreased esophageal motility
- C Increased intra-abdominal pressure due to the gravid uterus
- D A and C

12 When evaluating hypothyroidism during pregnancy, one should:
- A Measure a free T_4 (thyroxine) level
- B Measure a total T_4 level
- C Measure a total T_3 (triiodothyronine) level
- D Measure all of the above

13 Cervical tensile strength is determined by:
- A The composition of collagen and proteoglycans
- B Collagen content alone
- C Proteoglycan content alone
- D Glycosaminoglycan content alone

14 Cervical remodeling and ripening are mediated by which of the following substances?
- A Interleukin (IL)-8
- B Progesterone
- C Prostaglandins
- D All of the above

15 Increased uterine size during pregnancy is:
- A Due mainly to myometrial hyperplasia
- B Due mainly to myometrial hypertrophy
- C More rapid during the first trimester
- D None of the above

Questions 16–20: true or false

16 Cardiac output is positionally dependent.

17 Oxygen consumption increases only because of increased consumption by the developing fetus and placenta.

18 A low protein C level during pregnancy is indicative of protein C deficiency.

19 Elevated prolactin levels during pregnancy indicate the presence of a prolactinoma.

20 Increased electrical coupling within the myometrium is due to increased gap junction formation.

Further reading

Baylis C. Glomerular filtration rate in normal and abnormal pregnancies. *Semin Nephrol* 1999;19:133–139.

Carbillon L, Uzan M, Uzan S. Pregnancy, vascular tone, and maternal hemodynamics: a crucial adaptation. *Obstet Gynecol Surv* 2000;55:574–581.

Clark P. Changes of hemostasis variables during pregnancy. *Semin Vasc Med* 2003;3:13–24.

Davison JM. Edema in pregnancy. *Kidney Int* 1997;59(Suppl.): S90–96.

Fantz CR, Dagogo-Jack S, Ladenson JH, Gronowski AM. Thyroid function during pregnancy. *Clin Chem* 1999;45:2250–2258.

Furneaux EC, Langley-Evans AJ, Langley-Evans SC. Nausea and vomiting of pregnancy: endocrine basis and contribution to pregnancy outcome. *Obstet Gynecol Surv* 2001;56:775–782.

Glinoer D. What happens to the normal thyroid during pregnancy? *Thyroid* 1999;9:631–635.

Herrera E. Lipid metabolism in pregnancy and its consequences in the fetus and newborn. *Endocrine* 2002;19:43–55.

Hunter S, Robson SC. Adaptation of the maternal heart in pregnancy. *Br Heart J* 1992;68:540–543.

Mabie WC, DiSessa TG, Crocker LG, et al. A longitudinal study of cardiac output in normal human pregnancy. *Am J Obstet Gynecol* 1994;170:849–856.

Mastorakos G, Ilias I. Maternal and fetal hypothalamic-pituitary-adrenal axes during pregnancy and postpartum. *Ann NY Acad Sci* 2003;997:136–149.

Schwartz KA. Gestational thrombocytopenia and immune thrombocytopenias in pregnancy. *Hematol Oncol Clin North Am* 2000; 14:1101–1116.

36 Maternal nutrition

Barbara Luke

1 What is the caloric distribution of macronutrients during pregnancy?

2 What is the daily caloric requirement during pregnancy?

3 What five nutrients are most likely to be lacking in the diet of US women?

4 Birth defects have been reported at what intakes of vitamins A and D?

5 What is the Institute of Medicine (IOM) recommendation for iron supplementation as prophylaxis for iron deficiency?

6 What pregnancy complications are associated with maternal iron-deficiency anemia?

7 What are the factors most strongly correlated with both length of gestation and birthweight?

8 What are the weight gain recommendations for underweight and normal women?

9 What are the weight gain recommendations for overweight and obese women?

10 What changes at the MUAC (mid-upper arm circumference) are associated with adverse pregnancy outcomes?

11 Maternal weight gain in which trimester is most significantly associated with increased birthweight and lower maternal postpartum weight?

12 What are the two primary reasons for the contemporary rise in multiple births in the United States?

13 What are suggested weight gain recommendations for underweight and normal women pregnant with twins?

14 What are suggested weight gain recommendations for overweight and obese women pregnant with twins?

Further reading

Belizàn JM, Vilar J, Bergel E, et al. Long term effect of calcium supplementation during pregnancy on the blood pressure of offspring: follow up of a randomized controlled trial. *Br Med J* 1997;315: 281–285.

Gluckman PD, Hanson MA. Living with the past: evolution, development, and patterns of disease. *Science* 2004;305:1733–1736.

Godfrey KM, Barker DJP. Fetal nutrition and adult disease. *Am J Clin Nutr* 2000;7 (Suppl.):1344S–1352S.

Gülmezoglu AM, de Onis M, Villar J. Effectiveness of interventions to prevent or treat impaired fetal growth. *Obstet Gynecol Surv* 1997;6:139–149.

Li R, Haas JD, Habicht J-P. Timing of the influence of maternal nutritional status during pregnancy on fetal growth. *Am J Hum Biol* 1998;10:529–539.

Luke B, Brown MB, Misiunas R, et al. Specialized prenatal care and maternal and infant outcomes in twin pregnancy. *Am J Obstet Gynecol* 2003;189:934–938.

Sattar N, Greer IA. Pregnancy complications and maternal cardiovascular risk: opportunities for intervention and screening? *Br Med J* 2002;325:157–169.

Singer JE, Westphal M, Niswander K. Relationship of weight gain during pregnancy to birth weight and infant growth and development in the first year of life. *Obstet Gynecol* 1968;31:417–423.

World Health Organization. Maternal anthropometry and pregnancy outcomes: a WHO collaborative project. *Bull WHO* 1995;73 (Suppl.).

Wu G, Bazer FW, Cudd TA, et al. Maternal nutrition and fetal development. *J Nutr* 2004;134:2169–2172.

37 Trauma, shock, and critical care obstetrics

Erin A.S. Clark, Gary A. Dildy, and Steven L. Clark

Questions 1–20: choose the correct answer

1 The chief cause of overall pregnancy-related maternal death is:
- A Embolism
- B Hemorrhage
- C Hypertensive disease
- D None of the above

2 Among live births, the chief cause of pregnancy-related maternal death is:
- A Embolism
- B Hemorrhage
- C Hypertensive disease
- D None of the above

3 The first-line agent for volume resuscitation is:
- A Crystalloid
- B Hetastarch
- C Albumin
- D Dextran

4 Specific indications for the administration of FFP include:
- A Hypovolemia
- B Empiric replacement of clotting factors during massive transfusion
- C Hemorrhage where factor deficiencies are the primary derangement
- D Thrombocytopenia

5 The first-line inotropic agent is:
- A Dobutamine
- B Isoproterenol
- C Amrinone
- D Dopamine

6 The pulmonary artery catheter provides direct measurement of:
- A Cardiac output
- B Systemic vascular resistance
- C Pulmonary capillary wedge pressure
- D None of the above

7 Potential complications of pulmonary artery catheter placement include:
- A Pneumothorax
- B Insertion site infection
- C Pulmonary infarction
- D All of the above

8 The appropriate duration of monitoring in a hemodynamically stable pregnant trauma patient at 30 weeks' gestation with no signs or symptoms of abruption is:
- A 20 min
- B 24–48 hours
- C 2–6 hours
- D No extended monitoring necessary

9 Perimortem Cesarean section after maternal cardiac arrest should be initiated within:
- A 2 min
- B 4 min
- C 10 min
- D 15 min

10 The most common cause of postpartum hemorrhage is:
- A Uterine atony
- B Coagulopathy
- C Obstetric trauma
- D Retained placenta

11 In a hemodynamically unstable gravid trauma patient, the first course of action should be:
- A Delivery of the fetus
- B Surgical repair of wounds
- C Maternal stabilization
- D Initiation of vasopressors

12 The best predictor of maternal and fetal outcomes in motor vehicle accidents is:
- A Speed of impact
- B Direction of impact
- C Proper use of seat belts
- D Gestational age

13 Indications for delivery of the fetus at exploratory laparotomy for penetrating trauma include:
- A Fetal distress
- B Severely compromised maternal cardiovascular status
- C Uterine injury
- D All of the above

14 Early complications of major burns include:
- A Hypovolemia
- B Electrolyte abnormalities
- C Shock
- D All of the above

15 The first priority in treatment of anaphylactic reactions is:
- A Administration of epinephrine or ephedrine
- B Administration of hydrocortisone
- C Aggressive fluid replacement
- D Removal of the offending antigen

16 The fundus compression suture used in the management of uterine bleeding was described by:
- A O'Leary
- B B-Lynch
- C Haultain
- D Huntington

17 The suspected etiology of multisystem organ failure is:
- A Sepsis
- B Cardiac failure
- C Respiratory failure
- D Stroke

18 Most cases of infection complicated by shock are caused by:
- A Gram-positive organisms
- B Gram-negative organisms
- C Viruses
- D Fungi

19 The late phase of shock is characterized by:
- A Warm skin, fever, and diaphoresis
- B Clammy skin, fever, and diminished mental status
- C Warm skin, diaphoresis, and hypotension
- D Decreased body temperature, diminished mental status, hypotension

20 Treatment of necrotizing fasciitis includes:
- A Wide surgical debridement
- B Broad-spectrum antibiotics
- C Abscess drainage
- D All of the above

Further reading

American College of Obstetricians and Gynecologists. Hemorrhagic shock. *Tech Bull* 82;1984.

American College of Obstetricians and Gynecologists. Obstetric aspects of trauma management. *Tech Bull* 251;1998.

Ananth CV, Smulian JC. Epidemiology of critical illness and outcomes in pregnancy. In: Dildy GA, Belfort MA, Saade GR, et al, eds. *Critical care obstetrics*, 4th edn. Maldon: Blackwell Science; 2004:3.

Clark SL. Shock in the pregnant patient. *Semin Perinatol* 1990;14:52.

Dildy GA. Postpartum hemorrhage: new management options. *Clin Obstet Gynecol* 2002;45(2):330.

Dildy GA, Clark SL. Cardiac arrest during pregnancy. *Obstet Gynecol Clin* 1995;22:303.

Gonik B. Intensive care monitoring of the critically ill pregnant patient. In: Creasy RK, Resnik R, eds. *Maternal–fetal medicine: principles and practice*, 2nd edn. Philadelphia, PA: W.B. Saunders; 1989:845.

Katz VL, Dotters DJ, Droegemueller W. Perimortem cesarean delivery. *Obstet Gynecol* 1986;68:571.

Kirshon B, Cotton DB. Fluid replacement in the obstetric patient. In: Sciarra JJ, ed. *Gynecology and obstetrics*, Vol. 3. Hagerstown, MD: Harper & Row; 1989:1.

Lee W, Clark SL, Cotton DB, et al. Septic shock during pregnancy. *Am J Obstet Gynecol* 1988;159:410.

38 Hypertensive diseases in pregnancy

Frederick U. Eruo and Baha M. Sibai

Questions 1–20: indicate which of the statements A–E are true and which are false

1 Indications for the treatment of hypertension in a pregnant patient include the following:
- A Mild preeclampsia
- B Systolic blood pressure (BP) persistently above 160 mmHg
- C Diastolic BP persistently above 110 mmHg
- D Blood pressure persistently above 160/110 mmHg
- E Mild gestational hypertension

2 True or false?
- A Aneroid manometers are more accurate than mercury manometers
- B Aneroid manometers are more accurate than direct intra-arterial blood pressure measurement
- C Proper cuff size is important for blood pressure measurement
- D Blood pressure is not affected by the patient's position and/or the position of the arm
- E Diagnosis of preeclampsia requires documentation of blood pressure values at least 24 hours apart

3 Diagnosis of severe preeclampsia requires which of the following:
- A Proteinuria above 300 mg/24-h urine collection
- B Diastolic BP ≤ 90 mmHg
- C Systolic BP above 140 mmHg
- D Diastolic BP above 110 mmHg
- E Persistent headache

4 The following antihypertensive agents are used in pregnancy except:
- A Angiotensin-converting enzyme inhibitors
- B Hydralazine
- C Labetalol
- D Methyldopa
- E Nifedipine

5 Diagnosis of mild preeclampsia requires which of the following:
- A Mild peripheral pitting edema
- B Systolic BP of 135 mmHg
- C Diastolic BP of 80 mmHg
- D Presence of 300 mg of protein in 24-h urine collection
- E Platelet count of 135 000/μL

6 Criteria for the diagnosis of HELLP syndrome include:
- A Increased lactate dehydrogenase (LDH) levels, often > 600 IU/mL
- B Low platelet count ≤ 100 000/μL
- C Blood pressure is always elevated
- D Abnormal peripheral blood smear
- E Proteinuria must be present

7 True or false?
- A Severe gestational hypertension has the same outcome as mild gestational hypertension
- B Presence of proteinuria is necessary for the diagnosis of severe gestational hypertension
- C The rate of progression of gestational hypertension to preeclampsia approaches 50% if the diagnosis was made prior to 30 weeks of gestation
- D Urinary excretion of vanylmandelic acid (VMA) may be increased in pheochromocytoma
- E High VMA levels are indicative of mild preeclampsia

8 True or false?
- A Latent or transient hypertension is gestational hypertension in the intrapartum period but becomes transient hypertension (a retrospective diagnosis) if blood pressure returns to the normal value and no proteinuria is identified 12 weeks postpartum
- B Latent or transient hypertension with development of proteinuria in the immediate postpartum period (< 12 weeks postpartum) means gestational hypertension with progression to preeclampsia
- C Persistence of elevated blood pressures beyond 12 weeks post partum does not alter the initial diagnosis of gestational hypertension
- D Gestational hypertension is the same as superimposed preeclampsia

9 The following are features of pheochromocytoma:
- A May cause hypertensive emergency
- B May present with paroxysmal hypertension
- C Causes essential hypertension
- D Causes secondary chronic hypertension
- E Is a common cause of mild preeclampsia

10 The following are features of chronic hypertension in pregnancy:
- A Chronic hypertension accounts for 1–5% of hypertensive disorders of pregnancy
- B Essential hypertension is usually diagnosed in the third trimester of pregnancy
- C The blood pressure is often elevated in late first trimester/early second trimester
- D The blood pressure is often decreased in late first trimester/early second trimester
- E Is the number one cause of hypertension in pregnancy

11 The complications of hypertensive disorders of pregnancy include:
- A Abruptio placentae
- B Intrauterine growth retardation
- C Macrosomia
- D Recurrent urinary tract infection
- E Disseminated intravascular coagulation (DIC)

12 True or false?
- A Proteinuria is necessary for the diagnosis of preeclampsia
- B Proteinuria is necessary for the diagnosis of gestational hypertension
- C Proteinuria is always present in HELLP syndrome
- D Proteinuria is always present in eclampsia
- E Proteinuria is necessary for the diagnosis of essential hypertension

13 The following describe magnesium sulfate:
- A It is the drug of choice for seizure prophylaxis in severe preeclampsia and eclampsia
- B It is often indicated in mild gestational hypertension
- C May cause pulmonary edema
- D Causes exaggerated deep tendon reflexes
- E May lead to ECG changes

14 Features of chronic hypertension with superimposed preeclampsia include:
- A New-onset proteinuria in a woman known to have chronic hypertension
- B Exacerbation of hypertension despite appropriate antihypertensive medication
- C Exacerbation of hypertension irrespective of the use of antihypertensive agents in a patient with pre-existing chronic hypertension
- D Symptoms of severe preeclampsia have no role in the diagnosis of superimposed preeclampsia
- E New-onset abnormal liver function test

15 The following are correct statements about the management of preeclampsia:
- A Delivery of the baby is an effective therapy for preeclampsia
- B Pulmonary edema is indicative of mild preeclampsia
- C Mild pedal edema is suggestive of severe preeclampsia
- D Epigastric tenderness is suggestive of severe preeclampsia
- E Blood pressure values above 150/80 mmHg are always required for the diagnosis of severe preeclampsia

16 The following medications may be used in the management of hypertensive disorders of pregnancy in the postpartum period:
- A Calcium channel-blocking agents
- B Angiotensin-converting enzyme inhibitors
- C Labetalol
- D Central-acting agents such as clonidine
- E Diuretics

17 Anesthetic problems in the management of hypertensive diseases of pregnancy include the following:
- A Bleeding disorder in patients with HELLP syndrome
- B Hypertensive episodes are more likely to occur during intubation and extubation of a patient for general anesthesia
- C Regional anesthesia is contraindicated in mild preeclampsia
- D Women receiving magnesium sulfate are more sensitive to the depolarizing and nondepolarizing neuromuscular blocking agents

18 High-risk chronic hypertension includes the following:
- A Cardiomyopathy
- B Caucasian race
- C Diabetes mellitus (class B–F)
- D Renal disease

19 Magnesium toxicity:
- A Causes slurred speech followed by loss of deep tendon reflexes
- B Causes muscular paralysis followed by feeling of warmth
- C Can result in cardiac arrest
- D Can be alleviated by using calcium as an antidote

20 Risk factors for preeclampsia include the following:
- A Caucasian race
- B Renal disease
- C Diabetes mellitus
- D Chronic hypertension

Further reading

American College of Obstetricians and Gynecologists. *Chronic hypertension in pregnancy*. ACOG Practice Bulletin no. 29. Washington, DC: American College of Obstetricians and Gynecologists, 2001.

Lindheimer MD, Roberts JM, Cunningham FG, eds. *Chesley's hypertensive disorders in pregnancy*, 2nd edn. Norwalk, CT: Appleton and Lange, 1998.

Magee LA, Schick B, Donnenfeld AF, et al. The safety of calcium channel blockers in human pregnancy: a prospective, multicenter cohort study. *Am J Obstet Gynecol* 1996;174:823–828.

Magpie Trial Collaboration Group. Do women with pre-eclampsia, and their babies, benefit from magnesium sulphate? The Magpie Trial: a randomized placebo-controlled trial. *Lancet* 2002; 359(9321):1877–1890.

National Institute of Health (NIH): National Heart, Lung, and Blood Institute. *National High Blood Pressure Education Program: Working Group Report on high blood pressure in pregnancy*. NIH Publication No. 00-3029, 2000.

Ramanathan J, Bennett K. Pre-eclampsia: fluids, drugs, and anesthetic management. *Anesthesiol Clin North Am* 2003;21(1):145–163.

Sibai BM. Chronic hypertension in pregnancy. *Obstet Gynecol* 2002; 100;369–377.

Sibai BM. Diagnosis and management of gestational hypertension and preeclampsia. *Obstet Gynecol* 2003;102(1):181–192.

Sibai BM. Diagnosis, prevention, and management of eclampsia. *Obstet Gynecol* 2005;102(2):402–410.

39 Cardiac diseases in pregnancy

Kjersti Aagaard-Tillery and Steven L. Clark

Questions 1–20: choose the correct answer

1 Which of the following patients has the greatest likelihood of death during pregnancy?
- A Class IV mitral stenosis
- B Corrected tetralogy of Fallot
- C Ventricular septal defect with right-to-left shunt
- D Ventricular septal defect with left-to-right shunt

2 A patient with Marfan syndrome is contemplating pregnancy. Which of the following clinical findings places her at highest risk for mortality during pregnancy?
- A A grade 2/6 apical diastolic murmur with radiation to the axilla
- B An aortic root diameter of 47 mm
- C Marked tricuspid regurgitation
- D Unifocal premature ventricular contractions

3 Which of the following regimens is correctly recommended for anticoagulation during pregnancy in a patient with a prosthetic heart valve?
- A Coumadin during the first trimester and adjusted-dose subcutaneous heparin during the second and third trimesters
- B Adjusted-dose subcutaneous heparin during the first trimester and coumadin during the second and third trimesters
- C Adjusted-dose subcutaneous heparin throughout pregnancy
- d Minidose heparin and aspirin

4 Which of the following is not an absolute indication for pregnancy termination during the first trimester?
- A Primary pulmonary hypertension
- B Marfan syndrome with aortic root diameter of 52 mm
- C Aortic coarctation with a history of aortic dissection
- D Class IV mitral stenosis with pulmonary edema

5 Which of the following time periods has been identified as the most critical period for warfarin embryopathy?
- A 4–6 gestational weeks
- B 6–9 gestational weeks
- C 9–11 gestational weeks
- D None of the above

6 Which of the following patients is *least* likely to develop pulmonary hypertension if untreated?
- A Atrial septal defect
- B Ventricular septal defect
- C Patent ductus arteriosus
- D Mitral stenosis

7 Which is the anesthetic technique of choice for a patient undergoing Cesarean section with Eisenmenger's syndrome secondary to ventricular septal defect?
- A General anesthesia
- B Local anesthesia
- C Epidural anesthesia with bupivacaine
- D Epidural anesthesia with intrathecal fentanyl

8 A patient enters labor with pulmonary hypertension secondary to an uncorrected patent ductus arteriosus. Which of the following hemodynamic pictures is the most desirable as the patient approaches the second stage of labor?
- A Cardiac output 7.8 L/min, pulmonary capillary wedge pressure (PCWP) 5 mmHg
- B Cardiac output 4.6 L/min, PCWP 18 mmHg
- C Cardiac output 7.8 L/min, PCWP 18 mmHg
- D Cardiac output 5.2 L/min, PCWP 24 mmHg

9 Which of the following is *not* an ominous prognostic factor in a pregnant woman with cyanotic congenital heart disease?
- A Hematocrit 29%
- B Hematocrit 67%
- C P_{O_2} 55 mmHg
- D Pulmonary artery pressure 80/50

10 Which of the following patients is most likely to give birth to a child with congenital heart disease?
- A Congenital aortic stenosis
- B Tetralogy of Fallot
- C Rheumatic mitral stenosis class III
- D Uncorrected VSD with secondary pulmonary hypertension

11 Which of the following statements regarding severe tricuspid valvular disease in pregnancy is *not* true?
- A It is often found as an isolated lesion secondary to rheumatic fever
- B It is not associated with significant maternal or perinatal mortality
- C It is often seen secondary to endocarditis in intravenous drug abusers
- D It is unlikely to result in pulmonary edema in the immediate postpartum period

12 A pregnant patient with a history of rheumatic fever undergoes endocardiography. Which of the following lesions is most ominous?
- A Mitral stenosis with a 50% reduction in valve area
- B Aortic stenosis with a 50% reduction in valve area
- C Severe mitral insufficiency without stenosis
- D Severe tricuspid insufficiency

13 A patient with rheumatic mitral stenosis enters labor. She is found to have pulmonary edema, a pulmonary capillary wedge pressure (PCWP) of 33 mmHg, pulse 88, cardiac output 5.5 L/min. Assuming all other hemodynamic parameters remain unchanged, which would be an ideal predelivery therapeutic goal?
- A PCWP 4–6 mmHg
- B PCWP 14–16 mmHg
- C Cardiac output 9.5 L/min
- D Pulse 108

14 A patient with mitral stenosis enters labor and is found to have pulmonary edema. Pulmonary artery catheterization reveals a cardiac output of 4.5 L/min and PCWP of 26 mmHg. Her pulse is 124 and urine specific gravity 1.034. Which is an ideal first-line agent?
- A i.v. propranolol
- B i.v. furosemide
- C i.v. digoxin
- D i.v. dopamine

15 A patient with severe congenital aortic stenosis presents in labor with vaginal bleeding. Ultrasound examination documents the presents of a complete placenta previa. The patient has previously had two Cesarean sections. While preparations are made for repeat Cesarean, pulmonary catheterization is performed. Which of the following hemodynamic parameters is *least* desirable for this patient?
- A Cardiac output 7.2 L/min
- B Cardiac output 10.4 L/min
- C PCWP 18 mmHg
- D PCWP 3 mmHg

16 Which of the following agents is contraindicated for the treatment of dysrhythmia in pregnancy?
- A Intravenous lidocaine
- B Procainamide
- C Quinidine sulfate
- D None of the above

17 A 42-year-old patient in her fifth pregnancy suffers an anterior wall myocardial infarction at 37 weeks' gestation. Fetal age has been documented by a first-trimester sonogram. The mother is stable in the coronary care unit 24 hours post infarction, receiving intravenous lidocaine for frequent premature ventricular contractions. A fetal nonstress test is reactive. The mother's cervix is completely effaced and 3–4 cm dilated with the head at +1 station. What is the most appropriate management?
- A Careful induction of labor with standard epidural anesthesia
- B Careful induction of labor using narcotic epidural anesthesia
- C Cesarean section using narcotic epidural or balanced nitrous–narcotic anesthesia
- D None of the above

18 Which of the following cardiac lesions does not carry negligible maternal mortality even when optimally managed?
- A Uncomplicated VSD
- B Functional class II rheumatic mitral stenosis
- C Surgically absent tricuspid valve
- D Status post placement of Starr Edwards prosthetic valve

19 Which statement is *not* true regarding labor in patients with Eisenmenger's syndrome?
- A Systemic hypotension may lead to decreased right ventricular filling pressure and death
- B Pregnancy-associated maternal mortality approaches 25%
- C Prophylactic heparinization may result in a significant decrease in mortality due to peripartum thrombotic events
- D Delayed postpartum death is common despite optimal antepartum management

20 Which of these places the patient with rheumatic aortic stenosis at greatest risk of death?
- A Maternal age > 35 years
- B Shunt gradient of 110 mmHg
- C Concomitant mitral insufficiency
- D First stage of labor PCWP of 33 mmHg

Further reading

ACC/AHA Guidelines for the Management of Patients with Valvular Heart Disease: a Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Management of Patients with Valvular Heart Disease). *J Am Coll Cardiol* 1998;32:1486.

APPCR Panel and Scientific Roundtable. Anticoagulation and enoxaparin use in patients with prosthetic heart valves and/or pregnancy. *Clin Cardiol Consensus Rep* 2002;3(9).

Avila WS, Rossi EG, Ramires JA, et al. Pregnancy in patients with heart disease: experience with 1,000 cases. *Clin Cardiol* 2003;26:135.

Clark SL. Structural cardiac disease in pregnancy. In: Clark SL, Cotton DB, Phelan JP, eds. *Critical care obstetrics*, 3rd edn. Boston: Blackwell Scientific, 1997.

Gei AF, Hankins GD. Cardiac disease and pregnancy. *Obstet Gynecol Clin North Am* 2001;28:465.

Hung L, Rahimtoola SH. Prosthetic heart valves and pregnancy. *Circulation* 2003;107:1240.

Ramsey PS, Ramin KD, Ramin SM. Cardiac disease in pregnancy. *Am J Perinatol* 2001;18:245.

Ray P, Murphy GJ, Shutt LE. Recognition and management of maternal cardiac disease in pregnancy. *Br J Anaesth* 2004;93:428.

Reimold SC, Rutherford JD. Valvular heart disease in pregnancy. *N Engl J Med* 2003;349:52.

Rout CC. Anesthesia and analgesia for the critically ill parturient. *Best Pract Res Clin Obstet Gynecol* 2001;15:507.

40 Maternal pulmonary disorders complicating pregnancy

Steven L. Clark and Calla Holmgren

Questions 1–19: choose the correct answer/s

1 Which of the following antiasthmatic medications has/have been proven safe in the first trimester of pregnancy?
- A Theophylline
- B Inhaled β-adrenergic agonists
- C Ephedrine
- D Terbutaline
- E Cromolyn sodium
- F Ipratropium bromide
- G Corticosteroids

2 In a pregnant patient with stable asthma, blood gas analysis reveals a pH of 7.46, P_{O_2} of 103 mmHg, and a P_{CO_2} of 26 mmHg. The physician should:
- A Begin an inhaled β-adrenergic agonist
- B Start a short course of oral steroids
- C Begin theophylline
- D Observe
- E Prescribe a course of breathing relaxation exercises

3 Oxygen delivery to maternal and fetal tissues is significantly affected by all of the following except:
- A Cardiac output
- B Dissolved oxygen content
- C Respiratory function
- D Hemoglobin concentration
- E Maternal pH

4 Which is/are associated with increased risk of dissemination during pregnancy?
- A Cryptococcosis
- B Coccidioidomycosis
- C Both
- D Neither

5 Which is/are indicated for treatment of *Pneumocystis carinii* pneumonia in pregnancy?
- A Trimethoprim–sulfamethoxazole
- B Pentamidine

6 Which of the following is/are risk factor(s) for venous air embolism?
- A Surgical procedures
- B Central and subclavian catheter placement
- C Normal labor
- D Vaginal insufflation
- E Delivery of a placenta previa
- F Orogenital sex

7 Prompt empiric use of antibiotics may prevent complications and lead to early resolution of:
- A Status asthmaticus
- B Aspiration of stomach contents
- C Both
- D Neither

8 All are characteristic of the adult respiratory distress syndrome except:
- A "Stiff lungs"
- B Low or normal pulmonary capillary hydrostatic pressure
- C Markedly increased peak airway pressure with a normal plateau airway pressure
- D Ventilation–perfusion mismatching
- E Arterial P_{O_2} less than 50–60 mmHg despite an inspired oxygen concentration of 60% or more

9 Which is/are complication(s) of the adult respiratory distress syndrome?
- A Pulmonary barotrauma
- B Persistent small airway disease
- C Pneumonia
- D Sinusitis
- E Chronic emphysema

10 Pulmonary artery catheterization can help to make all of the following diagnoses except:
- A Venous air embolism
- B Aspiration of stomach contents
- C Amniotic fluid embolism
- D Adult respiratory distress syndrome

11 Which of the following is the most common respiratory complaint heard during pregnancy?
- A Cough
- B Wheezing
- C Dyspnea
- D Chest tightness

12 Pulmonary function tests in a woman with bronchiectasis reveal an FEV_1 of 1.8 L. Which of the following is/are true, if any?
- A The woman should be advised to avoid becoming pregnant
- B If pregnant, she faces a higher risk of postoperative pulmonary complications in the event that a Cesarean section is performed
- C She will probably experience dyspnea at rest during her pregnancy
- D Compared with a woman with restrictive lung disease, she will be more likely to experience an increase in respiratory symptoms during pregnancy

13 True statements regarding radiographic testing include:
- A Documented fetal exposure to more than 3 rad is a sufficient reason to electively terminate pregnancy
- B Radiation exposure during week 2 through week 9 after conception is more likely to be associated with obvious fetal malformations
- C Fluoroscopy is contraindicated during pregnancy
- D The overall risk of any adverse effect from exposure to 1 rad is estimated to be 1%

14 Severe and inadequately managed asthma has been associated with all of the following except:
- A Increased incidence of premature birth
- B Increased incidence of congenital malformations
- C Increased maternal and fetal mortality
- D Increased incidence of subsequent neurologic abnormalities in the offspring
- E Increased incidence of low birthweight babies

15 Poor prognostic signs in the evaluation of an acute asthma exacerbation include which of the following:
- A Carbon dioxide retention accompanied by a respiratory acidosis documented by an arterial blood gas
- B A peak expiratory flow rate < 120 L/min
- C The absence of wheezing on auscultation
- D Respiratory rate greater than 30/min
- E Use of accessory muscles

16 Patient paralysis to decrease oxygen consumption and maximize ventilation may be indicated in:
- A Acute exacerbation of asthma
- B Adult respiratory distress syndrome
- C Both
- D Neither

17 Adult respiratory distress syndrome may complicate which of the following:
- A Asthma
- B Bacterial pneumonia
- C Air embolism
- D Fat embolism
- E Aspiration

18 Which of the following is/are cause(s) of obstructive lung disease?
- A Emphysema
- B Asthma
- C Cystic fibrosis
- D Bronchiectasis
- E Chest wall deformities

19 Which of the following is/are associated with potentially fatal disseminated infection of the infant if the mother is infected within 5 days of delivery?
- A Influenza
- B Varicella
- C Both
- D Neither

Further reading

Ahmad H, Mehta NJ, et al. *Pneumocystis carinii* pneumonia in pregnancy. *Chest* 2001;120(2):666–671.

Anon. Influenza vaccination and treatment during pregnancy. *ACOG Committee Opin* 2004;305:1125–1126.

Barth W. Asthma in pregnancy. In: Clark SL, Cotton DB, Hankins GDV, Phenlan J, eds. *Critical care obstetrics*, 3rd edn. Malden, MA: Blackwell Science, 1997.

Benedetti TJ, Valle R, et al. Antepartum pneumonia in pregnancy. *Am J Obstet Gynecol* 1982;144(4):413–417.

Cheek TG, Gutsche BB. Maternal physiologic alterations during pregnancy. In: Shnider SH, Levinson G, eds. *Anesthesia for obstetrics*. Baltimore: Williams & Wilkins; 1984:3.

Clark SL, Hankins GD, et al. Amniotic fluid embolism: analysis of the national registry. *Am J Obstet Gynecol* 1995;172(4 Pt 1):1158–1167; discussion 1167–1169.

Fowler MJ Jr, Thomas CE, et al. Diffuse cerebral air embolism treated with hyperbaric oxygen: a case report. *J Neuroimaging* 2005; 15(1):92–96.

Gardner MO, Doyle NM. Asthma in pregnancy. *Obstet Gynecol Clin North Am* 2004;31(2):385–413, vii.

Mabie WC, Barton JR, et al. Adult respiratory distress syndrome in pregnancy. *Am J Obstet Gynecol* 1992;167(4 Pt 1):950–957.

41 Diabetes mellitus in pregnancy

Carol J. Homko, Zion J. Hagay, and E. Albert Reece

Questions 1–20: choose the correct answer

1 The prevalence of type 1 diabetes in the United States is:
- A 1–2%
- B 6–9%
- C Less than 1%
- D More than 4%

2 The lowest risk of inheriting type 1 diabetes is in those who have the following human leukocyte antigen (HLA) group:
- A DR_3
- B DR_4
- C DR_3/DRu
- D DR_2

3 Which of these statements about insulin is not true?
- A It acts on liver, muscle, and fat
- B It inhibits hepatic glycogenolysis but stimulates gluconeogenesis
- C It is secreted by the B cells of the pancreas
- D It stimulates triglyceride storage in the liver

4 In normal pregnancy, insulin levels increase:
- A Throughout the first trimester, reaching a peak level at 20 weeks' gestation
- B In the first and second trimesters and then reach a plateau in the third trimester
- C From 6 weeks of gestation until 34 weeks and then reach a plateau
- D In the third trimester, but are almost unchanged in the first and second trimesters

5 Which of these is not true about glucose levels in normal pregnancy compared with nonpregnant individuals?
- A Fasting glucose levels decrease
- B Glucose levels are higher 60 min after a glucose load
- C There are premeal and postmeal decreases in plasma glucose levels
- D Neither A nor C

6 The prevalence of major congenital anomalies among infants of diabetic mothers is estimated at:
- A 1–2%
- B 10–12%
- C 6–10%
- D 3%

7 The diet recommended to pregnant patients with diabetes mellitus is:
- A 15 kcal/kg ideal body weight
- B Increased in dietary fiber
- C Based on an individualized nutrition assessment
- D B and C only

8 Treatment of ketoacidosis in pregnancy includes all of the following except:
- A Fluid replacement
- B Insulin therapy
- C Potassium administration
- D Termination of pregnancy

9 Sodium bicarbonate is usually administered in diabetic ketoacidosis if:
- A Arterial pH is < 7.0
- B Arterial pH is < 7.1
- C Serum bicarbonate is < 5 mEq/L
- D Arterial pH is < 7.25
- E A, B, and C

10 In diabetic patients who are in premature labor, the drug of choice is:
- A A beta-sympathomimetic
- B Magnesium sulfate
- C Prostaglandin synthetase inhibitors
- D Salbutamol

11 In general, the insulin requirement for the diabetic patient during pregnancy:
- A Is higher in type 1 than in type 2 patients
- B Is almost equal in both
- C Is higher in type 2 than in type 1 diabetes
- D Depends mostly on maternal weight gain

12 Proliferative retinopathy in patients with type 1 diabetes of 15 years' duration is estimated to be:
- A 10%
- B 5%
- C 50%
- D 25%

13 Which of these statements is (are) true about diabetic retinopathy?
- A Retinal deterioration may occur during pregnancy in patients who have background retinopathy before pregnancy
- B Diabetic patients with no evidence of retinopathy before pregnancy may develop background retinopathy during pregnancy
- C All patients with active proliferative retinopathy in pregnancy should undergo Cesarean delivery in order to avoid the risk of vitreous hemorrhage related to vaginal delivery
- D A and B

14 Neonatal hypoglycemia is:
- A A glucose level of < 35 mg/dL in a term infant
- B Related to poor maternal glycemic control during pregnancy and at the time of delivery
- C A serious cause of neonatal morbidity that may present as neonatal convulsions and neurologic sequelae
- D All of the above

15 When screening selectively for glucose intolerance in pregnancy, all except one of the following indicate a need for testing:
- A Age younger than 24 years
- B Parent with type 2 diabetes
- C Obesity
- D Previous macrosomic infant

16 Which of the following statements is true regarding the management of women with gestational diabetes mellitus (GDM)?
- A Women with diet-controlled GDM should be monitored with weekly laboratory glucose determinations
- B Self blood glucose monitoring regimens should include postprandial determinations
- C Metformin therapy is recommended as adjunctive therapy for women with severe insulin resistance
- D The recommended dietary composition includes 20% protein, 50% carbohydrate, and 30% fat

17 Which of the following statements is true regarding current guidelines for the screening and diagnosis of GDM?
- A Meeting or exceeding two or more glucose targets as defined by either the National Diabetes Data Group (NDDG) or Carpenter–Coustan criteria
- B Women less than 25 years of age, with no personal or family history of diabetes and with a body mass index (BMI) < 27 kg/m^2 do not require screening
- C Women considered to be at high risk for GDM should be tested at 24 vs 26–28 weeks' gestation
- D Both the glucose challenge and the oral glucose tolerance test (OGT) test should be performed after an overnight fast of 8–14 h

18 Which statement is correct regarding diabetic nephropathy during pregnancy?
- A It is associated with increased perinatal morbidity because of an increased risk of macrosomia and increased fetal distress
- B Acute worsening of hypertension occurs in approximately 60% of cases
- C It is defined as persistent proteinuria of more than 500 mg/day during the second half of pregnancy in the absence of infection
- D Pregnancy has been shown to accelerate the natural course of nephropathy

19 Findings in GDM which indicate a need for insulin therapy include:
- A Fasting plasma glucose levels >95 mg/dL
- B Postprandial plasma glucose levels >120 mg/dL
- C Fetal abdominal circumference >75th percentile
- D All of the above

20 Which of the following statements is true about preconception care?
- A Spontaneous abortion rates have not been found to correlate with first-trimester HbA1c levels
- B Most major congenital malformations occur after the 10th week of gestation
- C Good preconception glucose control can dramatically reduce the risk of congenital anomalies and spontaneous abortion
- D Contraceptive therapy can be discontinued upon entry into a preconception care program

Further reading

Homko CJ, Sivan E, Reece EA, Boden G. Fuel metabolism during pregnancy. *Semin Reprod Endocrinol* 199;17:119–125.

Kjos SL, Schaefer-Graf U, Sardesi S, et al. A randomized controlled trial using glycemic plus fetal ultrasound parameters versus glycemic parameters to determine insulin therapy in gestational diabetes with fasting hyperglycemia. *Diabetes Care* 2001;24:1904–1910.

Langer O, Conway DL, Berkus MD, et al. A comparison of glyburide and insulin in women with gestational diabetes mellitus. *N Engl J Med* 2000;343:1134–1138.

Metzger BE, Coustan DR. Summary and recommendations of the Fourth International Workshop Conference on Gestational Diabetes Mellitus. *Diabetes Care* 1998;21(Suppl. 2):B161–167.

Mokdad AH, Ford ES, Bowman BA, et al. Diabetes trends in the US: 1990–1998. *Diabetes Care* 2000;23:1278–1283.

Reece EA, Homko CJ. Why do diabetic women deliver malformed infants? *Obstet Gynecol Clin* 2000;43:32–45.

Reece EA, Coustan DR, Gabbe SG, eds. *Diabetes in women: adolescence, pregnancy and menopause*, 3rd edn. Philadelphia, PA: Lippincott Williams & Wilkins, 2004.

Tyrala EE. The infant of the diabetic mother. *Obstet Gynecol Clin North Am* 1996;23:221–242.

deVeciana M, Major CA, Morgan MA, et al. Postprandial versus preprandial blood glucose monitoring in women with gestational diabetes requiring insulin therapy. *N Engl J Med* 1995;333: 1237–1241.

Warram IH, Krolewski AS, Gottlieb MS, et al. Differences in risk of insulin-dependent diabetes in offspring of diabetic mothers and diabetic fathers. *N Engl J Med* 1984;311:149–152.

42 Endocrine disorders in pregnancy

Fred H. Faas

1 What is the magnitude of the increase in prolactin levels during normal pregnancy?

2 What is the cause of increased serum and urine cortisols during normal pregnancy?

3 What changes occur in the hormones that control salt and water metabolism in normal pregnancy?

4 Do calcium and maternal vitamin D requirements change during pregnancy?

5 What changes in thyroid hormone levels occur during pregnancy, and what are the causes of these changes?

6 What important condition during pregnancy is associated with a magnification of the normal changes in thyroid-stimulating hormone (TSH) levels during pregnancy?

7 Are there any changes in L-thyroxine requirements during pregnancy in a patient being treated for hypothyroidism? If so, describe these changes.

8 What changes occur in the growth hormone/insulin-like growth factor (IGF) axis during normal pregnancy?

9 What is the difference between thyrotoxicosis and hyperthyroidism?

10 What is the commonest cause of thyrotoxicosis during pregnancy?

11 How is hyperthyroidism treated during pregnancy?

12 What is the natural course of Graves' hyperthyroidism during pregnancy?

13 What are the potential fetal consequences of Graves' disease in pregnancy?

14 What common thyroid condition may occur during the postpartum period and how is it manifest in the patient?

15 Which endocrine disorders may be difficult to diagnose during pregnancy because of the hormonal changes occurring in a normal pregnancy?

16 What is the commonest pituitary problem that has major therapeutic implications during pregnancy? Describe the therapeutic implications.

17 What two uncommon pituitary problems occur with increased frequency in the postpartum period, and how are they generally recognized?

18 What are some of the issues in a pregnancy in which the fetus is thought to be at risk for having congenital adrenal hyperplasia.

19 What are some of the principles to be considered in evaluating a pregnant woman with an adrenal mass?

20 How should the patient with suspected hyperparathyroidism during pregnancy be evaluated and treated?

Further reading

Alexander E, Marqusee E, Lawrence J, et al. Timing and magnitude of increases in levothyroxine requirements during pregnancy in women with hypothyroidism. *N Engl J Med* 2004;351:241.

Garner P. Congenital adrenal hyperplasia in pregnancy. *Semin Perinatol* 1998;22:446.

Gharib H, Tuttle R, Baskin J, et al. Consensus statement. Subclinical thyroid dysfunction: a joint statement on management from the American Association of Clinical Endocrinologists, the American Thyroid Association, and the Endocrine Society. *J Clin Endocrinol Metab* 2005;90:581.

Hollis B, Wagner C. Vitamin D requirements during lactation: high-dose maternal supplementation as therapy to prevent

hypovitaminosis D for both the mother and nursing infant. *Am J Clin Nutr* 2004;80(Suppl.):1752S.

Mastorakos G, Ilias I. Maternal and fetal hypothalamic–pituitary–adrenal axis during pregnancy and postpartum. *Ann NY Acad Sci* 2003;997:136.

Molitch M. Pituitary tumors and pregnancy. *Growth Hormone IGF Res* 2003;13:S38.

Nader S. Thyroid disease and other endocrine disorders in pregnancy. *Obstet Gynecol Clin North Am* 2004;31:257.

O'Leary P, Boyne P, Flett P, et al. Longitudinal assessment of changes in reproductive hormones during normal pregnancy. *Clin Chem* 1991;37:667.

Reis F, Florio P, Cobellis L, et al. Human placenta as a source of neuroendocrine factors. *Biol Neonate* 2001;79:150.

Tan J, Loh K, Yeo G, et al. Transient hyperthyroidism of hyperemesis gravidarum. *Br J Obstet Gynecol* 2002;109:683.

43 Gastrointestinal diseases complicating pregnancy

Washington Clark Hill and Alfred D. Fleming

Questions 1–30: choose the correct answer

1 Bendectin was removed from the market because it was:
- A Teratogenic
- B Not effective
- C A litogin
- D A cause of side-effects
- E Expensive

2 Pregnant women who need dental care should:
- A Not receive it during pregnancy
- B Receive it during the first trimester only
- C Receive it during the second trimester only
- D Receive it during the third trimester only
- E Receive it at any time during pregnancy

3 Pregnancy gingivitis is caused by:
- A Hormonal changes of pregnancy
- B Calculus
- C Bacteria
- D Poor dental hygiene
- E Gum disease

4 What percentage of pregnant patients experience some degree of heartburn daily?
- A 10%
- B 25%
- C 50%
- D 75%
- E 100%

5 Anticholinergic drugs for reflux esophagitis:
- A Relieve symptoms
- B Do not relieve symptoms
- C Are teratogenic
- D Have no effect on symptoms
- E Cause premature labor

6 A tocolytic that should not be used in a patient with peptic ulcer disease is:
- A Ritodrine
- B Terbutaline
- C Magnesium sulfate
- D A calcium channel blocker
- E Indomethacin

7 The first treatment indicated for a patient thought to have peptic ulcer disease is:
- A Cimetidine
- B Ranitidine
- C Sucralfate
- D Sodium bicarbonate
- E None of the above

8 The most frequent preceding operation causing acute intestinal obstruction during pregnancy is:
- A Cholecystectomy
- B Appendectomy
- C Herniorrhaphy
- D Surgery for kidney disease
- E Tubal ligation

9 Delay in the diagnosis of intestinal obstruction results in all of the following except:
- A Electrolyte imbalance
- B Hypotension
- C Oliguria
- D Fever
- E Marked elevation of the white blood cell (WBC) count

10 Each of the following statements about ulcerative colitis is true except:
- A The pathologic process primarily involves the mucosal lining
- B The process is characteristically transmural
- C Plasma cells and leukocytes are frequently seen in the inflammatory exudate
- D There may be abscesses of the mucosa
- E Toxic dilation of the colon can result

11 Each of the following statement about Crohn's disease is true except:
- A It is also called regional enteritis
- B Nearby mesentery may be thickened
- C Mesenteric lymphadenopathy is present
- D Skip areas are common
- E The pathologic process is not transmural

12 The most common time for intestinal obstruction to occur in pregnancy is:
- A First trimester
- B Second trimester
- C Third trimester
- D Immediately after delivery
- E During the puerperium

13 Sulfasalazine, when used in treating inflammatory bowel disease during pregnancy, should:
- A Be stopped during the third trimester and never given to the breastfeeding mother
- B Be continued throughout pregnancy, but not given to the breastfeeding mother
- C Be given throughout pregnancy and to the breastfeeding mother
- D Not be given during the first trimester, but may be reserved for the second trimester and used during breastfeeding
- E Not be used during the second trimester because it may be teratogenic

14 The incidence of appendicitis during pregnancy is:
- A 1 in 500
- B 1 in 1000
- C 1 in 3000
- D 1 in 4000
- E 1 in 5000

15 The condition most frequently misdiagnosed as appendicitis is:
- A Renal colic
- B Round ligament syndrome
- C Preterm labor
- D Pyelonephritis
- E Cystitis

16 A patient presents in labor with appendicitis. The correct management is:
- A Cesarean section with removal of the appendix
- B Vaginal delivery with appendectomy postpartum
- C Appendectomy followed by vaginal delivery
- D Appendectomy followed by Cesarean section
- E Tocolysis with appendectomy followed by vaginal delivery
- F Appendectomy followed by tocolysis and then vaginal delivery

17 Following jejunoileal bypass:
- A Pregnancy is contraindicated
- B The patient should wait 6 months before getting pregnant
- C The patient should wait 1 year before getting pregnant
- D The patient should wait 2 years before getting pregnant
- E If the patient gets pregnant before the specified period of time, the pregnancy should be terminated
- F The patient can get pregnant at any time

18 Following a gastric restrictive operation:
- A Pregnancy is contraindicated
- B The patient should wait 6 months before getting pregnant
- C The patient should wait 1 year before getting pregnant
- D The patient should wait 2 years before getting pregnant
- E If the patient gets pregnant before the specified period of time, the pregnancy should be terminated
- F The patient can get pregnant at any time

19 Oral contraceptives do not appear to be associated with the formation of gallstones except:
- A In women over 29 years of age
- B In women less than 29 years of age
- C In women over 35 years of age
- D In women less than 35 years of age
- E In women over age 40 years

20 The sensitivity of ultrasound in diagnosing gallstones has been found to be:
- A 75%
- B 80%
- C 85%
- D 90%
- E 95%

21 The percentage of asymptomatic women undergoing routine obstetrical ultrasound examinations and found to have gallstones is:
- A 1%
- B 3%
- C 6%
- D 9%
- E 10%

22 When cholecystectomy is necessary during pregnancy, the best time to perform it is:
- A First trimester
- B Second trimester
- C Third trimester
- D Immediately after delivery
- E Six weeks postpartum

23 In a study of gallbladder disease during pregnancy, the percentage of patients scanned who had evidence of gallstones was:
A 56%
B 66%
C 76%
D 86%
E 96%

24 The most common cause of acute pancreatitis in pregnancy is:
A Alcoholism
B Acute infection
C Pregnancy-induced hypertension
D Cholelithiasis
E Abdominal trauma

25 Total parenteral nutrition has been used during pregnancy for all of the following except:
A Reflux esophagitis
B Intestinal obstruction or failure
C Oral cavity complications of pregnancy
D Gallbladder disease
E Anorexia nervosa

26 Metabolic complications of the pregnant patient that put her at a major risk of parenteral nutrition include all of the following except:
A Hyperglycemia
B Hypoglycemia
C Hyperphosphatemia
D Hypophosphatemia
E Electrolyte derangement

27 Biochemical markers of malnutrition include all of the following except:
A Severe hypoalbuminemia less than 2 g/dL
B Persistent ketosis
C Hypocholesterolemia
D Hypercholesterolemia
E Lymphocytopenia

28 Complications of catheter placement in total parenteral nutrition include all of the following except:
A Superficial thrombophlebitis
B Pneumothorax
C Mediastinal disturbances
D Catheter-related infection
E Cardiac tamponade

29 Select the appropriate inflammatory bowel disease that is described by the following statements:
- Also called regional enteritis
- Not uncommon in women during their reproductive years
- Characteristically not transmural
- Toxic dilation of the colon is a complication
- Skip areas are characteristically found in bowel affected by this disease
- Primarily affects females
- Both sexes are equally affected
- Can affect pregnancy outcome
- Rectal bleeding is more common in this disease process than in the other
- Sulfasalazine is the most commonly used drug in treatment
- Proctocolectomy is curative.

A Crohn's disease
B Ulcerative colitis
C Both

30 Pregnancy increases the risk of gallstone formation by which of the following mechanisms:
A Impairment of cholecystokinin by progesterone
B Upregulation of progesterone receptors during the second and third trimesters
C Decreased gallbladder contractility
D All of the above

Question 31: true or false

31 The risk of oral contraceptives causing gallbladder disease differs among women and is age dependent.

Questions 32 and 33: choose the correct answer

32 A 26-year-old G3P2 at 20 weeks' gestation presents to her physician with constant right upper quadrant pain. She reports vomiting twice, once last night and once this morning. Her husband is concerned and has noticed that her face appears to be turning yellow. The physician obtained the following laboratory values: WBC = 11 000 cells/μL; aspartate aminotransferase (AST) = 40 IU/L; alkaline phosphatase = 154 IU/L; direct bilirubin = 0.7 mg/dL; and total bilirubin = 2.2 mg/dL. What is the most likely etiology of this women's symptoms?
A Cholecystitis
B Choledocholithiasis
C Cholelithiasis
D None of the above

33 Performing a cholecystectomy should be considered under which of the following circumstances:
A A G1P0 at 16 weeks' gestation who presents to the emergency room after being involved in a minor car accident and is found to have a solitary stone in her gallbladder. The patient denies any abdominal pain, nausea, and/or vomiting.

B A G2P1 at 12 weeks' gestation who presents to the emergency room complaining of midepigastric pain that appears to radiate to her lower back. She also admits to feeling nauseated and frequently draws her knees to her chest. Her WBC is 18 000 cells/μL and serum amylase is 150 U/100 mL.
C A G4P3 at 19 weeks' gestation who complains of recurrent, colicky abdominal pain that is localized to the right upper quadrant. The woman also experiences frequent episodes of nausea and vomiting. Her symptoms appear to occur after consuming her favorite meal consisting of fried chicken and mashed potatoes.
D A G2P1 at 21 weeks' gestation who presents with severe, constant abdominal pain that began at her epigastrum and then radiated to her right upper quadrant. She has vomited twice and has no appetite, not even for her favorite food.

Questions 34 and 35: true or false

34 Laparoscopic cholecystectomy is considered to be a safe procedure during pregnancy.

35 Chenodeoxycholic acid and ursodeoxycholic acid are gallstone-solubilizing agents that can be used in pregnant patients.

Questions 36 and 37: choose the correct answer

36 A 27-year-old G4P3 at 27 weeks' gestation presents with right upper quadrant pain that radiates to her back. The pain appears to increase upon taking a deep breath. The patient denies any nausea or vomiting. What would be the appropriate management for this patient?
A Emergent cholecystectomy
B Emergent appendectomy
C Conservative medical management including nasogastric suction, analgesia, intravenous hydration, and antibiotics
D Place the patient on strict bed rest and send her home

37 Which of the following complications can develop as a result of performing a laparoscopic cholecystectomy on a pregnant woman in her third trimester?
A Maternal infection
B Fetal demise
C Preterm labor
D All of the above

Questions 38 and 39: true or false

38 When pancreatitis occurs during pregnancy, a favorable outcome should be expected.

39 Pregnancy predisposes a woman to the development of pancreatitis.

Question 40: choose the correct answer

40 Which of the following should never be used when diagnosing gastrointestinal disease in a pregnant patient?
A Ultrasound
B Computed tomography scan
C Magnetic resonance imaging
D None of the above

Question 41: true or false

41 Treatment for pancreatitis in pregnancy is primarily operative.

Questions 42 and 43: choose the correct answer

42 Which of the following is not typically part of the treatment regimen for pancreatitis occurring in pregnancy?
A Insulin
B Broad-spectrum antibiotics
C Nasogastric suction
D Ritodrine

43 Which of the following is not a complication of managing pancreatitis in the pregnant patient?
A Abscess formation
B Blood coagulation disorders
C Elevated vitamin K levels
D Pulmonary embolus

Question 44: true or false

44 Total parenteral nutrition is considered to be safe and effective for use in pregnancy when a concern for the nutritional status of the mother exists.

Question 45: choose the correct answer

45 Which of the following complications of gastrointestinal disease occurring in pregnancy poses the greatest risk of fetal mortality?
- A Peritonitis
- B Pancreatic abscess
- C Hypocalcemia
- D Pseudocyst formation

Question 46: true or false

46 Drugs that fall into the Food and Drug Administration risk Category D may be used in pregnancy if the mother suffers from a serious illness and a safer drug cannot be used.

Questions 47 and 48: choose the correct answer

47 Which drug appears under the Food and Drug Administration risk category X?
- A Tetracycline
- B Omeprazole
- C Meperidine
- D Misoprostol

48 Which of the following is a characteristic of peripheral parenteral nutrition?
- A Can be used for long periods of time
- B Provides an inadequate long-term caloric supply
- C Requires small fluid volumes to decrease the osmolality of the solution
- D Requires large fluid volumes to increase the osmolality of the solution

Further reading

Abell TL, Riely CA. Hyperemesis gravidarum. *Gastroenterol Clin North Am* 1992;21:835.

Baron TH, Richter JE. Gastresophageal reflux disease in pregnancy. *Gastroenterol Clin North Am* 1992;21:777.

Briggs GG, Freeman RK, Yaffee SJ, eds. *Drugs in pregnancy and lactation*, 7th edn. Philadelphia, PA: Lippincott, Williams and Wilkins, 2005.

Eliakim R, Abulafia O, Sherer DM. Hyperemesis gravidarum: a current review. *Am J Perinatol* 2000;17:207.

Cappell MS. Gastrointestinal disorders during pregnancy. Preface. *Gastroenterol Clin North Am* 2003;32:xi–xiii.

Katz JA, Pore G. Inflammatory bowel disease and pregnancy. *Inflamm Bowel Dis* 2001;7:146.

Malangoni MA. Gastrointestinal surgery and pregnancy. *Gastroenterol Clin North Am* 2003;32:181.

Sharp HT. The acute abdomen during pregnancy. *Clin Obstet Gynecol* 2002;45:405.

Viktrup L, Hee P. Appendicitis during pregnancy. *Am J Obstet Gynecol* 2001;185:259.

Weiner CP, Buhimschi C, eds. *Drugs for pregnant and lactating women*. Philadelphia, PA: Churchill Livingstone, 2004.

44 Liver disease in pregnancy

Vivek Raj

Questions 1–18: choose the correct answer

1 A 24-year-old woman, who is 30 weeks' pregnant, presents with malaise, tiredness, and mild nausea. Her physical examination is unremarkable. On laboratory tests, her hemoglobin (Hb) is 11 g/dL, white blood cell (WBC) 11 000 mm^3, count Plt 110 000 mm^3, total bilirubin (TBR) 1.8 mg/dL, aspartate aminotransferase (AST) 152 IU/L, alanine aminotranferase (ALT) 155 IU/L, alkaline phosphatase (ALP) 230 IU/L, gamma-glutamyl-transferase (GGT) 70 IU/L. Ultrasound (US) of the abdomen shows a gravid uterus, distended gallbladder but no stones. The following would be the most appropriate workup:
- A Some elevation of liver enzymes is expected with pregnancy. She should be observed with repeat liver function tests in 2–3 weeks
- B The clinical and laboratory picture is consistent with HELLP syndrome, and she should be managed conservatively
- C Distended gallbladder and abnormal liver tests including TBR and ALP indicate cholecystitis, and a surgical consultation should be sought
- D Check hepatitis A, B, and C serology. If negative, look for other causes of acute hepatitis

2 A 32-year-old woman is 34 weeks' pregnant with her second pregnancy. She presents with preeclampsia with hypertension (HTN), proteinuria, and edema, which is treated with antihypertensives. Two weeks later she returns with increasing nausea, malaise, and epigastric pain. Physical examination reveals peripheral edema, blood pressure (BP) of 140/90, palmer erythema, mild icterus, spider angioma on the trunk, uterus consistent with gestation, but otherwise normal abdominal examination. Initial laboratory data show Hb 8.5, WBC 12 000, Plt 90 000, TBR 4.2, direct bilirubin (BR) 1.2 mg/dL, AST 450, ALT 300, ALP 200, GGT 130. The appropriate next step would be:
- A Admit the patient to hospital, observe closely, and consider delivery at 36–37 weeks' gestation
- B Check hepatitis serology (A, B, C, Herpes simplex) and ask her to return in 1 week. If any of these tests are positive, treat accordingly. If negative, investigate further
- C Liver biopsy to establish a quick diagnosis and then treat accordingly
- D Immediate admission and delivery.

3 A Caucasian woman who is 33 weeks' pregnant presents with epigastric pain, nausea, vomiting, and malaise of 2 weeks' duration, which has got worse. Two days ago, she also noticed dark urine. On examination, her BP is 150/95, temperature 99.2°F, pulse 90 beats per minute (b.p.m.). She has mild icterus. Abdominal examination reveals a gravid uterus and liver edge palpable 2 cm below the costal margin. Admission laboratory results show Hb 11, WBC 14 500, Plt 110 000, TBR 3.2, AST 150, ALT 175, ALP 300, GGT 230, international normalized ratio (INR) 1.5. She is admitted and tests are sent for hepatitis serology (A, B, C), antinuclear antibody (ANA), antimitochondrial antibody (AMA), and alpha 1-antitrypsin. Two days later, she is more somnolent. Her liver enzymes have remained unchanged. Her INR has increased to 2.8. US of liver is normal. The best course of action would be:
- A Correct INR with vitamin K and monitor on the wards
- B Send blood cultures, hepatitis E and Herpes simplex serology, and serum ceruloplasmin levels to cover all conditions that can cause acute hepatitis
- C Give fresh frozen plasma (FFP) to correct INR. Then consider liver biopsy to establish diagnosis. Wait 3 weeks until she is at 36 weeks' gestation and then deliver
- D Transfer to intensive care unit (ICU), observe closely and, if INR increases further and somnolence worsens, proceed with immediate delivery

4 The following is diagnostic of acute fatty liver of pregnancy (AFLP):
- A US showing fatty change in the liver in a patient in the third trimester with abnormal liver blood tests
- B MRI of abdomen showing fatty liver and areas of liver infarction
- C Liver biopsy showing large globules of fat in hepatocytes, with lymphocytic infiltration in the centrilobular region
- D Liver biopsy showing hepatocytes with microvesicular fat and minimal inflammatory cell infiltration

5 A 23-year-old woman presents for prenatal checkup. She is 12 weeks' pregnant and is asymptomatic. On routine laboratory tests, she is found to be hepatitis B surface antigen (HBsAg) positive. Liver function tests (LFTs), complete blood count (CBC), hepatitis A and C serology are all negative. There is no obvious source of infection on history. Which of the following is the best strategy?
- A Vaccinate the woman with hepatitis A and B vaccine to prevent infection of the child
- B Treat with interferon, so she can clear the virus by the time of delivery
- C Test for hepatitis Be antigen (HBeAg), anti-HBe antibody, anti-HBs antibody, anti-HBcore antibody (IgM, IgG). Based on the tests, treat the patient after the baby is delivered
- D Do blood tests as in C and treat the infant with hepatitis B virus (HBV) vaccine soon after birth
- E Blood tests as in C and treat the infant with hepatitis B immune globulin (HBIG) and HBV vaccine soon after birth
- F Blood tests as in C and treat the infant with HBIG only, as response to vaccine is unlikely to be good given the infant's immature immune system

6 A 28-year-old primigravida woman, who is 12 weeks' pregnant, presents with nausea and vomiting for 2 weeks. She denies abdominal pain, fever, or chills. Her pulse rate is 108 b.p.m., BP 110/70. Her workup reveals normal CBC, TBR 1.0, AST 450, ALT 350, ALP 140, GGT 100, LDH 50, and INR 1.2. US shows fatty liver. Which of the following statements is true?
- A She probably has acute fatty liver of pregnancy and should be admitted urgently to the ICU and monitored closely
- B She should be admitted to the floor, given intravenous fluids and antiemetics, and observed
- C Send hepatitis serology and ask her to return to the clinic within 1 week for re-evaluation
- D She should be admitted to hospital. Hepatitis serology should be checked. If negative, urgent liver biopsy should be done, given the high levels of liver enzymes

7 A 34-year-old woman, who is 35 weeks' pregnant, presents with severe right upper quadrant pain for 6 hours, with nausea, but no fever. Her BP is 160/100, pulse 90 b.p.m. She is not icteric. There is mild edema in her feet. Abdomen is diffusely tender, but more so in the right upper quadrant. Laboratory tests show WBC 13 000, Hb 9.5, Plt 90 000, TBR 1.2, AST 4800, ALT 5500, ALP 320, GGT 220. The likely clinical diagnosis is:
- A Acute cholecystitis
- B Hepatic infarction
- C Subcapsular hematoma
- D Any of the above
- E None of the above

8 The next best test in the above patient will be:
- A Abdominal ultrasound
- B Check urine for proteins
- C Abdominal computed tomography (CT) scan
- D Hepatitis A, B, C, E and Herpes simplex serology

9 A 28-year-old patient, who is 28 weeks' pregnant, presents with increasing pruritis for 3 days. She has mild nausea but no other symptoms. She received amoxicillin 5 days ago for urinary tract infection (UTI), and is still taking the medication. On examination, she has some excoriations on the arms and legs, normal vital signs, and no icterus. Her CBC was normal; TBR 0.9, AST 150, ALT 70, ALP 120, GGT 70, INR 1.1. Abdominal ultrasound showed normal liver, distended gallbladder with some sludge, and common bile duct (CBD) 8 mm in diameter with no obvious stones. The most likely diagnosis is:
- A Biliary obstruction due to a small stone in CBD
- B Allergic reaction to amoxicillin
- C Intrahepatic cholestasis of pregnancy
- D Normal expectation in a pregnant woman

10 A 30-year-old woman is 36 weeks' pregnant with her third child. About 1 month ago, she traveled to India for 1 week for a family emergency. She now presents with a 1 week history of malaise, severe anorexia, and dark urine. On further history, she had a needlestick injury 3 years ago, and also had a tattoo as a teenager. She has never been tested for hepatitis. On examination, she is jaundiced, but otherwise looks well. Pulse is 80 b.p.m., BP 120/70, abdomen is soft. Uterus is appropriate for gestation. Liver edge is palpable, and it is mildly tender. LFTs show TBR 14.8, AST 1400, ALT 1600, ALP 280, GGT 240, INR 1.7. Hepatitis serology sent by her primary doctor shows hepatitis A IgG antibody positive, HBsAg negative, anti-HBs antibody positive, anti-HBcore antibody positive, HCV antibody positive. The best management for this patient will be:
- A She has hepatitis A. Reassure the patient that it is a self-limiting illness and will get better in 2–3 weeks. You will see her weekly in the clinic
- B She has hepatitis B and C co-infection, and may have chronic active hepatitis B. She should be admitted and observed. Her child should receive HBIG and HBV vaccine. After delivery, she should be treated for hepatitis B and C
- C Admit the patient under close observation. Send hepatitis E, Herpes simplex, Epstein–Barr virus (EBV) serology, and consider early delivery.
- D Abdominal CT scan to rule out hepatic infarction, given very high transaminases

11 A 28-year-old woman is 34 weeks' pregnant with her third pregnancy. Other pregnancies have been uneventful. She presents with right upper quadrant abdominal pain, nausea, and vomiting. For the last 3 days, she has noticed increased distention of the abdomen and thinks her fetus is growing quickly. On examination, her pulse and BP are normal, and she has no edema. Abdomen is distended more than expected with her gestation, and there is possible shifting dullness. There is no hepatosplenomegaly. Fetal heart sounds are normal. The best test to establish a diagnosis will be:

A Abdominal paracentesis to evaluate ascitic fluid albumin, cell count, etc. and proceed with workup
B Abdominal CT scan to look for subcapsular hematoma or possible hemoperitoneum
C Ultrasound of abdomen including Doppler
D Liver function tests, serum albumin, CBC, INR, electrolytes. Based on the results, investigate further

12 A 23-year-old woman, who is 32 weeks' pregnant, presents with fever. She is found to have a UTI, and is treated with antibiotics. Her fever does not subside and, 3 days later, her blood culture comes back positive for Gram-negative rods. Urine culture shows *Proteus*, resistant to many antibiotics, including levofloxacin, which she had been receiving for UTI. She also complains of upper abdominal pain. Her laboratory results show WBC 15 000, Hb 11.5, Plt 150 000, TBR 5.8, direct BR 2.3, AST 55, ALT 60, ALP 450, GGT 380, INR 1.2. Total bile acids are mildly elevated. Ultrasound shows mildly distended gallbladder but no stones, hyperechogenicity of liver, and normal bile ducts. The best course of action is:

A Treat with antibiotics based on sensitivity tests, and recheck LFTs in 3–4 days
B Treat with appropriate antibiotics and start ursodeoxycholic acid to treat her intrahepatic cholestasis of pregnancy
C Proceed with endoscopic retrograde cholangiopancreatography (ERCP)
D Proceed with liver biopsy

13 A 28-year-old woman is 36 weeks' pregnant. She was diagnosed with preeclampsia when she was 32 weeks' pregnant. On her present evaluation, she is found to have Hb 8, WBC 4500, Plt 85 000, AST 230, ALT 180, TBR 1.9, ALP 220, GGT 100. You diagnose her as having HELLP syndrome, and advise that she be admitted to hospital, and observed closely, and that she will benefit from early induction of labor. She is reluctant, and has questions about the risk to herself and the fetus, and wants to wait until full term. Which of the following is the appropriate risk assessment that you can give her?

A Mortality risk for the patient is 40% and risk to fetus 30%
B Maternal mortality risk is about 2%, and perinatal mortality risk about 35%
C Maternal mortality risk is low (< 1%), but perinatal mortality risk for the baby is high (50%)
D Maternal mortality risk is high (40%), and perinatal mortality risk for the baby is low (< 2%)

14 A 22-year-old woman was diagnosed with hepatitis C, genotype 1a, when she was investigated for mildly elevated ALT of 55, found on routine blood tests. Liver biopsy confirms mild chronic active hepatitis, with no fibrosis. She has been trying to get pregnant. She wants to know if she can be treated for hepatitis C and continue to try and get pregnant, and what effect will her pregnancy have on her liver diseases and vice versa. Which of the following statements is true?

A Pregnancy will accelerate progression of liver disease due to hepatitis C
B The risk of transmission of hepatitis C to the fetus is very low (< 2%), and it should be safe for her to get pregnant and deliver the baby, without getting treatment for hepatitis C. The baby can be vaccinated for hepatitis C to prevent infection
C She should avoid getting pregnant and use contraception during the treatment phase of hepatitis C, because of teratogenicity of hepatitis C treatment
D She can be treated successfully with a 3-month intensive treatment regimen for hepatitis C and then try to get pregnant after that

15 One of your young patients, who is 24 years old, has been diagnosed recently with autoimmune hepatitis, and started on treatment with steroids and azathioprine. Her steroids are being tapered. She desperately wants to have a child. You can advise the following:

A Autoimmune hepatitis and other chronic liver diseases decrease fertility, and she is not likely to be able to get pregnant. She should think about adoption
B After successful treatment of autoimmune hepatitis, fertility is likely to return, and she can get pregnant. She will have to continue azathioprine and, at low doses, the teratogenic risk of this drug is low
C Her fertility is not affected at all by chronic liver disease, and she has a normal chance of getting pregnant and having a baby
D She has a chance of getting pregnant even when the disease is active, but you will advise her against it because of the teratogenic side-effects of azathioprine

16 A 30-year-old woman, who is 12 weeks' pregnant, presents with anorexia, nausea, and abdominal pain. There is no history of foreign travel. Her job as a sales representative involves touring rural as well as urban

areas in the United States. Physical examination reveals mild hepatomegaly, but no other abnormality. Laboratory tests reveal TBR 12.5, direct BR 8.2, AST 1800, ALT 2100, ALP 180, GGT 225, LDH 30, INR 1.1, Hb 11.9, WBC 6.7, Plt 180 000. Abdominal CT scan shows a normal looking liver, normal gallbladder and biliary system. The best next step will be:

A Admit her immediately and consider termination of pregnancy, as she has acute liver failure and may have AFLP
B Admit immediately and proceed with an urgent liver biopsy
C Send hepatitis A, B, C serology and manage conservatively in the meanwhile
D Send hepatitis E serology in addition to hepatitis A, B, and C

17 A 30-year-old woman, who is 24 weeks' pregnant, is admitted with sore throat, mild cough, rhinitis, abdominal pain, nausea, and mild jaundice. Her physical examination is unrevealing. Laboratory tests show normal CBC, TBR 3.5, direct BR 1.7, AST 1420, ALT 1600, ALP 240, GGT 230, INR 1.1, LDH 50. Total bile acid concentration is normal. Suspecting acute hepatitis, hepatitis A, B, and C serology is sent and comes back negative. She is HIV negative. She does not have hypertension, proteinuria, or edema, and preeclampsia is ruled out. Which of the following would be a good option?

A Admit to hospital and proceed with liver biopsy
B Start ursodeoxycholic acid for intrahepatic cholestasis of pregnancy (ICP)
C Send Herpes simplex and cytomegalovirus (CMV) serology
D Treat with intravenous fluids and observe in hospital

18 A woman who is 14 weeks' pregnant presents with severe nausea and vomiting. Despite hospital admission and treatment, her symptoms persist for 4 weeks, and eventually resolve. She wants to know what impact this will have on her baby. Which of the following is correct?

A The child's birthweight will be significantly lower than average
B There is increased risk of teratogenicity due to medication used during admission including phenargan, ondansetron, intravenous fluids, etc.
C There is a high risk of prematurity and higher risk of physical and mental development disorders in the infant
D The infant is likely to be normal or may have slightly lower birthweight, but no developmental problems

Further reading

Abell TL, Riely CA. Hyperemesis gravidarum. *Gastroenterol Clin North Am* 1992;21:835.

Bacq Y. Intrahepatic cholestasis of pregnancy. *Clin Liver Dis* 1999;3:1.

Bacq Y, Riely CA. The liver in pregnancy. In: *Schiffs textbook of liver disease*, Vol. 2, 9th edn. Lippincott Williams and Wilkins, 2003:1435.

Barron WM. The syndrome of preeclampsia. *Gastroenterol Clin North Am* 1992;21:851.

Davis A, Katz VL, Cox R. Gallbladder disease in pregnancy. *J Reprod Med* 1995;40:759.

Jaiswal SP, Jain AK, Naik G, et al. Viral hepatitis during pregnancy. *Int J Gynaecol Obstet* 2001;72:103.

Knox TA, Olans LB. Liver disease in pregnancy. *N Engl J Med* 1996;335:569.

Riely CA. Acute fatty liver of pregnancy. *Semin Liver Dis* 1987;7:47.

Riely CA. Liver diseases in pregnancy. In: Reece AE, Hobbins JC, eds. *Medicine of the fetus and mother*, 2nd edn. Philadelphia, PA: Lippincott-Raven Publishers, 1999:1153.

Sandhu BS, Sanyal AJ. Pregnancy and liver disease. *Gastroenterol Clin North Am* 2003;32:407.

Schweitzer IL, Peters RL. Pregnancy in hepatitis B antigen positive cirrhosis. *Obstet Gynecol* 1976;48:53S.

Sherlock S, Dooley J. *Diseases of the liver and biliary system*, 11th edn. Malden, MA: Blackwell Science, 2002.

Sibai BM, Ramadan MK, Usta I, et al. Maternal morbidity and mortality in 442 pregnancies with hemolysis, elevated liver enzymes, and low platelets (HELLP syndrome). *Am J Obstet Gynecol* 1993;169:1000.

45 Pregnancy complicated by renal disorders

Michelle W. Krause and Sudhir V. Shah

Question 1: choose the correct answer

1 The following physiologic changes occur in normal pregnancy except:
- A Sodium retention
- B Increase in plasma water
- C Increase in cardiac output
- D Decrease in glomerular filtration rate

Questions 2 and 3: true or false

2 Laboratory parameters such as the blood urea nitrogen (BUN) and creatinine that measure renal function are typically higher in pregnant women compared with women who are not pregnant.

3 The incidence of acute renal failure in pregnancy is increasing compared with previous decades.

Questions 4–10: choose the correct answer

4 The following are causes of prerenal acute renal failure that may occur in pregnancy except:
- A Hyperemesis gravidarum
- B Septic abortion
- C Ureteral obstruction
- D Postpartum cardiomyopathy

5 Preeclampsia/eclampsia syndrome and acute glomerulonephritis may be differentiated by which of the following?
- A Positive antinuclear antibody (ANA)
- B Edema
- C Renal failure
- D Hypertension

6 Characteristic renal pathological findings in the preeclampsia/eclampsia syndrome include:
- A Crescent formation
- B Glomerular endotheliosis
- C Glomerulosclerosis
- D Interstitial fibrosis

7 Typically, the renal manifestations of preeclampsia, such as renal failure, proteinuria, and hypertension, should return to normal within what time period postpartum?
- A 1 week
- B 4 weeks
- C 12 weeks
- D Never

8 Indications for dialysis in acute renal failure in pregnancy include:
- A Hyperkalemia
- B Metabolic acidosis
- C Fluid overload with pulmonary edema
- D All of the above

9 Women who become pregnant with underlying chronic kidney disease are at risk for which of the following complications?
- A Progressive loss of kidney function
- B Preeclampsia
- C Hypertension
- D All of the above

10 Infants born to mothers with chronic kidney disease are at risk for which of the following complications?
- A Prematurity
- B Intrauterine growth restriction
- C All of the above
- D None of the above

Question 11: true or false

11 Infants born to mothers with vesicoureteral reflux have an increased incidence of abnormal micturating cystourethrography consistent with vesicoureteral reflux.

Questions 12–17: choose the correct answer

12 The antiphospholipid antibody syndrome is typically associated with which renal disease?
- A Thrombotic microangiopathy
- B Minimal change disease
- C Focal segmental glomerulosclerosis
- D Membranous glomerulopathy

13 Which of the following classes of medications are not considered safe for the treatment of hypertensive disorders in pregnancy?
- A Beta-blockers
- B Angiotensin-converting enzyme (ACE) inhibitors
- C Calcium-channel blockers
- D Vasodilators

14 Which of the following renal transplant immunosuppressive medications are not considered safe during pregnancy?
- A Mycophenolate mofetil
- B Cyclosporine A
- C Prednisone
- D Azathioprine

15 Approximately what percentage of pregnancies will result in live births for women with endstage renal disease on dialysis therapy?
- A None
- B 25%
- C 50%
- D 100%

16 The treatment strategies for a pregnant dialysis patient include all of the following except:
- A Erythropoietin therapy for anemia
- B Decrease in frequency and duration of dialysis
- C Blood pressure control with hypertensive agents
- D Careful monitoring of fluid weight

17 Ideally, how long should women wait after renal transplantation before trying to conceive?
- A 0–3 months
- B 3–6 months
- C 1 year
- D Never, pregnancy is not safe for renal transplant recipients

Question 18: true or false

18 Vaginal deliveries are contraindicated for women after renal transplantation.

Questions 19–20: choose the correct answer

19 The initial management of symptomatic nephrolithiasis in the pregnant patient without renal failure includes:
- A Supportive therapy with fluids and pain control
- B Lithotripsy
- C Ureteral stent
- D Percutaneous nephrostomy tube

20 Common causes of intrinsic acute renal failure in the pregnant patient include all of the following except:
- A Preeclampsia/eclampsia
- B HELLP syndrome
- C Postpartum hemorrhage
- D Polyhydramnios

Further reading

Bar Oz B, Hackman R, Einarson T, Koren G. Pregnancy outcome after cyclosporin therapy during pregnancy. *Transplantation* 2001;71:1051.

Davison JM, Dunlop W. Renal hemodynamics in normal human pregnancy. *Kidney Int* 1980;18:152.

European Best Practice Guidelines (Part 2). *Nephrol Dial Transplant* 2002;17(Suppl. 4):50.

Hytten FE, Leitch I. *The physiology of human pregnancy*, 2nd edn. Oxford, UK. Blackwell Scientific Publications, 1971.

Jungers P, Chauveau D. Pregnancy in renal disease. *Kidney Int* 1997;52:871.

K/DOQI Advisory Board Members. Clinical Practice Guidelines for Chronic Kidney Disease. Part 4. Definition and Classification of Stages of Chronic Kidney Disease. *Am J Kidney Dis* 2002;39:S46.

46 Neurological disorders in pregnancy

R. Lee Archer, Stacy A. Rudnicki, and Bashir S. Shihabuddin

Questions 1 and 2: choose the correct answer

1 A change in headache pattern during pregnancy should prompt concern as to the cause because:
- A Many different disorders, including preeclampsia and subarachnoid hemorrhage, can present with a headache
- B Headaches are an early sign of preterm labor
- C All causes of headaches are bad
- D Migraine headaches can be deadly
- E Tension headaches do not occur during pregnancy

2 What are some concerning symptoms and signs that may accompany headaches?
- A Fever
- B Focal neurological signs
- C Sudden onset of severe headache
- D Papilledema
- E All of the above

Question 3: true or false

3 Headaches that have been present for over a year before pregnancy and that have not changed in frequency or type, in a woman with a normal neurological examination, generally do not require additional workup.

Questions 4–6: choose the correct answer

4 Benign intracranial hypertension presents with which of the following features?
- A Constricted pupils
- B Third cranial nerve palsies
- C Papilledema
- D Unilateral headaches
- E All of the above

5 When is cerebral venous sinus thrombosis most common?
- A During conception
- B First trimester
- C Second trimester
- D Third trimester
- E Puerperium

6 Heparin is considered the anticoagulant of choice most of the time during pregnancy because:
- A Warfarin is teratogenic in the first trimester and heparin does not cross the placenta
- B It is metabolized by the kidneys
- C It is metabolized by the liver
- D It does not induce preterm labor
- E This is not true. Warfarin is the anticoagulant of choice during pregnancy

Question 7: true or false

7 Multiple sclerosis does not contraindicate pregnancy, but there is an increased incidence of exacerbations during the third trimester.

Questions 8–13: choose the correct answer

8 Which of the following is true regarding carpal tunnel syndrome in pregnancy?
- A It tends to occur in association with Bell's palsy
- B Symptoms occur in 62% of pregnant women
- C Wrist splints at night do not help
- D Spontaneous resolution after delivery is uncommon
- E It is associated with a higher incidence of preeclampsia

9 Meralgia paresthetica causes a burning pain where?
- A On the lateral side of the head
- B On the lateral side of the calf
- C On the occipital aspect of the head
- D On the lateral side of the thigh
- E On the lateral side of the upper arm

10 Approximately what percentage of women have postpartum leg weakness or numbness attributable to a focal neuropathy, of which the most common are the femoral and lateral femoral cutaneous nerves?
- A 0.01%
- B 0.1%
- C 1%
- D 10%
- E 100%

11 Hyperemesis gravidarum can cause a neuropathy by causing a deficiency of what?
- A Vitamin B12
- B Vitamin B1 (thiamine)
- C Vitamin C
- D Vitamin D
- E Vitamin B2 (riboflavin)

12 What drugs should be avoided whenever possible in myasthenics?
- A Calcium and melatonin
- B Penicillin and dilantin
- C Magnesium and neuromuscular blocking agents
- D Tricyclic antidepressants and beta-blockers
- E None of the above

13 Which of the following is true regarding the treatment of autoimmune neurological disease with immune suppression during pregnancy?
- A Treatment of any autoimmune neurological disease in pregnancy should involve a neurologist to assist in weighing the pros and cons of immune suppression
- B Treatment of any autoimmune neurological disease should involve an infectious disease expert to help in dealing with the increased incidence of infections
- C Treatment with any immune suppressant during pregnancy is contraindicated
- D Treatment of any autoimmune disease during pregnancy should involve the use of steroids
- E None of the above

Question 14: true or false

14 Guillain–Barré syndrome can be treated safely with plasmapheresis during pregnancy.

Questions 15–17: choose the correct answer

15 Which of the following is true regarding women of childbearing age with epilepsy and folic acid supplements?
- A All women should take 0.4–4 mg daily during pregnancy
- B The higher dose of 4 mg daily is indicated for women who have previously had infants with neural tube defects
- C Folic acid will reduce the incidence of neural tube defects by 50–70%.
- D A and C are correct
- E A, B, and C are correct

16 Which of the following should be done with antiepileptic drugs in pregnancy?
- A Avoidance of monotherapy and phenytoin whenever possible
- B Avoidance of polytherapy and valproic acid whenever possible
- C Avoidance of carbamazepine and phenytoin whenever possible
- D Addition of low doses of two drugs rather than a high dose of one drug if seizures are uncontrolled
- E None of the above

17 Which of the following is true regarding antiepileptic drugs during pregnancy?
- A The drugs should be changed each trimester
- B The drugs should be changed if seizures recur
- C The drugs should be maintained as a rule, but the dose may need to be increased
- D The drugs should be changed to a liver-metabolized drug
- E The drugs should be changed to a renal-metabolized drug if possible

Question 18: true or false

18 Tension headaches during pregnancy are best managed with daily benzodiazepines.

Questions 19–20: choose the correct answer

19 How should antiepileptic drug serum levels be maintained during pregnancy?
- A The same as prior to conception
- B Higher than preconception levels
- C Lower than preconception levels
- D Serum levels are not needed during pregnancy
- E Serum levels are too inaccurate to be used during pregnancy

20 Which of the following is true regarding vitamin K supplementation during pregnancy for women with epilepsy?

A It should be given orally throughout pregnancy at a dose of 10–20 mg daily

B Those who are receiving enzyme-inducing AEDs should be given intramuscular vitamin K monthly throughout pregnancy

C Those who are not receiving enzyme-inducing drugs should receive it orally each day during the last month of pregnancy

D Those on enzyme-inducing drugs should receive intramuscular vitamin K once, 4 weeks before delivery

E None of the above

Further reading

Devinsky O, Yerby MS. Women with epilepsy: reproduction and effects of pregnancy on epilepsy. *Neurol Clin* 1994;12:479.

Djelmis J, Sastarko M, Mayer D, et al. Myasthenia gravis in pregnancy: report on 69 cases. *Eur J Obstet Gynecol Reprod Biol* 2002;104:21.

Ferrero S, Pretta S, Ragni N. Multiple sclerosis: management issues during pregnancy. *Eur J Obstet Gynecol Reprod Biol* 2004; 115:3.

Martin SR, Foley RF. Approach to the pregnant patient with headache. *Clin Obstet Gynecol* 2005;48:2.

Sawhney H, Vasishta K, Suri V, et al. Pregnancy with epilepsy—a retrospective analysis. *Int J Gynaecol Obstet* 1996;54:17.

Shehata HA, Okosun H. Neurological disorders in pregnancy. *Curr Opin Obstet Gynecol* 2004;16:117.

Shmorgun D, Chan WS, Ray JG. Association between Bell's palsy in pregnancy and pre-eclampsia. *Q J Med* 2002;95:359.

Steeger-Theunissen RPM, Renier WO, Borm GF, et al. Factors influencing the risk of abnormal pregnancy outcome in epileptic women: a multi-centre prospective study. *Epilepsy Res* 1994;18: 261.

Turan TN, Stern GJ. Stroke in pregnancy. *Neurol Clin* 2004;22: 821.

Wong CA, Scavone BM, Dugan S, et al. Incidence of postpartum lumbosacral spine and lower extremity nerve injuries. *Obstet Gynecol* 2003;101:279.

47 Thromboembolic disorders of pregnancy

Michael J. Paidas, Christian M. Pettker, and Charles J. Lockwood

Questions 1–20: choose the correct answer

1 The approximate risk of venous thromboembolism (VTE) in pregnancy is:
- A 1:500–1000
- B 1:1500–2000
- C 1:5000
- D 1:10 000

2 Deep venous thrombosis is more common in:
- A First trimester
- B Second trimester
- C Third trimester
- D Postpartum

3 The clotting factors that increase in pregnancy are:
- A II, V, X, XI, XII
- B II, VII, VIII, IX, X
- C I, II, V, VII, IX
- D II, V, VII, VIII, X

4 Virchow's triad, all of which are present at pregnancy and delivery, includes all of the following except:
- A Vascular stasis
- B Vascular trauma
- C Hyperviscosity
- D Hypercoagulability

5 For which thrombophilic condition can a definitive diagnosis not be made during pregnancy?
- A Factor V Leiden
- B Antithrombin deficiency
- C Antiphospholipid antibodies
- D Protein S deficiency

6 Which of the following factors confers the highest risk of thromboembolism:
- A Cesarean section
- B Pregnancy and a history of VTE
- C Presence of heterozygous factor V Leiden
- D History of thromboembolism in a first-degree relative

7 The most thrombogenic of the thrombophilias is:
- A Antiphospholipid antibody syndrome
- B Antithrombin III deficiency
- C Factor V Leiden mutation homozygosity
- D Prothrombin gene (G201210A) mutation homozygosity

8 The thrombophilic disorder with the best evidence for association with recurrent loss is:
- A Antiphospholipid antibody syndrome
- B Factor V Leiden mutation
- C Antithrombin III deficiency
- D Hyperhomocysteinemia

9 According to the American College of Obstetricans and Gynecologists, the maximum recommended total dose of ionizing radiation is:
- A 0.1 rad
- B 0.5 rad
- C 1 rad
- D 5 rad

10 The "gold standard" technique for the diagnosis of pulmonary embolus is:
- A Ventilation–perfusion scan
- B Spiral computed tomography angiography
- C Echocardiography
- D Pulmonary angiography

11 The risk of death from untreated pulmonary embolus associated with pregnancy is:
- A < 1%
- B 5%
- C 15%
- D 50%

12 Patients who should receive therapeutic anticoagulation antepartum and postpartum include all of the following except:
- A Patients with mechanical heart valves
- B A patient with deep venous thrombosis (DVT) diagnosed at 30 weeks
- C Patients with antithrombin deficiency
- D A patient with homozygosity for the factor V Leiden mutation but no history of VTE or adverse pregnancy outcome

13 Appropriate levels of antifactor Xa in therapeutic and prophylactic regimens of low-molecular-weight heparin are:
- A 0.6–1.0 IU/mL and 0.1–0.2 IU/mL respectively
- B 0.1–0.2 IU/mL and 0.6–1.0 IU/mL respectively
- C 0.5–1.0 IU/mL and 0.1–0.5 IU/mL respectively
- D 0.1–1.0 IU/mL for both

14 Anticoagulation should be reinitiated how many h after vaginal and Cesarean delivery?
- A Immediately following vaginal delivery, 4–6 h following Cesarean delivery
- B 4–6 h following either vaginal or Cesarean delivery
- C 3–6 h after vaginal delivery and 6–8 h after Cesarean delivery
- D 12–24 h after vaginal or Cesarean delivery

15 Appropriate fetal surveillance for patients on anticoagulation involves:
- A Serial ultrasounds for growth beginning at 20 weeks
- B Weekly fetal testing with nonstress tests/biophysical profiles beginning at 36 weeks
- C A and B
- D No particular fetal surveillance is required for these patients

16 The incidence of heparin-induced thrombocytopenia is approximately:
- A < 1%
- B 3%
- C 7–10%
- D 20%

17 Patients who should be tested for the inherited thrombophilias include those with a history of all of the following except:
- A One previous early miscarriage at 7 weeks
- B Abruptioplacentae in the previous pregnancy
- C Severe preeclampsia at 26 weeks
- D A mother who died of a pulmonary embolus in pregnancy at age 41 years

18 A patient with a history of thromboembolism associated with a temporary risk factor and no evidence of thrombophilia should:
- A Receive full therapeutic anticoagulation antepartum as the risk of thromboembolism is 10%
- B Receive prophylactic anticoagulation antepartum if the patient has a history of first trimester loss at < 10 weeks
- C Receive postpartum prophylactic anticoagulation only
- D Not receive antepartum or postpartum anticoagulation

19 The best initial prevention strategy for antiphospholipid antibody syndrome is:
- A Steroids
- B Heparin
- C Low-dose aspirin
- D B and C

20 In converting a patient postpartum from heparin to warfarin anticoagulation, the best strategy is to:
- A Reduce to prophylactic heparin, start minidose warfarin, and gradually build up to therapeutic international normalized ratio (INR) over 2 days
- B Discontinue heparin once patient is delivered and wait 8 h prior to initiating warfarin
- C Maintain these women on prophylactic doses of unfractionated heparin or low-molecular-weight heparin (LMWH) for 1 day and until the INR reaches the therapeutic range between 2.0 and 3.0 for 1 day
- D Maintain these women on therapeutic doses of unfractionated heparin or LMWH for 5 days and until the INR reaches the therapeutic range between 2.0 and 3.0 for 2 successive days

Further reading

Brill-Edwards P, Ginsberg JS, Gent M, et al. Safety of withholding heparin in pregnant women with a history of venous thromboembolism. Recurrence of clot in this pregnancy study group. *N Engl J Med* 2000;343:1439–1444.

Clinical Updates in Women's Health. *Thrombosis, thrombophilia and thromboembolism in women*. Washington, DC: American College of Obstetricians and Gynecologists, 2006.

Cochrane E. Antiphospholipid antibody and recurrent pregnancy loss. *Obstet Gynecol* 2002;99:135–144.

Greer IA, Nelson-Percy C. Safety and efficacy of LMWH: thromboprophylaxis and treatment of venous thromboembolism (64 reports, 2777 pregnancies). *Blood* 2005;106:401–407.

Gris JC, Mercier E, Quere II, et al. Low-molecular-weight heparin versus low-dose aspirin in women with one fetal loss and a constitutional thrombophilic disorder. *Blood* 2004;103:3695–3699.

Paidas MJ, Ku DH, Langhoff-Roos J, Arkel YS. Inherited thrombophilias and adverse pregnancy outcome: screening and management. *Semin Perinatol* 2005;29:150–163.

Preston FE, Rosendaal FR, Walker ID, et al. Increased fetal loss in women with heritable thrombophilia. *Lancet* 1996;348:913–916.

Rand JH, Wu XX, Andree HA, et al. Pregnancy loss in the antiphospholipid-antibody syndrome – a possible thrombogenic mechanism. *N Engl J Med* 1997;337:154–160.

Rey E, Kahn SR, David M, Shrier I. Thrombophilic disorders and fetal loss: a meta-analysis. *Lancet* 2003;361:901–908.

Tapson VF, Carroll BA, Davidson BL, et al. The diagnostic approach to acute venous thromboembolism. Clinical practice guideline. American Thoracic Society. *Am J Respir Crit Care Med* 1999;160:1043–1066.

48 Coagulation and hematological disorders of pregnancy

Carl P. Weiner and Chien Oh

Questions 1–20: choose the correct answer

1 Which of the following is incorrect?
- A Ferritin levels should be checked when the patient is not taking iron
- B Parenteral iron can cause anaphylaxis
- C The mean corpuscular volume (MCV) of a patient with an iron deficiency can be in the normocytic range
- D Useful iron studies include measurements of ferritin, total iron-binding capacity (TIBC), and transferrin

2 Which of the following does *not* cause megaloblastic anemia?
- A A deficiency in vitamin B12
- B A deficiency in folic acid
- C Lead poisoning
- D Malabsorption

3 Which of the following is *not* seen in hemolytic anemia?
- A A fall in haptoglobin levels
- B The presence of schistocytes
- C A rise in the reticulocyte count
- D Hypersegmentation of the polymorphonuclear leukocytes

4 Which of the following statements is incorrect?
- A There are a total of four copies of the α-globulin gene
- B Hemoglobin H disease is caused by a deletion of two copies of the α-globulin gene
- C Asians are at a higher risk of hemoglobin Bart disease than Africans
- D Untreated hemoglobin Bart disease in the fetus is associated with preeclampsia

5 Which of the following hemoglobinopathies does *not* cause sickle-cell crisis?
- A Hemoglobin SA
- B Hemoglobin SS
- C Hemoglobin SC
- D Hemoglobin S/β-thalassemia

6 Which of the following statements is incorrect?
- A Prophylactic transfusions in the sickle-cell patient have not been associated with any benefit
- B Acute chest syndrome is a major cause of mortality in a patient with a sickle-cell hemoglobinopathy
- C Pneumonia is indistinguishable from acute chest syndrome
- D Acute chest syndrome is treated with antibiotics and possibly an exchange transfusion

7 Which hemolytic anemia can be treated with a splenectomy?
- A Paroxysmal nocturnal hematuria
- B Glucose 6-phosphate dehydrogenase (G6PD) deficiency
- C Structural hemoglobinopathy
- D Autoimmune hemolytic anemia

8 Which of the following diseases is *not* transmitted in an X-linked fashion?
- A G6PD deficiency
- B Hemophilia A
- C Hemophilia B
- D Antithrombin deficiency

9 Which of the following statements is correct?
- A Gestational thrombocytopenia (GT) and immune thrombocytopenia purpura (ITP) can easily be differentiated by checking antiplatelet antibodies
- B A platelet count of 120 000/μl can be attributed to ITP
- C Regional anesthesia can be administered safely to patients with a platelet count of 25 000/μl
- D A safe platelet count for vaginal delivery is around 50 000/μl

10 The first-line treatment of ITP is:
- A Administration of corticosteroids
- B Administration of intravenous immunoglobulin (IVIG)
- C A splenectomy
- D Administration of azathioprine

11 Which of the following statements about alloimmune thrombocytopenia purpura (AITP) is incorrect?
- A The first newborn may be affected with thrombocytopenia
- B In an infant, thrombocytopenia caused by AITP has a worse outcome than thrombocytopenia caused by ITP
- C Corticosteroids have a consistent effect on the fetal platelet count
- D There is no reliable screening method available for AITP

12 Which of the following treatments is incorrectly matched to the disorder?
- A Hemolysis, elevated liver enzymes, and low platelets (HELLP) syndrome – high-dose dexamethasone
- B Thrombotic thrombocytopenic purpura (TTP) – plasmapheresis
- C Hemolytic uremic syndrome – antibiotics
- D AITP – IVIG

13 Which of the following statements about aspirin is incorrect?
- A Aspirin binds reversibly to platelet cyclo-oxygenase and is therefore considered to be safe in pregnancy
- B Aspirin has reportedly been used to improve the outcome in patients with thrombocytosis
- C Along with heparin, aspirin is used to treat obstetric antiphopholipid syndrome
- D A dose of as little as 40 mg has been associated with decreased platelet function

14 Which of the following is *not* associated with disseminated intravascular coagulation (DIC)?
- A Intrauterine fetal demise
- B Abruptio placentae
- C Septic abortion
- D Acute chest syndrome

15 Which of the following is *not* an indication for heparin in cases of obstetric DIC?
- A Evidence of thrombosis causing endorgan damage
- B DIC associated with intrauterine fetal demise (IUFD)
- C DIC associated with abruptio placentae
- D Prevention of further progression of the disease after treatment of the inciting disorder

16 Which of the following statements about von Willebrand's disease (vWD) is incorrect?
- A von Willebrand's factor (vWF) binds platelets to damaged endothelium
- B vWD can only be treated with vasopressin or cryoprecipitate
- C Vasopressin increases the amount of vWF released by the endothelium
- D Type 2B and type 3 vWD patients should not receive vasopressin

17 Which of the following statements is correct?
- A Obstetrical antiphospholipid antibodies will cause thrombosis and cause the activated partial thromboplastin time (PTT) to be elevated
- B The presence of antiphospholipid antibodies always requires treatment for prevention of pregnancy loss
- C The current treatment for obstetrical antiphospholipid antibodies uses prednisone to decrease the amount of circulating antibodies
- D Antiphospholipid antibodies can cause a false-negative rapid plasma reagin (RPR)

18 Which of the following statements about Factor V Leiden is incorrect?
- A The mutation results in Factor V being resistant to neutralization by the protein C/protein S complex
- B Factor V Leiden is present in approximately 1 out of 11 to 1 out of 20 pregnancies in Northern Europe
- C Factor V Leiden heterozygosity is associated with a shortened lifespan
- D Factor V Leiden homozygosity is considered to be a "greater" thrombophilia

19 Which of the following associations is incorrect?
- A Pregnancy – decreased protein C
- B Heparin – decreased antithrombin activity
- C Warfarin – decreased protein S antigen
- D Warfarin – increased antithrombin activity

20 Which of the following is *not* considered to be a "lesser" thrombophilia?
- A Antithrombin deficiency
- B Protein C deficiency
- C Protein S deficiency
- D Factor V Leiden heterozygosity

49 Maternal alloimmunization and fetal hemolytic disease

Anita C. Manogura and Carl P. Weiner

1 What three things must be present for Rhesus (Rh) alloimmunization to occur?

2 As a general rule, a patient's first Rh D-sensitized pregnancy results in minimal fetal/neonatal disease, and subsequent pregnancies are associated with a worsening of disease. Please explain.

3 Why does ABO incompatibility decrease the risk of alloimmunization?

4 Discuss fetal blood production.

5 Explain the pathogenesis of fetal hemolytic disease.

6 How can the degradation of hemoglobin result in kernicterus?

7 How does the bilirubin level correlate with the severity of hemolytic disease of the newborn?

8 How is the Liley curve associated with the severity of hemolytic disease of the newborn?

9 When should cordocentesis be used in the management of alloimmunization?

10 What are some sources of error with amniocentesis?

11 How is Doppler ultrasound used in the management of alloimmunization?

12 Describe the management of a newly sensitized woman.

13 Describe the management of the woman with a previously sensitized fetus.

14 What type of blood should be used for fetal transfusion?

15 What are some disadvantages of intraperitoneal fetal transfusion?

16 How do these infants fare (infants who have received *in utero* transfusions)?

17 Rhesus immune globulin (RhIG) prevents Rh immunization under two conditions. What are these conditions?

18 Describe the management of RhIG administration after delivery of a Rh-positive infant.

50 Maternal infections, human immunodeficiency virus infection, and sexually transmitted diseases in pregnancy

Richard L. Sweet and Howard Minkoff

Questions 1–10: choose correct answer

1 All of the following are approved for use throughout pregnancy except:
- A Efavirenz
- B Zidovudine
- C Nelvinavir
- D Lamivudine

2 The following are candidates for highly active antiretroviral therapy (HAART) except:
- A A pregnant woman with a viral load of 5000 copies/mL
- B A nonpregnant woman with a CD4 count of 220/μL
- C A pregnant women with a CD4 count of 450/μL
- D A nonpregnant woman with a CD4 count of 450/μL

3 A HAART regime should be changed if after starting therapy:
- A The viral load goes from 100 000 copies to 5000 copies/mL in 1 month
- B The viral load starts at 200 000 copies and 6 months later has dropped to 5000 copies/mL
- C The CD4 count goes from 200/μL to 300/μL in 2 months
- D The CD4 count does not change after 1 month

4 A Cesarean section has been shown to reduce rates of mother-to-child transmission (MTCT) in which of the following circumstances?
- A The mother is on no therapy and her viral load at term is 5000 copies/mL
- B The mother is on HAART
- C The viral load is undetectable
- D The mother has had ruptured membranes for 48 h

5 According to the Institute of Medicine and the American College of Obstetricians and Gynecologists (ACOG), the best way to test women for human immunodeficiency virus (HIV) is:
- A Using a universal opt-in approach with written informed consent at the beginning of pregnancy
- B In labor, using a rapid testing technology for women with risk factors
- C Using a universal opt-out process without written consent at the beginning of pregnancy
- D Using a risk-based assessment with informed consent for women with any risk factors

6 Which of the following is a HAART regimen?
- A Zidovudine intravenously in labor
- B Oral zidovudine for 16 weeks as well as intravenously in labor
- C Combivir and nelvinavir
- D Zidovudine and lamivudine

7 All of the following are recommended for use in the intrapartum period when an HIV-positive mother has received no previous care, except:
- A Stavudine
- B Zidovudine
- C Nevirapine
- D Zidovudine and lamivudine

8 Which of the following statements are true about Cesarean sections for the prevention of MTCT?
- A They should be performed at 39 weeks
- B They should be preceded by an amniocentesis for maturity if done at 38 weeks
- C There should a vertical incision in the uterus
- D The patient should be given prophylactic antibiotics

9 Which of the following statements about viral resistance testing are true?
- A Genotyping involves growing the virus in a culture media and then exposing it to various agents
- B Testing should be performed before the failing regimen is discontinued
- C All patients should be tested before antiretroviral therapy is started
- D Testing is indicated if virus is still detectable 1 month after beginning treatment with HAART

10 Which of the following is true about the epidemiology of HIV?
- A India is projected to be the county with the most cases by 2010
- B 70% of cases occur among women
- C There have been 20 million people infected with HIV
- D Currently, most cases occur in northern Africa

51 Rheumatologic and connective tissue disorders in pregnancy

Gustavo F. Leguizamón and E. Albert Reece

Questions 1–20: choose the correct answer

1 During pregnancy, systemic lupus erythematosus (SLE) may be confused with:
- A Pregnancy-induced hypertension
- B Myasthenia gravis
- C Hypothyroidism
- D Epilepsy
- E All of the above

2 SLE affects pregnancy by:
- A Increasing late pregnancy fetal losses
- B Increasing neonatal heart block
- C Increasing the incidence of late abortions
- D All of the above
- E None of the above

3 What is the effect of pregnancy on SLE?
- A Does not affect the long-term prognosis
- B May cause "flare ups"
- C May have no effect
- D All of the above
- E None of the above

4 The incidence of SLE may be affected by:
- A Weight
- B Metabolic state
- C Race
- D Diet
- E History of multiple infections

5 Renal impairment associated with poor prognosis in pregnant women with lupus nephritis is determined by:
- A Creatinine clearance < 60 mL/min
- B Proteinuria >3 g/24 h
- C Serum creatinine >1.5 mg/dL
- D All of the above
- E None of the above

6 From the following antibodies, which one is most commonly present in women with SLE?
- A Antinuclear antibodies (ANA)
- B Anti-ds DNA
- C Anti-Sm
- D Anti-Ro (SS-A)

7 For patients with lupus nephritis, what is the incidence of permanent renal failure secondary to pregnancy?
- A 40%
- B 7%
- C 80%
- D 2%
- E 30%

8 Which of the following is a risk factor for developing preeclampsia in a woman with SLE?
- A Lupus nephritis
- B Antiphospholipid antibody syndrome
- C Chronic hypertension
- D All of the above

9 The risk of preterm labor in women with SLE is:
- A Approximately 20–50%
- B Frequently associated with premature rupture of the membranes (PROM)
- C Not different from that of the general population
- D A and B

10 The fetus' risk of developing complete heart block when the mother is positive for anti-SS-A antibodies is approximately:
- A 1 in 20
- B 1 in 69
- C 1 in 80
- D 1 in 100

11 Regarding fetal complete heart block, which of the following is/are correct?
- A Mostly associated with structural heart defects
- B The cumulative 3-year survival rate is approximately 15%
- C Ninety percent require pacemaker placement
- D The recurrence rate is approximately 16%

12 Women undergoing treatment with cyclophosphamide have which of the following characteristics?
- A Rate of permanent amenorrhea of 25%
- B Decreased fertility
- C Require contraception during treatment
- D If conception occurs during treatment, there is risk of teratogenicity but not of spontaneous abortion
- E A, B, and C are correct

13 Pharmacologic agents used to treat SLE in pregnancy include:
- A Aspirin
- B Coumadin
- C Antiviral compounds
- D Erythromycin

14 Which of the following drugs is contraindicated during pregnancy?
- A Hydroxychloroquine
- B Corticosteroids
- C Aspirin
- D Leflunomide

15 The most effective treatment for scleroderma complicated with renal crisis during pregnancy is:
- A Angiotensin-converting enzyme (ACE) inhibitors
- B Corticosteroids
- C Nonsteroidal anti-inflammatory drugs (NSAIDs)
- D Methotrexate

16 The most frequent perinatal complication in women with scleroderma is:
- A Spontaneous abortion
- B Intrauterine growth restriction (IUGR)
- C Preterm labor
- D Pregnancy-induced hypertension

17 What is the effect of pregnancy–lactation on rheumatoid arthritis?
- A Generally, it induces improvement of symptoms during gestation
- B Generally, it induces remission during lactation
- C It increases the intensity of symptoms during gestation
- D None of the above

18 Women with rheumatoid arthritis:
- A Have similar perinatal outcomes to those of the general population
- B Have significantly higher rates of miscarriage than the general population
- C Have significantly higher rates of infertility than the general population
- D Have significantly higher rates of preterm labor than the general population

19 How long before conception should a women discontinue therapy with leflunomide?
- A 2 months
- B 2 years
- C 4 months
- D 6 months
- E 1 year

20 Which of the following statements are/is correct regarding ankylosing spondylitis (AS) complicating pregnancy?
- A It usually remits during pregnancy
- B Offspring have the same risk of developing AS as the general population
- C NSAIDs are contraindicated during the second trimester
- D Perinatal outcome is similar to that of the general population

Further reading

American College of Rheumatology Subcommittee on Rheumatoid Arthritis Guidelines. Guidelines for the management of rheumatoid arthritis: 2002 update. *Arthritis Rheum* 2002;46:328–346.

Janssen NM, Genta MS. The effects of immunosuppressive and anti-inflammatory medications on fertility, pregnancy, and lactation. *Arch Intern Med* 2000;160:610–619.

Mock CC, Wong RWS. Pregnancy in systemic lupus erythematosus. *Postgrad Med J* 2001;77:157–165.

Neelson JL, Ostensen M. Pregnancy and rheumatoid arthritis. *Rheum Dis Clin North Am* 1997;23:195–212.

Ruiz-Irastorza G, Khamashta MA, Castellino G. Systemic lupus erythematosus. *Lancet* 2001;357:1027–1032.

Steen VD. Pregnancy in women with systemic sclerosis. *Obstet Gynecol* 1999;94:15–20.

Warren JB, Silver RM. Autoimmune disease in pregnancy: systemic lupus erythematosus and antiphospholipid syndrome. *Obstet Gynecol Clin North Am* 2004;31:345–372.

52 Dermatologic disorders during pregnancy

Thomas D. Horn and Jerri Hoskyn

1 What is the most common pigmentary alteration in pregnancy?

2 What treatment approaches have been used in melasma?

3 During her pregnancy, a patient notices a significant change in the size of a mole. What should be done next?

4 A pregnant woman with a pigmented lesion that changed during pregnancy is found to have a melanoma. Does prognosis in melanoma differ for pregnant versus nonpregnant women?

5 Is treatment indicated for pyogenic granuloma arising during pregnancy?

6 Striae have been associated with what complication during delivery?

7 What would typically cause increased hair loss starting about 8 weeks after delivery?

8 After delivery, a patient develops transverse grooves in all her nails. What is this change called? Is it permanent?

9 What is the most common dermatosis of pregnancy?

10 What is a typical presentation of polymorphic eruption of pregnancy?

11 What is the most reliable way to distinguish polymorphic eruption of pregnancy from pemphigoid gestationis?

12 What maternal and fetal risks are associated with pemphigoid gestationis?

13 What is the treatment of choice for pemphigoid gestationis?

14 Impetigo herpetiformis has some clinical and histologic similarities to what skin disorder seen in the nonpregnant population?

15 What fetal risks are associated with impetigo herpetiformis?

16 What is a typical presentation of cholestasis of pregnancy?

17 How long does it take for the clinical and laboratory abnormalities associated with cholestasis of pregnancy to resolve after delivery?

18 What is the most common cause of jaundice in pregnancy?

19 What maternal and fetal risks are associated with cholestasis of pregnancy?

20 What treatments have been useful in cholestasis of pregnancy?

Further reading

Dacus JV. Pruritus in pregnancy. *Clin Obstet Gynecol* 1990; 33(4):738–745.

Jenkins RE, Hern S, Black MM. Clinical features and management of 87 patients with pemphigoid gestationis. *Clin Exp Dermatol* 1999;24(4):255–259.

Kroumpouzos G. Intrahepatic cholestasis of pregnancy: what's new. *J Eur Acad Dermatol Venereol* 2002;16(4):316–318.

Kroumpouzos G, Cohen LM. Dermatoses of pregnancy. *J Am Acad Dermatol* 2001;45(1):1–19.

Muzaffar F, Hussain I, Haroon TS. Physiologic skin changes during pregnancy: a study of 140 cases. *Int J Dermatol* 1998;37:429–431.

Pennoyer JW, Grin CM, Driscoll MS, et al. Changes in size of melanocytic nevi during pregnancy. *J Am Acad Dermatol* 1997; 36(3 Pt 1):378–382.

Roger D, Vaillant L, Fignon A, et al. Specific pruritic diseases of pregnancy. A prospective study of 3192 pregnant women. *Arch Dermatol* 1994;130(6):734–739.

Shornick JK, Black MM. Fetal risks in herpes gestationis. *J Am Acad Dermatol* 1992;26(1):63–68.

Wahman AJ, Finan MA, Emerson SC. Striae gravidarum as a predictor of vaginal lacerations at delivery. *South Med J* 2000; 93:873–876.

Yancey KB, Hall RP, Lawley TJ. Pruritic urticarial papules and plaques of pregnancy. Clinical experience in twenty-five patients. *J Am Acad Dermatol* 1984;10(3):473–480.

53 Cancer and other neoplasms in pregnancy

Peter E. Schwartz and Masoud Azodi

Questions 1–5: choose the correct answer

1 Chemotherapy administered in pregnancy is:
- A Routinely associated with congenital anomalies even when exposure is limited to the third trimester
- B Safe in all trimesters when limited to alkylating agents and antifolates
- C Associated with prematurity and low birthweight
- D Reported in insufficient numbers of patients to derive conclusions
- E Mandatory in any trimester because of the increased virulence of cancer occurring in association with pregnancy

2 The most common cancer associated with pregnancy according to population-based tumor registries is:
- A Breast
- B Cervix
- C Lymphoma
- D Ovary
- E Leukemia

3 The malignancy occurring in pregnancy most likely to be associated with fetal metastases is:
- A Thyroid
- B Hodgkin's disease
- C Chronic lymphocytic leukemia
- D Vulva
- E Melanoma

4 A 27-year-old G3P2 has been followed throughout her pregnancy with Pap smears and colposcopically directed biopsies for a persistent cervical carcinoma *in situ* (CIN III). Plans for delivery should include:
- A Vaginal delivery unless obstetrical contraindications intervene
- B Cesarean section and postpartum reassessment of the cervix
- C Vaginal delivery and immediate cone biopsy
- D Type II radical hysterectomy
- E Cesarean hysterectomy

5 Non-Hodgkin's lymphoma diagnosed in pregnancy:
- A Is the most common type of lymphoma to occur in pregnancy
- B Has not been successfully managed with chemotherapy
- C Should be treated with chemotherapy prior to fetal maturity because of its aggressive behavior
- D Behaves in a relatively indolent fashion postpartum
- E Generally requires extensive staging procedures prior to therapy

Questions 6–8: for each statement, select the one answer (options A–C) that is most closely associated with it
- **A** Preimplantation phase
- **B** Organogenesis phase
- **C** Fetal phase

6 Most sensitive time for radiation to cause fetal anomalies

7 Radiation exposure is associated with anemia, skin pigment changes, and dermal erythema

8 Radiation therapy is frequently associated with spontaneous abortion

Questions 9–12: for each statement, select the one answer (options A–E) that is most closely associated with it
- **A** Melphalan
- **B** Chlorambucil
- **C** Aminopterin
- **D** Doxorubicin
- **E** Prednisone

9 May be used in the first trimester of pregnancy

10 Associated with cleft lips and palates

11 Associated with syndromes of renal aplasia, cleft palate, and skeletal abnormalities

12 Abortifacient in first trimester

Questions 13–17: select the appropriate ovarian neoplasm (options A–E)

A Dysgerminoma
B Epithelial tumor of borderline malignant potential
C Granulosa cell tumor
D Epithelial cancer
E Endodermal sinus tumor

13 Overall, the most frequent form of ovarian malignancy, but rare in pregnancy.

14 The germ cell tumor most likely to occur bilaterally.

15 The most virulent germ cell tumor which may now be treated with chemotherapy in pregnancy.

16 Sex cord–stromal tumor reported to be only stage I in pregnancy.

17 May present with a hemoperitoneum.

Questions 18–20: for each of the descriptions, select the associated disease (options A–D)

A Hodgkin's disease
B Non-Hodgkin's lymphoma
C Acute leukemia
D Chronic myelocytic leukemia

18 Presenting symptoms are easy fatigability, bleeding diathesis, or recurrent infections.

19 May be associated with breast and ovarian involvement.

20 Physical findings at diagnosis include sternal tenderness, skin pallor, petechiae, ecchymoses, and hepatosplenomegaly.

Questions 21–24: choose:

A If 1, 2, and 3 are correct
B If 1 and 3 are correct
C If 2 and 4 are correct
D If only 4 is correct
E If all are correct

21 Cancer occurring in pregnancy:
1 Is a common event
2 Is frequently more advanced when first diagnosed
3 Is significantly influenced by termination of pregnancy
4 Is not more virulent than in the nonpregnant state

22 A 26-year-old primigravida is found on routine ultrasound examination to have an 8-cm unilocular adnexal cyst at 10 weeks' gestation. In anticipating possible surgery for this patient, the following should be taken into consideration:
1 Surgery should be performed promptly as the patient is at high risk of having an ovarian cancer
2 Surgery should be delayed until the patient is in her second trimester
3 Only the involved ovary should be removed at surgery as the pregnancy would be terminated if the contralateral ovary is removed at any time in pregnancy
4 It is safe to remove both ovaries if necessary once the second trimester has been reached as corpus luteum function is replaced by the placenta after the 12th week of gestation

23 In preparing a pregnant patient for surgery, the following factors should be taken into consideration:
1 The patient should be placed in a lateral position to avoid vena cava and aortic compression
2 A 15° wedge should be placed under the right hip when the patient is lying supine to displace the uterus off the vena cava
3 The gastroesophageal junction tends to be relaxed, and its ability to control regurgitation is diminished
4 The patient should be operated on only when it is certain that her stomach is emptied

24 Treatment of an invasive cervical cancer in pregnancy can be:
1 A radical hysterectomy in the first trimester
2 Delayed until fetal viability in the third trimester
3 Radiation therapy in the second trimester
4 Worse in terms of overall survival than in the nonpregnant state

Further reading

Aviles A, Diaz-Maqueo JC, Torra V, et al. Non-Hodgkin's lymphomas and pregnancy: presentation of 16 cases. *Gynecol Oncol* 1990;37:335.

Brent RC. The effect of embryonic and fetal exposure to x-ray, microwaves, and ultrasound: counseling the pregnant and nonpregnant patient about these risks. *Semin Oncol* 1989;16: 347.

Colbourn DS, Nathanson L, Belilos E. Pregnancy and malignant melanoma. *Semin Oncol* 1989;16:377.

Garber JE. Long-term follow-up of children exposed *in utero* to anti-neoplastic agents. *Semin Oncol* 1989:16:437.

Goodlin RC. Importance of the lateral position during labor. *Obstet Gynecol* 1971;37:698.

Jemal A, Tiwari RC, Murray T, et al. Cancer statistics, 2004. *Cancer* 2004;54:8.

Sood AK, Sorosky JI, Krogman S, et al. Surgical management of cervical cancer complicating pregnancy: a case–control study. *Gynecol Oncol* 1996;63:294.

Stovall M, Blackwell CR, Cundiff J, et al. Fetal dose from radiotherapy with photon beams: Report of AAPM Radiation Therapy Committee Task Force Group No. 36. *Med Phys* 1995; 22:63.

Willemse PHB, vd Sijde R, Sleijfer DT. Combination chemotherapy and radiation for stage IV breast cancer during pregnancy. *Gynecol Oncol* 1990;36:281.

Young RH, Dudley AG, Scully RF. Granulosa cell, Sertoli–Leydig cell and unclassified sex cord–stromal tumors associated with pregnancy. A clinicopathological analysis of thirty-six cases. *Gynecol Oncol* 1984;18:181.

54 Pregnancy before age 20 years and after age 35 years

Helen H. Kay

Questions 1–20: choose the correct answer/s

1 Which of the following are true?
- A Approximately 1 million teenage pregnancies occur each year in the US
- B Approximately one-third to one-half are aborted
- C The teenage birth rate in 2002 was highest in Hispanics
- D Between 1990 and 1999, there was a 22% drop in the abortion rate

2 In 2002, which ethnic group had the highest rise in teenage pregnancies?
- A Asians
- B Hispanics
- C Caucasians
- D Blacks

3 Factors that promote teenage pregnancies include:
- A Illegal drug use
- B Low socioeconomic status
- C Poor self-esteem
- D Good achievement in school

4 Adverse outcomes associated with teenage pregnancies compared with control older populations include:
- A Higher rate of maternal mortality
- B Higher rate of infant and neonatal mortality
- C High rate of preterm rupture of membranes
- D Higher rate of preterm birth

5 Approaches to decreasing the teenage pregnancy rate include:
- A Sex education
- B Abortion
- C Postpartum home visits by healthcare providers
- D Emergency contraception

6 Best outcomes for teenage pregnancies include:
- A Family and community support
- B Convenient access to a prenatal clinic
- C Involvement by the father of the baby
- D Screening for bacterial vaginosis

7 Emergency contraception:
- A May include insertion of an IUD
- B May be in the form of contraceptive pills for one or two doses
- C Is most effective when taken within 72 hours
- D May reduce the pregnancy rate by 99%

8 Teenage risk behaviors known to contribute to adverse teenage pregnancy outcomes include:
- A No prenatal vitamins
- B Poor nutrition
- C No prenatal classes
- D Late prenatal care

9 Substance abuse among adolescents is notable for:
- A 10–20% of teenagers admit to using drugs or alcohol
- B Drug and alcohol abuse are not related to adverse pregnancy outcomes in teenagers
- C White teenagers tend to drink more, but black teenagers tend to use more drugs
- D Substance abuse is on the rise among teenagers

10 Which of the following are true?
- A Cesarean sections are not increased among teenagers compared with control subjects
- B Teenagers do not necessarily have a higher rate of preeclampsia
- C Teenagers seem to have smaller babies than women in their twenties
- D Younger adolescents demonstrate different behaviors from older adolescents

11 Women have been able to delay pregnancies because:
- A Contraceptive methods are more acceptable and available
- B Medical illnesses are better treated and understood
- C It is more socially acceptable to be an older mother
- D Many job supervisors have discouraged maternity leave

12 Prenatal diagnostic options currently available include:
- A Chorionic villus sampling
- B Peripheral blood isolation of fetal cells
- C Serum marker screening
- D Peripheral blood isolation of fetal DNA

13 Which of the following are true regarding twins and older women?
- A The incidence of twins is higher
- B Perinatal risks of multiple gestations are not increased
- C Dizygotic twins are more common than monozygotic twins
- D A higher utilization of assisted reproductive technologies contributes to the twin incidence in older women

14 Which of the following are true regarding mortality among older women?
- A Hypertensive disease is the most common cause of mortality
- B Mortality rate increases with maternal age
- C Mortality rate has declined in past decades
- D Black women have higher mortality than white women

15 Pregnancy outcomes among older women are characterized by:
- A Low birthweight
- B Higher rates of postdate pregnancy
- C Early and late fetal loss
- D Lower incidence of neonatal malformation

16 Adverse perinatal outcomes among older women include:
- A Preterm labor
- B Preterm delivery
- C Postpartum hemorrhage
- D Higher incidence of antenatal bleeding

17 Complications of pregnancy in older women include:
- A Higher Cesarean section rate
- B Higher operative vaginal delivery
- C Higher rate of preeclampsia/eclampsia
- D Higher rate of postpartum hemorrhage

18 Risks of pregnancy in older women include:
- A Decreased spontaneous abortion rate
- B Declining fertility
- C Lower mortality rate
- D Increased risk of aneuploidy

19 Care of the elderly pregnant patient should include:
- A Genetic counseling
- B Anesthesia consultation
- C Evaluation of medical illnesses
- D Social worker evaluation

20 Factors that contribute to low birthweight offspring in older women include:
- A Higher incidence of medical illnesses
- B Higher incidence of placenta previa
- C Higher incidence of multiples
- D Higher incidence of cigarette smoking

Further reading

Berenson AB, Wiemann CM, McCombs SL. Adverse perinatal outcomes in young adolescents. *J Reprod Med* 1997;42(9):559–564.

Cnattingius S, Forman MR, Berendes HW, Isotalo L. Delayed childbearing and risk of adverse perinatal outcome. *JAMA* 1992; 268:886–890.

Dulitzki M, Soriano D, Schiff E, et al. Effect of very advanced maternal age on pregnancy outcome and rate of cesarean delivery. *Obstet Gynecol* 1998;92(6):935–939.

Flanagan P, Kokotailo P. Adolescent pregnancy and substance use. *Clin Perinatol* 1999;26(1):185–200.

Gilbert WM, Nesbitt TS, Danielsen B. Childbearing beyond age 40: pregnancy outcome in 24,032 cases. *Obstet Gynecol* 1999;93: 9–14.

Gilbert W, Jandial D, Field N, et al. Birth outcomes in teenage pregnancies. *J Matern Fetal Neonatal Med* 2004;16(5):265–270.

Jolly MC, Sebire N, Harris J, et al. Obstetric risks of pregnancy in women less than 18 years old. *Obstet Gynecol* 2000; 96:962–966.

Jolly M, Sebire N, Harris J, et al. The risks associated with pregnancy in women aged 35 years or older. *Hum Reprod* 2000;15(11): 2433–2437.

Newcomb WW, Rodriguez M, Johnson JW. Reproduction in the older gravida. A literature review. *J Reprod Med* 1991;36(12): 839–845.

Roberts CL, Algert CS, March LM. Delayed childbearing—are there any risks? *Med J Aust* 1994;160(9):539–544.

55 Essentials in biostatistics and perinatal epidemiology

Paula K. Roberson and Benjamin P. Sachs

Questions 1–4: choose the correct answer/s

1 Hill's causal criteria include:
- A Strength of association
- B $P < 0.05$
- C Consistency
- D Plausibility
- E All of the above

2 Which of the following is/are true of cohort studies?
- A The relative risk can be measured directly
- B They are highly subject to recall bias
- C They are generally more economical than case–control studies
- D All of the above

3 Which of the following must be considered when choosing the optimal statistical test?
- A The question posed
- B The study design
- C The nature of the variables
- D Assumptions of the statistical procedures
- E All of the above

4 Which of the following is a common cause of lack of internal validity?
- A Selection bias
- B Information bias
- C Confounding bias
- D All of the above

Questions 5–10: choose the correct term from the list
- A Precision
- B Positive predictive value
- C Sensitivity
- D Specificity
- E Stratification
- F Validity

5 A thermometer that records temperature as 0.3°F below the true temperature reflects a lack of what?

6 The probability of correctly identifying a sick individual.

7 The proportion of individuals with a specific risk factor who have the disease.

8 The consistency or closeness of repeated measurements of the same outcome.

9 A major approach for controlling confounding factors in categorical data analysis.

10 The probability of correctly identifying a healthy individual.

Questions 11–20: true or false

11 For a fixed sample size, the power of a statistical test of hypothesis decreases as the difference to be detected decreases.

12 A categorical variable can take on any value within a specified range.

13 Alpha (the type I error rate) is the probability that the null hypothesis is true.

14 The predictive value of a diagnostic test is an indication of its accuracy.

15 Correlational studies are considered to be good study designs for investigating causation.

16 A randomized clinical trial is considered to be the study design that gives the most convincing evidence of an intervention's effect.

17 High validity indicates a lack of bias.

18 Matching is a technique that can be used in study design to reduce confounding.

19 Confidence intervals and hypothesis tests are alternative approaches to reporting the same findings.

20 Cross-sectional surveys are considered to be good designs for testing hypotheses of causation.

Further reading

Bailar III JC, Mosteller F. *Medical uses of statistics*, 2nd edn. Boston, MA: NEJM Books, 1995.

van Belle G, Fisher LD, Heagerty PJ, et al. *Biostatistics: a methodology for the health sciences*, 2nd edn. Hoboken, NJ: John Wiley & Sons, 2004.

Cummings SR, Browner WS, Grady D, et al. *Designing clinical research: an epidemiologic approach*, 2nd edn. Philadelphia, PA: Lippincott Williams & Wilkins, 2001.

Dawson-Saunders B, Trapp RG. *Basic and clinical biostatistics*, 4th edn. New York: McGraw-Hill, 2004.

Fleiss JL, Levin B, Paik MC. *Statistical methods for rates and proportions*, 3rd edn. Hoboken, NJ: John Wiley & Sons, 2003.

Friedman LM, Furberg CD, DeMets DL. *Fundamentals of clinical trials*, 3rd edn. New York: Springer-Verlag, 1998.

Gordis L. *Epidemiology*, 3rd edn. Philadelphia, PA: Elsevier Saunders, 2004.

Matthews DE, Farewell VT. *Using and understanding medical statistics*, 3rd edn. Basel: S Karger AG, 1996.

Rosner B. *Fundamentals of biostatistics*, 6th edn. Pacific Grove, CA: Duxbury Press, 2005.

Sackett DL. Bias in analytic research. *J Chronic Dis* 1978;32:51.

56 Sexuality in pregnancy and the postpartum period

Kirsten von Sydow

1 Does an episiotomy help to prevent perineal problems which might otherwise be caused by spontaneous lacerations?

2 Does sexual intercourse in pregnancy harm the fetus?

3 Does breastfeeding increase female sexual interest?

4 Are pregnant women generally sexually disinterested?

5 Are postpartum sexual problems usually recognized by gynecologists?

6 Does undergoing a Cesarean section impair the postpartum sexual health of mothers?

7 Are all expectant fathers sexually faithful?

8 What are the indications for avoiding sexual intercourse during pregnancy?

9 During which periods in pregnancy and puerperium are (expectant) mothers physiologically best "prepared" to enjoy sex? During which periods are they least prepared?

Further reading

Avery MD, Duckett L, Frantzich CR. The experience of sexuality during breastfeeding. *J Midwifery Wom Health* 2000;45:227–237.

Barrett G, Victor C. Incidence of postnatal dyspareunia. *Br J Sex Med* 1996;23:6–8.

Berghella V, Klebanoff M, McPherson C, et al. Sexual intercourse association with asymptomatic bacterial vaginosis and *Trichomonas vaginalis* treatment in relationship to preterm birth. *Am J Obstet Gynecol* 2002;187:1277–1282.

Glazener CMA. Sexual function after childbirth: women's experiences, persistent morbidity and lack of professional recognition. *Br J Obstet Gynaecol* 1997;104:330–335.

Klein MC, Gauthier RJ, Robbins JM, et al. Relationship of episiotomy to perineal trauma and morbidity, sexual dysfunction, and pelvic floor relaxation. *Am J Obstet Gynecol* 1994;171:591–598.

Signorello LB, Harlow BL, Chekos AK, et al. Postpartum sexual functioning and its relationship to perineal trauma: a retrospective cohort study of primiparous women. *Am J Obstet Gynecol* 2001;184:881–890.

von Sydow K. Sexuality during pregnancy and after childbirth: a meta-content-analysis of 59 studies. *J Psychosom Res* 1999;47:27–49.

von Sydow K. Sexual enjoyment and orgasm postpartum: sex differences and perceptual accuracy concerning partners' sexual experience. *J Psychosom Obstet Gynecol* 2002;23:147–155.

von Sydow K. Female sexual dysfunction: pregnancy, childbirth and postpartum period. In: Goldstein I, Meston CM, Davis SR, et al. eds. *Women's sexual function and dysfunction*. London: Taylor & Francis, 2006.

von Sydow K, Ullmeyer M, Happ N. Sexual activity during pregnancy and after childbirth: results from the Sexual Preferences Questionnaire. *J Psychosom Obstet Gynecol* 2001;22:29–40.

57 Psychiatric problems during pregnancy and the puerperium

Linda L.M. Worley and Jennifer L. Melville

Questions 1–4: true or false

1 Suicide is the leading cause of maternal (antenatal and postpartum) mortality.

2 Postpartum psychiatric illnesses are likely to recur with similar timing and symptoms as previous episodes, and may be increasingly severe with subsequent pregnancies.

3 The recommended dose of folate for women taking anticonvulsant mood stabilizers (valproic acid and carbamazepine) is 4 mg per day.

4 Women with bipolar disorder (manic depressive disorder) have a 40% chance of postpartum psychosis, mania, or depression if they do not take their mood stabilizers after delivery.

Question 5: choose the correct answer

5 The first-line agent for use in bipolar disorder in pregnancy is:
- A Valproic acid (Depakote)
- B Carbamazepine (Tegretol)
- C Lithium (Lithobid)
- D Lamotrigine (Lamictal)

Questions 6–11: choose
- **A** If 1, 2, and 3 are correct
- **B** If 1 and 3 are correct
- **C** If 2 and 4 are correct
- **D** If only 4 is correct
- **E** If all are correct

6 The risks associated with antepartum depression include which of the following?
- 1 Maternal smoking
- 2 Preeclampsia and preterm birth
- 3 Small for gestational age babies and low birthweight
- 4 Increased physical pain and discomfort (nausea, stomach pain, shortness of breath, gastrointestinal symptoms, heart pounding, headaches, and dizziness)

7 Which antidepressants are recommended for use in pregnancy (based upon prospective exposure data)?
- **1** Sertraline (Zoloft), fluoxetine (Prozac) and citalopram (Celexa)
- **2** Monoamine oxidase inhibitors (Nardil)
- **3** Nortriptyline (Pamelor) and desipramine (Norpramine)
- **4** Escitalopram (Lexapro)

8 Guidelines for administering antidepressants in pregnancy include:
- **1** Beginning at a lower dose for women with high anxiety
- **2** Using the same medication during pregnancy and lactation
- **3** Ruling out previous manic episodes before the initiation of an antidepressant
- **4** The addition of a second antidepressant if the first one is not effective

9 Eating disorders are associated with the following:
- **1** Miscarriage, low birthweight, intrauterine growth retardation, preterm delivery
- **2** Infertility
- **3** Postpartum depression
- **4** Cesarean birth

10 A 30-year-old G3P2 reports that she had psychotic depression after the births of her first two children. She is not currently taking any psychotrophic medication and does not have a local psychiatrist. Optimal preventive management includes:
- 1 Educating her that she is at high risk for another postpartum psychotic depression
- 2 Eliciting the symptoms and timing of her previous episode
- 3 Refering her to a psychiatrist with expertise in women's mental health for collaborative care
- 4 Supporting her using medication during pregnancy and postpartum (avoiding the windows of greatest teratogenic risk if possible)

11 A woman with a major mental illness is undergoing a parental capacity evaluation to determine whether she will be able to take her infant home. Factors that are positive predictors of good parenting include:
- **1** Making appropriate preparations for the arrival of the infant
- **2** Having realistic expectations of the infant
- **3** Having an insight into her mental illness
- **4** Making appropriate responses to the infant's cues

Questions 12–15: choose the correct description for each antidepressant

- **A** More activating; longest half-life
- **B** The most anticholinergic; transfers least into breastmilk; must be monitored for neonatal discontinuation syndrome
- **C** Extensively studied for use in breastfeeding; option exists to discard milk 8 h after dose to further minimize exposure
- **D** Recommended for use in breastfeeding; contraindicated in women with right bundle branch block or in women with a history of suicide attempts by overdose

12 Paroxetine (Paxil)

13 Fluoxetine (Prozac)

14 Nortriptyline (Pamelor)

15 Sertraline (Zoloft)

Questions 16–20: choose the correct description for each mood stabilizer

- **A** Utilized as first-line agent for epilepsy in pregnancy; recently approved as maintenance therapy for bipolar disorder; neonate must be observed for hepatotoxicity and skin rash; fewer exposure data available
- **B** First-line treatment option in pregnancy; increase dose in second trimester; decrease dose in labor and hydrate well; observe neonate for "floppy baby" syndrome; breastfeed only with caution
- **C** More research is needed before safety in pregnancy and breastfeeding can be clarified
- **D** First-trimester exposure associated with neural tube defect (0.5–1%); associated with craniofacial defects (11%), fingernail hypoplasia (26%), and developmental delay (20%); can cause fetal vitamin K deficiency; usually compatible with breastfeeding
- **E** Highest rate of neural tube defect after first-trimester exposure between 17 and 30 days post conception (5–9%); observe neonate for withdrawal; usually compatible with breastfeeding

16 Valproic acid (Depakote)

17 Lithium (Lithobid)

18 Carbamazepine (Tegretol)

19 Lamotrigine (Lamictal)

20 Gabapentin and oxcarbazepine

Further reading

Cohen L. Bipolar disorder in pregnancy. *Clin Psychiatry News* 2002;30:20.

Cohen LS, et al. A reevaluation of risk of in utero exposure to lithium (see Comment) [erratum appears in *JAMA* 1994;271:1485]. *JAMA* 1994;271:146–150.

Dell DL, et al. Suicide in pregnancy. *Obstet Gynecol* 2003;102:1306–1309.

FDA, FDA Alert. *Increase in the risk of birth defects. Paroxetine hydrochloride (marketed as Paxil) information*. US Food and Drug Administration. Center for Drug Evaluation and Research, 2005.

Jacobson SJ, et al. Prospective multicentre study of pregnancy outcome after lithium exposure during first trimester (see Comment). *Lancet* 1992;339:530–533.

Jones K, et al. Pattern of malformations in the children of women treated with carbamazepine during pregnancy. *N Engl J Med* 1989;320:1661–1666.

Nair S, et al. The evaluation of maternal competency. *Psychosomatics* 2000;41:523–530.

Oates M. Perinatal psychiatric disorders: a leading cause of maternal morbidity and mortality. *Br Med Bull* 2003;67:219–229.

Pinelli JM, et al. Case report and review of the perinatal implications of maternal lithium use. *Am J Obstet Gynecol* 2002;187:245–249.

Rosa F. Spina bifida in infants of women treated with carbamazepine during pregnancy. *N Engl J Med* 1991;324:674–677.

Yonkers KA, et al. Management of bipolar disorder during pregnancy and the postpartum period. *Am J Psychiatry* 2004;161:608–620.

58 Ethical and legal dimensions of medicine of the pregnant woman and fetus

Judith L. Chervenak, Frank A. Chervenak, and Laurence B. McCullough

Questions 1–20: choose the correct answer

1 Ethics is largely based upon:
- A Law
- B Religion
- C Secular principles
- D Relationships

2 Which of the following is not a necessary component of the informed consent process?
- A Explanation by a physician
- B Patient understanding
- C Written authorization
- D Expressed patient preference

3 The legal obligations of informed consent were developed in which century?
- A Twentieth
- B Nineteenth
- C Eighteenth
- D Seventeenth

4 Which is the most common standard for informed consent?
- A Professional community
- B Reasonable person
- C Patient preference
- D Inalienable rights

5 The fetus as a patient defines:
- A Obligations to the fetus
- B Fetal rights
- C *Primum non nocere*
- D Respect for autonomy

6 Beneficence is best defined as:
- A *Primum non nocere*
- B Justice
- C The net balance of clinical benefits over harms
- D Benevolence

7 Nondirective counseling for fetal benefit is most commonly utilized at:
- A 22–23 weeks' gestation
- B 24–31 weeks' gestation
- C 32–39 weeks' gestation
- D 40 weeks' gestation and above

8 Which of the following is not included in the definition of malpractice?
- A Duty to the patient
- B Breach of a duty
- C Expert testimony
- D Causation
- E Damages

9 Wrongful pregnancy is a cause of action on behalf of the parents for:
- A An unwanted pregnancy in any circumstance
- B Pregnancy after *in vitro* fertilization
- C Pregnancy after negligent sterilization
- D Pregnancy while using contraception

10 Wrongful birth is a cause of action on behalf of:
- A The fetus
- B The infant
- C The parents
- D The mother only

11 Wrongful life is a cause of action on behalf of:
- A The fetus
- B The infant
- C The parents
- D The mother only

12 The duty to the patient is:
- A An implied contractual one
- B A financial one
- C Justice based
- D Autonomy based

13 Viability is determined by:
- A Biological factors
- B Technological factors
- C Both
- D Neither

14 For which anomaly should abortion be recommended if it is diagnosed at 18 weeks' gestation?
- A Anencephaly
- B Down syndrome
- C Spina bifida
- D None of the above

15 The Hippocratic writings are best expressed by the ethical principle of:
- A *Primum non nocere*
- B Beneficence
- C Respect for autonomy
- D Justice

16 Which of the following is not an ethical obligation owed to the fetal patient:
- A Autonomy-based obligations of the pregnant woman
- B Beneficence-based obligations of the pregnant woman
- C Beneficence-based obligations of the physician
- D All of the above

17 Which of the following cases best illustrates the federal rules of evidence for expert testimony?
- A *Schloendorff* v. *The Society of the New York Hospital*
- B *Daubert* v. *Merrill Dow*
- C *Rowe* v. *Wade*
- D *Truman* v. *Thomas*

18 Which case is most closely related to informed consent?
- A *Schloendorff* v. *The Society of the New York Hospital*
- B *Daubert* v. *Merrill Dow*
- C *Rowe* v. *Wade*
- D *Truman* v. *Thomas*

19 The standard of care for a general obstetrician–gynecologist is:
- A The same as for a general obstetrician–gynecologist
- B The same as for a maternal–fetal medicine specialist
- C The same as for a family practitioner
- D The state of the art at the time of trial

20 Courts generally allow causation testimony that is:
- A Limited to what was known at the time of the incident
- B Limited to what was known at the time of the doctor's deposition
- C Limited to what was known within 1 year after the incident
- D Currently accepted within the medical community at the time of trial

59 Bleeding in the third trimester

Lawrence W. Oppenheimer and Carl A. Nimrod

Questions 1–7: true or false

1 Bleeding as a result of placenta previa is associated with significant fetal growth restriction

2 A placental edge that overlaps the internal os by less than 10 mm on a transvaginal ultrasound at 24 weeks' gestation is highly unlikely to be associated with placenta previa at term

3 Prenatal diagnosis of vasa previa does not alter the fetal survival rate compared with diagnosis during delivery

4 Tocolytic therapy has been shown to demonstrate benefits in the treatment of placental abruption

5 The correlation between the number of previous Cesarean sections and the development of placenta accreta is weak

6 In pregnant hypertensive patients, the risk of abruption is increased by smoking

7 In severe abruption, fetal–maternal hemorrhage can occur in up to 30% of cases

Questions 8–20: choose the correct answer(s)

8 Placenta accreta:
- A May be diagnosed by color Doppler sonography
- B Has a mortality rate in the region of 7%
- C Is often well visualized using dynamic contrast magnetic resonance imaging
- D All of the above

9 Fetal deaths associated with placental abruption:
- A Are seen in the majority of cases
- B Are largely related to premature birth
- C Account for 8% of all perinatal mortality
- D None of the above

10 Placental abruption:
- A Has no association with risk factors in the majority of cases
- B Can be reduced by 25% by cessation of smoking
- C Has a higher association with female fetuses
- D All of the above

11 A higher incidence of placental abruption is seen in:
- A Women with mutations in the gene for Factor V Leiden
- B Twin pregnancies
- C Women with chronic hypertension
- D All of the above

12 The following principles are suggested for the management of severe placental abruption:
- A Maternal assessment for hypovolemia and coagulation status
- B Performance of the Kleihauer–Betke test
- C Expedition of delivery
- D All of the above

13 In patients who have been exposed to trauma:
- A The injury severity score is highly predictive of placental abruption
- B Fetal monitoring is of no value and is not recommended
- C Correct seatbelt restraints confer benefits by reducing abruption
- D None of the above

14 In the management of possible placental previa patients:
- A Cesarean section is the most likely outcome if the placental edge is < 10 mm from the os in the late third trimester
- B "Double-setup" is rarely necessary in modern practice
- C Preterm delivery is a common outcome
- D All of the above

15 Which of the following is not a risk factor for the development of placenta previa:
- A Maternal age
- B Smoking
- C Previous Cesarean section
- D Maternal anemia

16 Transabdominal ultrasound scanning for placenta previa can be associated with diagnostic errors because of:
- A Distension of the bladder
- B Underfilling of the bladder
- C Maternal obesity
- D All of the above

17 Ultrasound features of placenta accreta include:
- A Lacunar spaces in the placental parenchyma
- B No flow demonstrated in the lacunar spaces of the placenta
- C Hypoechoic zone between the myometrium and placenta of less than 4 mm
- D None of the above

18 The percentage of cases in which a clot associated with clinical placental abruption can be visualized on ultrasound is:
- A 60%
- B 40%
- C 20%
- D 10%

19 Common clinical presentation of moderate to severe abruption includes:
- A Uterine tenderness
- B Fetal distress
- C Unexplained preterm labor
- D All of the above

20 All of the following support the diagnosis of vasa previa *except for*:
- A The velamentous insertion of the cord
- B The diagnosis of a succenturiate lobe of the placenta
- C Doppler confirmation that the arterial flow is maternal
- D Consistent demonstration of vessels near the cervix on follow-up scans

Further reading

Ananth CV, Berkowitz GS, Savitz DA, et al. Placental abruption and adverse perinatal outcomes. *JAMA* 1999;282:1646–1651.

Becker RH, Vonk R, Mende BC, et al. The relevance of placental location at 20–23 gestational weeks for prediction of placenta previa at delivery: evaluation of 8650 cases. *Ultrasound Obstet Gynecol* 2001;17:496–501.

Bhide A, Prefumo F, Moore J, et al. Placental edge to internal os distance in the late third trimester and mode of delivery in placenta previa. *Br J Obstet Gynaecol* 2003;110:860–864.

Faiz AS, Ananth CV. Etiology and risk factors for placenta previa: an overview and meta-analysis of observational studies. *J Maternal–Fetal Neo Med* 2003;13:175–190.

Glantz C, Purnell L. Clinical utility of sonography in the diagnosis and treatment of placental abruption. *J Ultrasound Med* 2002; 21:837–840.

Hurd WW, Miodovnik M, Hertzberg V, et al. Selective management of abruptio placentae: a prospective study. *Obstet Gynecol* 1983;61:467–473.

Miller DA, Chollet JA, Goodwin TM. Clinical risk factors for placenta praevia/placenta accreta. *Am J Obstet Gynecol* 1997;177: 210–214.

Nelson JP. Interventions for suspected placenta praevia. *Cochrane Database Syst Rev* 2003:2. Oxford: Update Software.

Oppenheimer L, Farine D, Ritchie K, et al. What is a low-lying placenta? *Am J Obstet Gynecol* 1991;165:1036–1038.

Oyelese Y, Catanzarite V, Prefumo F, et al. Vasa previa: the impact of prenatal diagnosis on outcomes. *Obstet Gynecol* 2004;103:937–942.

60 Normal and abnormal labor

Wayne R. Cohen

Questions 1–20: choose the correct answer

1 Which of the following represents the correct order of the stages of labor?
- A Latent phase; active phase; deceleration phase; second stage
- B Acceleration phase; active phase; second stage; deceleration phase
- C First stage, latent phase, active phase, phase of linear slope
- D Latency, active labor, second stage, deceleration

2 Which of the following is not a characteristic of the latent phase of labor?
- A It may normally last more than 16 h in a nullipara
- B Considerable fetal descent usually occurs
- C It may be lengthened by analgesic use
- D It is a period of considerable cervical ripening

3 A fetal head that is floating above the inlet during early labor:
- A Is always associated with a deflexed attitude
- B Is associated with an increased risk of Cesarean delivery
- C Signifies a malposition
- D Only occurs in cases of android pelvic architecture

4 A nullipara has a normal first stage. At full cervical dilation, the head is at station 0 and the position is left occiput transverse. Two hours later the station is between + 2 and + 3. She has had no anesthesia. Which of the following is correct?
- A There is a deep transverse arrest
- B Descent is normal and no intervention is necessary
- C The use of forceps or a vacuum extractor is necessary if delivery does not occur within 30 min
- D Descent is protracted

5 During the latent phase of labor:
- A The fetal head normally rotates internally
- B The cervix dilates at ≤ 5 cm/h
- C Uterine contractions occur irregularly
- D All of the above

6 The labors of multiparas who have had all previous babies by Cesarean section:
- A Are generally prolonged
- B Have abnormal contractility patterns
- C Are not influenced by maternal age
- D Should have their progress judged by the criteria for nulliparas

7 During most of the active phase:
- A Fetal descent occurs
- B Uterine contractility diminishes
- C Cervical dilation occurs linearly
- D The cervix remains very posterior

8 Which of the following is generally true of multiparas?
- A Labor is longer than in nulliparas
- B Labor begins with the fetal head at a higher station than in nulliparas
- C Prolonged latent phase is diagnosed after 20 h of labor
- D Labor begins with a less mature cervix than in nulliparas

9 Prolonged latent phase is associated with:
- A A cervix that has undergone little ripening prior to labor
- B An increased risk of subsequent arrest of dilation
- C A need for Cesarean delivery
- D Unresponsiveness of the uterus to exogenous oxytocin

10 Which of the following is *not* associated with protracted active phase dilation?
- A Excessive maternal sedation or anesthesia
- B Persistent occiput posterior position
- C Fetal macrosomia
- D Pudendal nerve dysfunction

11 In a multipara, an arrest of descent has been diagnosed at station + 2 with the head occiput transverse. The fetal weight is estimated to be 3600 g. During the Müller–Hillis maneuver, the fetal head is felt to descend by 1 cm and to rotate internally by about 30°. The mother has a normally functioning epidural anesthetic. The best therapeutic option at this time would be:
- A Administration of oxytocin
- B Cesarean delivery
- C Vacuum extraction
- D Reassessment of fetal weight by ultrasound

12 If a protracted active phase is left untreated:
- A It will continue linearly until full dilation is eventually reached
- B It will convert to an arrest of dilation
- C It will require Cesarean delivery
- D Any of the above may occur

13 In a nullipara, an arrest of dilation occurs at 6 cm. The estimated fetal weight is 3000 g. The head is occiput posterior and at –3 station, and it overrides the symphysis pubis. It is possible to feel considerable molding of the cranial bones. The midpelvis is funneled and the sidewalls convergent. Contractions are occurring every 2–3 min and the fetal membranes are intact. The best approach would be:
- A Delivery by Cesarean section
- B Infusion of oxytocin
- C Watchful waiting without any intervention
- D Rupture of membranes

14 When oxytocin is given to treat an arrest of dilation:
- A It should be continued for as long as there is perceptible progress in cervical dilation
- B It should be discontinued if no fetal descent occurs in the first 3 h
- C Most patients who respond will do so within about 3 h
- D An intrauterine pressure catheter is mandatory

15 When the second stage of labor exceeds 3 h:
- A It should be considered abnormal
- B Cesarean or instrumental vaginal delivery should be performed
- C It may be normal, depending on the rate of fetal descent
- D Pelvic floor injury is inevitable

16 Epidural anesthesia may lengthen the second stage of labor by:
- A Inhibiting perineal sensation
- B Reducing uterine contractility
- C Interfering with maternal bearing-down efforts
- D All of the above

17 A 34-year-old multipara is examined in the latent phase of labor. The cervix is 3 cm dilated, 80% effaced and the presenting part is at station – 2. Eight hours later, the cervix is found to be fully dilated with the fetal head at station – 2 in an occiput transverse position. The fetal heart rate pattern is normal. Which of the following is correct?
- A The labor is normal and the patient should be observed
- B There is a failure of descent and a high likelihood of Cesarean delivery
- C There is a malposition
- D Epidural anesthesia should be withheld

18 Which of the following is not associated with an increased risk of dysfunctional labor?
- A Advanced maternal age
- B Chorioamnionitis
- C Premature rupture of membranes
- D Persistent occiput posterior position

19 The treatment of a protracted active phase in the presence of chorioamnionitis should include:
- A Oxytocin infusion
- B Prompt Cesarean delivery
- C Manual rotation of a malposition
- D Amnioinfusion with antibiotics

20 In a multipara with three previous vaginal deliveries, the cervix reaches 9 cm after a normal rate of dilation. Two hours later the cervix reaches full dilation and the presenting part is at 0 station. Which of the following is the correct diagnosis?
- A Normal labor
- B Prolonged deceleration phase
- C Cephalopelvic disproportion
- D Arrest of descent

Further reading

Chazotte C, Madden R, Cohen WR. Labor patterns in women with previous cesareans. *Obstet Gynecol* 1990;75:350.

Cohen WR. Influence of the duration of second stage labor on perinatal outcome and puerperal morbidity. *Obstet Gynecol* 1977; 49:266.

Cohen WR, Acker DB, Friedman EA. *Management of labor*, 2nd edn. Rockville, MD: Aspen Publishers, 1989.

Friedman EA. *Labor: clinical evaluation and management*, 2nd edn. New York: Appleton-Century-Crofts, 1978.

Friedman EA, Sachtleben MR. Dysfunctional labor: I. Prolonged latent phase in the nullipara. *Obstet Gynecol* 1961;17:135.

Friedman EA, Sachtleben MR. Dysfunctional labor: II. Protracted active phase dilatation in the nullipara. *Obstet Gynecol* 1961;17:566.

Friedman EA, Sachtleben MR. Dysfunctional labor: III. Secondary arrest of dilatation in the nullipara. *Obstet Gynecol* 1962;19: 576.

Friedman EA, Sachtleben MR. Station of the fetal presenting part: V. Protracted descent patterns. *Obstet Gynecol* 1970;36: 558.

Friedman EA, Sachtleben MR. Station of the fetal presenting part: VI. Arrest of descent in nulliparas. *Obstet Gynecol* 1976;47:129.

Impey L, MacQuillan K, Robson M. Epidural analgesia need not increase operative delivery rates. *Am J Obstet Gynecol* 2000;182: 358.

Murphy K, Shah L, Cohen WR. Labor and delivery in nulliparas who present with an unengaged fetal head. *J Perinatol* 1998;18:122.

Peisner DB, Rosen MG. Latent phase of labor in normal patients: a reassessment. *Obstet Gynecol* 1985;66:644.

Schifrin BS, Cohen WR. Labor's dysfunctional lexicon. *Obstet Gynecol* 1989;74:123.

61 Operative vaginal delivery

Edward R. Yeomans

Question 1: true or false

1 In the last 10 years, the operative vaginal delivery rate has ceased declining and begun to increase

Question 2: choose the correct answer

2 Which of the following criteria are not required for an outlet forceps?
A Head on the pelvic floor
B Sagittal suture in the anteroposterior diameter
C Head visible without separating the labia
D Station at +5 cm

Question 3: true or false

3 A clinical assessment of the pelvis should be included in a note prior to the performance of operative vaginal delivery

Questions 4–7: choose the correct answer

4 Early experiments with a type of vacuum extractor were conducted by:
A Levret
B Smellie
C Tarnier
D Simpson

5 Which of the following is more strongly associated with vacuum extraction than with forceps?
A Deep perineal lacerations
B Increased need for anesthesia
C Subgaleal hemorrhage
D Later development of fecal incontinence

6 By 1980, how many consecutive Cesarean deliveries had been reported without a maternal death?
A 100
B 1000
C 10 000
D 100 000

7 What feature of Luikart forceps is useful to correct asynclitism?
A Pseudofenestrated blades
B Overlapping shanks
C Sliding lock
D A bar built into the handle

Question 8: true or false

8 The author of this chapter believes that there is still a role for the elective use of forceps in modern obstetrics

Questions 9–11: choose the correct answer

9 Which of the following cannot be classified as a low forceps?
A Delivery from +3, LOA
B Delivery from +2, ROP
C Delivery from +4, OA
D Delivery from +1, ROT

10 In checking for proper application of forceps, which of the following "checks" was not recommended by Dr Dennen in his classic textbook on forceps?
A Sagittal suture bisects the plane of the shanks
B The lambdoid sutures can be felt superior to the upper aspect of the blades
C For a fenestrated blade, the heel of the blade should not admit one finger in the fenestra
D The posterior fontanelle should be one fingerbreadth above the plane of the shanks

11 Which principle is most important in the proper conduct of a vacuum extraction delivery?
- A Cup size
- B Station of presenting part
- C Type of cup
- D Placement of cup

Question 12: true or false

12 Forceps should be removed before delivery of the fetal head

Questions 13–17: choose the correct answer

13 Long-term follow-up studies on women and infants delivered via either forceps or vacuum confirm that:
- A Fecal incontinence is not observed after vacuum extraction
- B Urinary incontinence is seen more often after forceps than after vacuum extractions
- C Neurologic injury to the fetus is more common with forceps
- D Both forceps and vacuum deliveries result in a comparable incidence of urinary and fecal incontinence at 5-year follow-up

14 Which of the following indications is not acceptable for operative vaginal delivery?
- A A second stage of 4 h in a nullipara with an epidural
- B A second stage of 1 h in a multipara without an epidural
- C A second stage of 1 h in a nullipara with the fetal head at +5 station
- D A second stage of 1.5 h in a multipara with an epidural

15 Select the most important prerequisite for the performance of operative vaginal delivery:
- A Estimated fetal weight < 4000 g
- B Gynecoid pelvis
- C Adequate anesthesia
- D Experienced operator

16 Neonatal intracranial hemorrhage occurs more often with:
- A Forceps than vacuum
- B Vacuum than forceps
- C Simpson forceps than Luikart forceps
- D None of the above

17 Which of the following instruments is best suited for rotating the fetal head from occiput posterior to occiput anterior?
- A Simpson forceps
- B Kielland forceps
- C Luikart forceps
- D Piper forceps

Question 18: true or false

18 Routine episiotomy is a prerequisite for forceps delivery

Questions 19 and 20: choose the correct answer

19 The meta-analysis of trials comparing forceps with vacuums concluded that:
- A Forceps caused more neonatal trauma than vacuums
- B Vacuums caused more perineal trauma than forceps
- C Vacuums caused less perineal trauma than forceps
- D Intracranial bleeding was only seen with vacuums

20 Which instrument requires less training to become proficient?
- A Vacuum extractor
- B Simpson forceps
- C Luikart forceps
- D Kielland forceps

Further reading

American College of Obstetricians and Gynecologists. Operative obstetrics. *Precis* 3:154–156.

Gei AF, Belfort MA. Forceps-assisted vaginal delivery. *Obstet Gynecol Clin North Am* 1999;26:345–370.

Miksovsky P, Watson WJ. Obstetric vacuum extraction: state of the art in the new millennium. *Obstet Gynecol Surv* 2001;56:736–751.

Patel RR, Murphy DJ. Forceps delivery in modern obstetric practice. *Br Med J* 2004;328:1302–1305.

Uchil D, Arulkumuran S. Neonatal subgaleal hemorrhage and its relationship to delivery by vacuum extraction. *Obstet Gynecol Surv* 2003;58:687–693.

62 Preterm labor

Erol Amon and Thomas D. Myles

Questions 1–20: choose the correct answer

1 A recent analysis of neonatal survival rates indicates that there is a 50% chance of survival at:
- A 22 weeks' gestation
- B 24 weeks' gestation
- C 26 weeks' gestation
- D 28 weeks' gestation

2 Which of the following has the highest positive predictive value for a preterm birth?
- A A score of nine on the Creasy scoring system
- B Positive fetal fibronectin at 24 weeks' gestation
- C A finding of more than 50% funneling on cervical sonography
- D Cervical dilation of 1 cm at 24 weeks' gestation

3 Which of the following has the highest risk for a preterm birth?
- A A primigravida
- B A patient with a previous term birth followed by a preterm birth
- C A patient with a previous preterm birth followed by a term birth
- D A patient with two previous term births

4 Which of the following is not associated with an increased risk for preterm birth?
- A Asymptomatic bacterial vaginosis
- B Heavy colonization with Group B streptococci
- C Asymptomatic bacteriuria
- D Asymptomatic trichomoniasis

5 Which of the following is not a symptom of preterm labor?
- A Back pain
- B Pelvic pain
- C Vaginal bleeding
- D Pelvic pressure
- E All are symptoms of preterm labor

6 Each of the following is necessary to make a diagnosis of preterm labor *except*:
- A Documented uterine contractions (8 in a 60-min period)
- B Documented cervical change
- C Ruptured membranes
- D Gestational age of 20–37 weeks

7 Which of the following is not a strict contraindication to tocolysis?
- A Fetal demise
- B Chorioamnionitis
- C Chronic placental abruption
- D Eclampsia

8 Contraindications to tocolysis with magnesium sulfate include:
- A Oligohydramnios
- B Myasthenia gravis
- C Thyroid disease
- D Uncontrolled diabetes

9 Which of the following statements are *not* true?
- A Preterm labor occurs more frequently when the fetus is male
- B Preterm labor occurs frequently in patients with a unicornuate uterus
- C The risks of necrotizing enterocolitis (NEC) are negligible in a patient at 33 weeks' gestation with a mature fetal lung profile
- D Analysis of amniotic fluid for infection or fetal lung maturity is cost-effective

10 Which of the following metabolic complications can be caused by beta-agonists?
- A Hypoglycemia
- B Decreased insulin levels
- C Decreased risk of lactic acidosis
- D Lipolysis

11 Which of the following drugs is approved by the FDA for the treatment of preterm labor?
- A Ritodrine
- B Terbutaline
- C Magnesium sulfate
- D Indocin
- E All are approved

12 Magnesium-induced respiratory depression occurs at which of the following levels?
- A 6–8 mg/dL
- B 9–11 mg/dL
- C 12–14 mg/dL
- D 16–18 mg/dL

13 When using beta-mimetics, risk factors for pulmonary edema include all of the following *except*:
- A Multiple gestation
- B Underlying cardiac disease
- C Severe anemia
- D Controlled diabetes

14 Magnesium sulfate infusions can cause all the following *except*:
- A Hypotension
- B Hypothermia
- C Hyperthermia
- D Cardiac arrest

15 In preterm labor, long-term maintenance therapy with which of the following has been shown to be of benefit?
- A Oral terbutaline
- B Oral ritodrine
- C Oral magnesium
- D None of the above

16 Which of the following combination therapies have the lowest incidence of complications?
- A Magnesium sulfate and terbutaline
- B Magnesium sulfate and ritodrine
- C Terbutaline and ritodrine
- D Magnesium sulfate and nifedipine

17 Which of the following is not a complication caused by the long-term use of prostaglandin synthetase inhibitors (as a single agent)?
- A Oligohydramnios
- B Premature closure of the ductus arteriosus
- C Fetal death
- D Pulmonary edema

18 The advantage of using nifedipine is that:
- A It has more effect on cardiac rhythm than verapamil
- B It causes headaches in less than 1% of patients
- C It is absorbed rapidly from the gastrointestinal tract
- D It is superior to intravenous magnesium sulfate

19 Which of the following patients could most benefit from administration of 17α-hydroxyprogesterone caproate (17P)?
- A A patient with two previous spontaneous preterm births
- B A smoker
- C A primigravida
- D A person presenting with preterm premature rupture of membranes

20 Which of the following statements about antenatal steroid administration is not true?
- A Betamethasone and dexamethasone are equally efficacious
- B There is no benefit if the patient delivers less than 24 h after the first dose
- C The incidences of respiratory distress syndrome (RDS), intraventricular hemorrhage (IVH), and possibly NEC are reduced in infants whose mothers are given steroid injections before delivery
- D Steroids can induce diabetic ketoacidosis

63 Prelabor rupture of the membranes

Joaquin Santolaya-Forgas, Roberto Romero, Jimmy Espinoza, Offer Erez, Lara A. Friel, Juan Pedro Kusanovic, Ray Bahado-Singh, and Jyh Kae Nien

Questions 1–22: choose the correct answer

1 The overall frequency of prelabor rupture of membranes (term and preterm) is:
- A 2–3%
- B 10%
- C 30%
- D 60%
- E 40%

2 The most frequent cervical dilatation at which the chorioamniotic membranes rupture spontaneously is:
- A 1 cm
- B 3 cm
- C 4 cm
- D 5 cm
- E 10 cm

3 The term "zone of altered morphology" refers to:
- A The zone of amnion, chorion, and decidua in the edge of the placental mass
- B The zone of amnion, chorion, and decidua at the midpoint between the placental mass at the site of rupture of membranes
- C The zone of amnion, chorion, and decidua close to the endocervix that undergoes morphologic changes before the onset of labor
- D The area of amnion, chorion, and decidua formed after the application of platelets and cryoprecipitate to seal the membranes
- E None of the above

4 Biophysical studies of chorioamniotic membranes of patients with PROM indicate that:
- A A generalized weakness (elasticity and force to rupture) can be demonstrated in membranes that rupture spontaneously compared with those that do not rupture spontaneously
- B Weakness of membranes that rupture prematurely is localized rather than generalized
- C Neither of the statements is true

5 The tensile strength of the membranes is due to:
- A Fibrillar collagen such as type I and III
- B Collagen in the basement membrane (type IV)
- C Elastin
- D Proteoaminoglycans
- E None of the above

6 Select the correct match of the matrix-degrading enzyme with its most likely substrate.
- A MMP-1/gelatin
- B MMP-2/laminin
- C MMP-8/gelatin
- D MMP-9/gelatin
- E MMP-13/gelatin

7 Which of the amniotic fluid concentrations of the following MMPs are increased in preterm PROM?
- A MMP-1
- B MMP-8
- C MMP-9
- D All of the above

8 Stretching of the membranes enhances gene expression in which of the following cytokines?
- A IL-8
- B Pre-B cell colony-enhancing factor
- C IL-10
- D IL-17
- E A and B

9 The most important risk factor for preterm PROM is:
- A Previous conization of the cervix
- B Smoking
- C Vaginal bleeding
- D Previous preterm PROM
- E Frequent sexual intercourse during pregnancy

10 Which of the following is a risk factor for preterm PROM in the current pregnancy?
- A Cervical length of 25 pmm or less
- B Working during pregnancy
- C Previous spontaneous preterm birth
- D All of the above

11 The most common microorganism isolated by culture of amniotic fluid in preterm PROM is:
- A *Ureaplasma urealyticum*
- B *Fusobacterium nucleatum*
- C *Mycoplasma hominis*
- D *Escherichia coli*
- E Group B *Streptococcus*

12 Which of the following is (are) potential consequences of preterm PROM?
- A Preterm labor
- B Intrauterine infection
- C Abruptio placentae
- D Pulmonary hypoplasia
- E Club feet
- F All of the above

13 The frequency of positive amniotic fluid culture in women who present with preterm PROM not in labor is:
- A 10%
- B 30%
- C 75%
- D 90%

14 Among patients with preterm PROM and a positive amniotic fluid culture, what proportion will have a positive fetal blood culture by cordocentesis?
- A 1%
- B 10%
- C 30%
- D 60%
- E All blood cultures will be negative for microorganisms

15 Digital examination in patients with preterm PROM not in labor:
- A Provides valuable prognostic information
- B Should be performed in all patients
- C Shortens the duration of the latency period
- D All of the above

16 Fetal lung maturity testing with vaginal fluid in preterm PROM:
- A Should never be performed
- B Provides prognostic information about fetal lung maturity
- C Is unreliable when compared with fluid obtained by amniocentesis
- D Allows for serial L/S ratio and phosphatidylglycerol determinations
- E Only B and D are correct

17 The accuracy of ferning to diagnose PROM is:
- A 40%
- B 95%
- C 80%
- D 75%

18 In cases of uncertainty (equivocal nitrazine, ferning, and pooling), which of the following dyes should not be injected transabdominally for the diagnosis of preterm PROM:
- A Indigo carmine
- B Methylene blue
- C Evans blue
- D Fluorescein

19 Which of the following microorganisms cannot be detected with a Gram stain of amniotic fluid when the inoculum size is large?
- A Group B *Streptococcus*
- B *Escherichia coli*
- C *Ureaplasma urealyticum*
- D *Enterococcus*
- E *Fusobacterium nucleatum*

20 Which of the following is associated with the presence of microorganisms (intra-amniotic infection) in the amniotic fluid?
- A A nonreactive NST
- B Absence of fetal breathing
- C Absence of fetal gross body movement
- D Severe oligohydramnios
- E A low biophysical profile
- F All of the above

21 The optimal management of a patient with PROM remote from term (24–31 weeks 6 days) includes all the following except:
- A Antibiotic administration
- B Steroid administration
- C Tocolysis
- D Frequent fetal surveillance
- E Admission to hospital

22 The optimal management of a patient with PROM at term is:
- A Expectant management until spontaneous onset of labor
- B Induction of labor with oxytocin
- C Induction of labor with prostaglandins
- D Tocolysis until the results of fetal lung maturity are available
- E B and C are correct

Further reading

ACOG Technical Bulletin No. 15. *Premature rupture of the membranes*. Washington, DC: ACOG, 1988.

Bell SC, Malak TM. Structural and cellular biology of the fetal membranes. In: Elder M, Romero R, Lamont R, eds. *Preterm labor*. New York: Churchill Livingstone; 1997:401–428.

Gomez R, Romero R, Ghezzi F, et al. The fetal inflammatory response syndrome. *Am J Obstet Gynecol* 1998;179:194–202.

Hannah ME, Ohlsson A, Farine D, et al. Induction of labor compared with expectant management for prelabor rupture of the membranes at term. TERMPROM Study Group. *N Engl J Med* 1996;334: 1005–1010.

Kenyon SL, Taylor DJ, Tarnow-Mordi W. Broad-spectrum antibiotics for preterm, prelabour rupture of fetal membranes: the ORACLE I randomised trial. ORACLE Collaborative Group. *Lancet* 2001; 357:979–988.

Mercer BM. Preterm premature rupture of the membranes. *Obstet Gynecol* 2003;101:178–193.

Mercer BM, Miodovnik M, Thurnau GR, et al. Antibiotic therapy for reduction of infant morbidity after preterm premature rupture of the membranes. A randomized controlled trial. National Institute of Child Health and Human Development Maternal–Fetal Medicine Units Network. *JAMA* 1997;278:989–995.

Pacora P, Chaiworapongsa T, Maymon E, et al. Funisitis and chorionic vasculitis: the histological counterpart of the fetal inflammatory response syndrome. *J Matern Fetal Neonatal Med* 2002; 11:18–25.

Parry S, Strauss JF, III. Premature rupture of the fetal membranes. *N Engl J Med* 1998;338:663–670.

Romero R, Yoon BH, Mazor M, et al. A comparative study of the diagnostic performance of amniotic fluid glucose, white blood cell count, interleukin-6, and gram stain in the detection of microbial invasion in patients with preterm premature rupture of membranes. *Am J Obstet Gynecol* 1993;169:839–851.

64 Prolonged pregnancy

Curtis L. Lowery and Paul Wendel

Questions 1 and 2: true or false

1 A pregnancy is considered postterm after 294 days

2 Inaccurate dating is the most common cause of prolonged pregnancy

Question 3: choose the correct answer

3 Which recognizable clinical feature is seen in infants suffering from postmaturity?
- A Peeling, parchment-like skin
- B Meconium staining of skin, membranes, and the umbilical cord
- C Bluish face
- D Overgrown nails
- E A, B, and D

Questions 4 and 5: true or false

4 A woman with a previous incidence of prolonged pregnancy is less likely to experience another prolonged pregnancy

5 Failure to diagnose prolonged pregnancy can result in perinatal death

Question 6: choose the correct answer

6 In a Canadian multicenter study of 3407 women of > 42 weeks' gestation, which group experienced a higher Cesarean section rate?
- A Induction group
- B Conservatively managed group
- C Results were similar among both groups

Question 7: true or false

7 At 38 weeks, perinatal mortality reaches its nadir

Question 8: choose the correct answer

8 In a study by Hilder comparing stillbirth rates in the 37th and 43rd weeks, what was the increase in stillbirths among each group?
- A Sixfold increase
- B Eightfold increase
- C 10-fold increase

Questions 9 and 10: true or false

9 Data reported by Bochner et al. showed that positive predictive values for adverse outcomes were better when testing began at 42 weeks, but negative predictive values were worse

10 Excessive perinatal mortality associated with a prolonged pregnancy occurs during the intrapartum and neonatal periods

Question 11: choose the correct answer

11 What is considered to be the most common complication of the prolonged pregnancy?
- A Inaccurate dating
- B Fetal macrosomia
- C Perinatal death

Question 12: true or false

12 Most studies have demonstrated a clear benefit from the induction of labor versus conservative management with aggressive fetal assessment

Questions 13 and 14: choose the correct answer

13 What is the most important way to minimize the incorrect diagnosis of postterm pregnancy?
- A To establish accurate pregnancy dating as early as possible
- B To perform sweeping of the membranes
- C To induce labor at 41 weeks

14 The crown–rump length can determine gestational age to any accuracy within how many days?
- A 7 days
- B Exact date
- C 5 days

Questions 15 and 16: true or false

15 Serial measurements of symphysis fundal height are useful in establishing gestational age

16 No single method of fetal assessment has proven superior in either sensitivity or specificity of fetal evaluation in the prolonged pregnancy

Question 17: choose the correct answer

17 Which is one of the many conditions exhibited in postterm infants?
- A Intrapartum asphyxia
- B Hair loss
- C Cerebral myelination

Questions 18–20: true or false

18 Pregnancies that continue beyond 42 weeks have an increased risk of stillbirth

19 Conservatively managed pregnancies greater than 42 weeks demonstrate a significantly lower cost

20 Studies on sweeping of membranes have demonstrated increases in adverse outcomes including infections or bleeding

Further reading

American College of Obstetricians and Gynecologists (ACOG). Management of postterm pregnancy. *ACOG Practice Patterns* 1997;6.

American College of Obstetricians and Gynecologists (ACOG). ACOG practice patterns. Management of postterm pregnancy. No. 6, October 1997. *Int J Gynaecol Obstet* 1998;60(1):86–91.

Crowley P. Interventions for preventing or improving the outcome of delivery at or beyond term. *Cochrane Database Syst Rev* 2000;2:CD000170.

Goeree R, Hannah M, Hewson S. Cost-effectiveness of induction of labour versus serial antenatal monitoring in the Canadian Multicenter Postterm Pregnancy *Trial. Can Med Assoc J* 1995;152(9): 1445–1450.

Hannah ME, Hannah WJ, Hellmann J, et al. Induction of labor as compared with serial antenatal monitoring in post-term pregnancy. A randomized controlled trial. The Canadian Multicenter Postterm Pregnancy Trial Group. *N Engl J Med* 1992;326(24):1587–1592.

Hilder L, Costeloe K, Thilaganathan B. Prolonged pregnancy: evaluating gestation-specific risks of fetal and infant mortality. *Br J Obstet Gynaecol* 1998;105(2):169–173.

Myers ER Blumrick R, Christian AL, et al. *Management of prolonged pregnancy*. Evidence Report/Technology Assessment No. 53 (Prepared by Duke Evidence-based Practice Center, Durham, NC, under Contract No. 290-97-0014). Rockville, MD: Agency for Healthcare Research and Quality, 2002. AHRQ Publication No. 02-E018.

O'Reilly-Green CP, Divon MY. Receiver operating characteristic curves of sonographic estimated fetal weight for prediction of macrosomia in prolonged pregnancies. *Ultrasound Obstet Gynecol* 1997;9(6):403–408.

Sanchez-Ramos L, Olivier F, Delke I, Kaunitz AM. Labor induction versus expectant management for postterm pregnancies: a systematic review with meta-analysis. *Obstet Gynecol* 2003;101(6):1312–1318.

The National Institute of Child Health and Human Development Network of Maternal–Fetal Medicine Units. A clinical trial of induction of labor versus expectant management in postterm pregnancy. *Am J Obstet Gynecol* 1994;170(3):716–723.

Vrouenraets FP, Roumen FJ, Dehing CJ, et al. Bishop score and risk of cesarean delivery after induction of labor in nulliparous women (see comment). *Obstet Gynecol* 2005;105(4):690–697.

65 Anesthesia in the high-risk patient

Danny Wilkerson and Richard B. Clark

Questions 1–5: choose the correct answer

1 Obesity is associated with which of the following?
- A Increased morbidity
- B Increased mortality
- C Hypertension
- D Coronary artery disease
- E All of the above

2 Functional residual capacity (FRC):
- A Increases during pregnancy
- B Stays the same during pregnancy
- C Decreases during pregnancy
- D First increases then decreases during the third trimester
- E None of the above

3 Obesity is associated with which of the following?
- A Obstructive sleep apnea
- B Chronic hypoxemia
- C Hypocarbia
- D A, B, and C
- E A and B

4 The spinal level that is appropriate for Cesarean section is:
- A T1–T2
- B T4–T6
- C T6–T8
- D T10
- E T7–T10

5 In severe preeclampsia, the anesthesiologist may want to carry out which of the following laboratory tests?
- A Prothrombin time
- B International normalized ratio (INR)
- C Partial thromboplastin time (PTT)
- D Platelet count
- E All of the above

Question 6: true or false

6 The severely preeclamptic patient needs at least 1000 mL of crystalloid solution delivered intravenously before epidural placement

Questions 7–10: choose the correct answer

7 Which of the following antihypertensives are commonly used in pregnancy?
- A Labetalol
- B Hydralazine
- C Methyldopa
- D All of the above
- E None of the above – they are contraindicated

8 Does magnesium sulfate antagonize the effects of neuromuscular blocking agents (muscle relaxants)?
- A Yes
- B No
- C Usually not in pregnant women
- D There is no relationship between these drugs
- E Only in pregnancy

9 Patients with left-to-right cardiac shunts:
- A Tolerate pregnancy poorly
- B Cannot receive epidural anesthesia
- C Need to have an epidural late in the progression of labor
- D Should only have a single-shot spinal epidural in labor
- E Can have an epidural using saline for loss of resistance (LOR)

10 The most common cyanotic heart lesion is:
- A A ventricular septal defect (VSD)
- B An atrial septal defect (ASD)
- C Patent ductus arteriosus (PDA)
- D Tetralogy of Fallot
- E Dextrocardia

Questions 11–20: choose

A If 1, 2, and 3 are correct
B If 1 and 3 are correct
C If 2 and 4 are correct
D If only 4 is correct
E If all are correct

11 Primary pulmonary hypertension can be treated with:
1 Calcium channel blockers
2 Methyldopa
3 Inhaled nitric oxide
4 Single-shot spinal anesthesia

12 In the preeclamptic patient, the best anesthetic option for Cesarean delivery is:
1 General endotracheal anesthesia
2 Spinal anesthesia
3 Epidural anesthesia
4 All of the above are acceptable methods of anesthesia

13 Peripartum cardiomyopathy is characterized by:
1 Biventricular hypokinesis
2 High cardiac output
3 Elevated filling pressures
4 Low mortality

14 In patients with peripartum cardiomyopathy:
1 General anesthesia may result in myocardial stimulation and improved cardiac function
2 The etiology is unknown
3 Vaginal delivery should not be attempted
4 The onset is often insidious

15 Conditions that exacerbate multiple sclerosis are:
1 Stress
2 Infection
3 Hyperpyrexia
4 Increased oxygen delivery

16 In patients with myasthenia gravis:
1 Epidural is contraindicated
2 Epidural is preferred
3 Combined spinal epidural (CSE) is contraindicated
4 CSE can be used

17 Which of the following agents can be used safely in patients with myasthenia gravis undergoing Cesarean section with general anesthesia?
1 Propofol
2 Ketamine
3 Thiopental
4 Narcotics

18 Illegal opioids used during pregnancy:
1 Can be smoked, inhaled, or injected
2 Cause no harm to the fetus
3 Are associated with preterm labor
4 Cause fetal macrosomia

19 Cocaine use in the parturient:
1 Can cause placental abruption
2 Can result in severe hypertension on induction of anesthesia
3 Can cause the patient to be chronically catecholamine depleted
4 Is contraindicated for epidural analgesia in labor

20 The chronic "crack" smoker:
1 May be at risk for other drug abuse
2 May be catecholamine depleted and not responsive to ephedrine therapy
3 May have significant pulmonary problems
4 May be at risk for myocardial infarction

Further reading

Birnbach DJ. *Ostheimer's manual of obstetric anesthesia*, 3rd edn. New York: Churchill Livingstone, 2000.

Chestnut DH. *Obstetric anesthesia principles and practice*, 3rd edn. Philadelphia, PA: Elservier Mosby, 2004.

Datta S. *The obstetric anesthesia handbook*, 3rd edn. New York: Hanley & Belfus, 2000.

Datta S. *Anesthetic and obstetric management of high-risk pregnancy*, 3rd edn. New York: Springer-Verlag, 2004.

Gambling DR, Douglas MJ. *Obstetric anesthesia and uncommon disorders*. Philadelphia, PA: WB Saunders Co., 1998.

Hood DD, Curry R. Spinal versus epidural anesthesia for cesarean section in severely preeclamptic patients: a retrospective survey. *Anesthesiology* 1999;90:1276–1292.

Hughes SC, Levinson G, Rosen MA. *Shnider and Levinson's anesthesia for obstetrics*. Philadelphia, PA: Lippincott, Williams & Wilkins, 2002.

Miller RD, ed. *Anesthesia*, 5th edn. Philadelphia, PA: Churchill Livingstone, 2000.

Stoelting RE, Dierdorf SF. *Anesthesia and co-existing disease,* 4th edn. Philadelphia, PA: Churchill Livingstone, 2002.

Tsen LC. The Gerald W. Ostheimer "What's new in obstetric anesthesia" lecture. *Anesthesiology* 2005;102:672–679.

66 Puerperium and lactation: physiology of the reproductive system

Judy M. Hopkinson, Pamela D. Berens, and E. Albert Reece

Questions 1–20: choose the correct answer

1 The mean duration of lochia is:
- A 33 days with 15% of women continuing to experience lochial discharge at 6 weeks postpartum
- B 45 days with 15% of women continuing to experience lochial discharge at 8 weeks postpartum
- C 56 days

2 Following vaginal delivery, the uterus is no longer palpated on abdominal examination:
- A By 24 h postpartum
- B By 1 week postpartum
- C By 2 weeks postpartum
- D By 6 weeks postpartum

3 Which of the following are contraindications for breastfeeding term, healthy infants?
- A Maternal hepatitis C
- B Maternal hepatitis B
- C Infant cleft lip or palate
- D Infant galactosemia

4 Which of the following suggests the possibility that the mother may produce milk deficient in one or more nutrients normally adequate in human milk?
- A Mother consumes seven or more fast food meals per week
- B Mother consumes no animal products
- C Mother consumes no dairy products
- D Mother is overweight and consumes three or more soft drinks per day

5 In the initial postoperative period, which of the following forms of pain management is most likely to interfere with early breastfeeding?
- A Patient-controlled analgesia with morphine
- B Continuous extradural anesthesia
- C Meperidine

6 Onset of copious milk production is triggered by:
- A Decreased progesterone levels
- B Early, frequent nursing
- C Use of a breast pump
- D Rising prolactin levels

7 The mean time for onset of copious milk production is best described as:
- A The day after delivery
- B 3 days after delivery
- C 5 days after delivery
- D 7 days after delivery

8 Onset of copious milk production is generally associated with which of the following behaviors in neonates:
- A Completion of meconium passage
- B Sleeping through the night
- C Onset of colic symptoms
- D Increased wakefulness between feedings

9 During the puerperium, which of the following should prompt the physician to consider the possibility of retained placental fragments?
- A Persistent heavy bleeding
- B A continued open cervical os
- C Persistent absence of copious milk production
- D All of the above

10 The total concentration of lipid in human milk:
- A Increases during the course of a feeding
- B Reflects the percentage of fat in the maternal diet
- C Determines the growth rate of the breastfed infant
- D Is higher in colostrum than in mature milk

11 Mothers who choose to breastfeed should be advised to offer the breast:
- A Every 4 h beginning at 6 am
- B Whenever the baby cries vigorously
- C When the baby shows early hunger signs
- D Every 3 h with one 5-h stretch at night

12 Which of the following best characterizes the relationship between maternal exercise, maternal weight loss, and infant feeding choice?
- A Postpartum weight loss occurs spontaneously in breastfeeding women, but generally requires diet and exercise in the absence of breastfeeding
- B Postpartum weight loss may require diet and exercise regardless of the infant feeding method
- C If diet and exercise are required for postpartum weight loss, they should be delayed until after weaning
- D B and C

13 Which best describes appropriate management of breastfeeding for a mother newly diagnosed with tuberculosis?
- A Discontinue breastfeeding, express and discard breast milk until mother is no longer contagious
- B Continue breastfeeding with a mask and gown until mother is no longer contagious
- C While the mother is contagious, separate her from the infant and have a non-contagious caregiver feed the mother's expressed milk
- D Wean infant and discard milk until mother is no longer taking medications

14 After parturition, nonlactating women experience ovulation on average at:
- A 45 days
- B 60 days
- C 90 days
- D 120 days

15 The risk of pregnancy during breastfeeding is less than 2% when the mother is:
- A Exclusively breastfeeding
- B Amenorrheic and breastfeeding at least eight times per 24 h
- C Amenorrheic and exclusively breastfeeding and less than 6 months postpartum
- D None of the above

16 Which of the following best characterizes milk production during exclusive breastfeeding after the first 4 weeks postpartum? Milk volume:
- A Increases in proportion to infant weight
- B Increases until 5 months and then declines
- C Averages 125 mL/breastfeeding
- D Averages 750 mL/day

17 Decreased milk production and involution of the mammary gland are triggered by:
- A Milk stasis and accumulation of FIL in the mammary gland
- B Decreased gastrointestinal somatotropin leading to reduced dietary calcium absorption
- C Continued maternal weight loss beyond the fourth postpartum month
- D Prolonged aerobic exercise

18 Determination of appropriate pharmacologic treatment for illness in a breastfeeding mother requires the use of specialized, lactation-specific references:
- A True
- B False

19 Early symptoms of mastitis are most similar to those of:
- A Food poisoning
- B Flu
- C Insufficient milk production
- D Breast cancer

20 Initial treatment for mastitis includes a 10- to 14-day course of a penicillinase-resistant antibiotic with advice to the mother to:
- A Continue nursing with careful attention to thorough breast drainage
- B Pump and discard milk with careful attention to through breast drainage
- C Allow the breasts to "rest" removing only enough milk to relief discomfort
- D Bind the breasts

67 Premature birth and neurological complications

Alan Hill

1 What is the approximate percentage of premature deliveries among all livebirths?

2 Approximately what percentage of VLBW infants (birthweight between 500 and 1500 g) survive the neonatal period?

3 What are the estimated percentages of survivors of prematurity that develop the following neurological sequelae: cerebral palsy; developmental disabilities, e.g., cognitive, behavioral, and school difficulties?

4 What are the two major neurological complications of intraventricular hemorrhage?

5 (a) What is the source of hemorrhage in intraventricular hemorrhage in premature newborns? (b) Name the principal function of this structure.

6 What percentage (approximately) of premature newborns currently develop germinal matrix–intraventricular hemorrhage?

7 (a) What percentage of germinal matrix–intraventricular hemorrhage can be diagnosed on the basis of clinical criteria alone? (b) How may the diagnosis be confirmed?

8 What is the most common mechanism involved in the pathogenesis of posthemorrhagic hydrocephalus?

9 What is the pathogenetic mechanism underlying periventricular hemorrhagic infarction?

10 Contrast periventricular hemorrhage infarction (PVI) and periventricular leukomalacia (PVL) in terms of (a) anatomic distribution and (b) vascular origin.

11 List three pathogenetic factors that may be involved in the causation of periventricular leukomalacia.

12 List two common long-term sequelae of PVL.

13 What is the most common neurological impairment following bilirubin neurotoxicity in children born prematurely?

14 What is the relationship between hypoglycemia and cerebral blood flow?

15 What is a potential risk associated with this relationship?

16 (a) What is the most effective antenatal pharmacological intervention to reduce the incidence and severity of GMH–IVH? (b) List two mechanisms whereby antenatal cortical steroids may reduce GMH–IVH.

17 List two intrapartum obstetric factors that may increase the risk of GMH–IVH in some very low birthweight infants.

18 List two postnatal pharmacological interventions that appear to be associated with decreased risk of GMH–IVH.

19 List four patterns of hypoxic–ischemic brain injury in premature newborns.

20 List three clinical features that predict poor neurological outcome in infants born prematurely.

Further reading

De Vries LS, Roelants-van Rijn AM, Rademaker KJ, et al. Unilateral parenchymal hemorrhagic infarction in the preterm infant. *Eur J Pediatr Neurol* 2001;5:139.

Dubowitz LMS, Dubowitz V, Palmer PG, et al. Correlation of neurological assessment in the preterm infant with outcome at one year. *J Pediatr* 1984;105:452.

Ferreiro DM. Neonatal brain injury. *N Engl J Med* 2004;351: 1985.

Ment LR, Oh W, Ehrenkranz Z, et al. Antenatal steroids delivery mode and intraventricular hemorrhage in preterm infants. *Am J Obstet Gynecol* 1995;172:795.

du Plessis AJ, Volpe JJ. Perinatal brain injury in the preterm and term newborn. *Curr Opin Neurol* 2002;15:151.

Pryds O, Christensen NJ, Friis HB. Increased cerebral blood flow and plasma epinephrine in hypoglycemic, preterm neonates. *Pediatrics* 1990;85:172.

Roland EH, Hill A. Germinal matrix–intraventricular hemorrhage in the premature newborn: management and outcome. *Neurol Clin North Am* 2003;21:833.

Volpe JJ. Neurobiology of periventricular leukomalacia in the premature infant. *Pediatr Res* 2001;50:553.

Volpe JJ. *Neurology of the newborn*. Philadelphia, PA: W.B. Saunders, 2001.

Watchko JF, Meisels MJ. Jaundice in low birth weight infants: pathobiology and outcome. *Arch Dis Child Fetal Neonatal Ed* 2003; 88:F455.

68 Common problems of the newborn

Fernando R. Moya and Matthew Laughon

Questions 1–3: choose the correct answer

1 In the fetus, which path does oxygenated blood take from the placenta to the fetus?
- A Umbilical vein–inferior vena cava–patent foramen ovale–left atrium
- B Umbilical artery–inferior vena cava–patent foramen ovale–left atrium
- C Umbilical vein–superior vena cava–patent foramen ovale–left atrium
- D Umbilical vein–portal vein–patent foramen ovale–left atrium
- E Umbilical vein–aorta–patent foramen ovale–left atrium

2 In infants with persistent pulmonary hypertension, which one of the following medications has been demonstrated by randomized, controlled trials to reduce the need for extracorporeal membrane oxygenation (ECMO)?
- A Sodium bicarbonate
- B Fentanyl (narcotic)
- C Pancuronium (paralytic)
- D Inhaled nitric oxide
- E Albuterol

3 In the full-term newborn, anemia can be due to:
- A Fetal–maternal hemorrhage
- B Rh isoimmunization
- C ABO incompatibility
- D Diamond–Blackfan syndrome
- E All of the above

Question 4: true or false

4 ABO hemolytic anemia is always worse than anemia secondary to Rh isoimmunization.

Questions 5–8: choose the correct answer

5 In infants with polycythemia and symptoms secondary to hyperviscosity, most centers would:
- A Perform a double-volume exchange transfusion
- B Initiate phototherapy
- C Perform a partial exchange transfusion
- D Administer intravenous immunoglobulin (IVIG)
- E Perform a triple lindy

6 Morbidities of prematurity might include all of the following, except:
- A Retinopathy of prematurity (ROP)
- B Necrotizing enterocolitis (NEC)
- C Neurodevelopmental impairment
- D Chronic lung disease (CLD)/bronchopulmonary dysplasia (BPD)
- E Coronary artery disease (CAD)

7 The following diseases can present with respiratory distress:
- A Transient tachypnea of the newborn
- B Respiratory distress syndrome
- C Pneumonia
- D Sepsis
- E All of the above

8 During the second and third trimesters, over 90% of the hemoglobin of the fetus is:
- A Hemoglobin A
- B Hemoglobin F
- C Hemoglobin G
- D Hemoglobin H
- E Hemoglobin Z

Question 9: true or false

9 The goal of phototherapy in unconjugated hyperbilirubinemia is to reduce the risk of bilirubin encephalopathy.

Question 10: choose the correct answer

10 Infants born to a diabetic mother are at risk of:
- A Hypoglycemia
- B Hypoparathyroidism
- C Hyperparathyroidism
- D Hypothyroidism
- E Hyperthyroidism

Questions 11 and 12: true or false

11 A term infant born through meconium-stained amniotic fluid who starts crying spontaneously within seconds of delivery does not need endotracheal suctioning.

12 The overall mortality for preterm infants with confirmed necrotizing enterocolitis remains below 5–10%.

Questions 13–20: choose the correct answer

13 Preterm neonates can lose heat by:
- A Evaporation
- B Conduction
- C Convection
- D Radiation
- E All of the above

14 Which of the following statements regarding surfactant therapy for RDS is false?
- A Its use has lowered neonatal mortality
- B Commonly used surfactants contain surfactant proteins
- C For infants below 26 weeks of gestation, prophylactic use of surfactant is advantageous
- D Use of surfactant is associated with a lower risk of intraventricular hemorrhage

15 Which of the following statements regarding bronchopulmonary dysplasia (BPD) is true?
- A Its incidence increases with advancing gestational age
- B Inflammatory cytokines play an important role in its pathogenesis
- C Its diagnosis is based primarily on the need for mechanical ventilation at 28 days after birth
- D Use of surfactant has substantially reduced the incidence of BPD
- E The mainstay of therapy for BPD is inhaled nitric oxide

16 Regarding neonatal infections, which statement is false?
- A The incidence of group B streptococcal infections has recently declined
- B *Candida* species are a common cause of late onset infections
- C Late nosocomial infections are associated with a good neurodevelopmental outcome
- D The incidence of nosocomial infections is inversely correlated with gestational age
- E Fever is an uncommon sign in early neonatal infection

17 Common clinical signs observed in infants with moderate to severe hypermagnesemia include all of the following, except:
- A Hypotonia
- B Delayed passage of stools
- C Jitteriness
- D Respiratory depression

18 In a term, growth-retarded 10-hour-old neonate with some hypotonia, jitteriness, moderate tachypnea, and a blood glucose of 10 mg/dL assessed by a rapid reagent test, the following is the most appropriate immediate course of action:
- A Send a confirmatory blood glucose sample and start enteral feedings
- B Start enteral feedings and send a blood sample for insulin determination
- C Send a confirmatory blood glucose sample and start an intravenous glucose infusion
- D Give a dose of epinephrine and start enteral feeds
- E Repeat the rapid reagent test in 30 min and begin enteral feeds

19 Regarding neonatal mortality, the following statements are true except:
- A At any gestational age, it is higher for Hispanic infants than those of Caucasian or African–American descent
- B It increases with decreasing gestational age
- C It has decreased substantially over the past 30 years
- D At lower gestational ages, it is lower for females than for male infants

20 With reference to neonatal resuscitation, the following statements are false except:
- A All term infants born through meconium-stained amniotic fluid must have a laryngoscopy for visualization and aspiration of the trachea
- B It is possible to initiate administration of positive pressure ventilation without supplemental oxygen if this is not available
- C If a preterm infant does not initiate spontaneous respiratory efforts within 3–4 min after delivery, volume expansion must be given via the umbilical vein
- D For preterm infants of less than 32 weeks of gestation, surfactant should be given before attempting any resuscitative maneuvers

Answers

Chapter 1
Early conceptus growth and immunobiologic adaptations of pregnancy

1	False	**11**	False
2	True	**12**	False
3	False	**13**	True
4	False	**14**	False
5	True	**15**	True
6	False	**16**	False
7	False	**17**	False
8	True	**18**	True
9	True	**19**	True
10	True	**20**	True

Chapter 2
Normal embryonic and fetal development

1	D	**17**	D
2	B	**18**	C
3	B	**19**	A
4	E	**20**	A
5	E	**21**	A
6	C	**22**	B
7	E	**23**	B
8	D	**24**	C
9	D	**25**	E
10	E	**26**	A
11	A	**27**	D
12	E	**28**	C
13	B	**29**	B
14	D	**30**	E
15	D	**31**	B
16	B	**32**	A

Chapter 3
Normal and abnormal placentation

1	B	**11**	B
2	C	**12**	A
3	A	**13**	D
4	B	**14**	B
5	E	**15**	E
6	E	**16**	B
7	D	**17**	C
8	E	**18**	E
9	A	**19**	C
10	C	**20**	E

Chapter 4
Fetoplacental perfusion and transfer of nutrients

1	B	**11**	A and C
2	A	**12**	D
3	A and B	**13**	C
4	C	**14**	True
5	C	**15**	True
6	B	**16**	True
7	D	**17**	False
8	B	**18**	True
9	A	**19**	False
10	B	**20**	False

Chapter 5
Endocrinology of pregnancy and the placenta

1	B	**10**	E
2	D	**11**	B
3	D	**12**	A
4	B	**13**	C
5	A	**14**	A
6	C	**15**	B
7	C	**16**	A
8	B	**17**	A
9	C		

Chapter 6
Fetal lung development and amniotic fluid analysis

1	C	**11**	C
2	D	**12**	B
3	B	**13**	D
4	A	**14**	A
5	A	**15**	A
6	B	**16**	B
7	A	**17**	C
8	B	**18**	A
9	B	**19**	D
10	C	**20**	B

Chapter 7
Fetal cardiovascular physiology and response to stress conditions

1 Chaotic arrangement of myofibrils
Greater proportion of noncontractile proteins
Nuclei and mitochondria in the center of the cells
Sarcoplasmic reticulum less effective at Ca^{2+} release.

2 Size of foramen ovale
Flow from IVC
Pulmonary venous return
Diastolic filling characteristics of the RV.

3 All of the SVC flow
Portion of IVC flow that does not cross the foramen ovale
Size of the foramen ovale
Diastolic filling characteristics of the LV.

4 Cerebral vascular resistance.

5 Placental vascular resistance.

6 Fetal profile shows a higher A wave (later diastolic portion due to atrial contraction) and a lower E wave (early diastolic portion due to active ventricular relaxation) after birth, the pattern is reversed.

7 Inequality of ventricular outputs
Similarity of systolic pressures
Reciprocal influence of ventricular diastolic functions
Possibility of adequate perfusion by a single ventricle
Special status of the aortic isthmus.

8 High resistance and low flow
Systemic pressure.

9 Oxygen
Alpha-adrenergic agonists
Beta-adrenergic antagonists
Endothelin
Acidosis
Thromboxane
$PGF_{2\alpha}$.

10 Beta-adrenergic agonists
Alpha-adrenergic antagonists
Alkalosis
Prostacyclin
Adenosine/ATP.

11 Significant forward diastolic flow
Evidence of low vascular resistance.

12 Provides a shunt for blood from the umbilical vein to enter more directly into the IVC
Regulates the placental circulation
Is responsible for the acceleration of the umbilical venous flow, causing a preferential shunting of highly oxygenated blood across the foramen ovale.

13 The ductus arteriosus.

14 The aortic isthmus.

15 Ventricular performances
Resistance in the downstream vascular beds of each ventricle
LV causes forward flow/RV causes retrograde flow
Low placental resistance favors forward flow.

16 Downstream resistances to each ventricle
Low placental resistance favors forward flow.

17 AV malformation
Anemia
Twin–twin transfusion syndrome.

18 Increase in right ventricular volume load due to higher SVC venous return
Cardiomegaly
Retrograde diastolic flow through the aortic isthmus.

19 Preload increases due to:
decreased blood viscosity
increased venous return.
Afterload decreases due to:
decreased blood viscosity
peripheral vasodilatation related to a lower blood O_2 content.

20 Increased blood pressure
Decreased heart rate
Redistribution of blood flow to the heart, brain, and adrenals
No change in placental blood flow and combined cardiac output.

21 Change in the proportion of blood diverted through the ductus venosus to favor an increased proportion of highly oxygenated blood going more quickly into the heart.

22 Relatively rapid drop in PO_2
Earlier development of both respiratory and metabolic acidemia compared with hypoxic hypoxia.

23 Decreased umbilical blood flow
Decreased combined cardiac output
Redistribution of blood flow to the brain, heart and adrenals
Variable effects on heart rate and blood pressure.

24 Progressive decrease in diastolic forward flow
As severity worsens, there may be absent or reverse flow in the umbilical artery.

25 Reverse diastolic flow correlates with decreased umbilical blood flow
The pattern of flow in the isthmus is worse than that in the umbilical artery, i.e. reverse flow in the isthmus precedes the appearance of reverse flow in the umbilical artery.

Chapter 9
Fetal endocrinology

1 C
2 E
3 D
4 D
5 D
6 D
7 C
8 A
9 C
10 E
11 True
12 False
13 False
14 False
15 False
16 False
17 True
18 False
19 True
20 True

Chapter 10
Fetal hematology

1 Yes, fetal haemoglobin increases from 10 g/100 mL at 10–17 weeks to 13 g/mL after 30 weeks.

2 First stage: mesoblastic hematopoiesis of the yolk sac; second stage: visceral hematopoiesis, mainly from the liver; third stage: medullary hematopoiesis.

3 No, platelet numeration is stable during the second and third trimesters, and not very different from adults: 200–300 $\times 10^9$/L.

4 Yes, white blood cell count increases from 4.7 to 7.7 $\times$ 10.3/µl.

5 Fetal TQ is about 24% at 28 weeks and increases progressively to 33% at the end of pregnancy; TCA decreases progressively.

6 There is only one peak of leukocytes (lymphocytes and nucleated erythrocytes), the average erythrocyte volume is much higher in the fetus, and red cell distribution width is broader in the fetus.

7 Mainly lymphocytes decreasing from 88% at 18 weeks to 68.5% by 30 weeks.

8 No, it means that the fetal blood sample is contaminated by maternal or placental blood.

9 It decreases from 150 fL at 10 weeks to 115 fL after 30 weeks.

10 Amniotic fluid activates coagulation factors and causes platelet aggregation.

11 1:100:400.

12 βhCG dosage in the fetal blood sample compared with the maternal blood sample.

13 It increases from 1.8 to 3.6 $\times 10^{12}$/L from 10 to 30 weeks.

14 Yes, from 9 weeks.

15 No, it begins during the fourth month.

16 T4/T8 is decreased and CD3 count is increased.

17 True.

18 Yes, and even occasionally in the spleen.

19 False. Fetal haemoglobin is α and γ chains.

20 True.

Chapter 11
Sporadic and recurrent pregnancy loss

1 D
2 C
3 D
4 B
5 A
6 A
7 C
8 D
9 D
10 A
11 C
12 A
13 C
14 B
15 D
16 D
17 B
18 B
19 A
20 C
21 B
22 D
23 C

Chapter 12
Ectopic and heterotopic pregnancies

1 B. The most common denominator is tubal obstruction and injury. Previous pelvic inflammatory disease, especially when caused by *Chlamydia trachomatis*, is a major risk factor for ectopic pregnancy.

2 D. The most common denominator is tubal obstruction and injury, owing to pelvic inflammatory disease. Other factors associated with an increased risk of ectopic pregnancy include prior ectopic pregnancy (which increases the risk for subsequent ectopic pregnancy 10-fold), a history of infertility (and specifically *in vitro* fertilization), cigarette smoking (causing alterations in

tubal motility and ciliary activity), prior tubal surgery, diethylstilbestrol exposure (which alters fallopian tube morphology), and advanced maternal age.

3 A. The classic symptom triad of ectopic pregnancy includes amenorrhea, irregular bleeding, and lower abdominal pain. However, the most common complaint is sudden severe abdominal pain, which is present in more than 90% of patients. The triad is present in only one-half of patients and most commonly when rupture occurs.

4 D. (See answer 2.)

5 C. The first stage in the evaluation of women with a suspected ectopic pregnancy is to determine if the patient is pregnant. The human chorionic gonadotropin (β-hCG) enzyme immunoassay, with a sensitivity of 25 mIU/mL, is an accurate screening test for ectopic pregnancy and is positive in virtually all cases of ectopic pregnancy.

6 C. The β-hCG in normal pregnancies doubles every 2 days (48 h), and thus, at present, clinicians rely on a normal "doubling time" to characterize a viable gestation. Basically, a 66% rise in the β-hCG level over 48 h represents the lower limit of normal values for viable intrauterine pregnancy.

7 D. At β-hCG levels of approximately 2000 mIU/mL, a viable intrauterine pregnancy should be seen by vaginal ultrasound.

8 E. The excellent benefits of laparoscopic treatment include less blood loss, less analgesia, less postoperative pain, shorter recovery period, and decreased hospital costs. Because of lower peri- and postoperative morbidity, lower cost, and equivalent efficacy, laparoscopy is preferred to laparotomy for the treatment of ectopic pregnancy.

9 A. The only absolute contraindication for laparoscopy is shock or hemodynamic instability.

10 C. Higher rates of intrauterine pregnancies were reported following conservative surgery than with radical surgery. Thus, linear salpingostomy is the procedure of choice. It was found to be as effective as segmental resection with reanastomosis, and it is technically easier with a shorter operative time.

11 C. Methotrexate was proven to be a cost-saving, nonsurgical, fallopian tube-sparing treatment for ectopic pregnancy in a meta-analysis. Moreover, methotrexate does not subject patients to surgical intervention and possible associated complications. Thus, at present, methotrexate is considered to be the treatment of choice for ectopic pregnancy.

12 D. Absolute contraindications to medical therapy include breastfeeding, immunodeficiency, alcoholism, hepatic/pulmonary/renal or hematological dysfunction, known sensitivity to methotrexate, blood dyscrasias, or peptic ulcer disease. Relative contraindications for methotrexate treatments include embryonic cardiac activity and a gestational sac of 3.5 cm or more.

13 E. It is clear that the main predictor for successful medical treatment is rigorous patient selection. Several orienting parameters aimed at the suitable choosing of patients have already been assessed, such as the presence of fetal cardiac activity, size of the ectopic pregnancy, initial levels of β-hCG, and endometrial thickness. Interestingly, a history of a previous ectopic pregnancy was found to be another independent risk factor for methotrexate failure.

14 D. The overall success rate of methotrexate treatments is almost 90%.

15 E. Methotrexate has the potential for serious toxicity and, indeed, high doses can cause bone marrow suppression, hepatotoxicity, stomatitis, pulmonary fibrosis, alopecia, and photosensitivity. Toxic effects are usually related to the amount and duration of therapy. Nevertheless, most side-effects experienced during regular treatment for ectopic pregnancy are minor and self-limited, and generally limited to an increase in hepatic transaminases, mild stomatitis, and gastrointestinal disturbance.

16 C. (See answer 13.)

17 D. The occurrence of a heterotopic pregnancy following spontaneous cycles is rare, with an estimated incidence of 1 in 30 000. It was calculated by multiplying the rate of ectopic pregnancy (0.37%) by the rate of dizygous twinning (0.8%), thus producing a hypothetical approximation. However, the incidence is increased to around 1% by the use of assisted reproductive technology. This is particularly high among women who are undergoing ovulation induction with gonadotropins and among women undergoing *in vitro* fertilization, as it has become standard practice to transfer at least two embryos.

18 B. Abdominal pain was found to be the most frequent presenting symptom, occurring in above 80% of patients. A combination of signs and symptoms, including abdominal pain, adnexal mass, peritoneal irritation, and an enlarged uterus, was the most significant finding in support of a presumptive diagnosis of combined gestations.

19 B. The interstitial part of the fallopian tube is the proximal portion that lies within the muscular wall of the uterus. Interstitial implantation of the blastocyst is the rarest form (1.9%) of *tubal* ectopic pregnancy. Abdominal pregnancy occurs in approximately 1 in 8000 births and represents 1.4% of ectopic pregnancies. Ovarian pregnancy is an infrequent variant of ectopic pregnancy with an incidence of 0.5–3% of all ectopic pregnancies. Cervical pregnancy, which results from

implantation of the blastocyst within the cervical canal, is a rare complication of pregnancy. Its incidence varies from 1 in 2400 to 1 in 50 000 normal pregnancies.

20 B. Methotrexate is the best treatment for cervical pregnancies, with a success rate of approximately 80%. Other treatment regimens include arterial embolization and even Shirodkar cerclage placement to reduce bleeding. However, in cases of massive and uncontrolled vaginal bleeding, abdominal hysterectomy is necessary.

21 A. The most common site of ectopic pregnancy implantation is the fallopian tubes, accounting for around 98% of all ectopic pregnancies. The majority of ectopic pregnancies occur in the ampullary part of the fallopian tube (79.6%), 12.3% in the isthmus, 6.2% in the fimbria, and 1.9% in the interstitial part.

22 C. Abdominal pregnancies are classified as primary (primary peritoneal implantation) or secondary reimplantation. The latter are more common, resulting from tubal abortion or rupture. Distinction between the two is problematic, but basically treatment is provided according to the clinical presentation. Diagnosis is best made by ultrasound.

Chapter 13
Multifetal pregnancies: epidemiology, clinical characteristics, and management

1	B	**12**	B
2	D	**13**	E
3	A	**14**	D
4	A	**15**	E
5	D	**16**	A
6	A	**17**	B
7	A	**18**	D
8	C	**19**	C
9	A	**20**	A
10	C	**21**	B
11	C		

Chapter 14
Biology of normal and deviant fetal growth

1 Genetic imprinting is a mechanism by which one of the two alleles of a gene is expressed according to its parental origin. Insulin-like growth factor (IGF)-2 is an example of an imprinted gene that plays an important role in fetal growth. Biallelic expression of IGF-2 results in fetal overgrowth (Beckwith–Wiedemann syndrome).

2 The mechanisms by which imprinting is altered include chromosomal deletion/duplication, point mutations, and uniparental disomy (UPD). The last refers to a situation in which chromosome fragments originate from a single parent. Murine studies have shown that, for some specific fragments, abnormal fetal growth occurred, suggesting that this portion of the chromosome carried an imprinted gene. There are several examples of human imprinted genes associated with UPD. In humans, UPD has been observed for most chromosomes, although only a few are associated with an abnormal phenotype (often growth restriction), again suggesting that these carry an imprinted gene. Specific examples include Prader–Willi syndrome, Angelman syndrome, and Silver–Russell syndrome.

3 Maternal anemia is one of the most important medical conditions worldwide that is associated with fetal growth restriction. The mechanisms involved may include increased levels of catecholamines, hypoxia, increased oxidative stress, and/or infections.

4 Micronutrients such as folate, zinc, iron, copper, and vitamins A and E play a role in the regulation of fetal growth.

5 IGF-2 is important in embryonic growth and is involved in promoting cellular differentiation. Placental IGF-2 plays a role in the regulation of diffusion capacity and, therefore, in fetal growth.

6 Several factors influence IGFs' actions including their binding proteins and associated proteases, their receptor status, the presence of other hormones and, most importantly, maternal nutrition.

7 Placental transfer of glucose depends on the total surface area of the syncytium available for exchange, the thickness of the placental barrier, the placenta's own metabolic needs, the concentration gradient of glucose between maternal and fetal blood, maternal blood supply and, finally, the presence of transporters.

8 The importance of amino acid transport for fetal growth is highlighted by the observations made in IUGR. These fetuses display a decrease in amino acid concentration, an impairment of some transport systems, a decrease in surface area for exchange, decreased placental perfusion, and specific demonstrations of decreased transfer of taurine, phenylalanine, and leucine.

9 Placental growth hormone (GH-v) gradually replaces maternal pituitary growth hormone throughout the first trimester. It exerts its biologic effects on the mother and placenta as it is not detected in the fetus. It has high somatogenic and low lactogenic activities and has been shown to modulate maternal metabolism by stimulating gluconeogenesis, lipolysis, and anabolism. The end result

is to increase nutrient supply to the fetus and, therefore, indirectly influence fetal growth. It is responsive to changes in glucose concentration in the maternal circulation and is a key regulator of maternal IGF-1, as well as a mediator of insulin resistance in the mother, thereby having an important role in compartmentalization.

10 Abnormal fetal growth is associated with adult-onset diseases. Growth restriction increases the risk of cardiovascular diseases, hypertension, hyperlipidemias, and diabetes, whereas fetal macrosomia appears to carry an increased risk of the incidence of certain types of cancers (breast, ovarian) in the adult.

Chapter 15
Developmental toxicology, drugs, and fetal teratogenesis

1 B
2 C
3 G
4 C
5 F
6 B
7 A
8 F
9 D
10 C
11 C
12 A
13 D
14 B
15 F
16 A
17 C
18 E
19 F
20 B
21 D

Chapter 16
Drugs, alcohol abuse, and effects in pregnancy

1 Dose, route of administration, physiologic handling by both the pregnant woman and the fetus, genetic predisposition, and timing of the exposure during pregnancy.

2 Thalidomide exposure between days 22 and 36 causes characteristic limb shortening defects in human fetuses.

3 (i) Genetic differences in rates of induction of alcohol dehydrogenase, hepatic microsomal ethanol-oxidizing system, and the peroxisomal catalase lead to differential susceptibility to cell injury or disruption.
(ii) Fetuses with polymorphic variants of NAT1, an enzyme involved in the detoxification of smoke, demonstrate an increased incidence of facial clefting anomalies when exposed to maternal smoking during pregnancy.

4 Growth restriction (either prenatal or postnatal in onset), craniofacial abnormalities, and central nervous system anomalies.

5 No. Analysis of the Spanish Collaborative Study of Congenital Malformations found that even low and/or sporadic alcohol ingestion during pregnancy was associated with increased rates of fetal malformations.

6 Increased neurodegeneration via apoptosis during synaptogenesis
Defects in neuronal migration
Defective myelination leading to decreases in white matter volume
Increased c-myc and growth-associated protein 43 levels in neuronal cells
Interference with placental amino acid transport[11]

7 CAGE, T-ACE, TWEAK (see Tables 16.3, 16.4, and 16.5 in the textbook).

8 By blocking reuptake of norepinephrine and dopamine at presynaptic nerve terminals, causing accumulation of these neurotransmitters at postsynaptic receptor sites.

9 Placental abruption, intrauterine growth restriction (IUGR), preterm labor, preterm premature rupture of membranes (PPROM), meconium, spontaneous abortion, intrauterine cerebral infarctions, genitourinary (GU) tract anomalies, and neurobehavioral disorders.

10 Vasoconstriction or reperfusion directly, with the generation of oxygen free radicals during the reperfusion that follows vasoconstriction, may result in the trend toward an increase in all malformations and a significant increase in GU anomalies seen among pregnant cocaine users.

11 Fetal cocaine exposure is associated with abnormalities in arousal, attention, and neurophysiologic function, but the effects appear to be short-lived phenomena seen in infancy and early childhood, and are correlated with other factors, including exposure to alcohol, tobacco, and marijuana.

12 Fetal addiction, intrauterine withdrawal, low birthweight, behavioral teratogenesis, sudden infant death syndrome (SIDS), neonatal abstinence syndrome.

13 Structural teratogenicity has not been demonstrated, but behavioral teratogenicity manifests as impaired interactive abilities and motor changes.

14 Tremors, restlessness, hyperreflexia, high-pitched cry, sneezing, sleeplessness, tachypnea, yawning, sweating, fevers, and in severe cases seizures.

15 Spontaneous abortion, ectopic pregnancy, preterm delivery, placenta previa, IUGR/low birthweight, placental abruption, PPROM, SIDS.

16 It decreases birthweight by 10–15 g per cigarette smoked daily by direct effects of smoking on fetal growth, decreased maternal caloric intake seen in pregnant smokers, or decreased intervillous volume and decreased number/surface area of fetal capillaries in the placentas of pregnant smokers.

17 It increased overall perinatal mortality from 23.3 per 1000 births in the Ontario Perinatal Mortality Study to 33.4 per 1000 births.

18 Carbon monoxide, because it is preferentially trapped on the fetal side of the placenta, and nicotine.

19 There is an association between cleft palate and smoking seen in all case designs and between cleft lip with or without cleft palate in case–control analyses found in the Swedish Medical Birth Registry. The incidence of oral clefts was increased among smokers whose fetuses have a polymorphic variant of NAT1, an enzyme that is involved in the detoxification of smoke.

20 Ask, Advise, Assess, Assist, and Arrange. (See Table 16.10.)

21

Coffee/tea	100–150 mg/cup
Cola	35–55 mg/12-oz serving
Cocoa	200 mg theobromine/average cup.

22 Limb and digit malformations are seen in rodents exposed to caffeine doses of 50–75 mg/kg. Three cases of ectrodactyly were seen in human neonates, but their mothers had consumed 1100–1777 mg of caffeine daily throughout pregnancy. Epidemiologic studies can identify no increase in congenital malformations related to caffeine intake. There is no convincing evidence supporting a teratogenic or other adverse effect of caffeine on pregnancy when taken in amounts equivalent to less than 10 cups of coffee per day.

Chapter 17
Teratogenic viruses

1 CMV.

2 B. The most common finding in congenital infections with CMV is a petechial rash.

3 D. VZV vaccine; this is a live virus, which is contraindicated in pregnancy. Hepatitis A and B virus vaccines
are recombinant vaccines, while tetanus is a toxoid preparation.

4 D. Newborns are not vaccinated against rubella.

5 C. VZIG has been shown to be effective in preventing the development of acute chickenpox following exposure. It has no efficacy in people who already have clinical manifestations of the disease, or if used 5 days after exposure.

6 A. HSV infection is directly correlated with increased sexual activity.

7 True.

8 D. The second-generation thymidine kinase inhibitor valaciclovir (not penciclovir) is converted to acyclovir *in vivo*.

9 B. Immediate Cesarean delivery in patients with active HSV and preterm premature rupture of the membranes is controversial. Shingles is caused by varicella zoster virus, not herpes simplex virus.

10 C. Rubella causes a fine, macular, "rubelliform" rash, typically starting in the face and neck and extending to the trunk. The most likely diagnosis in this clinical scenario is shingles.

11 D. There is no definitive evidence that HIV type 1 causes teratogenic effects in fetuses and newborns.

12 B. Perinatal transmission of HSV1 and HSV2 is thought to occur predominantly through exposure of the infant to the virus present in the birth canal.

13 A. Parvovirus B19 has not been implicated as a cause of chorioretinitis in fetuses and newborns.

14 D. Limb scarring and hypoplasia is characteristic, though rare, in congenital varicella zoster infections.

15 C. The Centers for Disease Control has identified foreign-born immigrants, primarily from Central and Latin America, as the most common source of individuals serosusceptible to rubella.

16 C.

17 False. Breastfeeding is *not* contraindicated following rubella vaccine administration to postpartum women.

18 A. Approximately 10–20% of patients with acute chickenpox will develop shingles later on in life.

19 A. Without VZIG, infants of mothers who develop chickenpox from 5 days before and up to 2 days following delivery are at high risk of developing disseminated varicella. This high risk relates to delivery of an infant presumably before development of maternal antibodies against chickenpox.

20 A.

Chapter 18
Transplacentally acquired microbial infections in the fetus

1 D
2 C
3 C
4 E
5 D
6 E
7 B
8 A
9 A
10 A
11 D
12 A
13 B
14 C
15 D
16 A
17 B
18 C
19 False
20 True
21 False
22 False
23 False
24 C
25 B
26 E
27 A
28 B
29 A, B, C, D
30 E
31 C
32 D
33 A
34 C
35 B
36 E
37 E
38 B
39 C
40 A
41 B
42 A
43 D
44 E
45 A
46 B

Chapter 19
Antibiotics and other antimicrobial agents in pregnancy and during lactation

1 D
2 C
3 D
4 C
5 D
6 B
7 E
8 B
9 A
10 B
11 B
12 E
13 D
14 D
15 B
16 D
17 A
18 C
19 B
20 A

Chapter 20
Principles of human genetics: chromosomal and single-gene disorders

1 False
2 False
3 True
4 False
5 True
6 False
7 False
8 True
9 False
10 True
11 False
12 True
13 True
14 False
15 False
16 True
17 False
18 True
19 True
20 True

Chapter 22
Basic principles of ultrasound

1 False
2 False
3 True
4 False
5 A
6 B
7 C
8 True
9 B
10 False
11 False
12 True
13 True
14 E
15 D
16 C
17 True
18 True
19 True
20 False

Chapter 23
Prenatal diagnosis of central nervous system malformations

1 C
2 B
3 E
4 D
5 B
6 D
7 A
8 B
9 D
10 D
11 D
12 D
13 C
14 C
15 B
16 A
17 D
18 C
19 A
20 A

Chapter 24
Prenatal diagnosis of thoracic and cardiac abnomalities

1 C
2 A
3 B
4 C
5 A
6 A
7 C
8 C
9 D
10 E

Chapter 25
Gastrointestinal and genitourinary anomalies

1 B
2 C
3 A
4 C
5 C
6 D
7 C
8 D
9 B
10 C
11 D
12 D
13 A
14 D
15 C
16 D
17 D
18 C
19 D
20 A

Chapter 26
Fetal skeletal anomalies

1 C
2 A
3 C
4 B
5 D
6 E
7 E
8 E
9 D
10 B
11 A
12 E
13 C
14 D
15 B
16 E
17 A
18 E
19 E
20 C

Chapter 27
First- and second-trimester prenatal diagnosis

1 D
2 True
3 B
4 True
5 False
6 D
7 False
8 B
9 D
10 C
11 True
12 True
13 True
14 C
15 D
16 True
17 True
18 False
19 A
20 D

Chapter 28
First- and second-trimester screening for open neural tube defects and Down syndrome

1 C
2 B
3 E
4 D
5 A
6 True
7 False
8 True
9 True
10 False
11 Pregnancy-associated plasma protein-A (or PAPP-A)
12 13 (or between 11 weeks/0 days and 13 weeks/6 days)
13 To combine both into a single risk estimate
14 External quality assurance
15 It can result in an earlier offer of diagnostic testing
16 C
17 E
18 A
19 B
20 E

Chapter 29
Prenatal diagnosis of deviant fetal growth

1 C. IUGR could be manifest at a weight above the population determined at the 10th percentile.

2 A. The early stage of embryonic–fetal development is characterized by active mitosis from 4 to 20 weeks' gestation and is called the hyperplastic stage.

3 B. IUGR is an abnormality of fetal growth and development that affects 3–7% of all deliveries.

4 C. Symmetric IUGR accounts for 20–30% of growth-restricted fetuses.

5 C. Fetal growth accelerates from about 5 g/day at 14–15 weeks' gestation to 10 g/day at 20 weeks, peaking at 30–35 g/day at 32–34 weeks, after which growth rates decrease.

6 B. Between 12 and 24 weeks' gestation, the BPD measurements provide reliable estimates comparable to those of the CRL measurement performed in the first trimester of pregnancy.

7 C. The AC has been reported to be the best fetal biometric parameter that correlates with fetal weight and is the most sensitive parameter for detecting IUGR.

8 D. Significant fetal growth restriction is not seen with Turner syndrome or Klinefelter syndrome.

9 D. The infections most associated with IUGR are those caused by rubella and cytomegalovirus, hepatitis A and B, listeriosis, tuberculosis, syphilis, toxoplasmosis, and congenital malaria.

10 D. Several associated morbid conditions of serious concern occurring after different periods of growth failure *in utero* include birth asphyxia, neonatal

hypoglycemia, hypocalcemia, polycythemia, meconium aspiration, and persistent fetal circulation.

11 C. During labor, up to 50% of growth-restricted fetuses exhibit abnormal heart rate patterns. Oligohydramnios is a common finding in growth-restricted fetuses. Incidences of low Apgar scores and cord blood acidemia increase significantly in small-for-gestational-age neonates.

12 D. It has been demonstrated by several authors that there is a linear relationship between FL specifically and long bones in general and crown–heel length of a newborn.

13 A. Depending on the maternal history and ultrasound findings, further diagnostic evaluation may require any or all of the following: fetal karyotyping, maternal serum studies for evidence of seroconversion when there is suspicion of viral infection, with specific amniotic fluid viral DNA testing when indicated, careful observation for early detection of preeclampsia, evaluation of the congenital and acquired thrombophilic disorders, particularly if a previous pregnancy was complicated by early and severe preeclampsia.

14 C. It is now well established by numerous randomized trials that the use of this modality can significantly reduce perinatal death as well as unnecessary induction of labor in the preterm IUGR fetus.

15 B. This form of IUGR is frequently associated with maternal diseases such as chronic hypertension, renal disease, diabetes mellitus with vasculopathy, and others.

16 D. The prenatal diagnosis of IUGR using placental grading is rather limited. In fact, placental grading in general has been supplanted by more sensitive tests and, consequently, is infrequently used in clinical practice.

17 A. Fetal macrosomia is defined as either an estimated fetal weight of more than 4000 g at term or an estimated fetal weight of more than the 90th percentile for gestational age.

18 A. Macrosomia is often associated with diabetes mellitus in pregnancy, especially in women without vasculopathy.

19 D. The American College of Obstetricians and Gynecologists (2000) has concluded that most cases of shoulder dystocia cannot be predicted or prevented.

20 B. Introduction of a protocol of routine Cesarean delivery for ultrasonic estimates of fetal weight of 4250 g or greater in diabetic women significantly reduced the rate of shoulder dystocia from 2.4% to 1.1%.

Chapter 30
Three- and four-dimensional ultrasound and magnetic resonance imaging in pregnancy

1 True
2 False
3 True
4 True
5 False
6 True
7 False
8 False
9 True
10 True
11 False
12 False
13 False
14 False
15 True
16 True
17 False
18 True
19 True
20 True
21 False
22 True
23 True
24 True
25 False

Chapter 31
Doppler ultrasonography and fetal well-being

1 False. However, peak velocity of the maximum velocity envelope correlates with volume flow.

2 False. Waveform patterns are affected by downstream resistance, branching, upstream pump and vessel wall properties, and the blood within.

3 True. This is associated with a decreasing umbilical artery systolic:diastolic ratio with advancing gestation.

4 False. Blood flow may be preserved when the FVW pattern is one of high resistance in the early stages.

5 True. The resistance index provides a measure of the size of the peripheral vascular bed.

6 False. The high-resistance FVW pattern predicts risk of fetal death *in utero*, distress in labor, or neonatal problems in the fetus whether small or large. Only 60–70% of growth-restricted fetuses have a high-resistance pattern.

7 False. Serial studies or trends are useful. A decreasing resistance index predicts expansion of the downstream vascular bed, which indicates placental growth, and an increase indicates contraction.

8 False. It is useful in detecting developing vascular disease even if the fetus is macrosomic.

9 False. The finding of absent or reversed end-diastolic flow velocities indicates poor prognosis.

10 False. In postdate pregnancy, umbilical artery Doppler study does not predict adverse fetal outcome.

11 False. Absent diastolic flow velocities in the fetal aorta predict adverse fetal outcome.

12 False. A low-resistance pattern is seen with developing fetal hypoxemia.

13 True. In profound fetal compromise, there is redistribution of cardiac output to the vital cerebral and coronary circulations.

14 True. Flow and pressure are inversely related.

15 True. The "A" wave of the FVW, produced by atrial systole, tends to zero.

16 False. The degree of fetal anemia is predicted by the peak velocity of the maximum FVW envelope.

17 True. Meta-analysis of randomized controlled trials suggests a 30% reduction in perinatal mortality.

18 True. At 24 weeks, predictive values of 6–40% and sensitivity of 20–60% have been reported. There is debate about the clinical use of this.

19 False. In early pregnancy, no predictive patterns or differences have been observed.

20 True. The notch is probably the result of reflected waves in the uterine circulation.

Chapter 32
Antepartum and intrapartum surveillance of the fetus and the amniotic fluid

1 E. The common basis for selecting patients for antepartum fetal surveillance are those who are at increased risk of perinatal mortality, uteroplacental insufficiency, and fetal asphyxia. Fetal macrosomia, in the absence of other factors (such as diabetes), is not a reason alone to initiate fetal surveillance.

2 E. Active sleep is characterized by frequent gross body movements, rapid eye movements, breathing, normal FHR variability, and accelerations. The near-term fetus spends its time mainly in either a quiet or an active sleep state.

3 B. In general, patients perceive about 80% of ultrasonographically visualized fetal movements.

4 A. A CST is considered *unsatisfactory* if there is an insufficient fetal heart rate tracing or inability to achieve appropriate uterine contractions. Various causes of unsatisfactory CSTs include obesity, excessive fetal activity, and polyhydramnios. A CST is considered *suspicious* if there are nonpersistent (< 50% of the contractions) late decelerations. An important drawback of CST testing, unfortunately, is the high incidence of false-positive CSTs. In fact, the false-positive rate has been reported to be > 50%, depending on which perinatal outcome is defined. This may lead to intervention, which can be significant for the preterm fetus. A CST is considered *positive* when there are consistent, persistent late decelerations, regardless of contraction frequency, in the absence of uterine hyperstimulation. Another possible occurrence is the positive, reactive CST. Some have found that, in those with positive CSTs but accelerations, there were lower rates of perinatal mortality, intrapartum fetal distress, low 5-min Apgar scores, primary Cesarean sections, and neonatal morbidity (versus positive, nonreactive CSTs).

5 E. The CST should be avoided when there is a contraindication to labor. Examples include prior myomectomy or classical Cesarean section scar, placenta previa or placental abruption, premature rupture of membranes, current preterm labor, multiple gestations, and incompetent cervix.

6 D. When the CST is positive and nonreactive, this is the most ominous FHR pattern seen in this testing. In fact, the corrected perinatal mortality rate has been found to be as high as 17% in this group; nonreassuring FHR patterns have been found to occur during labor, and up to 25% of cases demonstrate fetal growth restriction. Therefore, this type of CST result usually necessitates delivery, and Cesarean section should be considered. Varying results have been reported with the suspicious CST. While some have found that they went on to have a positive CST or subsequent perinatal death, others have found no association between this finding and neonatal morbidity or mortality. Thus, it is recommended that patients with a suspicious CST should have a repeat CST within 24 h or be evaluated with another form of antepartum testing.

7 B. While there is excellent specificity with a reactive NST, the predictive value of a positive test is low (in most large studies, it is < 40%). The false-positive rate of a nonreactive NST is also very high. A literature review found false-positive rates of 57–100% for perinatal mortality, and 44–92% with softer outcome measures of perinatal morbidity. Therefore, given this fact, when a nonreactive NST is seen, one can either extend the time of the NST or proceed with other forms of testing (such as the BPP). FHR reactivity is felt to be a good indicator of normal fetal autonomic function and well-being; it depends on normal neurologic development and normal integration of the central nervous system (CNS) control of FHR. On initial testing, almost 85% of high-risk patients show a reactive NST, and the remaining 15% are nonreactive.

8 C. On initial testing, almost 85% of high-risk patients show a reactive NST, and the remaining 15% are nonreactive. Other factors besides fetal hypoxia, asphyxia, behavioral states, and gestational age can lead to a nonreactive NST. They include depressants (narcotics, phenobarbital), beta-blockers (propranolol), and smoking (causes decreased NST reactivity). Preterm fetuses are less likely to have FHR accelerations in association with fetal movements. Thus, the lower the gestational age, the higher the percentage of nonreactive NSTs. This concept should be kept in mind, as fetuses may undergo antepartum surveillance at < 32 weeks.

9 A. Because the majority of nonreactive NSTs occur in healthy fetuses in a physiologically normal sleep state, some have tried to improve NST efficacy by "stimulating" the fetus, in the hope of distinguishing normal fetal sleep from asphyxia. This method may elicit FHR accelerations by utilizing an artificial larynx (positioned on the maternal abdomen over the fetal vertex). While VAS produces increases in intrauterine sound, and although these sound pressure levels are elevated, they are thought to be safe and harmless to the fetus.

10 C. The BPP is performed using real-time ultrasonography to assess multiple fetal biophysical activities, as well as amniotic fluid volume. The BPP is unique in that it assesses both acute (FHR reactivity, fetal breathing movements, fetal movements, fetal tone) and chronic (amniotic fluid volume) markers of fetal condition. Fetal Doppler velocimetry evaluation is not a component of the BPP. An understanding of the fetal biophysical response to hypoxemia and acidemia is essential to interpret the BPP score. The fetus will respond to central hypoxemia/acidemia by altering its movement, tone, breathing, and heart rate pattern.

11 E. The presence of each BPP parameter reflects a normally functioning area of the CNS, evolves *in utero* at predictable gestational ages, and is based on fetal neurophysiology. The gradual hypoxia concept states that the biophysical activities developed last *in utero* are also the first to become abnormal in the presence of fetal acidemia or infection. At about 7.5 weeks, the CNS center controlling fetal tone is the first to develop, followed by development of body movement at 8.5–9.5 weeks. The center controlling regular breathing movements develops after 20–21 weeks, and the center controlling FHR reactivity functions by the end of the second/beginning of the third trimester. Thus, in accordance with the gradual hypoxia concept, early stages of compromise are revealed by abnormalities in FHR reactivity and breathing, while movement and tone are not abolished until much later stages of compromise.

12 E

13 B. Polyhydramnios (pathologic accumulation of amniotic fluid) is defined as an amniotic fluid index > 25 cm, and occurs in 0.2–1.6% of the general population. The causes of polyhydramnios depend on its severity. For instance, one study found the cause to be apparent in only 17% of patients with mild polyhydramnios (idiopathic in the remaining 83%), but in 91% of those with moderate or severe polyhydramnios. When the cause of polyhydramnios can be found, the diagnosis usually falls into the following categories: fetal malformations and genetic disorders, diabetes, Rh sensitization, and congenital infections. Fetal swallowing impairment due to gastrointestinal obstruction (e.g., esophageal atresia) or neurologic deficits may also result in excess amniotic fluid volume. Once polyhydramnios is diagnosed, a targeted and detailed ultrasound should be performed to examine for fetal abnormalities and movement disorders (e.g., gastroschisis, duodenal atresia, anencephaly). Increases in fetal blood volume (twin–twin transfusion) likely increase urine flow and induce polyhydramnios in the recipient twin. Placental dysfunction, however, may result in decreased fetal renal perfusion, leading to oligohydramnios.

14 B. The pathophysiologic processes that can lead to fetal death or damage include decreased uteroplacental blood flow, decreased gas exchange at the trophoblastic membrane level, metabolic processes, fetal sepsis, fetal anemia, fetal heart failure, and umbilical cord accidents. Examples of these processes include the following maternal–fetal conditions: chronic hypertension, postdates pregnancy, fetal hyperglycemia, intra-amniotic infection, erythroblastosis fetalis, cardiac arrhythmia, and umbilical cord entanglement (monoamniotic twins) respectively.

15 A. Normal FHR variability is generally described as the most reliable indicator of fetal well-being, as it reflects intact integration of the central nervous and cardiovascular systems. It is associated with fetal well-being despite the concomitant presence of FHR decelerations. Various causes of decreased variability include fetal asphyxia, fetal behavioral states, gestational age, narcotics, and fetal anomalies. During labor, extended periods of decreased FHR variability (up to 45 min) can normally be seen. If decreased variability is associated with baseline FHR changes, or is seen with recurrent decelerations, the likelihood of fetal compromise increases.

16 C. In 1997, the National Institute of Child Health and Human Development Research Planning Workshop developed standardized definitions for electronic FHR patterns and recommendations for interpreting them. Please refer to Table 32.8 in the textbook to view the definitions of various FHR patterns.

17 D. FHR acceleration as a response to fetal stimulation indicates a nonacidemic fetus. Forms of stimulation include VAS or scalp stimulation. Fetal scalp sampling has limitations and cannot be used in all patients (e.g., closed cervix, intact membranes, presenting fetal part high). In addition, equipment for pH analysis and skilled personnel to perform this technique may not be available. On the other hand, fetal stimulation techniques are noninvasive, are not technically difficult, can be performed earlier in labor, and can be done when scalp pH sampling is not feasible. If the fetus responds normally to either VAS or scalp stimulation, significant acute fetal acidemia has been ruled out, and thus a scalp pH may be unnecessary. Although scalp and acoustic stimulation techniques are simple to perform, they are limited by falsely nonreassuring results.

18 A. FPO is a tool that continuously and directly measures the fetal arterial O_2 saturation during the labor process, with the intent of improving the accuracy of evaluating fetal well-being in labor. It is generally reserved for use when a nonreassuring FHR has been recorded, to assist in identifying those hypoxemic fetuses who may benefit from further intervention, and as an adjunct to (not a replacement for) FHR monitoring. The hope is to decrease the Cesarean rate for fetal distress when fetal O_2 saturation is normal. Fetal acidemia is rare when the fetal arterial O_2 saturation is continually > 30% (critical threshold). Thus, FPO values ≥ 30% are considered reassuring (even when the EFM is nonreassuring), whereas values < 30% warrant consideration of interventions, such as maternal position change or urgent Cesarean.

19 B. Because animal and human studies have shown that fetal hypoxemia during labor can alter the shape of the fetal ECG waveform (notably elevation or depression of the ST segment), technical systems have been developed to monitor the fetal ECG during labor, as an adjunct to continuous electronic FHR monitoring, with the aim of improving fetal outcome and minimizing unnecessary obstetric interference. The fetal ECG STAN analyzes the repolarization segment of the ECG (ST) waveform, which is altered by intramyocardial potassium release, resulting from metabolic acidemia. A recent Cochrane review (2003) of two randomized controlled trials assessing the use of fetal ECG as an adjunct to continuous electronic FHR monitoring during labor found that using ST waveform analysis was associated with fewer babies with severe metabolic acidosis at birth (cord pH < 7.05 and base deficit > 12 mmol/L). This was achieved along with fewer fetal scalp samples during labor and fewer operative deliveries. Their conclusion was to restrict fetal ST waveform analysis to those fetuses demonstrating disquieting features on cardiotocography. Another Cochrane review (2004) of the addition of fetal ECG monitoring reported a nonsignificant trend toward reducing the overall Cesarean rate, when compared with electronic FHR monitoring only. Some have found that, by adding fetal ECG STAN to standard FHR monitoring, this improved FHR tracing interpretation and improved observer consistency in both the decision for and the timing of obstetric interventions, and that it may reduce the number of unneeded obstetric interventions when fetal compromise is absent.

20 E. Antepartum fetal/amniotic fluid surveillance techniques include fetal movement monitoring, contraction stress test, nonstress test, vibroacoustic stimulation, biophysical profile, amniotic fluid volume assessment, Doppler testing (discussed in another chapter), and condition-specific testing. Intrapartum fetal surveillance techniques include fetal heart rate monitoring, fetal acid–base evaluation (fetal scalp blood sampling, umbilical cord acid–base determination), fetal stimulation techniques (fetal scalp stimulation, vibroacoustic stimulation), fetal pulse oximetry, and fetal electrocardiogram ST segment automated analysis.

Chapter 33
The fetus at surgery

1 UCSF in the early 1980s.

2 Sonographically guided shunt procedures for draining obstructed fetal bladders.

3 Open hysterotomy, FETENDO, and FIGS.

4 Fetal meningomyelocele, chest masses with hydrops at previable gestation, solid vascular fetal tumors and hydrops.

5 Balloon tracheal occlusion for congenital diaphragmatic hernia, laser for twin-to-twin transfusion, fetal cystoscopy.

6 Vascular ablations in complicated monochorionic twin pregnancies, balloon angioplasty in obstructive cardiac lesions.

7 Prematurity, fetal injury, fetal death.

8 Premature labor, premature rupture of membranes, uterine rupture/dehiscence in index and subsequent pregnancies, placenta accreta in subsequent pregnancies.

9 Bleeding and infection, pulmonary edema from aggressive tocolytic management.

10 To potentially reduce the need for shunting, and possibly improve neuromuscular and sensory function.

11 The mass effect on the mediastinum may lead to venous obstruction and poor filling of the ventricles leading to hydrops and death.

12 By occluding the trachea, the lungs are expanded by the buildup of fluid in the bronchial tree. This growth may improve survival.

13 Using laser, the causative connecting vessels can be ablated.

14 Ablating the vessels perfusing the acardiac twin reduces the cardiac output of the normal pump twin, decreasing the risk of catastrophic heart failure.

15 Magnesium sulfate, indomethacin, and nifedipine.

16 28%

17 5 weeks

18 18%

19 Endoscopic laser ablation for twin–twin transfusion syndrome.

20 This is a FIGS.

Chapter 34
Fetal medical treatment

1 B
2 False (Lilly under X-ray)
3 False
4 True
5 False
6 True
7 True
8 False
9 False
10 C
11 B
12 D
13 B
14 False
15 False
16 True
17 False
18 True
19 True
20 False

Chapter 35
Maternal biological, biomechanical, and biochemical changes in pregnancy

1 D
2 B
3 C
4 D
5 C
6 D
7 A
8 C
9 D
10 B
11 D
12 A
13 A
14 D
15 B
16 True
17 False
18 False
19 False
20 True

Chapter 36
Maternal nutrition

1 20% of kcal from protein, 30–35% from fat, and 45–50% from carbohydrate.

2 Approximately 27–30 kcal/kg maternal prepregnancy weight during the first trimester, and 30 kcal/kg maternal prepregnancy weight plus 200–300 kcal during the second and third trimesters.

3 Calcium, magnesium, zinc, and vitamins E and B_6.

4 Kidney malformations with 40 000–50 000 IU of vitamin A and aortic stenosis with 4000 IU of vitamin D.

5 30 mg/day.

6 Low birthweight, preterm delivery, and inadequate maternal weight gain.

7 Maternal height, pregravid or early pregnancy body weight, maternal fat deposition, and gestational weight gain.

8 12.5–18.0 kg and 11.5–16.0 kg respectively.

9 7.0–11.5 kg and ≥ 6.8 kg respectively.

10 The loss of upper arm fat or the failure to accrue maternal fat during the second trimester associated with poor fetal growth and subsequent lower birthweights.

11 Second trimester.

12 Older maternal age at childbearing and assisted reproductive technologies.

13 50–62 pounds (22.7–28.1 kg) and 40–54 pounds (18.1–24.5 kg) respectively.

14 38–47 pounds (17.2–21.3 kg) and 29–38 pounds (13.2–17.2 kg) respectively.

Chapter 37
Trauma, shock, and critical care obstetrics

1 B
2 C
3 A
4 C
5 D
6 C
7 D
8 C
9 B
10 A
11 C
12 C
13 D
14 D
15 D
16 B
17 A
18 B
19 D
20 D

Chapter 38
Hypertensive diseases in pregnancy

1 A, false; B, true; C, true; D, true; E, false
2 A, false; B, false; C, true; D, false; E, false
3 A, true; B, false; C, false; D, true; E, false
4 A, false; B, true; C, true; D, true; E, true
5 A, false; B, false; C, false; D, true; E, false
6 A, true; B, true; C, false; D, true; E, false
7 A, false; B, false; C, true; D, true; E, false
8 A, true; B, true; C, false; D, false
9 A, true; B, true; C, false; D, true; E, false
10 A, true; B, false; C, false; D, true; E, false
11 A, true; B, true; C, true; D, false; E, true
12 A, true; B, false; C, false; D, false; E, false
13 A, true; B, false; C, true; D, false; E, true
14 A, true; B, true; C, false; D, false; E, true
15 A, true; B, false; C, false; D, true; E, false
16 A, true; B, true; C, true; D, true; E, true
17 A, true; B, true; C, false; D, true
18 A, true; B, false; C, true; D, true
19 A, false; B, false; C, true; D, true
20 A, false; B, true; C, true; D, true

Chapter 39
Cardiac diseases in pregnancy

1 C
2 B
3 B
4 D
5 B
6 A
7 D
8 C
9 A
10 A
11 A
12 A
13 B
14 A
15 D
16 D
17 D
18 D
19 C
20 B

Chapter 40
Maternal pulmonary disorders complicating pregnancy

1 A, C, G
2 D
3 B
4 B
5 A, B
6 All
7 D
8 C
9 A, B, C, D
10 B
11 C
12 B, D
13 B
14 B
15 All
16 C
17 B, C, D, E
18 A, B, C, D
19 B

Chapter 41
Diabetes mellitus in pregnancy

1 C
2 D
3 B
4 D
5 C
6 C
7 C
8 D
9 E
10 B
11 C
12 D
13 D
14 D
15 A
16 B
17 A
18 B
19 D
20 C

Chapter 42
Endocrine disorders in pregnancy

1 Prolactin levels increase to approximately 10 times nonpregnant values, with peak levels averaging > 150 ng/mL late in pregnancy.

2 Increased cortisol-binding globulin levels during pregnancy contribute to rises in total plasma cortisol. However, levels of adrenocorticotrophic hormone (ACTH) and free cortisol rise substantially due to very high levels of corticotropin-releasing hormone derived from the fetal–placental unit. Urine free cortisol levels commonly triple during pregnancy.

3 Renin and aldosterone levels double during pregnancy. In addition, plasma osmolality decreases by about 10 mOsm/kg because of a resetting of the osmostat.

4 Although there is clearly a need for increased calcium availability during pregnancy, it is not clear what the actual vitamin D "requirements" are during pregnancy. However, relatively large doses of vitamin D, up to 2000 IU/day, have been shown to be safe for the mother and may be beneficial.

5 Increases in total thyroxine (T_4) and triiodothyronine (T_3) occur during pregnancy because of the increase in thyroid-binding globulin levels. This does not affect free hormone levels. However, mild increases in free hormone levels (usually within the normal range) and a mild lowering of TSH occur during normal pregnancy because of the thyrotropic effect of the high chorionic gonadotropin levels. This requires slightly different normal ranges for TSH levels during pregnancy.

6 Hyperemesis gravidarum is associated with very high human chorionic gonadotropin levels and may cause transient biochemical hyperthyroidism.

7 For patients taking replacement doses of L-thyroxine, requirements increase by 30–50% during pregnancy.

8 A placental growth hormone variant is secreted during normal pregnancy, which suppresses maternal pituitary growth hormone and increases maternal IGF-1 levels about twofold.

9 Thyrotoxicosis refers to a clinical condition caused by excess thyroid hormone levels from any cause, whereas hyperthyroidism refers to those conditions caused by increased synthesis and release of thyroid hormone by the thyroid gland.

10 The commonest cause of thyrotoxicosis during pregnancy is Graves' hyperthyroidism.

11 Hyperthyroidism is usually treated with the thiouracil class of antithyroid drugs during pregnancy. Doses are adjusted to maintain high normal free T4 levels to minimize fetal risk.

12 During early pregnancy, Graves' hyperthyroidism commonly worsens, then improves during the third trimester of pregnancy. These changes need to be taken into consideration during therapy.

13 Uncontrolled Graves' hyperthyroidism is associated with increased fetal loss. Overtreatment of Graves' hyperthyroidism with antithyroid drugs may cause fetal goiter and fetal hypothyroidism. Patients with Graves' disease, even if not hyperthyroid, may develop antibodies, which may cause transient fetal hyperthyroidism.

14 Postpartum thyroiditis, also called silent thyroiditis, is related to lymphocytic thyroiditis. It usually presents with a painless goiter and thyrotoxicosis in the postpartum period, and is sometimes followed by hypothyroidism.

15 The diagnosis of acromegaly, Cushing disease, hyperaldosteronism, and a pituitary prolactinoma may all be complicated by the normal hormonal changes that occur during pregnancy.

16 Patients with a prolactin-producing tumor, which may have resulted from induction of fertility by a dopamine agonist, present a therapeutic challenge during pregnancy. Although prolactinomas may grow during pregnancy, most patients with a microprolactinoma can be managed simply by close observation during pregnancy without dopamine agonist therapy.

17 Lymphocytic hypophysitis and Sheehan syndrome may occur in the postpartum period. The former generally presents with headaches, visual field disturbances, and variable pituitary dysfunction often including diabetes insipidus. Sheehan syndrome usually presents after heavy blood loss during delivery with failure to lactate and resume menses. It is usually due to pituitary infarction and is associated with anterior pituitary panhypopituitarism.

18 A mother with congenital adrenal hyperplasia who comes pregnant may have an affected fetus. Prenatal diagnosis is possible, but this is not without risk, and the risk must be weighed against the probability of the fetus being an affected female. Genetic counseling should be included.

19 Pregnant patients with an adrenal mass of unknown etiology can usually be followed during pregnancy with diagnostic evaluation for hormone secretion delayed until the postpartum period. If a large tumor is present or tumor growth occurs making adrenal carcinoma a possibility, a laparoscopic adrenalectomy can be accomplished during surgery.

20 Most patients with primary hyperparathyroidism can simply be followed during pregnancy without specific therapy. If marked hypercalcemia is present with a calcium level > 12 mg/dL, a directed ultrasound-guided parathyroidectomy can be done by an experienced parathyroid surgeon.

Chapter 43
Gastrointestinal diseases complicating pregnancy

1 C
2 E
3 A
4 B
5 D
6 E
7 E
8 B
9 E
10 B
11 E
12 C
13 C
14 B
15 D
16 B
17 D
18 C
19 B
20 E
21 B
22 B
23 E
24 D
25 C
26 C
27 D
28 A
29 A
30 D
31 True
32 B
33 C
34 True
35 False
36 C
37 D
38 True
39 False
40 D
41 False
42 D
43 C
44 True
45 A
46 True
47 D
48 B

Chapter 44
Liver disease in pregnancy

1 D. Bilirubin and liver enzymes remain normal throughout pregnancy, except ALP, which is elevated on account of placental ALP. Any elevation in transaminases or bilirubin should be investigated further. Gallbladder motility is normally decreased in pregnancy. In the absence of clinical signs of acute cholecystitis or a complication related to gallstones, there is no indication for cholecystectomy. Viral hepatitis can occur at any stage of pregnancy and is associated with transaminase elevation, systemic symptoms, and jaundice. The other differential to keep in mind here is AFLP, which occurs in the third trimester, with nonspecific symptoms. Liver biopsy may be needed for diagnosis, but should be done after common causes have been ruled out with noninvasive testing, unless the patient deteriorates clinically.

2 A. This is the classical presentation of HELLP syndrome seen in 4–12% of patients with preeclampsia. Management is expectant, with early delivery if needed, preferably once fetal lung maturity is reached. Liver biopsy can be higher risk because of low platelets.

3 D. This patient has AFLP. The earliest indicator of acute liver failure is prolongation of prothrombin time and encephalopathy. Liver failure can progress very rapidly. Delivery is the definitive treatment for AFLP. Most patients improve in 1–4 weeks after delivery, with complete recovery of liver function. If untreated, patients rapidly develop complications including hepatic coma, seizures, gastrointestinal or uterine bleeding, pancreatitis, DIC, etc., and the mortality risk increases rapidly. Vitamin K only corrects coagulopathy if there is a condition associated with vitamin K deficiency such as obstructive jaundice, malnutrition, etc.

4 D. Microvesicular steatosis is characteristic of AFLP. It is also seen in Reye syndrome, valproate or tetracycline toxicity.

5 E. HBsAg indicates either chronic active hepatitis or a carrier state, and anyone with HBsAg in blood is potentially infectious. Detailed serological analysis can help to determine whether the woman is a carrier or has chronic active hepatitis. Normal liver enzymes suggest that she may not have chronic active hepatitis. The presence of e Ag indicates active viral replication and a much higher risk of transmission of infection to the fetus. Once the patient is infected, there is no role for vaccine for the mother. Transmission of infection to the fetus occurs intrapartum in > 95% of cases. HBIG given at delivery and HBV vaccine soon after prevents infection of the fetus. Interferon treatment during pregnancy is not indicated because of the high side-effect profile for mother and fetus. Patients with normal ALT respond poorly to treatment with interferon, lamivudine, or adefovir. Even with successful treatment, most patients have a decrease in HBV viremia to $< 10^5$ copies/mL and develop anti-HBe antibodies, but do not become HBSAg negative or HBV DNA negative by PCR. They therefore still remain infectious.

6 B. This is the classical presentation of hyperemesis gravidarum. Resting tachycardia indicates early dehydration and should be treated with intravenous fluids. Liver AST and ALT can be elevated up to 500–1000 IU/L and return to normal quickly following intravenous hydration and conservative management. While it is useful to check hepatitis serology in any patient admitted with abnormal liver enzymes, liver biopsy is not usually necessary. In most cases, diagnosis can be established by noninvasive testing and following the clinical course. Fatty liver on US is a common finding. AFLP occurs in the third trimester or postpartum, and not in the first trimester.

7 B

8 C. The patient has preeclampsia and possible HELLP syndrome. Acute onset of severe pain can be seen in any of the three conditions listed in question 7, but elevation of transaminases to > 1000 IU/L is seen only in liver infarction, among the conditions listed. CT or MRI is the diagnostic test of choice. Viral hepatitis and drug toxicity are other conditions that can cause severe elevation of liver transaminases, but a clinical history of acute severe abdominal pain does not support those.

9 C. Although allergy to drugs is possible, it usually causes urticarial or maculopapular eruption. Upper limit of CBD diameter in an adult is 7 mm, and it is not unusual to find slightly dilated CBD. Gallbladder hypomotility and lithogenicity are consequences of pregnancy and do not need attention unless there is a complication. Elevation of transaminases is a sensitive early test for ICP. Total bile acid concentration should be measured to confirm the diagnosis.

10 C. The patient has acute hepatitis. Hepatitis A IgG antibody suggests past exposure to HAV. IgM antibody suggests newly acquired infection. HBsAg-negative and anti-HBS antibody-positive status suggests past infection with spontaneous clearance of virus and protective antibody response. HCV antibody remains positive for life once the patient is exposed, and is not a protective

antibody. HCV does not cause the severity of hepatitis seen in this patient. Confirmation of active HCV infection is by PCR. Hepatitis E is prevalent in South Asia, Mexico, and many other developing countries. Normally, it is a self-limiting illness but, in pregnant patients, it can take a severe fulminant course with very high mortality. Given her recent travel to India, this is the most likely diagnosis, and requires admission, very close monitoring, and early delivery. Herpes simplex can also cause a severe acute hepatitis. EBV usually causes a mild hepatitis.

11 C. The patient has rapid accumulation of ascites as suggested by shifting dullness on clinical examination. Absence of severe abdominal pain and shock makes subcapsular hematoma and rupture less likely. Budd–Chiari syndrome (hepatic vein thrombosis) develops in the setting of a hypercoagulable state such as pregnancy, or other underlying coagulation disorders. It presents with rapid accumulation of ascites, hepatomegaly, development of varices, and can progress rapidly to liver failure. Doppler ultrasound reveals decreased or absent hepatic venous flow. It is managed with prompt delivery, anticoagulation, and supportive care.

12 A. Sepsis can cause ICP, and this improves with appropriate treatment of sepsis. Improvement in bilirubin can lag behind improvement in liver enzymes by days to weeks. ICP is a possibility, but total bile acids are only mildly elevated, and she does not have any pruritis. It is therefore unlikely to be ICP. There are no gallstones and no biliary dilation to suggest choledocholithiasis. Therefore, there is no need for ERCP. Liver biopsy is an invasive test with a 1% risk of significant bleeding, and even a very low risk of mortality. If she fails to improve after adequate antibiotic therapy, then it may be necessary to do a liver biopsy, but not at this stage.

13 B. The maternal mortality risk is 1–3%, although rates as high as 25% have been reported. Perinatal mortality risk is about 35% (range 10–60% in different studies). If preeclampsia is severe or develops after 36 weeks' gestation, and fetal lung maturity is likely to have been reached, then the baby should be delivered. This decreases maternal and fetal mortality risks significantly.

14 C. Pregnancy has no effect on the natural history of hepatitis C. However, interferon and ribavarin used to treat hepatitis C are teratogenic and, therefore, patients are advised not to get pregnant during treatment for hepatitis C. For genotype 1a, which is the commonest genotype in the USA, the treatment duration is 1 year. With good patient compliance, and if the patient is able to tolerate at least 80% of the dose of pegylated interferon and ribavarin each, for at least 80% of the total duration of therapy, sustained viral response (SVR) rates are up to 70%. Genotypes 2 and 3 have much higher SVR rates of > 90% given the 80/80/80 rule described above. Overall response rates for hepatitis C treatment for all genotypes combined, and without the 80/80/80 criteria being met, are about 55%. There is no vaccine for hepatitis C. Risk of transmission to the fetus from the mother is about 10% in hepatitis C antibody-positive patients, and is 30–33% if they are PCR positive for hepatitis C.

15 B. Autoimmune hepatitis, like other chronic liver diseases, reduces fertility but, after successful treatment, fertility returns, and these patients can get pregnant. In most cases, they have to continue low-dose immunosuppressant medication long term, and the risk of teratogenicity is very small at these doses. There is an increased risk of prematurity, stillbirth, preeclampsia, etc. Some patients can come off all immunosuppressant medication after 18–24 months. All these patients should be managed in close consultation with a hepatologist.

16 C. AFLP is seen in the third trimester or postpartum. She has acute hepatitis, but not acute liver failure. The latter is characterized by coagulopathy, encephalopathy, and rapid deterioration. Increasing prothrombin time is an early indicator of acute liver failure. Her clinical picture is consistent with acute hepatitis. Hepatitis A is the most likely virus, although hepatitis B is also possible. Hepatitis A is still prevalent in the United States. Hepatitis B is transmitted parenterally, and a more detailed history may be needed about sexual exposure, blood exposure, intravenous drug use, etc. Hepatitis E is not prevalent in the United States, but is seen in developing countries, and behaves like hepatitis A, except that, in pregnancy, it takes a more fulminant course.

17 A. Herpes simplex usually causes mild hepatitis but, in pregnant women, it can cause a more severe hepatitis. Most patients have upper respiratory infections. Diagnosis is established easily if there are genital lesions that can be cultured. Serology can be helpful, but does not distinguish easily between previous and current active infection. Liver biopsy shows classical inclusion bodies in hepatocytes. Treatment with acyclovir is successful in most cases.

18 D. Hyperemesis gravidarum has no effect on the infant. In severe cases, birthweight may be slightly lower than average, but there is no developmental anomaly or retardation.

Chapter 45
Pregnancy complicated by renal disorders

1 D
2 False
3 False
4 C
5 A
6 B
7 C
8 D
9 D
10 C
11 True
12 A
13 B
14 A
15 C
16 B
17 C
18 False
19 A
20 D

Chapter 46
Neurological disorders in pregnancy

1 A
2 E
3 True
4 C
5 E
6 A
7 False
8 B
9 D
10 C
11 B
12 C
13 A
14 True
15 E
16 B
17 C
18 False
19 A
20 E

Chapter 47
Thromboembolic disorders of pregnancy

1 A
2 D
3 B
4 C
5 D
6 C
7 B
8 A
9 D
10 D
11 C
12 D
13 A
14 C
15 C
16 B
17 A
18 C
19 D
20 D

Chapter 48
Coagulation and hematologic disorders of pregnancy

1 D
2 C
3 D
4 B
5 A
6 A
7 C
8 D
9 D
10 A
11 C
12 C
13 A
14 D
15 C
16 B
17 D
18 C
19 A
20 A

Chapter 49
Maternal alloimmunization and fetal hemolytic disease

1 See below:
- The woman must be Rh negative and the fetus must be Rh positive.
- The mother must be immune competent.
- Fetal erythrocytes must enter the maternal circulation in sufficient quantity to evoke a maternal response.

2 With the first transplacental hemorrhage (TPH), the maternal primary Rh immune response develops slowly (typically over 6–12 weeks, but sometimes up to 6 months). This first response is primarily IgM mediated, and is usually weak. IgM does not cross the placenta; consequently, the fetus is protected. With a subsequent pregnancy and a subsequent TPH, a previously immunized woman can convert rapidly (days) to an IgG-mediated response, which does readily cross the placenta. The anti-D IgG coats Rh-positive fetal erythrocytes and triggers hemolysis. Additional episodes of TPH may further increase the antibody titer. Long periods between Rh-positive erythrocyte exposures are associated with marked increases in Rh antibody titer along with increased binding avidity for the D antigen. The greater the avidity, the more severe the disease.

3 ABO incompatibility between the Rh-positive fetus and the Rh-negative mother reduces the risk of immunization to 1.5–2%. The partial protection reflects, at least in part, rapid intravascular hemolysis of the fetal ABO-incompatible cells and their sequestration in the liver, where there are fewer antibody-forming lymphocytes than in the spleen. ABO incompatibility confers no protection once Rh immunization has developed.

4 Fetal blood is produced in the yolk sac as early as the third week. Erythropoiesis begins in the yolk sac but moves to the liver and, finally, to the bone marrow by 16 weeks' gestation. The Rh antigen is detectable on the red cell membrane by the sixth week.

5 Maternal IgG anti-D crosses the placenta and coats the D-positive fetal red cells. The fetal red cells are destroyed extravascularly, primarily in the spleen, as anti-D does not fix complement. The resulting anemia stimulates fetal erythropoietin synthesis and release. A reticulocytosis occurs when the fetal hemoglobin deficit exceeds 2 g/dL compared with gestational age-appropriate norms. Should marrow red cell production fail to compensate, extramedullary erythropoiesis recurs, initially in the liver and the spleen. Hepatomegaly may become extreme. Cardiac output increases, and 2,3-diphosphoglycerate levels are enhanced. Although the blood P_{O_2} is unaltered, tissue hypoxia results from

the decreased carrying capacity. Umbilical arterial lactate begins to rise only after the fetal hemoglobin falls below 8 g/dL, while the umbilical venous lactate begins to rise after the hemoglobin falls below 4 g/dL. Nucleated red cell precursors from normoblasts to primitive erythroblasts are released into the circulation (hence the term erythroblastosis fetalis).

6 When the globin chain is split from hemoglobin during hemolysis, the remaining heme pigment is converted by heme oxygenase to biliverdin, and then by biliverdin reductase to neurotoxic indirect bilirubin. The fetal and newborn liver is deficient in glucuronyl transferase and Y transport protein. Thus, the increased indirect bilirubin is deposited in the perinate's extravascular fluid. Indirect bilirubin is water insoluble and can remain in the plasma only when bound to albumin. When the albumin-binding capacity of the perinate's plasma is exceeded, "free" indirect bilirubin appears and diffuses into fatty tissues. The neuron membrane has a high lipid content, and the free indirect bilirubin penetrates the neuron, where it interferes with cellular metabolism. Mitochondria swell, then balloon, and the neuron dies. The dead neurons with accumulated bilirubin appear yellow at autopsy (kernicterus).

7 Bilirubin reaches the amniotic fluid primarily by excretion into fetal pulmonary and tracheal secretions and diffusion across the fetal membranes and umbilical cord. Amniocentesis allows spectrophotometric determination of amniotic fluid bilirubin, which correlates with the severity of fetal hemolysis. The deviation from linearity at 450 nm (the ΔOD 450 reading) correlates directly with disease severity.

8 Liley divided a plot of single amniotic fluid sample ΔOD 450 readings from 101 pregnancies after 28 weeks' gestation into three zones and related them to neonatal outcome. Readings in zone 1 indicated mild or no disease, but did not exclude the possibility that treatment would be required after birth. Readings in zone 2 were felt to indicate intermediate disease, increasing in severity as the zone 3 boundary was approached. With further study, it became clear that a single measurement of ΔOD 450 was poorly predictive of the fetal status unless it was extremely high or extremely low. Liley emphasized the need for repeating the amniotic fluid analyses to establish the ΔOD 450 trend.

9 Cordocentesis is the most accurate means of determining the degree of severity of hemolytic disease, in the absence of hydrops fetalis – it allows the measurement of all blood parameters that can be measured after birth (hemoglobin, hematocrit, serum bilirubin, direct and indirect platelet count, leukocyte count, serum proteins, and blood gases). Cordocentesis has an associated mortality rate of 1% and approximately 5% morbidity (prolonged bradycardia, umbilical cord hematoma, amnionitis with maternal adult respiratory distress syndrome, and placental abruption). Consequently, cordocentesis is recommended when a screening tool such as the measurement of the middle cerebral artery (MCA) peak velocity is abnormal.

10 Maternal or fetal blood produces sharp 580-, 540-, and 415-nm oxyhemoglobin peaks that obscure the ΔOD 450 readings. Small amounts of blood do not mask the ΔOD 450, but small amounts of plasma, particularly fetal plasma, can increase the ΔOD 450 reading, giving a falsely high reading. Heme produces a 405-nm peak, which may obscure the 450-nm peak, but can itself be indicative of severe hemolytic disease. Meconium in amniotic fluid distorts and increases the 450-nm peak. Exposure of the sample to light (particularly fluorescent light) decolorizes bilirubin, reducing the ΔOD 450 peak. Maternal urine produces no ΔOD 450-nm peak. Ascitic fluid is clear, bright yellow, and more viscous than amniotic fluid because of a higher protein level. It has a much higher ΔOD 450 level. Congenital anomalies, such as anencephaly, open meningomyelocele, and upper gastrointestinal obstruction, produce hydramnios and markedly elevated ΔOD 450 readings, which may be misleading if the mother is immunized.

11 A number of investigators reasoned that decreasing fetal hemoglobin would be associated with a lower blood viscosity and increased cardiac output, producing higher blood velocities. Sites studied include the descending aorta, the umbilical vein, the splenic artery, the common carotid artery, and the MCA. The peak systolic velocity in the fetal MCA has proved more accurate. Normative data have been established for gestational age. Using a threshold value of 1.5 multiples of the mean (MoM) to predict moderate to severe anemia, more than 70% of invasive tests were avoided. Since 2000, multiple reports have confirmed the high sensitivity of the peak MCA velocity in detecting moderate to severe fetal anemia.

12 Management begins upon identification. When the maternal indirect Coombs' antibody titers are below the threshold (below which severe fetal hemolytic disease does not occur), they should be repeated monthly. Once the critical titer is exceeded, the fetus is followed with serial measurements of the peak MCA velocity. (It is important to remember that a determination of the fetal Rh genotype using polymerase chain reaction (PCR) analysis should be standard in any at-risk women undergoing CVS or second-trimester amniocentesis because a negative result eliminates the need for further testing.) The timing of invasive fetal testing (cordocentesis) is now determined by ultrasound

evidence of fetal anemia (when the peak MCA velocity becomes elevated). The first cordocentesis should be performed when the peak MCA velocity becomes elevated. Laboratory tests performed on the first fetal specimen include: type and Rh status, direct Coombs' test, complete blood count (CBC), manual reticulocyte count, and total bilirubin. Laboratory tests on subsequent fetal specimens include CBC, manual reticulocyte count, and total bilirubin. If the fetus is not anemic when first sampled, a strongly positive direct Coombs' test or a manual reticulocyte count outside the 95% confidence interval are strong risk factors for the development of anemia *in utero*. Approximately 50% of isoimmunized women will require only one cordocentesis and, with the use of Doppler ultrasound, delivery may be safely deferred until term.

13 Again, this begins with identification. If the fetus is deemed to be at risk, initiate serial MCA Doppler measurements by 18 weeks to monitor these pregnancies. Testing should be repeated every 1–2 weeks as long as they are normal. If a rising value for peak MCA Doppler velocity greater than 1.5 MoM is found, a cordocentesis should be performed and the fetus transfused if the hematocrit is < 30%.

14 The blood used for fetal transfusion should be from a fresh donor, group O, and negative for the antigen (or antigens) to which the mother is sensitized. It should also be negative for hepatitis B surface antigen (HBsAg), anti-human immunodeficiency virus (HIV), anti-hepatitis C virus (HCV), and anti-cytomegalovirus (CMV).

15 Intraperitoneal fetal transfusion is the original, but now least preferred, method of fetal transfusion. Disadvantages include a slow correction of the fetal anemia and a higher risk of trauma. There is the added risk of obstruction of cardiac return if the intra-abdominal pressure becomes too high.

16 Infants who have received *in utero* transfusion therapy do well after birth. Generally, the neonatal capillary hematocrit increases by about 15% within the first few hours of life (likely secondary to fluid shifts) and then decreases slowly to a level at or below the umbilical cord hematocrit level at delivery over the next few days to weeks. As these infants are now delivered at term, they have a higher tolerance to bilirubin levels and can usually be managed with phototherapy alone. The infant may develop anemia by 5 weeks after delivery; this is expected as the transfused blood is nearing the end of its lifespan. This neonatal anemia is also likely indicated by a low reticulocyte count. These neonates should have their hematocrit and reticulocyte count monitored weekly. The therapeutic goal is to maintain them with a modest anemia; small transfusions will keep the infant asymptomatic but leave the erythropoietic stimulus unblunted. Once reticulocytosis is observed, the neonate will no longer need further transfusion therapy.

17 RhIG must be given in adequate amounts, and it must be given before Rh immunization has begun. RhIG administration does not suppress Rh immunization once it has begun, no matter how weak the immunization.

18 In the United States, it is recommended that 300 µg of RhIG be administered within 72 h of delivery of a Rh-positive infant. This dose will protect against sensitization from TPH of 30 mL of fetal whole blood. Approximately 1 in 1000 deliveries will exceed this volume. Therefore, routine screening at delivery for excessive TPH is indicated. The rosette test is performed first; if negative, the patient need only receive the standard dose of RhIG, and if positive, a Kleihauer–Betke stain is performed to determine the number of additional vials of RhIG needed to prevent maternal sensitization.

Chapter 50
Maternal infections, human immunodeficiency virus infection, and sexually transmitted diseases in pregnancy

1 A	**6** C
2 D	**7** A
3 B	**8** D
4 A	**9** B
5 C	**10** B

Chapter 51
Rheumatologic and connective tissue disorders in pregnancy

1 A	**11** D
2 D	**12** E
3 D	**13** A
4 C	**14** D
5 D	**15** A
6 A	**16** C
7 B	**17** A
8 D	**18** A
9 D	**19** B
10 A	**20** D

Chapter 52
Dermatologic disorders during pregnancy

1 Hyperpigmentation is the most common skin change during pregnancy, and is most pronounced in scars,

melanocytic nevi and ephelides, areolae, and genital, perineal, and axillary skin.

2 Delay of treatment until well after delivery is reasonable, as melasma resolves spontaneously in the majority of patients. If treatment is desired, 4% hydroquinone with sunscreen may be used. Topical retinoids and azeleic acid have also been reported to be effective.

3 A skin biopsy. Any melanocytic nevus undergoing significant change during pregnancy should be sampled to explore the possibility of melanoma.

4 No. Prognosis appears to be the same, based upon the characteristics of the tumor. Of note, melanoma is the most common cause of placental metastasis.

5 Although pyogenic granulomas may decrease in size and involute if left alone, treatment is usually indicated to stop the nearly constant erosion and bleeding. Treatment is best accomplished by removing the bulk of the tumor surgically followed by destruction of the feeder vessel.

6 Striae have been associated with vaginal lacerations during delivery.

7 Telogen effluvium is a shedding of hair that begins roughly 2–4 months after delivery, lasts for 2–4 months, and resolves over many months without intervention.

8 Beau's lines are transverse depressions in the surface of the nail plate that arise from physiologic changes in the nail matrix. The Beau's lines will move distally with continued nail growth, resulting in a normal nail plate after many months.

9 Polymorphic eruption of pregnancy, at up to 1:150 pregnancies.

10 A primigravida presents in her third trimester with pruritic urticarial papules on the abdomen, favoring the striae, but sparing the periumbilical skin.

11 Skin biopsy with direct immunofluorescence (DIF) is the most reliable. DIF is negative in polymorphic eruption of pregnancy. In pemphigoid gestationis, DIF shows a characteristic linear deposition of C3 (and sometimes IgG) along the basement membrane zone.

12 Maternal risks include the predictable postpartum flare and a high likelihood of recurrence with subsequent pregnancies. Fetal risks include prematurity, low birthweight, and small size for gestational age. In addition, some newborns may get a transient, nonscarring bullous eruption that resolves within 2 weeks.

13 Systemic steroids. Topical steroids may suffice in milder cases or in the newborn with an eruption.

14 Pustular psoriasis.

15 Impetigo herpetiformis is associated with placental insufficiency, which puts the fetus at risk of stillbirth, neonatal death, and fetal abnormalities.

16 Cholestasis of pregnancy typically presents in the third trimester with pruritus on the palms and soles that later spreads to include the trunk, extremities, and face. Cholestasis of pregnancy has no primary skin lesions, but may present with excoriations in more severe cases. Jaundice may follow pruritus in a minority of cases.

17 Pruritus resolves within 1–2 weeks of delivery, and the laboratory values normalize somewhat later, about 4–6 weeks postpartum.

18 Viral hepatitis.

19 Maternal risks are generally minimal and limited to severe pruritus, but there is a 70% risk of recurrence in subsequent pregnancies. In a few cases, postpartum hemorrhage has been reported. The risk of fetal complications is substantial and may include fetal distress, meconium staining, preterm labor, and increased perinatal mortality.

20 Symptomatic treatment with emollients, anti-itch lotions, and antihistamines may suffice in mild cases. In more severe cases, systemic therapy may be required, and those aimed at reducing serum bile acids have had the most success in treating the pruritus and normalizing the laboratory values. Finally, many authors advocate elective early delivery, as most singleton intrauterine deaths have occurred after 37 weeks of gestation.

Chapter 53
Cancer and other neoplasms in pregnancy

1 C
2 B
3 E
4 A
5 C
6 B
7 C
8 A
9 D
10 E
11 B
12 C
13 D
14 A
15 E
16 C
17 C
18 C
19 B
20 C
21 C
22 C
23 E
24 A

Chapter 54
Pregnancy before age 20 years and after age 35 years

1 A–D
2 B
3 A, B, C
4 B, D
5 A–D
6 A, B, C
7 A, B, C
8 B, D
9 A, C
10 A–D
11 A, B, C
12 A, C
13 A–D
14 A–D
15 A, C
16 A–D
17 A–D
18 B, D
19 A, C
20 A, B, C

Chapter 55
Essentials in biostatistics and perinatal epidemiology

1 A, C, D
2 A
3 E
4 D
5 F
6 C
7 B
8 A
9 E
10 D
11 True
12 False
13 False
14 False
15 False
16 True
17 True
18 True
19 True
20 False

Chapter 56
Sexuality in pregnancy and the postpartum period

1 Usually no. On average, spontaneous lacerations lead to fewer perineal problems than episiotomies.

2 Sexual intercourse might harm the fetus if it leads to an infection with a sexually transmitted disease (STD) or if the expectant mother has certain pregnancy complications, e.g., vaginal bleeding, placenta previa. There is no reason to discourage the great majority of healthy pregnant women and their partners from sexual activity; however, the male superior position should not be used in advanced pregnancy.

3 No. Breastfeeding is associated with reduced sexual interest and lack of lubrication as a result of hormonal effects, lack of sleep, and (possibly) psychological problems of women and their partners (nutritional versus erotic function of the breasts, irritation because of milk leakage during sexual activity). The sexual situation usually improves after the termination of breastfeeding; however, breastfeeding is very healthy for the baby and mother and should not be terminated for sexual reasons.

4 No. At the end of pregnancy, most expectant mothers are not very interested in sex; however, the second trimester of pregnancy, especially, can be a very erotic phase of life. Variability is very high in this respect.

5 No, unfortunately not. The postbirth visit usually focuses only on contraception and takes place at a time when only about one-half of all new mothers have resumed intercourse. Taboo topics such as perineal pain, fear of resuming intercourse, or incontinence are often not even mentioned.

6 No, it seems not; although undergoing a Cesarean section presents a greater health risk than vaginal delivery in other respects.

7 In Western countries, up to about one-quarter of the partners of pregnant women have extramarital relationships during pregnancy and the first months postpartum, and often the women are unaware. This raises questions about the risks of STD/HIV during pregnancy and breastfeeding.

8 Vaginal bleeding, abdominal pains, rupture of the membranes, premature dilation of the cervix, heightened risk of premature labor, placenta previa, placental insufficiency, incompetent cervix, and, possibly, multiple pregnancy.

9 Physiologically "good" times for sex are during the first two trimesters of pregnancy (intensified genital vasocongestion during sexual excitement; intensified orgasm). Sexual physiology is possibly impaired in the third trimester of pregnancy (climax might be accompanied by cramps and tonic muscle spasms, big belly), and usually impaired in the first 3 months after birth and for the duration of (full) breastfeeding (problems with episiotomy or perineal tears; less sexual arousability; walls of the vagina thinner; orgasm less intense). Breastfeeding women may ejaculate milk during climax. After about 3 months, or on cessation of breastfeeding, these changes regress.

Chapter 57
Psychiatric problems during pregnancy and the puerperium

1 True. The leading cause of maternal death through the first postpartum year has been found to be suicide. In one large study, the women who committed suicide had support, were more often socially advantaged with a better education, and were frequently health professionals. The majority suffered from psychosis or a severe depressive illness. Almost one-half had been admitted to a psychiatric hospital following a previous

childbirth. Providers caring for them in subsequent pregnancies were unaware of their history.

2 True

3 True. This is 10 times the recommended daily dose for women of childbearing age.

4 True. Puerperal prophylaxis with a mood stabilizer reduces the rate of recurrence to 10%.

5 C. Lithium is currently considered the first-line treatment option to manage bipolar disorder in pregnancy. The risk for Ebstein's anomaly is lower than initial reports claimed. For first-trimester exposure to lithium, high-resolution ultrasound should be performed to aid in decision-making; this should include fetal echocardiography at 16–18 weeks. Whenever possible, taper and hold lithium during the cardiac window of risk (21–56 days after conception) and resume thereafter. Lamotrigine may be a promising agent to use in the future as it appears to have a lower teratogenic potential than the other anticonvulsants; however, exposure data are limited.

6 E. All of the above.

7 B. 1 and 3 are correct. Monoamine oxidase inhibitors are generally contraindicated in pregnancy because of the risk of a hypertensive crisis if co-administered with tocolytic agents. Adequate prospective exposure data for escitalopram are not available. First-trimester paroxetine exposure may be associated with a slightly increased risk for cardiac malformations (FDA alert, 2005; see Further reading).

8 A. 1, 2, and 3 are correct. Avoid prescribing multiple antidepressants as data reporting the risks of exposure to multiple agents are not available; instead, increase the single medication to a full therapeutic dose.

9 E. All of the above.

10 E. All of the above.

11 E. All of the above.

12 B

13 A

14 D

15 C

16 E

17 B

18 D

19 A

20 C

Chapter 58
Ethical and legal dimensions of medicine of the pregnant woman and fetus

1	C	11	B
2	C	12	A
3	A	13	C
4	B	14	D
5	A	15	B
6	C	16	A
7	A	17	B
8	C	18	A
9	C	19	A
10	C	20	D

Chapter 59
Bleeding in the third trimester

1	False	11	D
2	True	12	D
3	False	13	C
4	False	14	D
5	False	15	D
6	True	16	D
7	True	17	A
8	D	18	C
9	B and C	19	D
10	B	20	C

Chapter 60
Normal and abnormal labor

1	A	11	A
2	B	12	D
3	B	13	A
4	B	14	C
5	B	15	C
6	D	16	D
7	C	17	B
8	B	18	C
9	A	19	A
10	D	20	B

Chapter 61
Operative vaginal delivery

1	False	11	D
2	B	12	True
3	True	13	D
4	D	14	D
5	C	15	D
6	C	16	D
7	C	17	B
8	True	18	False
9	D	19	C
10	B	20	A

Chapter 62
Preterm labor

1 B
2 C
3 D
4 D
5 E
6 C
7 C
8 B
9 C
10 D
11 A
12 C
13 D
14 C
15 D
16 D
17 D
18 C
19 A
20 B

Chapter 63
Prelabor rupture of the membranes

1 B
2 E
3 C
4 B
5 A
6 D
7 D
8 E
9 D
10 D
11 A
12 F
13 B
14 C
15 C
16 E
17 B
18 B
19 C
20 F
21 C
22 E

Chapter 64
Prolonged pregnancy

1 True

2 True

3 E

4 False. Women with one previous prolonged pregnancy have a 30% chance of a recurrent prolonged pregnancy.

5 True

6 B

7 False. Reaches nadir at 39–40 weeks and increases at 41 weeks.

8 A

9 True

10 True

11 B

12 False. While there is an increased incidence of stillbirth with increasing gestational age beyond 40 weeks, most studies have shown no clear benefit from the induction of labor versus conservative management with aggressive fetal assessment.

13 A

14 C

15 False. Serial measurements of symphysis fundal height may be useful in identifying the occasional case of growth restriction or macrosomia; however, these measurements are of no value in establishing gestational age.

16 True

17 A

18 True

19 False. In a study by Goeree et al., an induction strategy resulted in significantly lower cost (US$2502 for induction strategy versus US$2684 for conservatively managed).

20 False

Chapter 65
Anesthesia in the high-risk patient

1 E
2 C
3 E
4 B
5 E
6 False
7 D
8 B
9 E
10 D
11 B (1 and 3)
12 D (4 only)
13 B (1 and 3)
14 C (2 and 4)
15 A (1, 2, and 3)
16 C (2 and 4)
17 E (All)
18 B (1 and 3)
19 A (1, 2, and 3)
20 E (All)

Chapter 66
Puerperium and lactation: physiology of the reproductive system

1 A
2 C
3 D
4 B
5 C
6 A
7 B
8 A
9 D
10 A
11 C
12 B
13 C
14 A
15 C
16 D
17 A
18 A
19 B
20 A

Chapter 67
Premature birth and neurological complications

1 Approximately 1.5%.

2 More than 85%.

3 5–15%; 25–50%.

4 Posthemorrhagic hydrocephalus (PHH); periventricular hemorrhagic infarction (PVI).

5 a) Subependymal germinal matrix.
b) Source of neuronal precursors in the first trimester or production of glioblasts during the third trimester.

6 Less than 20%.

7 a) Less than 50%.
b) Cranial ultrasonography (performed between 7 and 14 days of age).

8 Obliterative arachnoiditis in the posterior fossa causes obstruction of cerebrospinal fluid flow.

9 Venous infarction resulting from obstruction of flow in the terminal vein by ipsilateral large germinal matrix hemorrhage.

10

PVI:	PVL:
a) unilateral–periventricular white matter;	bilateral–periventricular white matter;
b) venous.	arterial.

11 Hypoxic–ischemic insult to watershed zone of arterial blood supply; vulnerability of oligodendrocyte precursors; injury to white matter from inflammatory mediators.

12 Spastic diplegia; visual impairment.

13 Hearing impairment.

14 Hypoglycemia causes a two- to threefold increase in cerebral blood flow.

15 In premature newborns (with impaired cerebrovascular autoregulation), it may increase the risk of GMH–IVH.

16 a) Antenatal corticosteroids.
b) Induced lung maturation and therefore decrease respiratory distress syndrome; stabilization of germinal matrix vessel wall.

17 Prolonged labor (>10–12 h); vaginal delivery.

18 Neuromuscular paralysis with pancuronium; prophylactic indomethacin for patent ductus arteriosus.

19 Selective neuronal necrosis of thalamus, brainstem; periventricular leukomalacia; multifocal infarction; periventricular hemorrhagic infarction.

20 Seizures; abnormal neurological examination at term; posthemorrhagic hydrocephalus.

Chapter 68
Common problems of the newborn

1	A	**11**	True
2	D	**12**	False
3	E	**13**	E
4	False	**14**	D
5	C	**15**	B
6	E	**16**	D
7	E	**17**	C
8	B	**18**	C
9	True	**19**	A
10	A	**20**	B