



# 5

## Growth and Measurement

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### LEARNING OBJECTIVES

*After studying Chapter 5 in the textbook and completing this section of the workbook, students should be able to:*

1. Recognize anatomic and physiologic factors that influence growth.
2. Identify interview methods to gather data pertinent to growth and development.
3. Describe tools and instruments used to assess developmental achievement.
4. Identify expected findings relevant to growth and development throughout the life span.
5. Describe variations in findings that may be considered within normal range.

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### TEXTBOOK REVIEW

Chapter 5 Growth and Measurement (pages 102–132)

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### CONTENT REVIEW QUESTIONS

#### Multiple Choice

*Circle the correct answer for each of the following questions.*

1. A patient's frame size can be estimated by:
  - a. dividing the height by the weight.
  - b. dividing height by one-half of the weight.
  - c. measuring the head circumference.
  - d. measuring the elbow breadth.
2. A 38-year-old female is 5 feet 7 inches tall, weighs 163 pounds, and has a wrist circumference ratio of 11.2 cm. Based on these measurements, the examiner estimates her frame size as:
  - a. extra-small.
  - b. small.
  - c. medium.
  - d. large.

3. Into what percentile of weight would the patient in question 2 fall? (Refer to Table 5-4 on page 119 in the textbook.)
  - a. 45th percentile
  - b. 60th percentile
  - c. 85th percentile
  - d. 90th percentile
4. Eighty percent of brain growth is completed by age:
  - a. 1 year.
  - b. 2 years.
  - c. 4 years.
  - d. 7 years.
5. Which cultural group tends to have the highest maturity score of term infants at birth?
  - a. African-American
  - b. Native American
  - c. Caucasian American
  - d. Asian American
6. A waist-to-hip circumference ratio over 0.9 in men and 0.8 in women indicates which of the following?
  - a. a healthy nutritional status
  - b. a low percentage of body fat
  - c. a large body frame
  - d. an increased risk for disease
7. A child has an arm span that measures greater than his height. With what condition is this finding consistent?
  - a. Turner's syndrome
  - b. Marfan's syndrome
  - c. acromegaly
  - d. failure to thrive
8. Growth at puberty is dependent on the interaction of which of the following?
  - a. IGF I and sex steroids
  - b. FSH and LH
  - c. GHRH and IGF I
  - d. estrogen and testosterone
9. In the child who fails to thrive, an accompanying lack of emotional attention results in what type of physiologic response?
  - a. inability to digest and metabolize nutrients
  - b. lack of growth hormone production
  - c. excessive thyroid hormone production
  - d. neuromuscular degeneration
10. In order to accurately assess height velocity, a child's height must be measured at:
  - a. 6-month intervals.
  - b. about 9-month intervals.
  - c. 12-month intervals.
  - d. 14-month intervals.
11. A pregnant patient has a prepregnancy weight-to-height body mass index of 22.4. The examiner expects this patient's weight gain during pregnancy to fall into which weight range?
  - a. less than 20 pounds
  - b. 20 to 26 pounds
  - c. 25 to 35 pounds
  - d. 40 to 50 pounds

12. Which group of children is typically the heaviest for weight-to-height measurement?
  - a. Hispanics
  - b. Native Americans
  - c. Caucasians
  - d. African-Americans
13. The beginning of adolescence is marked by the:
  - a. 12th birthday.
  - b. development of selfish, impatient behavioral traits.
  - c. development of a conscience and a sense of morality.
  - d. onset of puberty.
14. To assess and monitor growth, the examiner makes routine measurements of an infant's weight, height/length, and which of the following?
  - a. head circumference
  - b. hip-to-toe length
  - c. forearm length
  - d. chest circumference
15. A 4-month-old infant is brought to the clinic. At birth the baby weighed 6 pounds 8 ounces. If the baby is gaining weight at a desired rate, the examiner should expect the baby to now weigh:
  - a. 8 pounds.
  - b. 9.5 pounds.
  - c. 12 pounds.
  - d. 15 pounds.

## Terminology Review

### Word Choice Ilox

adult stature   gestational age   head circumference   infant stature   SMR (Sexual Maturity Rating)  
 recumbent length   Ballard Gestational Age Assessment   BMI (Body Mass Index)

*Fill in the blanks in the following statements, selecting the appropriate terms from the word choice box. Use each term once.*

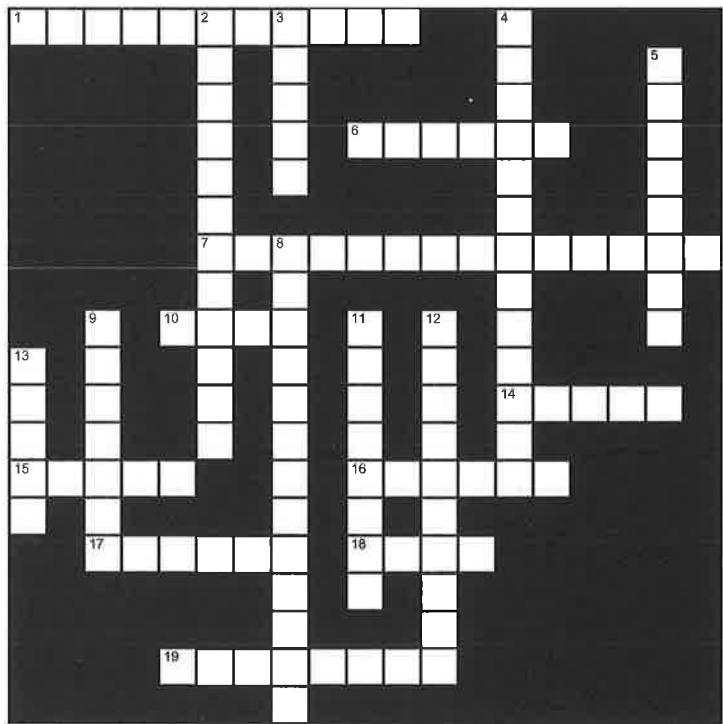
16. The examiner should measure the \_\_\_\_\_ of a baby with each visit until the age of 2 years.
17. The \_\_\_\_\_ is a rating to determine a child's pubertal development.
18. The \_\_\_\_\_ is used to provide guidance in weight gain during pregnancy.
19. A normal finding for \_\_\_\_\_ is that the patient's sitting height is approximately half the standing height.
20. The \_\_\_\_\_ is a tool using physical and neuromuscular findings to confirm the gestational age of a newborn.
21. Until 2 or 3 years of age, the baby's height is measured by assessing \_\_\_\_\_.
22. \_\_\_\_\_ is an indicator of a newborn's maturity.
23. A normal finding for \_\_\_\_\_ is that the sitting height is greater than half the standing height.

**Matching**

Match each condition to its corresponding common findings.

Findings	Condition
24. _____ Child with pronounced head enlargement and increased intracranial pressure	a. Acromegaly
25. _____ 5-year-old girl demonstrates pubertal changes	b. Achondroplasia
26. _____ 60-year-old man with exaggerated facial features and massive hands	c. Cushing's syndrome
27. _____ 16-year-old female exhibits absence of sexual development; also has short stature and increased carrying angle of elbow	d. Hydrocephalus
28. _____ Child with normal-sized head and trunk; short, curved arms and legs; dorsal kyphosis and lumbar lordosis	e. Precocious puberty
29. _____ Woman with hyperpigmentation to skin, round face, and fat accumulation in lower posterior cervical area	f. Turner's syndrome

**Crossword Puzzle**



**Across**

- 1. Half of individual's ideal weight gained during this period
- 6. Syndrome of phenotypic females with abnormal sex chromosomes
- 7. Genetic disorder resulting in abnormalities of endochondrial ossification
- 10. Growth of this body part predominates during fetal period
- 14. Growth of this body part predominates during infancy
- 15. Fetal weight gain peaks during this trimester
- 16. Gender that develops a wider pelvic outlet during adolescence
- 17. Increase in size of individual or organ
- 18. Fastest growing body part during childhood
- 19. Gestational age is an indicator of this in the newborn

**Down**

- 2. Half of body fat present in these tissue layers
- 3. Body frame size estimated by measuring width of this body part
- 4. Gestational age used to evaluate this progress
- 5. Changes in height over a time interval are used to calculate this parameter of growth
- 8. Result of excessive accumulation of cerebrospinal fluid in the brain or ventricular system
- 9. Syndrome resulting from chronic excessive cortisol production or long-term administration of glucocorticoids
- 11. Nutritional status evaluated by measuring thickness of this body part
- 12. Growth disorder associated with pituitary tumor
- 13. Age at which stature usually begins to decline

## CONCEPTS APPLICATION

*Baby Michael is a 1-day-old neonate. You have just completed an examination of Michael. Here are the findings you observed:*

### Measurements

Birth weight: 2300 g

Length: 44.5 cm

Head circumference: 33.0 cm

### Neuromuscular Maturity Rating

Posture: 2 points

Square window: 2 points

Ankle dorsiflexion: 2 points

Arm recoil: 1 point

Leg recoil: 1 point

Popliteal angle: 2 points

Heel to ear: 3 points

Scarf sign: 2 points

Head lag: 1 point

Ventral suspension: 2 points

### Appearance

Skin: Pale pink with a few large blood vessels noted over the abdomen. Skin has slight thickening with some peeling on the hands and feet. No edema noted.

Lanugo: Some areas of lanugo and bald patches on back of head.

Plantar creases: Slight creases observed over entire heel.

Breast: 2-cm areola diameter, slightly raised. Breast tissue noted on both sides about 0.75 cm.

Ear: Partial incurving of the upper pinna; firm, with instant recoil.

Genitals: Testes descended with moderate rugae.

1. Circle the appropriate boxes on the Newborn Maturity Rating and Classification Form on pages 34 and 35, and determine baby Michael's maturity rating and gestational age based on these findings.

Maturity rating score = \_\_\_\_\_ Gestational age = \_\_\_\_\_

2. Plot baby Michael's measurements for length, weight, and head circumference, using the graphs on page 36.

Baby Michael's length percentile \_\_\_\_\_ Baby Michael's weight percentile \_\_\_\_\_

Baby Michael's head circumference percentile \_\_\_\_\_

3. What does the data tell you about baby Michael's gestation and percentile?

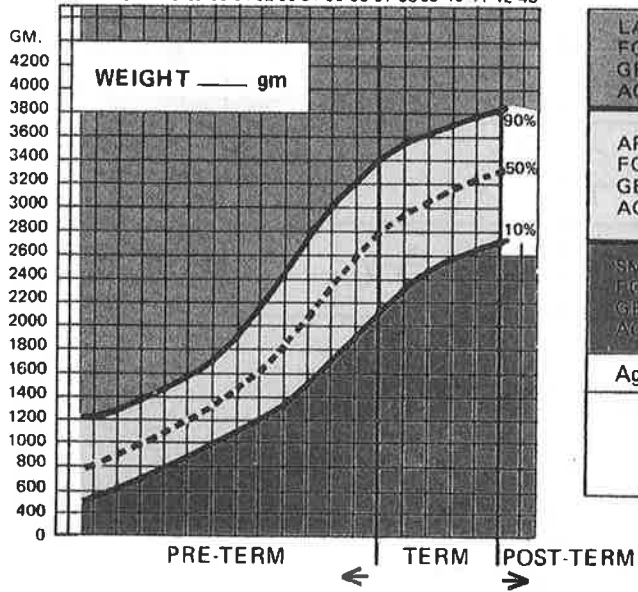
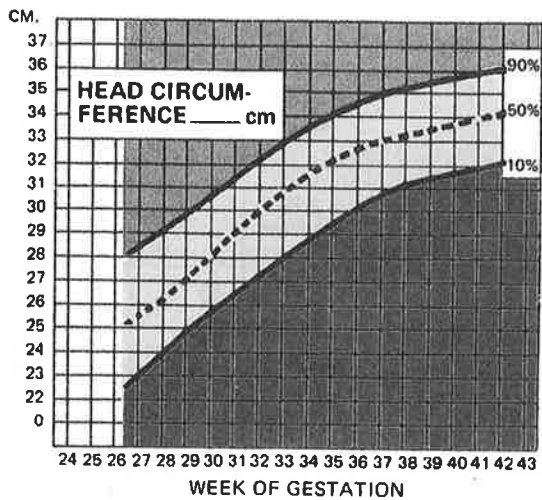
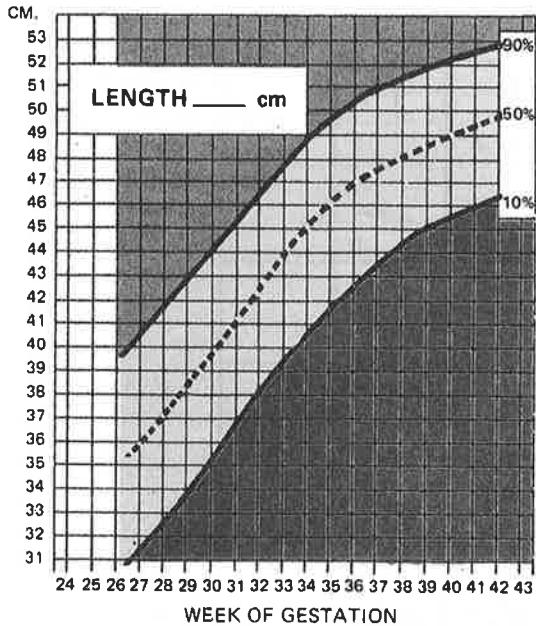
External sign	Score				
	0	1	2	3	4
Edema	Obvious edema of hands and feet; pitting over tibia	No obvious edema of hands and feet; pitting over tibia	No edema		
Skin texture	Very thin, gelatinous	Thin and smooth	Smooth; medium thickness. Rash or superficial peeling	Slight thickening. Superficial cracking and peeling, especially of hands and feet	Thick and parchmentlike; superficial or deep cracking
Skin color	Dark red	Uniformly pink	Pale pink; variable over body	Pale; only pink over ears, lips, palms, or soles	
Skin opacity (trunk)	Numerous veins and venules clearly seen, especially over abdomen	Veins and tributaries seen	A few large vessels clearly seen over abdomen	A few large vessels seen distinctly over abdomen	No blood vessels seen
Lanugo (over back)	No lanugo	Abundant; long and thick over whole back	Hair thinning especially over lower back	Small amount of lanugo and bald areas	At least 1/2 of back devoid of lanugo
Plantar creases	No skin creases	Faint red marks over anterior half of sole	Definite red marks over anterior 1/2; indentations over < anterior 1/3	Indentations over > anterior 1/3	Definite deep indentations over > anterior 1/3
Nipple formation	Nipple barely visible; no areola	Nipple well defined; areola smooth and flat, diameter < 0.75 cm	Areola stippled, edge not raised, diameter < 0.75 cm	Areola stippled, edge raised, diameter > 0.75 cm	
Breast size	No breast tissue palpable	Breast tissue on one or both sides, < 0.5 cm diameter	Breast tissue both sides; one or both 0.5-1 cm	Breast tissue both sides; one or both > 1 cm	
Ear form	Pinna flat and shapeless, little or no incurving of edge	Incurving of part of edge of pinna	Partial incurving whole of upper pinna	Well-defined incurving whole of upper pinna	
Ear firmness	Pinna soft, easily folded, no recoil	Pinna soft, easily folded, slow recoil	Cartilage to edge of pinna, but soft in places, ready recoil	Pinna firm, cartilage to edge; instant recoil	
Genitals Male	Neither testis in scrotum	At least one testis high in scrotum	At least one testis right down		
Female (with hips 1/2 abducted)	Labia majora widely separated, labia minora protruding	Labia majora almost cover labia minora	Labia majora completely cover labia minora		

Neurologic signs	Score					
	0	1	2	3	4	5
Posture						
Square window	90°	60°	45°	30°	0°	
Ankle dorsiflexion	90°	75°	45°	20°	0°	
Arm recoil	180°	90°-180°	<90°			
Leg recoil	180°	90°-180°	<90°			
Popliteal angle	180°	160°	130°	110°	90°	<90°
Heel to ear						
Scarf sign						
Head lag						
Ventral suspension						

**Total score      Weeks of gestation**

0-9	26
10-12	27
13-16	28
17-20	29
21-24	30
25-27	31
28-31	32
32-35	33
36-39	34
40-43	35
44-46	36
47-50	37
51-54	38
55-58	39
59-62	40
63-65	41
66-69	42

**CLASSIFICATION OF NEWBORNS –  
BASED ON MATURITY AND INTRAUTERINE GROWTH**  
Symbols: X - 1st Exam O - 2nd Exam



	1st Exam (X)	2nd Exam (O)
LARGE FOR GESTATIONAL AGE (LGA)		
APPROPRIATE FOR GESTATIONAL AGE (AGA)		
SMALL FOR GESTATIONAL AGE (SGA)		
Age at Exam	hrs	hrs
Signature of Examiner	_____ M.D.	_____ M.D.