

MCB 135E, 2nd midterm
November 6, 1998

Answer Key

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I. (75 points) Multiple choice questions. Only one answer is correct. 3 points each correct answer.

1. Major hormones and local substances involved in parturition (delivery) include the following, EXCEPT:

- A. oxytocin
- B. estrogens
- D** C. prostaglandins
- D. IGFII (insulin growth factor II)
- E. relaxin

2. In Pygmies, a population of central Africa with short stature, the major endocrine deficiency is:

- A. lack/deficiency of growth hormone (GH)
- B** B. lack/deficiency of IGFI
- C. lack/deficiency of triiodothyronine (T3)
- D. lack/deficiency of testosterone
- E. lack/deficiency of dehydroepiandrosterone (DHEA)

3. The kidney undergoes four successive transformations during prenatal development. The final stage from which the permanent kidney will emerge is:

- A. pronephros
- B. holonephros
- C** C. metanephros
- D. mesonephros
- E. none of the above

4. The kidney of the newborn is less efficient than that of the adult with respect to water reabsorption/conservation, because:

- A. the loop of Henle is shorter
- B. the glomeruli are located in the medulla, not in the cortex
- C. the amount of urea produced by the liver is less than in the adult, due to growth requirements
- E** D. the distal tubule is longer
- E. A and C only

5. Surfactant:

- A. is a lipoprotein
- B. lines the alveoli of the lung
- E** C. reduces surface tension in the alveoli and thereby facilitates their opening with the first breaths
- D. is produced from the 5th month of gestation on under the influence of adrenocortical and thyroid hormones
- E. all of the above

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6. Normal water content of tissues and cells is important for good health at all ages but especially in newborns/infants. Newborns/infants are more likely to lose water because of the following considerations, EXCEPT:

- E
- A. the greater irritability of the intestine with consequent rapidity of feces transit and decreased water reabsorption
 - B. the large ratio of body surface to body mass in the newborn and infant and therefore, the possibility of greater loss of water through the skin
 - C. frequent diarrhea (watery feces) due to gastrointestinal infections
 - D. the relative inefficiency of the kidney to compensate for water loss by increasing urine concentration and thereby reduce urinary volume
 - E. the release of the antidiuretic hormone (ADH) from the posterior pituitary in greater amounts in newborn and infants than at later ages

7. The gastrointestinal system of the newborn and infant is most efficient in digesting and absorbing nutrients necessary for growth if they are provided:

- A
- A. as a fluid diet
 - B. as solid food
 - C. as food high (20-20%)in lipids
 - D. as food with a high fiber content
 - E. all of the above

8. Of the many and important functions of the liver, the least developed in the newborn is:

- D
- A. carbohydrate storage and release
 - B. formation of urea
 - C. manufacture of plasma proteins
 - D. detoxification of many drugs and toxins
 - E. lipid metabolism

9. In the hemolytic disease of the newborn, the following events occur, EXCEPT:

- E
- A. occurs when the mother is Rh- and the fetus is Rh+
 - B. is characterized by a massive destruction of red blood cells,
 - C. massive hemolysis leads to the production of very high amounts of bilirubin
 - D. high bilirubin levels induce jaundice
 - E. jaundice is limited to the skin and mucosae and does not penetrate the brain because of a very strongly protective blood-brain barrier

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10. Circulatory changes at birth include:

- A. a sudden increase in pulmonary vascular resistance with lung expansion
- B. a sudden decrease in aortic blood pressure as the systemic circulation improves.
- E C. a sudden decrease in pulmonary blood flow during the first few hours of birth.
- D. a and c only.
- E. none of the above.

11. After birth changes in the infant's heart include:

- A. Closure of the foramen ovale as blood pressure increases in the left and declines in the right side of heart
- D B. The gradual atrophy of the left atrial wall with a gradual increase in the thickness of the right atrial wall.
- C. The oxygenation of blood occurs in the neonatal lungs instead of in the placenta.
- D. a and c only
- E. none of the above.

12. Which of the following statements regarding the ductus arteriosus (DA) is FALSE?

- A. Constriction of the DA occurs at birth; however it can be kept open by the administration of PGE 2.
- B. Constriction is stimulated by high oxygen levels that stimulate bradykinin release.
- C C. Bradykinins act on the skeletal muscle and are associated with increasing prostaglandin release.
- D. A healthy infant can have a temporary reversed direction of flow as a small amount of blood may be shunted from the aorta to the pulmonary artery in the first few days.
- E. Functional closure of the DA occurs first, followed by anatomic closure later on.

13. Various fetal cardiovascular structures constrict or close at birth to form adult structures over time. Which of the following is incorrectly matched with its normal adult structure:

- A. ductus venosus - ligamentum venosum
- B. umbilical vein - ligamentum teres
- C C. umbilical artery - superior vesicular ligament
- D. foramen ovale - fossa ovalis
- E. ductus arteriosum - ligamentum arteriosum

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14. Two common defects in neonatal circulation are the patent ductus arteriosus (PDA) and the patent foramen ovale (PFO). Which of the following statements is TRUE:

- C
- A. A PDA is much more common in male than female infants.
 - B. In a PDA aortic blood can be shunted into the pulmonary vein.
 - C. A PDA is associated with the a rubella infection in early pregnancy or hypoxia in premature infants.
 - D. A patent foramen ovale is a form of a ventricular septal defect (VSD).
 - E. A probe patent foramen ovale usually occurs after full anatomic closure has taken place.

15. Which of the following statements regarding fetal growth are FALSE?

- D
- A. IGF I is most active in postnatal growth while IGF II is most active prenatally.
 - B. Fetal growth is relatively independent from control by systemic hormones.
 - C. Paracrine and autocrine mechanisms play an important role in fetal growth.
 - D. GH from the fetal pituitary is necessary for fetal growth.
 - E. Nerve growth factor is a protein which is involved in growth and maintenance of sympathetic and sensory neurons as well as growth of neurons in the adult CNS.

16. Regarding the development of the breasts, which of the following statements is LEAST accurate?

- C
- A. Males are born with rudimentary lactiferous ducts.
 - B. The breasts are derived from the embryonal mammary ridges, which extend from the armpit to the groin.
 - C. Development of the breasts in females is completed during puberty, at which time alveoli capable of secreting milk are formed.
 - D. Estrogen is primarily responsible for stimulating growth of the ductal and connective tissue of the breast, while progesterone stimulates the development of alveoli with milk-producing potential.
 - E. Females are born with rudimentary lactiferous ducts.

17. Which of the following does not have a thermogenic (heat-producing) effect?

- C
- A. muscular activity (shivering)
 - B. epinephrine
 - C. vasodilation activity
 - D. thyroxine
 - E. basal metabolism

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18. Regarding hormonal control of lactation, which of the following statements is LEAST accurate?

- B
- A. The hormone prolactin is primarily responsible for stimulating actual milk production.
 - B. A thin secretion known as colostrum may leak from the newborn's nipples after birth, due to the effects of high maternal levels of estrogen that crossed the placenta late in pregnancy.
 - C. Milk produced by the breasts is stored in lactiferous sinuses until the baby suckles. This stimulates the release of oxytocin from the posterior pituitary, which in turn causes contraction of smooth muscle cells around the mammary ducts.
 - D. Prolactin secretion is stimulated by suckling, so that cessation of breastfeeding leads shortly to the loss of milk production.
 - E. The hormone prolactin is secreted by the pituitary gland.

19. Regarding benefits and contraindications of breastfeeding to both the baby and mother, which of the following statements is LEAST accurate?

- C
- A. Breastfed babies have lower rates of most common infections.
 - B. Extended periods of lactational amenorrhea are associated with decreased risk of contracting breast cancer over the lifetime of a woman.
 - C. Breastfeeding is not appropriate for most women who experience a great deal of stress in their lives or suffer from chronic illnesses.
 - D. Some drugs may be secreted in breast milk so extra caution with medical treatment is necessary while breastfeeding.
 - E. Extended periods of lactational amenorrhea are associated with decreased risk of pregnancy.

20. Regarding the nutritional and immunologic qualities of breast milk, which of the following is LEAST accurate?

- D
or
E
- A. Breast milk contains IgA antibodies that help protect the infant's gastrointestinal tract from invasion by pathogens.
 - B. Lactose, a disaccharide of glucose and galactose, is the primary carbohydrate found in milk.
 - C. Breast milk is high in essential fatty acids that are important for optimal brain development.
 - D. Breast milk provides complete nutrition to the infant until 4 months of age.
 - E. After 4 months of age, supplementation with other foods is necessary for complete nutrition of the infant.

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21. Newborns have a greater capacity for heat loss than adults since:
- A. They have more body surface area relative to heat production capacity than adults.
 - B. They have less brown fat cells than adults.
 - C. They have a thin body shell through which heat is lost.
 - D. They are unable to uncouple the proton gradient from ATP synthesis in the mitochondria of their brown fat cells.
 - E. A and C only.
22. Regarding the thermoregulatory mechanisms of the adult and infant, which of the following is LEAST ACCURATE:
- A. The preterm infant cannot maintain body temperature below 33 degrees Celsius.
 - B. The lower threshold of the thermoneutral zone is higher for full-term infants than for adults.
 - C. In shivering thermogenesis, ATP is broken down to generate ADP and heat in skeletal muscle.
 - D. In nonshivering thermogenesis norepinephrine release can increase levels of fatty acids and T3 inside brown fat cells.
 - E. The preterm infant lacks a narrow thermoneutral temperature range in which metabolic rate is minimal.
23. Normal growth can be disrupted by an imbalance of hormones in the fetus and newborn. Which of the following endocrine disorders is incorrectly matched to the resulting condition?
- A. insulin deficiency - growth retardation of fetus
 - B. excess insulin - macrosomia
 - C. deficient growth hormone - fetal prematurity
 - D. deficient thyroid hormones - cretinism
 - E. excess androgens/estrogens - precocious puberty

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24. Depending on the cause, children with short stature may display different growth patterns. Which of the following descriptions is(are) INCORRECT:

- A. In constitutional growth delay, children are slow to begin growth but can continue to grow to reach normal adult values.
- B. In a child who develops a craniopharyngioma, excess cortisol production inhibits growth.
- C. In hypochondroplasia, the child has consistently slower growth until growth stops completely.
- D. In the growth hormone deficient child, birthweight is normal but growth rates slow after infancy.
- E. A and C only.

25. Which of the following are disorders associated with prematurity?

- A. Possible stroke due to immature and weak blood vessels and blood pressure fluctuations.
- B. Increased growth of blood vessels into the retina that could result in retinal detachment.
- C. The failure of adequate surfactant production by the Type II pneumatocytes.
- D. The bronchopulmonary dysplasia as a result of barotrauma, for example.
- E. All of the above.

II. (14 points) TRUE (A) AND FALSE (B) 2 points each

- A 26. The newborn and infant must take several meals, at intervals of 3-5 hrs throughout the 24 hrs day period because of the small storage capacity of the stomach.
- A 27. In the pregnant uterus, sensitivity to oxytocin is increased by estrogens and prostaglandins.
- B 28. Relaxin is a protein secreted by the corpus luteum of the ovary; its main functions are to contract the ligaments of the pubic symphysis and to soften the cervix.
- A 29. Congenital malformations are one of the major causes of death in newborns.
- A 30. Some teratogens (malformation producing agents) induce malformations which can be apparent only late in life.
- B 31. Infants take less time to excrete as urine a water load than adults due to the increased response to ADH (antidiuretic hormone) to reabsorb water in the collecting ducts.
- A 32. Infants take longer and are less able to stabilize excess acid in the urine.

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33. (11 points) The physiological status of the newborn is measured according to several physiologic/pathologic endpoints. One of the most common measure is the APGAR Score. Fill in the blanks.

APGAR Scoring System

Parameters measured	Score		
	0	1	3

APGAR SCORING SYSTEM*

Score	0	1	2
Heart rate	Absent	Less than 100/min	More than 100/min
Respiratory effort	Absent	Slow, irregular	Good, crying
Muscle tone	Limp	Some flexion of extremities	Active motion
Reflex Irritability (in response to catheter in nose)	Absent	Grimace	Grimace and cough or sneeze
Color	Blue, pale	Body pink, extremities blue (acrocyanosis)	Completely pink

*Each sign is elevated individually and scored from 0 to 2 at both 1 and 5 min of life. The final score at each time is the sum of the individual scores. From *Apgar: Curr Res Anesthesiol* 32:260, 1953.

Maximum score is 10.

Minimum score compatible with survival is 7-6.