Reproductive System

Jan 96, 1

Use the following information to answer the next two questions

Numerical Response

1. Provide the number of the reproductive structure that is directly affected by each technology named below.

   (Record your four-digit answer in the numerical-response section of the answer sheet.)

<table>
<thead>
<tr>
<th>Reproductive Structure:</th>
<th>Technology: Vasectomy</th>
<th>Tubal ligation</th>
<th>Castration</th>
<th>Use of an Intrauterine Device (IUD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td>3</td>
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<td>4</td>
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<tr>
<td>5</td>
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<td>6</td>
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<td>7</td>
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<td>8</td>
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<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Jan 96, 16
1. The birth control pill prevents the maturation and release of ova. The structure that is directly affected by the birth control pill is

   A. structure 6, because ova are produced by follicles in this organ
   B. structure 6, because this organ will secrete excess estrogen and progesterone
   C. structure 8, because implantation will not occur in this organ unless ovulation occurs
   D. structure 8, because follicular development is controlled by feedback from this organ

Jan 96, 17
2. The vas deferens is most similar in function to which female reproductive organ?

   A. Ovary
   B. Uterus
   C. Vagina
   D. Fallopian tube
Possible Effects of Testosterone

1. Inhibits skeletal muscle development
2. Enhances skeletal muscle development
3. Inhibits development of body hair
4. Promotes development of body hair
5. Inhibits gametogenesis
6. Stimulates gametogenesis
7. Enhances growth of the larynx
8. Inhibits growth of the larynx

Numerical Response

2. Select all the correct effects of normal levels of testosterone in an adolescent male.

(Record your answer in lowest-to-highest numerical order in the numerical-response section of the answer sheet.)

Answer: ____________
Use the following information to answer the next two questions

3. Which row correctly identifies hormones 2, 3, 4, and 5?

<table>
<thead>
<tr>
<th>Row</th>
<th>Hormone 2</th>
<th>Hormone 3</th>
<th>Hormone 4</th>
<th>Hormone 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>FSH</td>
<td>LH</td>
<td>Estrogen</td>
<td>Progesterone</td>
</tr>
<tr>
<td>B</td>
<td>LH</td>
<td>FSH</td>
<td>Estrogen</td>
<td>Progesterone</td>
</tr>
<tr>
<td>C</td>
<td>FSH</td>
<td>LH</td>
<td>Progesterone</td>
<td>Estrogen</td>
</tr>
<tr>
<td>D</td>
<td>LH</td>
<td>FSH</td>
<td>Progesterone</td>
<td>Estrogen</td>
</tr>
</tbody>
</table>

4. According to the diagram, secretion of hormone 1 is likely inhibited by

A. increased levels of gonadotropins in the blood
B. decreased levels of gonadotropins in the blood
C. increased levels of ovarian hormones in the blood
D. decreased levels of ovarian hormones in the blood
Jan 96,20

Use the following information to answer the next two questions

Based on the principles of genetics and the analysis of cells produced by meiosis, it is predicted that male and female humans should be produced in equal numbers. However, the ratio of the number of males and females, known as the sex ratio, changes throughout the life cycle. The sex ratio at conception (comparing the number of "male" zygotes to "female" zygotes) is often as high as 1.6 to 1 in favour of males. The sex ratio at birth is 1.05 to 1 in favour of male. In adults aged 20 to 25 years, the sex ratio is 1 to 1. After age 25, the sex ratio shifts in favour of females.

5. Which row correctly identifies one genetic factor and one environmental factor that might cause the described changes in the sex ratio?

<table>
<thead>
<tr>
<th>Row</th>
<th>Genetic Factor</th>
<th>Environmental Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>X-linked disorders affect more males than females</td>
<td>A male pre-embryo has a greater chance of successful implantation than a female pre-embryo</td>
</tr>
<tr>
<td>B</td>
<td>X-linked disorders affect more females than males</td>
<td>A male pre-embryo has a greater chance of successful implantation than a female pre-embryo</td>
</tr>
<tr>
<td>C</td>
<td>X-linked disorders affect more males than females</td>
<td>Accidents are the leading cause of death among males aged 15 to 35 years</td>
</tr>
<tr>
<td>D</td>
<td>X-linked disorders affect more females than males</td>
<td>Accidents are the leading cause of death among males aged 15 to 35 years</td>
</tr>
</tbody>
</table>

6. Which statement provides the best explanation for the underlying cause of the sex ratio at conception?

A. Sperm that contain an X chromosome are more motile than those that contain a Y chromosome
B. Sperm that contain a Y chromosome are more motile than those that contain an X chromosome
C. There is a greater probability that males will produce sperm that contain an X chromosome than those that contain a Y chromosome
D. There is a greater probability that males will produce sperm that contain a Y chromosome than those that contain an X chromosome

Jan 96,22

7. RU-486 is a drug that inhibits the action of progesterone. Hormones called prostaglandins cause the cervix to soften and dilate. Administering RU-486 and prostaglandins to a woman during pregnancy would likely cause

A. expulsion of the fetus
B. accelerated fetal development
C. a decrease in secretion of HCG by the pituitary
D. an increase in the development of the endometrium
8. A home pregnancy test that is positive reveals the presence of hormone in urine. This hormone is only present in the first trimester of pregnancy. Which hormone is detected by this home pregnancy test?

A. Progesterone  
B. Oxytocin  
C. Relaxin  
D. HCG

9. During pregnancy, menstruation is prevented by the action of

A. estrogen, initially secreted by the ovaries and later by the pituitary gland  
B. estrogen, initially secreted by the corpus luteum and later by the placenta  
C. progesterone, initially secreted by the ovaries and later by the pituitary gland  
D. progesterone, initially secreted by the corpus luteum and later by the placenta

10. A poorly developed uterine lining mainly affects the

A. lifespan of the unfertilized egg  
B. implantation of the fertilized egg  
C. ability of the sperm to fertilize the egg  
D. development of the egg within the ovary

Use the following information to answer the next question

Some Events that Occur During Birth

1. The baby is expelled from the uterus  
2. Secretion of progesterone decreases and the release of oxytocin increases  
3. Dilation of the cervix increases and amniotic fluid is released  
4. The placenta separates from the endometrium and is expelled

Numerical Response

3. Provide the correct sequence of these four events that occur during birth

(Record your four-digit answer in the numerical-response section of the answer sheet.)

Answer: _____________

11. Infection by Chlamydia bacteria may cause tissue scarring that results in blockage of the Fallopian tubes. Without treatment, which event will still occur in an individual with this condition?

A. Ovulation  
B. Parturition  
C. Fertilization  
D. Implantation
Use the following diagrams to answer the next question

Numerical Response
4. Choose the correct number for the reproductive structure where each of the functions described below occurs.
(Record your four-digit answer in the numerical-response section of the answer sheet.)

<table>
<thead>
<tr>
<th>Reproductive Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spermatogenesis</td>
</tr>
<tr>
<td></td>
<td>Oogenesis</td>
</tr>
<tr>
<td></td>
<td>Fertilization</td>
</tr>
<tr>
<td></td>
<td>Implantation</td>
</tr>
</tbody>
</table>

Jun 96,12

Use the following information to answer the next two questions

12. Which structure in the diagram is the prostate gland?
   A. Structure 1
   B. Structure 2
   C. Structure 3
   D. Structure 4
Jun 96, 13
13. A symptom of an enlarged prostate gland may be

A. enlarged testes  
B. abdominal pain  
C. reduced urine flow  
D. decreased sperm production

Jun 96, 14
Use the following information to answer the next two questions

Possible Pathways for Some Hormones in Human Females

14. During a normal menstrual cycle, FSH production is inhibited when high levels of estrogen travel along pathway

A. 1  
B. 4  
C. 5  
D. 7

Jun 96, 15
15. Pathway 6 likely represents the pathway followed by

A. pituitary gonadotropins  
B. chorionic gonadotropin  
C. oxytocin  
D. relaxin
16. Medical geneticists are able to remove one cell from the structure shown at stage 4 and test it for the presence of the recessive gene for cystic fibrosis. If the cell is found to carry both genes, then the pre-embryo could potentially be altered by gene therapy. Gene therapy is likely used at this early stage of development because

A. mitosis has not yet occurred  
B. extra embryonic membranes are forming  
C. meiosis during later stages may cause genetic variation  
D. cell differentiation and tissue formation have not yet occurred
Use the following information to answer the next two questions

17. Based on the data, a possible inference is that
   A. body temperature is highest during ovulation
   B. body temperature is lowest during menstruation
   C. increased estrogen concentrations cause increased body temperature
   D. increased progesterone concentrations cause increased body temperature

18. Over time, which sequence would result from the administration of large doses of synthetic estrogen and progesterone to a female?
   A. Reduction of FSH and LH secretion → no follicle development → no ovulation
   B. Reduction of FSH and LH secretion → no ovulation → no follicle development
   C. No follicle development → no ovulation → reduction of FSH and LH secretion
   D. No follicle development → reduction of FSH and LH secretion → no ovulation

19. Compared with cow’s milk, human’s milk is more advantageous to a child because human’s milk contains a useful source of
   A. lipids
   B. calcium
   C. antibodies
   D. lactose sugar
20. At the onset of labour, strong uterine contractions are initiated by increased levels of

A. oxytocin, which is released by the pituitary gland
B. HCG, which is released by the pituitary gland
C. oxytocin, which is secreted by the placenta
D. HCG, which is secreted by the placenta

21. Why do the levels of estrogen and progesterone fall rapidly after time Z?

A. The pituitary is inactive during birth
B. The ovaries are inactive during birth
C. During pregnancy, these hormones are produced by the fetus, which is absent after birth
D. During pregnancy, these hormones are produced by the placenta, which is absent after birth
22. If a physician performed an amniocentesis during pregnancy, the hypodermic needle used to obtain a sample of fetal cells would have to penetrate structure

A. 1  
B. 2  
C. 3  
D. 4

23. Which is a correct description of chorionic villi?

A. They form part of the placenta  
B. They are developed from the endometrium  
C. They are found in the digestive tract of the fetus  
D. They contain cells whose nuclei differ genetically from cells of the fetus

24. In females, the onset of puberty is initiated by secretions from the

A. follicle  
B. endometrium  
C. corpus luteum  
D. hypothalamus
25. In males, a *Chlamydia* infection may cause inflammation in areas of the reproductive system. The maturation and storage of sperm might be directly affected if inflammation occurs in the
   A. epididymis
   B. vas deferens
   C. prostate gland
   D. seminal vesicles

26. The collective function of structures 1, 2, and 3 is the production of components of
   A. urine
   B. sperm
   C. semen
   D. testosterone

27. The row that identifies the structures in the male that have similar functions to structures 4 and 5 in the female is

<table>
<thead>
<tr>
<th>Row</th>
<th>Structure 4</th>
<th>Structure 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>vas deferens</td>
<td>testes</td>
</tr>
<tr>
<td>B.</td>
<td>vas deferens</td>
<td>prostate gland</td>
</tr>
<tr>
<td>C.</td>
<td>seminiferous tubules</td>
<td>testes</td>
</tr>
<tr>
<td>D.</td>
<td>seminiferous tubules</td>
<td>prostate gland</td>
</tr>
</tbody>
</table>
Use the following information to answer the next question.

28. Which hormone is at its lowest level at the time of ovulation?
   A. LH
   B. FSH
   C. Estrogen
   D. Progesterone

29. A thick and vascularized endometrium
   A. remains when progesterone levels and estrogen levels both decrease
   B. is present when an egg is fertilized and progesterone levels decrease
   C. is present when an egg is fertilized and progesterone levels remain high
   D. remains when progesterone levels decrease and estrogen levels remain high
One type of livestock cloning involves the removal and separation of cells from a growing calf embryo. Unfertilized egg cells are taken from surrogate cows and the nucleus from each egg cell is removed. A nucleus from each of the embryo cells is then injected into an unfertilized, enucleated egg cell and implanted into the surrogate cow. In theory, the implanted structures will develop into calves identical to each other.

30. During their development into calf fetuses, the clones undergo repeated cycles of

A. mitosis
B. meiosis
C. both mitosis and meiosis
D. neither mitosis nor meiosis
31. In the surrogate cow, implantation would occur in the
   A. ovary  
   B. uterus  
   C. cervix  
   D. Fallopian tube

32. During labour, smooth muscle contractions occur in structure
   A. 1  
   B. 2  
   C. 3  
   D. 5

33. Milk production and the release of milk, respectively, are stimulated by the hormones
   A. estrogen and oxytocin  
   B. prolactin and oxytocin  
   C. estrogen and progesterone  
   D. prolactin and progesterone
Use the following information to answer the next question

<table>
<thead>
<tr>
<th>Process in Human Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ovulation</td>
</tr>
<tr>
<td>2 parturition</td>
</tr>
<tr>
<td>3 fertilization</td>
</tr>
<tr>
<td>4 implantation</td>
</tr>
</tbody>
</table>

Numerical Response

5. Identify the sequence of the processes in human reproduction

(Record your four-digit answer in the numerical-response section of the answer sheet.)

Answer: ____________

Jun 97,24

Use the following information to answer the next question

Hall and Stillman, *in-vitro* fertilization specialists in Washington, D.C., recently announced that they successfully took a two-cell stage human embryo and separated the two cells. These separated cells grew independently of each other for five successive divisions before cell division spontaneously stopped.

From *Discover*

34. If each of the two cell masses produced had developed into a normal fetus, the fetuses would have been

A. identical twins and of the same sex
B. fraternal twins and of the same sex
C. fraternal twins and of the different sexes
D. identical twins and of different sexes
35. The structure that may function both as a site for spermatogenesis and as an endocrine gland is labelled

A. 1  
B. 2  
C. 3  
D. 4

36. When this occurs, infertility results because of

A. decreased spermatogenesis  
B. an inability to maintain an erection  
C. decreased secretions of alkaline buffers  
D. the failure of sperm to reach the urethra
37. The part of the diagram that represents the follicle just before day 14 of an average ovarian cycle is labelled

A. 1  
B. 2  
C. 3  
D. 4

38. Which description identifies the chromosome content of cell 4?

A. $n = 23$  
B. $n = 46$  
C. $2n = 23$  
D. $2n = 46$

39. The reason this first sperm may not fertilize the oocyte is that

A. its nucleus may not acceptable for fertilization  
B. some sperm produce enzymes that fail to break down the protective layers  
C. the enzymes from many sperm are needed to penetrate the protective layers  
D. the protective layers secrete chemicals that destroy many sperm that contact the oocyte
A graph that illustrates the cyclical variation in progesterone levels in one reproductive cycle of a non-pregnant human female is

Jan 98.25
40. It has been observed that some breastfeeding mothers do not ovulate until they stop breast-feeding. Ovulation would not occur if

A. prolactin inhibits the release of oxytocin
B. prolactin inhibits follicular development
C. oxytocin stimulates the release of FSH and LH
D. oxytocin stimulates the release of gonadotropin-releasing hormone
42. Which of the following does not normally occur at the placenta?

A. Nutrients move from the maternal blood to the fetal blood
B. Blood cells move from the maternal blood to the fetal blood
C. Carbon dioxide moves from the fetal blood to the maternal blood
D. Metabolic wastes move from the fetal blood to the maternal blood
43. Study the diagram. In the table below, the row that identifies two pairs of male and female external genital structures where each pair develops from the same embryonic structure is

<table>
<thead>
<tr>
<th>Come from Same Embryonic Structure</th>
<th>Come from Same Embryonic Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male</strong></td>
<td><strong>Female</strong></td>
</tr>
<tr>
<td>A. penis-shaft</td>
<td>clitoris</td>
</tr>
<tr>
<td>B. penis-shaft</td>
<td>labia majora</td>
</tr>
<tr>
<td>C. penis-glands</td>
<td>clitoris</td>
</tr>
<tr>
<td>D. penis-glands</td>
<td>labia majora</td>
</tr>
</tbody>
</table>

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**Development of external genital structures of both sexes from the same undifferentiated embryonic structures**

Undifferentiated stage at 7 weeks

Female development

Male development

---

(from Campbell)
44. Under normal circumstances, what **initially** determines whether an embryo develops into a male or a female?

   A. The embryo develops testes for a male and ovaries for a female
   B. The embryo predominantly produces testosterone for a male and estrogen for a female
   C. The embryo’s genital embryonic structures develop into those of a male or those of a female
   D. The embryo develops into a male if fertilization involved a Y-carrying sperm and into a female if fertilization involved an X-carrying sperm

45. The gland that releases oxytocin and the target organ for oxytocin are labeled

   A. 1 and 2
   B. 1 and 3
   C. 2 and 1
   D. 2 and 3
Use the following information to answer the next two questions

46. Structure X represents
   A. an ovary
   B. a follicle
   C. an oocyte
   D. a corpus luteum

47. A reasonable interpretation of the graph and drawings would that FSH is beginning to increase at day
   A. 10
   B. 14
   C. 21
   D. 28
Use the following information to answer the next question.

**Numerical Response**

6. The target organs for FSH in the male and the female are labeled, respectively, __________ and __________

(Record your two-digit answer in the numerical-response section of the answer sheet.)

**Answer:** __________

Jun 98,20

48. Birth control pills prevent pregnancy. One form of birth control pill works by mimicking some characteristics of pregnancy. A direct result of using this birth control pill is that during most of the menstrual cycle

A. increased and sustained levels of LH are released from the pituitary
B. increased and sustained levels of FSH are released from the pituitary
C. progesterone and estrogen levels are maintained at a relatively low level
D. progesterone and estrogen levels are maintained at a relatively high level

Jun 98,21

49. Which of the following statements about normal human fertilization is correct?

A. Fertilization occurs in the uterus of the woman
B. Fertilization occurs in a simple, one-step process
C. Fertilization involves the use of enzymes by sperm
D. Fertilization involves the replication of chromosomes

Jun 98,22

50. Which hormone induces uterine contractions

A. Relaxin
B. Prolactin
C. Oxytocin
D. Progesterone
Use the following information to answer the next question

**Events That Occur When Lactation is Initiated by the Feeding Action of a Baby**

1. Release of oxytocin into the blood
2. Transmission of nerve impulses to the hypothalamus
3. Contraction of smooth muscle in the gland
4. Stimulation of sensory nerve endings in the breast

**Numerical Response**

7. The sequence of events that occurs when lactation is initiated by a bay is ______________

(Record your four-digit answer in the numerical-response section of the answer sheet.)

Answer: _____  _____  _____  _____

Use the following information to answer the next question

In male and female embryos, the development of the genital ridge influences gender determination. The male and female genotypes (sex chromosomes) differ in that they cause the release of different hormone form the genital ridge in males and females during development.

51. Which of the following statements about normal embryonic hormone secretion is correct?

   A. The X chromosome secrets estrogen in a female embryo
   B. The Y chromosome secrets testosterone in a male embryo
   C. The genital ridge produces estrogen in a potential female embryo
   D. The genital ridge produces testosterone in a potential female embryo

52. The development of secondary sexual characteristics in the female is due to the secretion of

   A. LH, followed by the secretion of estrogen
   B. LH, followed by the secretion of progesterone
   C. FSH and LH, followed by the secretion of estrogen
   D. FSH and LH, followed by the secretion of progesterone

53. The hormone that stimulates sex-cell production in both males and females is

   A. LH
   B. FSH
   C. testosterone
   D. progesterone
54. Which area of the brain regulates male or female reproductive behaviour by directly controlling the release of gonadotropins from the pituitary gland?

A. Hypothalamus  
B. Pituitary gland  
C. Medulla oblongata  
D. Frontal lobe of the cerebrum

Use the following information to answer the next two questions

55. Meiosis occurs in which male and female structures, respectively?

A. 6 and 9  
B. 6 and 8  
C. 5 and 9  
D. 5 and 8

56. Reproductive structures that have similar functions in males and females

A. 4 and 10  
B. 3 and 7  
C. 2 and 8  
D. 1 and 9

57. Collectively, the seminal vesicles, prostate gland, and Cowper’s glands contribute to which of the following functions?

A. Produce testosterone  
B. Stimulate spermatogenesis  
C. Help sperm survive in the female body  
D. Signal the pituitary to release gonadotropins
58. Hormones that stimulate the production of testosterone are transported by the
   A. blood
   B. vas deferens
   C. seminiferous tubules
   D. ducts from the gland secreting the hormones

59. For human males to produce milk and to eject milk, high levels of which two hormones, respectively, must be present?
   A. Prolactin and relaxin
   B. Relaxin and prolactin
   C. Prolactin and oxytocin
   D. Oxytocin and prolactin

60. A new technology that may help William involves sperm extraction followed by sperm injection to produce a fertilized egg. This technology must involve
   A. LH therapy
   B. testosterone therapy
   C. extraction of sperm from the male’s urethra
   D. extraction of sperm from the male’s epididymis

8. The above events, in the sequence in which they occur before childbirth, are _______.
   (Record your four-digit answer in the numerical-response section on the answer sheet.)
   Answer: _____  _____  _____  _____
Some Events in the Human Reproductive Cycle

1. Pre-embryo releases HCG, which maintains hormone levels
2. A hormone signals the follicle to rupture
3. Blastocyst is implanted
4. The egg is fertilized to form a zygote

Numerical Response
9. The above events, in the sequence in which they occur during the reproductive cycle, are _______.

(Record your four-digit answer in the numerical-response section on the answer sheet.)

Answer: _____  _____  _____  _____

Numerical Response
10. Identify the processes, as labeled in the diagram above that represent the activities given below.

(Record your three-digit answer in the numerical-response section on the answer sheet.)

<table>
<thead>
<tr>
<th>Process:</th>
<th>Activity:</th>
<th>Division of diploid cells to produce diploid cells</th>
<th>Haploid cells combine to form a diploid cell</th>
<th>Division of diploid cells to produce haploid cells</th>
</tr>
</thead>
</table>
Scientists believe that a mutant form of an autosomal gene called BRCA1 may be associated with 5% to 10% of all cases of breast cancer. About 80% of women who inherit the gene in its defective form are likely to develop a cancerous breast tumour. Men who carry the faulty BRCA1 gene rarely develop breast cancer, but they may pass the gene to their offspring.

A couple has two children, a girl and a boy. The mother has a single mutant gene for breast cancer; the father is not a carrier of the mutant BRCA1 gene.

61. What is the probability that their daughter has inherited the mutant BRCA1 gene?

A. 75%
B. 50%
C. 25%
D. 0%

There is some evidence that two genes, BRCA1 and BARD1, suppress certain types of cancer. If either of these genes is defective, ovarian and/or breast tumours may develop. The mutant form of BARD1 is considered to be recessive.

Studies have shown that the proteins encoded by the BRCA1 and BARD1 genes differ from one another, but that they probably link up. In doing so, they somehow prevent tumour growth. The abnormal genes may result in the production of faulty proteins that will not link.

62. Four individuals undergo carrier screening for the two genes, and the following results are observed. Which of the following individuals is most likely to develop ovarian and/or breast tumors?

<table>
<thead>
<tr>
<th>Row</th>
<th>Individual</th>
<th>BRCA1</th>
<th>BARD1</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Individual 1</td>
<td>heterozygous</td>
<td>homozygous dominant</td>
</tr>
<tr>
<td>B</td>
<td>Individual 2</td>
<td>heterozygous</td>
<td>heterozygous</td>
</tr>
<tr>
<td>C</td>
<td>Individual 3</td>
<td>homozygous normal</td>
<td>homozygous normal</td>
</tr>
<tr>
<td>D</td>
<td>Individual 4</td>
<td>heterozygous</td>
<td>homozygous recessive</td>
</tr>
</tbody>
</table>
Use the following information to answer the next question

Compared with premenopausal women, women entering menopause have increased levels of FSH and LH. These women can choose to undergo estrogen and/or progesterone hormone replacement therapy to alleviate the symptoms of menopause.

63. If a menopausal woman takes hormone replacement therapy, the levels of her FSH and LH will

A. not be affected because her ovaries no longer respond to estrogen
B. cause the ovary to produce eggs, and the woman will again be fertile
C. drop because of the negative-feedback effect of progesterone and estrogen
D. rise as estrogen and progesterone levels stimulate the production of FSH and LH

Use the following information to answer the next five questions

The spermicide nonoxynol-9, which is applied to contraceptive devices such as diaphragms and condoms, has been linked to increased urinary tract infections in women. Although nonoxynol-9 is helpful in fighting the herpes virus and HIV, it also destroys beneficial bacteria (lactobacilli) that moderate the acidity of a woman’s vagina. As a woman’s vagina and external genitalia become more acidic, another bacterium, *Escherichia coli* (*E. coli*), increases in number and invades her urethra. This overpopulation of *E. coli* causes a bladder infection.

-from Vergano, 1996

64. The relationships described above between the human female, lactobacilli, and E. coli are identified in row

<table>
<thead>
<tr>
<th>Row</th>
<th>Human Female/lactobacilli</th>
<th>Human female/ <em>E. coli</em></th>
<th>Lactobacilli/ <em>E. coli</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>parasitic</td>
<td>mutualistic</td>
<td>interspecific competition</td>
</tr>
<tr>
<td>B</td>
<td>mutualistic</td>
<td>mutualistic</td>
<td>intraspecific competition</td>
</tr>
<tr>
<td>C</td>
<td>mutualistic</td>
<td>parasitic</td>
<td>interspecific competition</td>
</tr>
<tr>
<td>D</td>
<td>parasitic</td>
<td>parasitic</td>
<td>intraspecific competition</td>
</tr>
</tbody>
</table>

65. The site of sperm production and the gland that produces an alkaline secretion that neutralizes the acidity of the vagina are given in row

<table>
<thead>
<tr>
<th>Row</th>
<th>Site of sperm Production</th>
<th>Gland that Produces an Alkaline Secretion</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>seminiferous tubules</td>
<td>testis</td>
</tr>
<tr>
<td>B</td>
<td>seminiferous tubules</td>
<td>prostate gland</td>
</tr>
<tr>
<td>C</td>
<td>seminal vesicles</td>
<td>testis</td>
</tr>
<tr>
<td>D</td>
<td>seminal vesicles</td>
<td>prostate gland</td>
</tr>
</tbody>
</table>
66. Testes are responsible for the production of sperm and testosterone. Cutting and tying the vas deferens (vasectomy) blocks the passage of sperm. After a vasectomy, the hormone testosterone

A. reaches all the body tissues because it comes from exocrine tissue  
B. reaches all the body tissues because it comes from endocrine tissue  
C. does not reach all the body tissues because it comes from exocrine tissue  
D. does not reach all the body tissues because it comes from endocrine tissue

67. Some contraceptives, such as condoms, prevent fertilization. Fertilization usually occurs in the structure labelled

A. 1  
B. 2  
C. 3  
D. 4

68. Another contraceptive, the birth control pill, causes negative feedback on the pituitary, which prevents the release of eggs. Typically, the hormones in the birth control pill are similar to

A. FSH and LH  
B. oxytocin and prolactin  
C. estrogen and progesterone  
D. relaxin and gonadotropins
69. According to this diagram, the birth of a lamb is linked to

A. increasing levels of estrogen in pregnant sheep
B. decreasing production of cortisol by the fetal lamb
C. increasing levels of progesterone in pregnant sheep
D. decreasing activity of the hypothalamus by the fetal lamb

70. To maintain a pregnancy for a normal gestation period, the contraction of uterine muscles is inhibited. According to the diagram, this inhibition is brought about by

A. high levels of estrogen from the placenta
B. low levels of progesterone from the uterus
C. high levels of cortisol from the adrenal gland
D. high levels of progesterone from the placenta
71. Which of the following statements concerning human reproduction is supported by the findings of this research?

A. Developments within the fetus determine when birth will begin
B. The production of fetal cortisol delays birth until gestation is complete
C. During early fetal development, fetal hormones do not pass into the mother
D. High levels of progesterone in the mother’s blood are essential for birth to begin

72. Use the following additional information to answer the next question:

Ingestion of a plant called skunk cabbage by pregnant sheep has been found to cause severe birth defects and to delay birth for several weeks.

A reasonable hypothesis is that skunk cabbage contains a chemical that

A. increases uterine sensitivity to estrogen
B. decreases placental production of progesterone
C. inhibits the fetal hypothalamus or adrenal gland
D. increases conversion of progesterone to estrogen

73. Cryptorchidism is the failure of one or both of the testes to descend from the abdominal cavity into the scrotum during human fetal development. Sterility results if both testes fail to descend. In this case, the likely cause of sterility is that

A. lack of oxygen inhibits testosterone function
B. gonadotropic hormones cannot stimulate the testes
C. the testes are not connected to the external environment
D. normal sperm do not readily develop at body temperature

74. Fluids in rat semen bathe the egg and sperm for several days after fertilization. This fluid contains secretions from the

A. prostate gland only
B. seminal vesicles only
C. urethra and seminal vesicles
D. Cowper’s glands, prostate gland, and seminal vesicles
75. Reduction in pregnancy rates for rodent couples in the study group could have been caused by

A. alcohol-treated males’ inability to copulate normally
B. alcohol in the female’s blood affecting egg production
C. alcohol in the male’s blood increasing pituitary hormone secretions
D. alcohol in the semen fluids producing a poisonous environment for fertilization

76. Prolonged high concentrations of alcohol in the male would likely affect male fertility in all of the following way except by

A. reducing the rate of meiosis
B. preventing the maturation of sperm
C. depressing motility in sperm by damaging cells
D. stimulating motility in sperm by increasing metabolism

11. To complete this statement, select the gland or hormone numbered above that best fills each blank.

The production of sperm in the male is directly stimulated by the hormone _____, which is produced in the _____, and by the hormone _____, which is produced in the _____.

1. pituitary
2. estrogen
3. testosterone
4. hypothalamus
5. FSH
6. seminal vesicle
7. LH
8. testis

Numerical Response

The five-digit answer in the numerical-response section on your answer sheet.

77. This process is similar to spermatogenesis in males in that

A. eggs and sperm are both diploid
B. eggs and sperm are both haploid
C. eggs and sperm are both produced before puberty
D. an equal number of both eggs and sperm reach maturity
In order to initiate *in vitro* fertilization, a woman must undergo hormonal therapy to release numerous mature eggs and to prepare the uterine lining. The eggs are removed using a laparoscope and fertilized in a petri dish. The developing embryos are inserted back into the woman for implantation to take place.

78. What hormone changes would cause a female to develop and release a large number of mature eggs?

A. Increased FSH and LH  
B. Decreased FSH and LH  
C. Increased estrogen and progesterone  
D. Decreased estrogen and progesterone

79. To obtain oocytes for *in vitro* fertilization, the structure numbered above that must be hormonally stimulated is

A. 1  
B. 2  
C. 3  
D. 4
80. In order for artificial implantation to be successful, what hormone would a female need to take to maintain the uterine lining for implantation, and which of the structures of the ovary numbered above would naturally produce this hormone?

A. Estrogen and structure 1  
B. Estrogen and structure 2  
C. Progesterone and structure 1  
D. Progesterone and structure 2

Numerical Response
12. Match the parts of the diagram numbered above that represents the terms given below.

<table>
<thead>
<tr>
<th>Part of Diagram:</th>
<th>Terms:</th>
<th>Oocyte</th>
<th>Blastocyst</th>
<th>First mitotic Division</th>
<th>Fertilization</th>
</tr>
</thead>
</table>

(Record your four-digit answer in the numerical-response section on the answer sheet.)
Use the following information to answer the next four questions

A rare defect inherited by 19 descendants of a Dominican man named Altagracia Carrasco caused genetically male children to be considered female until age 12. At this age, hormone levels increased dramatically and caused the testes to descend from the abdomen to the scrotum and male primary and secondary sexual characteristics to develop.

In their Dominican Republic village, these people were given the name “guevedoces.” Which means “penis at 12 years of age.”

-from Pringle, 1992

81. The “guevedoces” were genetically programmed at conception by a sperm with

A. a Y chromosome fertilizing an egg with a Y chromosome
B. a Y chromosome fertilizing an egg with an X chromosome
C. an X chromosome fertilizing an egg with a Y chromosome
D. an X chromosome fertilizing an egg with an X chromosome

82. The “guevedoces” might have reduced fertility because the late descent of their testes would cause

A. high production of testosterone
B. high production of progesterone
C. cell development problems in their follicular cells
D. cell development problems in their seminiferous tubules

83. The sex hormone that increased in these individuals at age 12 and a secondary sexual characteristic are individuals would develop as a result are, respectively,

A. FSH and decreased body fat
B. testosterone and decreased breast size
C. testosterone and increased larynx size
D. FSH and increased muscle development
Use the additional information to answer the next question

<table>
<thead>
<tr>
<th>Stage</th>
<th>Time Period:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fetus has a beating heart</td>
</tr>
<tr>
<td>2</td>
<td>Embryo differentiates into three layers (gastrulation)</td>
</tr>
<tr>
<td>3</td>
<td>Blastocyst implants in endometrium</td>
</tr>
<tr>
<td>4</td>
<td>Cleavage (mitosis) leads to a large number of cells without growth</td>
</tr>
</tbody>
</table>

(Record your four-digit answer in the numerical-response section on the answer sheet.)

A study published in the journal *Pediatrics* indicates that breast-fed infants have a substantially decreased risk of developing diarrhea compared with infants fed formula. Another study reported that although a majority of infants harbour populations of bacteria that would cause diarrhea in adults, breast-fed infants do not get sick. The bacterium *Clostridium difficile* produces a toxin that irritates the lining of the colon-causing diarrhea. Breast milk contains a protein called secretory component that binds to the toxin, thus causing the toxin to be ineffective.

- from J.T., 1997

84. The protein secretory component is produced in breast milk when

A. DNA is translated
B. DNA is replicated
C. mRNA is translated
D. mRNA is replicated
Use the following additional information to answer the next three questions

The human milk protein, secretory component, can be manufactured by transgenic sheep. The following steps are necessary for producing transgenic sheep.

1. The gene for secretory component is isolated and cloned into a vector.
2. Vectors carrying the gene are microinjected into fertilized sheep eggs, which are then implanted into female sheep.
3. Heterozygous transgenic offspring are identified.

85. The heterozygous offspring described above are next mated to non-transgenic sheep. If the allele for human secretory protein is $s$ and the absence of the human gene is $S$, the symbolic representation of the cross is

A. $ss \times ss$
B. $Ss \times ss$
C. $Ss \times SS$
D. $SS \times ss$

Jun 00.4

Numerical Response

14. The proportion of offspring from the mating of a heterozygous transgenic sheep and a non-transgenic sheep that are predicted to be heterozygotes is \__________.

(Record your answer as a value from 0 and 1, rounded to two decimal places in the numerical-response section on the answer sheet.)

Jun 00.5

Numerical Response

15. The heterozygous offspring are then mated and their homozygous transgenic offspring are used for producing the milk product. Out of 220 offspring produced from these crosses, how many offspring are predicted to be transgenic homozygotes?

Answer: \__________

(Record your answer as a whole number in the numerical-response section on the answer sheet.)
86. The reason males do not lactate even though they have breast tissue is that

A. estrogen levels in males are too low to overcome the inhibiting action of dopamine
B. males do not need to produce milk, thus the breast tissue in males is not designed to produce milk
C. males have a Y chromosome, which has a gene that prevents the breast secretory tissue from producing milk
D. males have high levels of testosterone, which inhibits the pituitary from releasing the hormone that stimulates lactation

87. Hormone X, which initiates and maintains milk production in females, is

A. estrogen
B. oxytocin
C. prolactin
D. progesterone
Use the following information to answer the next two questions

88. The difference in size between the human oocyte and sperm is mostly due to the
   A. difference in magnification of the two photographs
   B. distance that the sperm must travel in order to reach the oocyte
   C. amount of cytoplasm present in the oocyte as compared with that in the sperm
   D. number of chromosomes in the nucleus of the oocyte as compared with the number in the sperm

89. The nucleus of a human oocyte would normally be
   A. diploid and contain 23 chromosomes
   B. diploid and contain 46 chromosomes
   C. haploid and contain 23 chromosomes
   D. haploid and contain 46 chromosomes

90. For the processes of spermatogenesis and oogenesis, respectively, the row that identifies the hormone that stimulates the process, the location where the process occurs, and the number of gametes produced per germ cell is

<table>
<thead>
<tr>
<th>Row</th>
<th>Hormone</th>
<th>Location of process</th>
<th>Number of gametes produced</th>
<th>Hormone</th>
<th>Location of process</th>
<th>Number of gametes produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>FSH</td>
<td>seminiferous tubules</td>
<td>4</td>
<td>FSH</td>
<td>ovaries</td>
<td>1</td>
</tr>
<tr>
<td>B.</td>
<td>LH</td>
<td>epididymis</td>
<td>8</td>
<td>LH</td>
<td>pituitary</td>
<td>1</td>
</tr>
<tr>
<td>C.</td>
<td>testosterone</td>
<td>interstitial cells</td>
<td>4</td>
<td>estrogen</td>
<td>follicle</td>
<td>4</td>
</tr>
<tr>
<td>D.</td>
<td>FSH</td>
<td>testes</td>
<td>8</td>
<td>progesterone</td>
<td>corpus luteum</td>
<td>4</td>
</tr>
</tbody>
</table>
Jan 01,14
91. The two insufficiencies in semen that would affect sperms’ ability to travel to the oocyte are the lack of

A. FSH and testosterone
B. fructose and testosterone
C. FSH and alkaline buffers
D. fructose and alkaline buffers

Jan 01,15

Use the following information to answer the next two questions

The picture below shows how sperm is injected into an egg. This technology may be used to overcome infertility problems caused by sperm that are unable to penetrate an egg, or by sperm that lack a proper flagellum (tail).

![Intracytoplasmic Sperm Injection (ICSI)](image)

92. Sperm are normally able to penetrate an egg by

A. fusing their nuclei with the nucleus of the egg
B. releasing hydrolytic enzymes from the acrosome found in the head of the sperm
C. dissolving the covering of the egg with alkaline secretions from the prostate gland
D. dissolving the covering of the egg using the hydrolytic enzymes secreted from Cowper’s gland

Jan 01,16
93. If, during the ICSI process, more than one sperm head were injected into the egg’s cytoplasm,

A. fraternal twins would be formed
B. identical twins would be formed
C. the zygote would develop into a male child since more male chromosomes would be present
D. the zygote would likely not develop because more than a diploid set of chromosomes would be present
Use the following information to answer the next three questions

Clomiphene citrate is a fertility drug used to induce ovulation in women. Clomiphene citrate, generally taken daily from day 3 to day 7 of the menstrual cycle, decreases the naturally circulating estrogen. The pituitary responds by increasing production of two gonadotropic hormones that then stimulate the ovary to ripen and release an egg. Follicle development and ovulation are usually monitored with a combination of home urine tests (on day 11 or 12) and a follow-up ultrasound examination. About 70% of women using clomiphene citrate will ovulate and 40% of those will become pregnant. The risk of multiple pregnancy (usually twins) increase by 6% to 7%.

- from Bay Area Fertility and Gynecology Medical Group

94. Without the negative feedback that results from increasing amounts of naturally circulating estrogen, the body responds by secreting more

A. FSH  
B. HCG  
C. prolactin  
D. progesterone

95. Following clomiphene citrate treatments, patients are advised to monitor their urine for the presence of a hormone that will signal ovulation. This hormone is

A. LH  
B. FSH  
C. HCG  
D. estrogen

96. The incidence of multiple births increases in women who use clomiphene citrate because high levels of

A. progesterone may stimulate the release of more than one egg  
B. FSH may stimulate the fertilized egg cell to divide and separate  
C. FSH may stimulate the complete development of more than one follicle  
D. progesterone may stimulate the fertilized egg cell to divide and separate

97. During the first three days of development, the human embryo obtains nutrients and energy from the

A. HCG  
B. amniotic fluid  
C. cytoplasm of the mother’s egg  
D. mitochondria of the father’s sperm
Numerical Response

16. Match each embryonic structure, as numbered above, with the letter that represents its function, as listed above.

<table>
<thead>
<tr>
<th>Structure:</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
</table>

(Record your **four-digit answer** in the numerical-response section on the answer sheet.)

98. The presence of a particular hormone in urine indicates that pregnancy has occurred. This hormone is secreted by the

A. ovary
B. amnion
C. chorion
D. pituitary
Jan 01.3

Use the following information to answer the next question

Some Events in Labour

1. Uterine contractions increase in force
2. Oxytocin travels through the bloodstream
3. Nervous impulses are sent to the hypothalamus
4. Oxytocin is released from the posterior pituitary

Numerical Response
17. At the onset of labour, a baby’s head pushes on the cervix. Following this, the events given above, listed in the order in which they occur, are _____, _____, _____, and _____.

(Record your four-digit answer in the numerical-response section on the answer sheet.)

Jan 01.22

Use the following information to answer the next question

Premature infants born at 24-weeks gestation face a wide spectrum of physiological problems.

99. These problems arise because prior to the third trimester of pregnancy, fetuses

A. have organs that are underdeveloped
B. have not yet begun cell specialization
C. depend upon amniotic fluid for oxygen
D. depend upon amniotic fluid for nutrients

Jan 02.3

Use the following information to answer the next two questions

New research has led to advances in the development of male contraceptives. One of the most promising contraceptive methods involves injecting androgens (testosterone or other male hormones) into a male’s muscles. The androgens produce a negative feedback effect on the hypothalamus and pituitary gland. In trials involving a combination of androgens, sperm counts were reduced to zero in test subjects, but this method was effective for only three weeks.

Events in a Negative Feedback Loop Controlling Sperm Production

1. Production of sperm is inhibited
2. Hormone levels in the blood return to normal
3. Production of FSH and LH is inhibited
4. High levels of the injected androgens circulate in the blood

-from Alexander, 1999

Numerical Response
18. The order in which the events listed above would occur following the injection of androgens into a male’s muscle is _____, _____, _____, and _____.

(Record all four digits of your answer in the numerical-response section on the answer sheet.)
Researchers developing male contraceptives have found other methods of interfering with various stages of sperm development and sperm release from the body. Some methods of contraception currently being investigated are given below.

1. Interfering with the process of meiosis by which sperm are produced
2. Blocking the release of hormones that stimulate the release of FSH and LH
3. Using removable polyurethane plugs to block the tubes that transport sperm
4. Administering a calcium-blocking drug that interferes with the final maturation of sperm

Use the following information to answer the next three questions

100. The movement of which of the following substances could **not** be affected by BPH?

A. Urine  
B. Sperm  
C. Testosterone  
D. Seminal vesicle secretions

- from Seppa, 1998
101. In the diagram above, the structure **most affected** by the absence of the protein coded for by the p27 gene is numbered

A. 1  
B. 2  
C. 3  
D. 4

102. In normally functioning cells, the protein coded for by the p27 gene is produced continuously. The process by which the p27 gene’s code is read from the DNA and the name of the molecule formed in the process are identified in row

<table>
<thead>
<tr>
<th>Row</th>
<th>Process</th>
<th>Molecule</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>transcription</td>
<td>mRNA</td>
</tr>
<tr>
<td>B.</td>
<td>translation</td>
<td>mRNA</td>
</tr>
<tr>
<td>C.</td>
<td>transcription</td>
<td>tRNA</td>
</tr>
<tr>
<td>D.</td>
<td>translation</td>
<td>tRNA</td>
</tr>
</tbody>
</table>
103. The mitotic proliferation stage of spermatogenesis occurs in the

A. epididymis  
B. vas deferens  
C. seminal vesicles  
D. seminiferous tubules

Jan 02,17  
104. The chromosome number at stage A and the chromosome number at stage B are, respectively,

A. 46 and 46  
B. 46 and 23  
C. 23 and 46  
D. 23 and 23
The birth of the Dionne Quintuplets on May 28, 1934, near Callander, Ontario, surprised the world. The quintuplets had a combined weight of 6 kg, and theirs was the first known case in which all members of a quintuplet set survived. The process by which the quintuplets were formed is thought to be as diagrammed below.

A. pre-embryo splitting, which resulted in fraternal quintuplets
B. pre-embryo splitting, which resulted in identical quintuplets
C. fertility drugs, which resulted in multiple ovulation and produced fraternal quintuplets
D. fertility drugs, which resulted in multiple ovulation and produced identical quintuplets
Most autosomal trisomies are lethal. The average survival survival age for infants with Patau syndrome (trisomy 13) is six months. Infants with Edward syndrome (trisomy 18) survive, on average, only two to four months. Individuals with Down syndrome (trisomy 21) can survive into adulthood. In order to identify autosomal trisomies, chorionic villus sampling (CVS) can be used to obtain cells that are then used to create a karyotype like the one shown below.

106. The sex and the condition of the individual whose karyotype is shown above are given in row

<table>
<thead>
<tr>
<th>Row</th>
<th>Sex</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>female</td>
<td>Patau syndrome</td>
</tr>
<tr>
<td>B.</td>
<td>female</td>
<td>Down syndrome</td>
</tr>
<tr>
<td>C.</td>
<td>male</td>
<td>Edward syndrome</td>
</tr>
<tr>
<td>D.</td>
<td>male</td>
<td>normal</td>
</tr>
</tbody>
</table>

Jan 02,20
107. The villus region sampled using CVS develops from the

A. amnion
B. chorion
C. ectoderm
D. endoderm
108. Progesterone and HCG, which are used to maintain the developing fetus, are both produced in the structure numbered

A. 1
B. 2
C. 3
D. 4