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Semen Production & Sperm Maturation

Exam — Reproductive System

Pre-med/IB-style questions on semen composition, accessory gland contributions (seminal vesicles, prostate, bulbourethral glands), sperm production vs maturation (seminiferous tubules vs epididymis), and key physiology concepts such as pH, coagulation/liquefaction, capacitation, and ejaculation control.

50 items — Printable Exam

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1 **Which statement BEST distinguishes semen from spermatozoa?**

A Semen is produced only in the seminiferous tubules of the testes.

B Spermatozoa are the fluid portion of the ejaculate; semen is the male gamete.

C Semen is a mixture of spermatozoa plus secretions from accessory glands; spermatozoa are the male gamete cells.

D Semen is a haploid cell that carries paternal DNA.

E Spermatozoa are produced mainly by the prostate gland.

2 **In a typical ejaculate, which structure contributes the LARGEST share of the semen fluid volume?**

A Seminal vesicles

B Prostate gland

C Bulbourethral (Cowper's) glands

D Epididymis

E Seminiferous tubules

3 **Fructose in semen is important because it can be used as an energy source by sperm. Which gland secretes most of this fructose?**

A Prostate gland

B Seminal vesicles

C Bulbourethral glands

D Testes (Leydig cells)

E Epididymis

4 **Semen contains prostaglandins that can influence the female reproductive tract. They are produced mainly by the:**

A Seminal vesicles

B Epididymis

C Seminiferous tubules

D Bulbourethral glands

E Scrotal skin (dartos muscle)

5 **A fresh semen sample often coagulates soon after ejaculation and then becomes more liquid again. Which secretion is MOST directly responsible for the later liquefaction?**

A Fructose from seminal vesicles

B Proteolytic enzymes (e.g., PSA) from the prostate

C Mucus from bulbourethral glands

D Testosterone from Leydig cells

E Inhibin from Sertoli cells

6 **Which source provides most of the proteins that cause semen to form an initial gel (coagulate) after ejaculation?**

A Seminal vesicles

B Prostate gland

C Bulbourethral glands

D Epididymis

E Aortic arch baroreceptors

7 **A small amount of clear fluid released before ejaculation can lubricate the urethra and help neutralize residual acidity. This pre-ejaculate is produced mainly by the:**

A Seminal vesicles

B Prostate gland

C Bulbourethral (Cowper's) glands

D Testes

E Epididymis

8 **Spermatozoa are produced (spermatogenesis occurs) primarily in the:**

A Epididymis

B Seminal vesicles

C Seminiferous tubules of the testes

D Prostate gland

E Urethra

9 **Most sperm maturation (including gaining motility and being stored) occurs in the:**

A Seminiferous tubules

B Epididymis

C Seminal vesicles

D Prostate gland

E Urinary bladder

10 Which statement about sperm leaving the testes (entering the epididymis) is MOST accurate?

A They are already fully motile and ready to fertilize an egg immediately.

B They are diploid cells that will become haploid in the epididymis.

C They are generally non-motile and not yet fully capable of fertilization.

D They are produced by the prostate and stored in the testes.

E They contain no mitochondria until capacitation occurs.

11 Which change is a key hallmark of sperm maturation in the epididymis?

A Sperm undergo meiosis I and II to become haploid.

B Sperm acquire progressive motility and undergo surface membrane changes that support later fertilization.

C Sperm synthesize large amounts of semen fructose for their own energy storage.

D Sperm develop their acrosome for the first time by budding from the plasma membrane.

E Sperm replicate their nuclear DNA to prepare for embryonic development.

12 **Capacitation is a process that increases a sperm's ability to fertilize an egg. It occurs mainly in the:**

- A Seminiferous tubules
- B Epididymis
- C Female reproductive tract after ejaculation
- D Seminal vesicles before ejaculation
- E Prostate gland during semen production

13 **A sperm must release enzymes to penetrate the egg's outer protective layers (especially the zona pellucida). Which event provides this enzyme release?**

- A Capacitation
- B Acrosome reaction
- C DNA replication
- D Translation of hemoglobin
- E Synaptic transmission

14 **During spermiogenesis, the acrosome forms primarily from the:**

- A Golgi apparatus
- B Mitochondria
- C Ribosomes
- D Centrioles only, without any membrane contribution
- E Nuclear envelope

15 **Which part of a sperm cell contains a high concentration of mitochondria that help supply ATP for movement?**

A Acrosome

B Nucleus in the head

C Midpiece

D Tail tip only

E Zona pellucida

16 **The basic structural arrangement that allows a sperm flagellum to beat is the axoneme, which typically has a:**

A 1+1 arrangement of microtubules

B 3+3 arrangement of microtubules

C 9+2 arrangement of microtubules

D Random arrangement of actin filaments only

E Double-membrane arrangement like mitochondria

17 **Why is the blood–testis barrier important for normal spermatogenesis?**

A It prevents oxygen from reaching developing sperm, forcing anaerobic metabolism.

B It isolates developing germ cells from immune surveillance and helps maintain a controlled microenvironment.

C It allows sperm to enter the bloodstream to reach the prostate.

D It increases urine acidity to activate sperm enzymes.

E It is mainly needed to pump testosterone into the brain.

18 **The blood–testis barrier is formed mainly by:**

A Tight junctions between Sertoli cells

B Gap junctions between Leydig cells

C Desmosomes between sperm heads

D Myelin sheaths around seminiferous tubules

E Chloroplast membranes

19 **Spermatogenesis requires a high local concentration of testosterone within the seminiferous tubules. Which Sertoli-cell product helps achieve this?**

A Erythropoietin

B Androgen-binding protein (ABP)

C Renin

D Surfactant

E Pepsin

20 **Which hormone most directly stimulates Leydig cells to produce testosterone?**

A FSH

B LH

C ADH

D TSH

E Insulin

21 **FSH supports sperm production mainly by acting on:**

A Leydig cells to make testosterone

B Sertoli cells to support developing germ cells

C Red blood cells to carry oxygen

D Platelets to initiate clotting

E Bulbourethral glands to secrete mucus

22 **Inhibin released from Sertoli cells mainly provides negative feedback on which hormone?**

A FSH

B LH

C ADH

D Oxytocin

E Cortisol

23 **A student says: "If blood testosterone is normal, sperm production must be normal." What is the BEST correction?**

A Correct—spermatogenesis depends only on blood testosterone and nothing else.

B Incorrect—spermatogenesis requires a high LOCAL (intratesticular) testosterone level and Sertoli-cell support, not just normal blood levels.

C Incorrect—testosterone prevents spermatogenesis, so normal testosterone should lower sperm production.

D Correct—FSH and LH do not affect sperm production.

E Incorrect—sperm are produced in the seminal vesicles, not the testes.

24 Why are the testes located in the scrotum rather than inside the abdominal cavity?

A To keep them warmer than body temperature so enzymes work faster

B To keep them slightly cooler than core body temperature, which supports normal spermatogenesis

C To protect sperm from oxygen exposure

D To allow seminal vesicles to attach directly to the testes

E Because testosterone cannot be produced at core temperature

25 Which pairing correctly matches a structure with its role in testicular temperature regulation?

A Dartos muscle—raises and lowers the testes by pulling on the spermatic cord

B Cremaster muscle—wrinkles scrotal skin to reduce heat loss

C Cremaster muscle—raises the testes closer to the body in cold conditions

D Seminal vesicle—contracts to move testes away from the body in heat

E Prostate—acts as a heat exchanger for the scrotum

26 **Which sequence correctly traces sperm from the site of production to leaving the body (simplified)?**

A Seminiferous tubules → epididymis → vas deferens → ejaculatory duct → urethra

B Seminiferous tubules → vas deferens → epididymis → ejaculatory duct → urethra

C Epididymis → seminiferous tubules → vas deferens → urethra → ejaculatory duct

D Seminal vesicle → epididymis → prostate → vas deferens → urethra

E Seminiferous tubules → urethra → epididymis → vas deferens → ejaculatory duct

27 **The ejaculatory duct is formed by the union of the:**

A Ureter and urethra

B Duct of the seminal vesicle and the vas deferens

C Epididymis and seminiferous tubules

D Prostate and bulbourethral glands

E Aortic arch and carotid sinus

28 **Which outcome is MOST expected after a successful vasectomy?**

A Ejaculate contains no seminal vesicle fluid, so semen volume drops dramatically.

B Ejaculate contains little or no sperm, but most semen volume remains because accessory glands still secrete fluid.

C Testosterone production stops because the vas deferens produces testosterone.

D Spermatogenesis stops immediately because sperm cannot be made without an open vas deferens.

E Urine becomes alkaline because sperm normally acidify urine.

29 **After a vasectomy, sperm are still produced in the testes. What happens to most of these sperm?**

A They are excreted in urine through the ureters.

B They accumulate forever and the testes rapidly swell to several times their size in all cases.

C They are broken down and reabsorbed (e.g., by cells in the epididymis/testis).

D They enter the bloodstream and travel to the lungs for oxygenation.

E They are converted into seminal vesicle fluid.

30 **A semen sample has unusually LOW volume and very LOW fructose, but testicular hormone function appears normal. Which structure is the most likely cause?**

A Seminal vesicles are not contributing normally.

B Leydig cells are not producing testosterone.

C The kidney glomerulus is filtering too much fructose.

D The epididymis is not storing sperm.

E The carotid sinus baroreceptors are damaged.

31 **A semen sample remains abnormally gel-like and does not liquefy properly after ejaculation. Reduced secretion from which gland best explains this?**

A Seminal vesicles

B Prostate gland

C Bulbourethral glands

D Adrenal glands

E Thyroid gland

32 Semen is typically slightly alkaline overall. Which structure contributes most to this alkalinity?

A Seminal vesicles

B Prostate gland

C Epididymis

D Ureters

E Testicular veins

33 What is the BEST reason semen being slightly alkaline can be beneficial for fertility?

A It dissolves sperm DNA so the egg can read it more easily.

B It helps protect sperm and support motility in the acidic environment of the vagina.

C It prevents capacitation from occurring.

D It turns sperm into diploid cells.

E It blocks oxygen from entering sperm cells.

34 Which statement BEST captures the likely purpose of prostaglandins in semen (concept level)?

A They provide the sperm's nuclear DNA.

B They can influence contractions and secretions in the female reproductive tract, helping sperm transport.

C They are required to make sperm haploid during meiosis.

D They neutralize stomach acid to allow digestion of semen proteins.

E They form the sperm tail microtubules.

35 Which pairing of process and primary nervous control is MOST accurate?

A Emission (moving semen into urethra) — parasympathetic; Ejaculation (expulsion) — parasympathetic

B Emission — somatic motor; Ejaculation — endocrine only

C Emission — sympathetic; Ejaculation (expulsion) — somatic motor reflex (with sympathetic involvement)

D Emission — controlled by the kidneys; Ejaculation — controlled by the liver

E Emission — controlled by the vagus nerve; Ejaculation — controlled by baroreceptors

36 Which statement about autonomic control is MOST accurate at a basic level?

A Erection is mainly sympathetic; ejaculation is mainly parasympathetic.

B Both erection and ejaculation are controlled only by the kidneys.

C Erection is mainly parasympathetic (NO-mediated vasodilation); ejaculation involves sympathetic and somatic pathways.

D Erection requires aldosterone; ejaculation requires ADH.

E Erection occurs only after capacitation.

37 **Retrograde ejaculation (semen flowing into the bladder) is most likely if which event fails?**

A Closure of the internal urethral sphincter (bladder neck) during emission

B Opening of the ureters during ejaculation

C Production of sperm in the prostate gland

D Liquefaction of semen by the seminal vesicles

E Filtering of semen by the kidneys before ejaculation

38 **The ejaculatory ducts deliver semen into which part of the urinary/reproductive tract?**

A Urinary bladder

B Ureter

C Prostatic urethra

D Epididymis

E Scrotal sac

39 **Most mature sperm are stored primarily in the:**

A Seminal vesicles

B Tail of the epididymis

C Prostate gland

D Urinary bladder

E Bulbourethral glands

40 **During emission, sperm are propelled toward the urethra mainly by powerful smooth muscle contractions in the:**

A Vas deferens

B Ureter

C Seminiferous tubules

D Carotid artery

E Trachea

41 **Which change would most likely DECREASE semen volume the MOST while leaving sperm production in the testes relatively intact?**

A Loss or blockage of seminal vesicle secretion

B A vasectomy (cutting the vas deferens)

C Damage to the sperm tail microtubules

D Complete failure of LH secretion

E Destruction of Sertoli cells

42 **A man has normal spermatogenesis in the testes, but severe epididymal damage prevents normal maturation. Which finding is MOST likely?**

A Semen contains normal volume and many sperm that are often less motile/less functionally mature, reducing fertility.

B Semen volume becomes zero because the epididymis makes most semen fluid.

C Testosterone level becomes zero because the epididymis produces testosterone.

D Sperm become diploid again in the epididymis and cannot fertilize.

E Semen becomes strongly acidic because sperm produce hydrochloric acid.

43 Which process occurs primarily in the seminiferous tubules (as part of spermiogenesis), NOT in the epididymis?

A Acrosome formation on developing spermatids

B Acquisition of progressive motility

C Long-term storage of mature sperm

D Capacitation in preparation for fertilization

E Major mixing with seminal vesicle fluid

44 Which change is MOST characteristic of sperm capacitation (concept level)?

A Replication of the sperm's nuclear DNA

B Removal/alteration of surface coatings (e.g., cholesterol/glycoproteins), increasing membrane responsiveness and enabling the acrosome reaction

C Conversion of the sperm head into a gel to prevent movement

D Formation of the sperm's flagellum for the first time

E Production of semen fructose inside the sperm nucleus

45 From a functional perspective, what is a plausible advantage of semen initially coagulating after ejaculation?

A It permanently immobilizes sperm so they cannot leave the male body.

B It may help retain semen in the female tract temporarily, reducing immediate leakage; later liquefaction allows sperm to swim onward.

C It prevents the acrosome reaction by destroying the acrosome.

D It makes semen acidic so sperm become activated.

E It is required to make sperm diploid again.

46 A semen sample is unusually watery immediately after ejaculation and fails to form the normal initial gel. Which gland's secretion is most likely reduced?

A Seminal vesicles

B Prostate gland

C Bulbourethral glands

D Adrenal cortex

E Pituitary posterior lobe

47 If the seminal vesicles contribute little or nothing to the ejaculate, which pattern is MOST expected?

A Greatly reduced semen volume and fructose, with semen tending to be less alkaline; sperm may still be present from the testes.

B Normal semen volume but no sperm, because seminal vesicles produce sperm.

C Normal fructose but no liquefaction, because fructose is produced by the prostate.

D No testosterone production, because seminal vesicles make testosterone.

E Sperm become diploid again due to loss of seminal vesicle hormones.

48 **Two men have no sperm detected in the ejaculate. Man 1 has normal semen volume and normal fructose. Man 2 has low semen volume and very low fructose. Which interpretation is BEST?**

A Man 1 is more consistent with ejaculatory duct obstruction; Man 2 with vasectomy.

B Man 1 is more consistent with vasectomy; Man 2 with ejaculatory duct obstruction affecting seminal vesicle input.

C Both patterns must be identical because accessory glands do not affect semen volume.

D Both patterns indicate failure of the blood–testis barrier.

E Man 2 is more consistent with increased baroreceptor firing.

49 **Where do sperm FIRST mix with most seminal vesicle secretions (simplified anatomy)?**

A Seminiferous tubules

B Epididymis

C Ejaculatory duct (where vas deferens meets seminal vesicle duct)

D Ureter

E Renal pelvis

50 **At puberty, the accessory sex glands enlarge and begin producing much more seminal fluid. This change is driven primarily by increased:**

A Testosterone (and other androgens)

B Insulin

C Thyroxine (T4)

D Erythropoietin

E Glucagon

Answer Key

#	Ans	Answer Text
1	C	Semen is a mixture of spermatozoa plus secretions from accessory glands;...
2	A	Seminal vesicles
3	B	Seminal vesicles
4	A	Seminal vesicles
5	B	Proteolytic enzymes (e.g., PSA) from the prostate
6	A	Seminal vesicles
7	C	Bulbourethral (Cowper's) glands
8	C	Seminiferous tubules of the testes
9	B	Epididymis
10	C	They are generally non-motile and not yet fully capable of fertilization...
11	B	Sperm acquire progressive motility and undergo surface membrane changes ...
12	C	Female reproductive tract after ejaculation
13	B	Acrosome reaction
14	A	Golgi apparatus
15	C	Midpiece
16	C	9+2 arrangement of microtubules
17	B	It isolates developing germ cells from immune surveillance and helps mai...
18	A	Tight junctions between Sertoli cells
19	B	Androgen-binding protein (ABP)
20	B	LH
21	B	Sertoli cells to support developing germ cells
22	A	FSH
23	B	Incorrect—spermatogenesis requires a high LOCAL (intratesticular) testos...
24	B	To keep them slightly cooler than core body temperature, which supports ...
25	C	Cremaster muscle—raises the testes closer to the body in cold conditions
26	A	Seminiferous tubules → epididymis → vas deferens → ejaculatory duct → ur...
27	B	Duct of the seminal vesicle and the vas deferens
28	B	Ejaculate contains little or no sperm, but most semen volume remains bec...
29	C	They are broken down and reabsorbed (e.g., by cells in the epididymis/te...
30	A	Seminal vesicles are not contributing normally.
31	B	Prostate gland
32	A	Seminal vesicles
33	B	It helps protect sperm and support motility in the acidic environment of...
34	B	They can influence contractions and secretions in the female reproductiv...
35	C	Emission — sympathetic; Ejaculation (expulsion) — somatic motor reflex (...
36	C	Erection is mainly parasympathetic (NO-mediated vasodilation); ejaculati...
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