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**BIOLOGY
HIGHER LEVEL
PAPER 1**

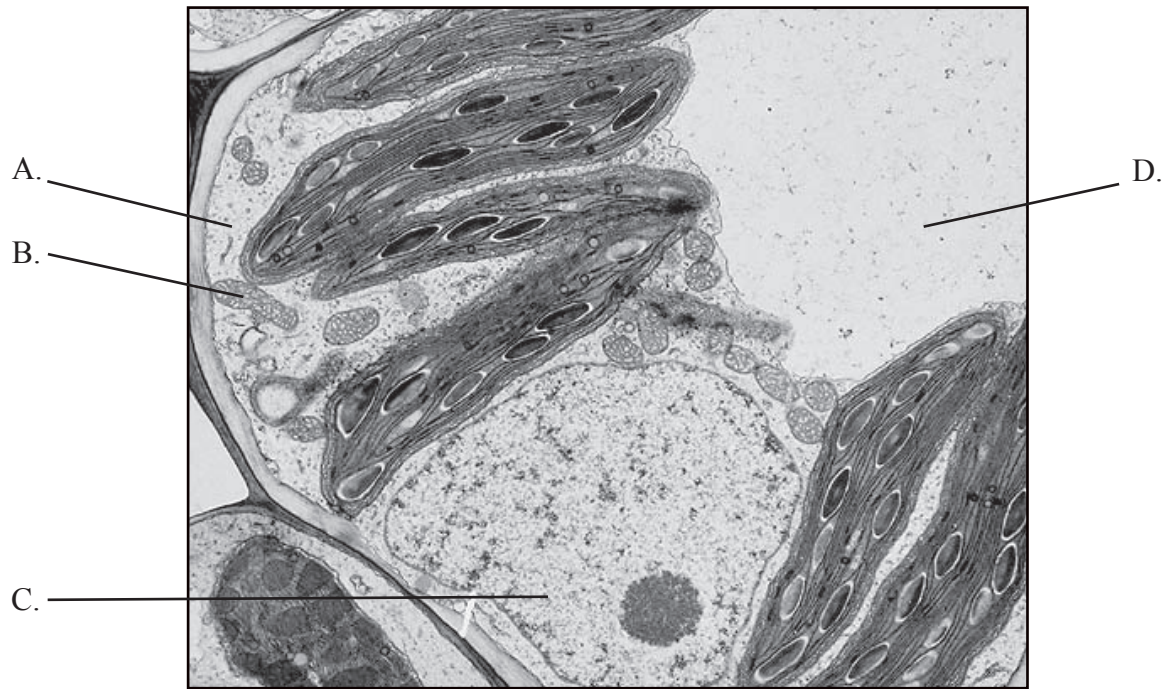
Tuesday 2 November 2010 (afternoon)

1 hour

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

1. Which labelled structure on the electron micrograph below identifies this as a plant cell and not an animal cell?



[George Johnson and Jonathan Losos, The Living World, 5/e 2008. Mc Graw Hill Education. Reproduced with permission.]

2. What is the sequence of stages during the cell cycle?

- A. $G_1 \rightarrow S \rightarrow G_2 \rightarrow \text{mitosis} \rightarrow \text{cytokinesis}$
- B. $\text{mitosis} \rightarrow G_1 \rightarrow G_2 \rightarrow \text{cytokinesis} \rightarrow S$
- C. $G_1 \rightarrow G_2 \rightarrow S \rightarrow \text{mitosis} \rightarrow \text{cytokinesis}$
- D. $G_1 \rightarrow G_2 \rightarrow \text{mitosis} \rightarrow \text{cytokinesis} \rightarrow S$

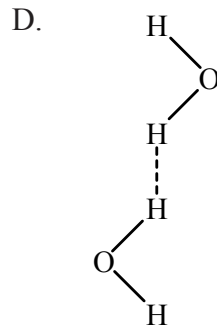
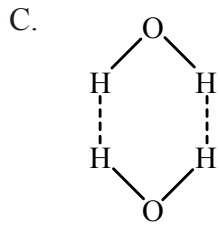
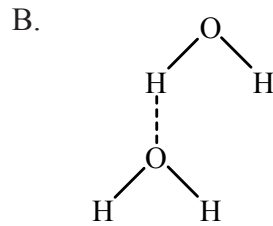
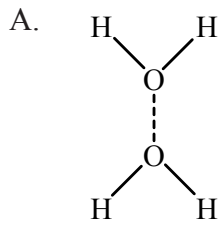
3. The levels of iron in liver tissue from 12 rats fed on beef and 11 rats fed on plant oils were compared using the *t*-test to see if there was a significant difference at the 5% level. Part of the table showing the critical values for the *t*-test is shown below.

Degrees of freedom	p=0.1	p=0.05	p=0.01	p=0.001
19	1.729	2.093	2.861	3.883
20	1.725	2.086	2.845	3.850
21	1.721	2.080	2.831	3.819
22	1.717	2.074	2.819	3.792
23	1.714	2.069	2.807	3.767

What is the critical value above which the two samples can be considered significantly different?

- A. 2.086
 - B. 2.080
 - C. 2.074
 - D. 2.069
4. When observing the behaviour of a vesicle in a cell, what identifies it as a vesicle **only** involved in exocytosis?
- A. Adhesion between two lipid bilayers
 - B. Fusion of two membranes
 - C. Secretion of material
 - D. Invagination of a plasma membrane

5. Which diagram best illustrates the interactions between water molecules?



6. The base ratios in the DNA and RNA for an onion (*Allium cepa*) are given below.

Bases	A / %	G / %	C / %	T / %
DNA	31.8	18.4	18.2	31.3

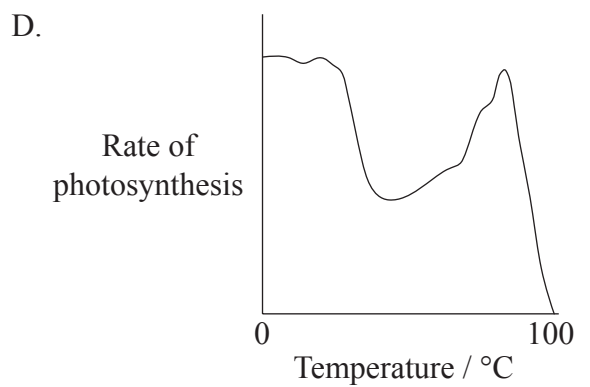
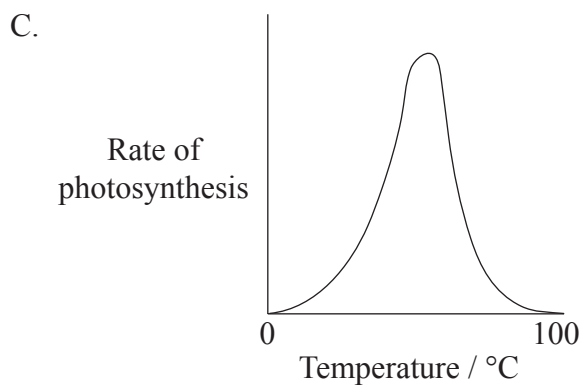
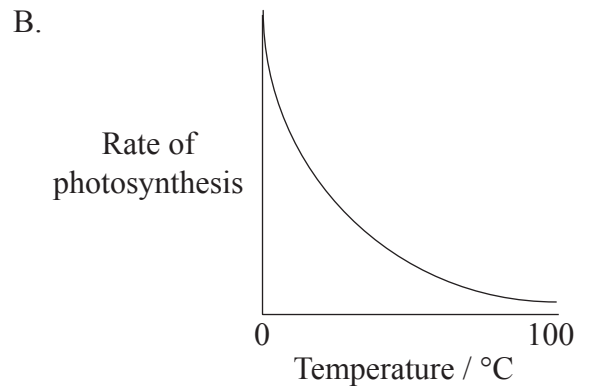
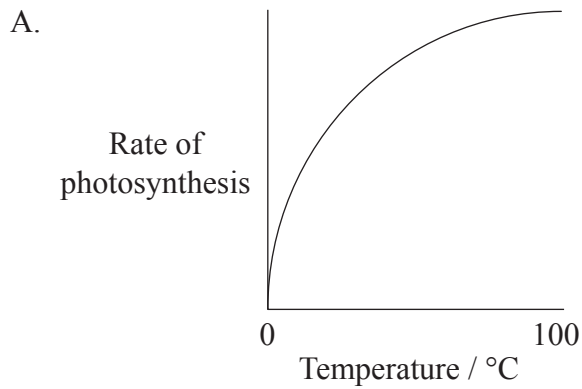
Bases	A / %	G / %	C / %	U / %
RNA	24.9	29.8	24.7	20.6

What is the reason for the difference between these figures?

- A. DNA is only found in the nucleus but RNA is found throughout the cell.
- B. DNA is made entirely of double helix but RNA is not.
- C. In DNA bases A and T are complementary but in RNA bases A and C are complementary.
- D. RNA comes in three forms but DNA only comes in one form.

7. What is lactase used for?
- A. It is used to make sugar-free milk.
 - B. It hydrolyses lactose to glucose and fructose.
 - C. It improves the digestion of milk by some people.
 - D. It decreases the acidity of the milk.
8. What will be produced during aerobic respiration?
- I. Water
 - II. ATP
 - III. Ethanol
- A. I only
 - B. I and II only
 - C. II and III only
 - D. I, II and III

9. Which graph best represents the effect of temperature on the rate of photosynthesis of a plant?



10. What does the nucleus of a human lymphocyte contain?

- A. Only the genes to produce a specific antigen
- B. Only the genes to produce a range of antibodies
- C. Only the genes that control the growth and development of a lymphocyte
- D. The whole genetic information for a human

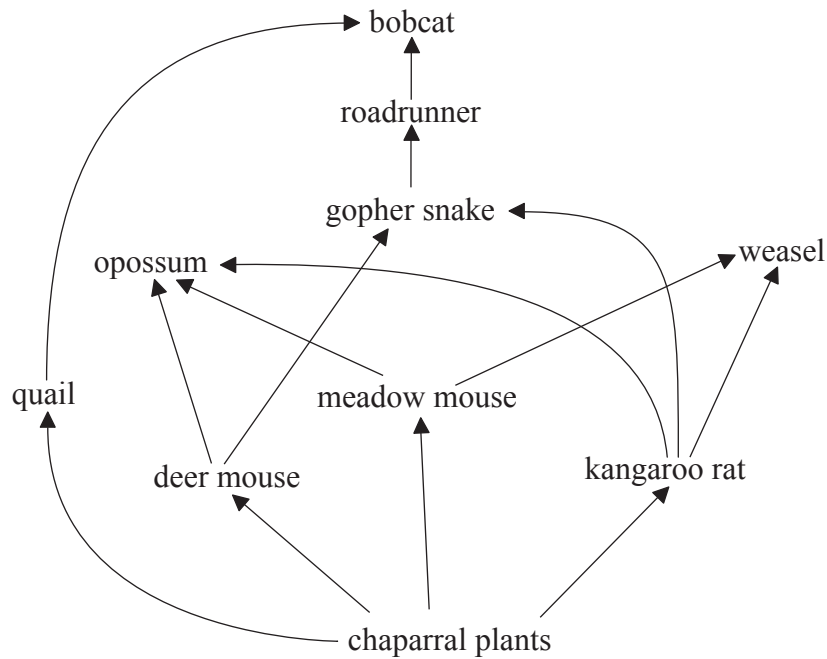
11. What is chorionic villus sampling?
- A. Sampling cells from the placenta
 - B. Sampling cells from the fetal digestive system
 - C. Sampling fetal cells from the amniotic fluid
 - D. Sampling stem cells from the umbilical cord
12. How is red-green colour blindness inherited?
- A. Girls inherit the condition from their fathers only.
 - B. Boys can inherit the condition from unaffected parents.
 - C. Boys inherit the condition from their fathers only.
 - D. Girls inherit the condition from their mothers only.
13. To produce artificial erythrocytes for use in blood transfusions, tobacco plants have been genetically modified to produce human hemoglobin. The first three triplets of the human hemoglobin gene are:

ATG GTG CAT

What would be the first three triplets of the hemoglobin gene inserted into the genome of the modified tobacco plants?

- A. TAC GTG GTA
- B. ATG GTG CAT
- C. TAC CAC GTA
- D. GCAACA TGC

14. What is the energy transfer level from the kangaroo rat to the weasel shown in the food web below?



- A. Three times greater than the energy transfer from the roadrunner to the bobcat
- B. Half the energy transfer from chaparral plants to the meadow mouse
- C. A quarter of the energy transfer from the quail to the bobcat
- D. Approximately the same as the energy transfer from the meadow mouse to the opossum

15. Which of the following gases will contribute to the greenhouse effect?

- I. Oxygen
 - II. Nitrous oxide
 - III. Argon
- A. I only
 - B. II only
 - C. I and II only
 - D. I, II and III

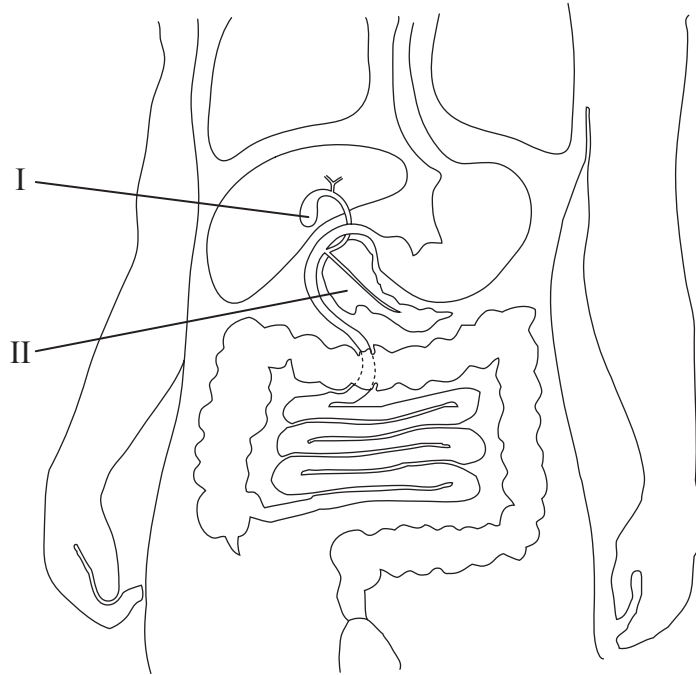
16. Why has antibiotic resistance evolved in bacteria?
- A. All bacteria reproduce very quickly.
 - B. Bacteria exposed to antibiotics developed a resistance to them.
 - C. Varieties of bacteria resistant to antibiotics reproduce faster than non-resistant varieties.
 - D. Bacteria showing resistance to antibiotics survive after antibiotics are used.

17. Which taxa do *Zerynthia rumina* and *Zerynthia polyxena* share?
- A. They share the same class but not the same family.
 - B. They share the same species but not the same class.
 - C. They share the same class but not the same genus.
 - D. They share the same family but not the same species.

18. What features distinguish Platyhelminthes from Annelida?

	Platyhelminthes	Annelida
A.	segmented body	non-segmented body
B.	non-segmented body	segmented body
C.	bilateral symmetry	no bilateral symmetry
D.	no bilateral symmetry	bilateral symmetry

19. What are the names of the organs labelled I and II in the diagram below?



	I	II
A.	pancreas	liver
B.	small intestine	large intestine
C.	gall bladder	pancreas
D.	esophagus	stomach

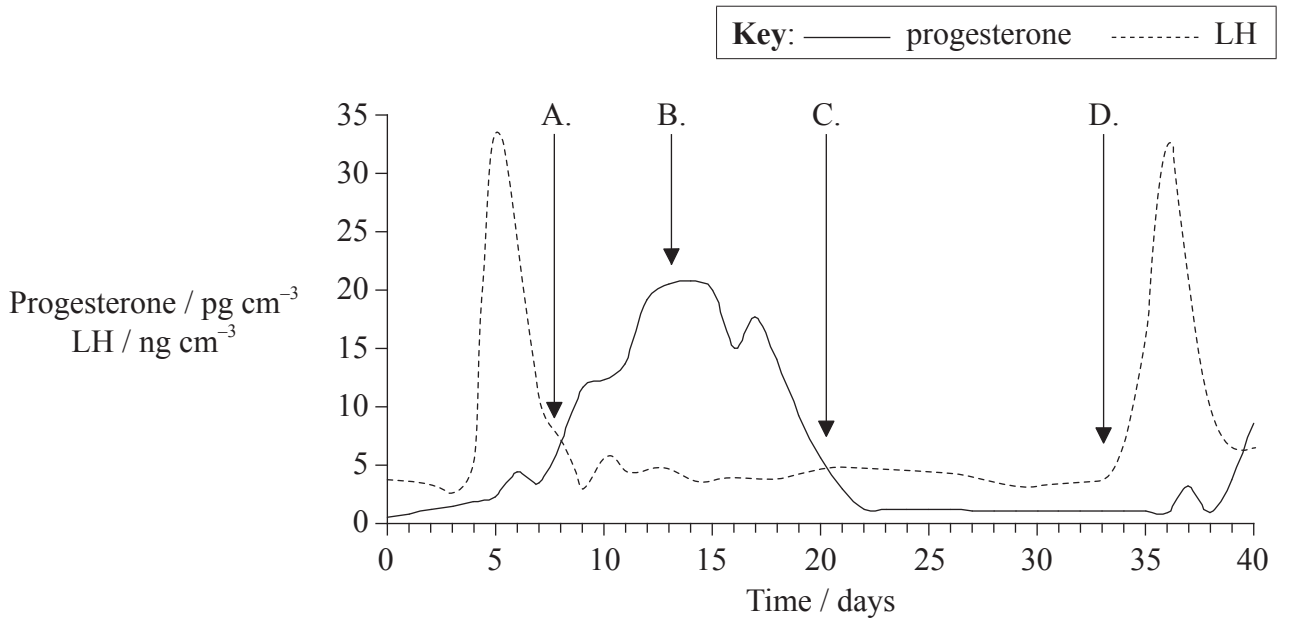
20. Where in a cell are antigens found?

- A. In the nucleus
- B. In the cytoplasm
- C. In the plasma membrane
- D. On the surface of the Golgi apparatus

21. Which feature maintains a high concentration gradient of gases in the ventilation system?
- A. Thin-walled alveoli
 - B. Thin-walled capillaries
 - C. A moist lining of the alveoli
 - D. Blood flowing in the capillaries
22. What causes the formation of a nerve impulse on the post-synaptic membrane?
- A. Ca^{2+} binding with a receptor site
 - B. K^+ leaking into the post-synaptic membrane
 - C. Neurotransmitter binding with receptor sites
 - D. Neurotransmitter being removed from the synapse
23. What is the difference between the origin of type I and type II diabetes?

	Type I	Type II
A.	caused by an autoimmune reaction	target cells fail to respond to insulin
B.	occurs in adults only	starts in childhood
C.	too much insulin secreted	too little insulin secreted
D.	caused by dietary problems	caused by hereditary factors

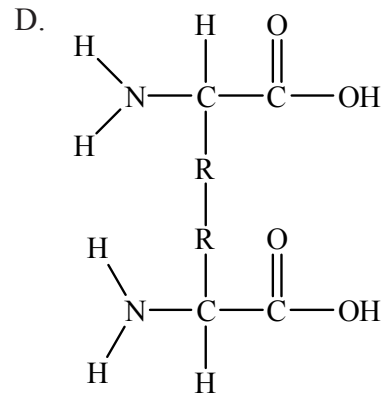
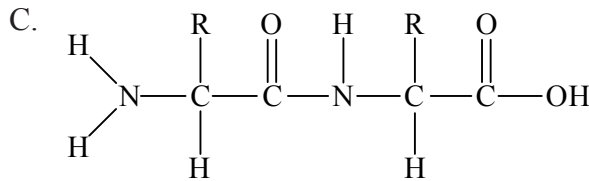
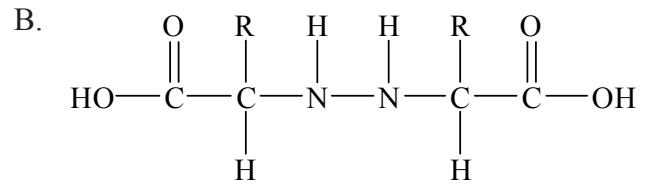
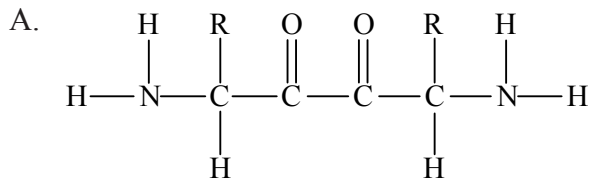
24. The hormones progesterone and LH were measured in a woman's blood over 40 days. When did her menstrual bleed start?



25. How does transcription of RNA proceed?

- A. From 3' to 5' in exons only
- B. From 5' to 3' in exons and introns
- C. From 3' to 5' in introns and from 5' to 3' in exons
- D. From 3' to 5' in exons and from 5' to 3' in introns

26. Which of the following correctly shows a peptide bond between two amino acids?



27. What is a polysome?

- A. A ribosome that is synthesizing proteins from several mRNA molecules at the same time
- B. A ribosome that is synthesizing different proteins for secretion
- C. Several ribosomes using a mRNA molecule to synthesize protein at the same time
- D. Several ribosomes that are synthesizing different proteins for use in the cytoplasm

28. What does oxidation involve?

- A. A loss of electrons
- B. A gain of electrons
- C. A loss of oxygen
- D. A gain of hydrogen

- 29.** What is required for ATP synthesis in mitochondria?
- A. Active pumping of protons into the matrix
 - B. Diffusion of protons out of the matrix
 - C. Accumulation of protons in the intermembrane space
 - D. Accumulation of protons in the matrix
- 30.** What happens in the light-independent reactions of photosynthesis?
- A. Splitting of water molecules
 - B. ATP synthesis
 - C. Reduction of NADP
 - D. Reduction of CO₂
- 31.** Which two tissues of a leaf are photosynthetic?
- A. Upper epidermis and palisade mesophyll
 - B. Palisade mesophyll and spongy mesophyll
 - C. Spongy mesophyll and xylem
 - D. Upper epidermis and xylem

32. How are fluids transported in the xylem and the phloem?

	Xylem	Phloem
A.	away from the root only	towards the root only
B.	towards the root only	away from the root only
C.	away from and towards the root	towards the root only
D.	away from the root only	away from and towards the root

33. How does phytochrome control flowering in plants?

- A. P_{fr} turns into P_r in the light, causing short-day plants to flower.
- B. P_r turns into P_{fr} in the light, causing long-day plants to flower.
- C. P_{fr} turns into P_r in the dark, causing long-day plants to flower.
- D. P_r turns into P_{fr} in the dark, causing short-day plants to flower.

34. Which processes result in recombination?

	Meiosis	Crossing over	Independent assortment	Mutation
A.	yes	yes	yes	no
B.	yes	no	yes	no
C.	yes	yes	no	yes
D.	no	no	no	yes

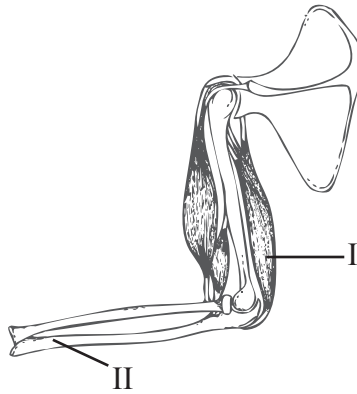
35. What is the correct sequence of factors involved in blood clotting?

- A. platelets → clotting factors → fibrin → fibrinogen
- B. clotting factors → platelets → fibrinogen → fibrin
- C. platelets → clotting factors → fibrinogen → fibrin
- D. clotting factors → platelets → fibrin → fibrinogen

36. How do vaccines give immunity to infectious diseases?

- A. They kill pathogenic microbes.
- B. They produce an immune response.
- C. They contain antibodies against pathogens.
- D. They inhibit the antigen-antibody reaction.

37. What are the names of the two structures labelled I and II in the arm joint diagram below?



	I	II
A.	biceps	radius
B.	biceps	humerus
C.	triceps	humerus
D.	triceps	ulna

38. What does the reabsorption of glucose in the proximal tubules of the kidney require?
- A. Movement of water by osmosis out of the tubule cells
 - B. Facilitated diffusion of Na^+ out of the tubule cells
 - C. Active transport of K^+ into the tubule cells
 - D. Active transport of Na^+ out of the tubule cells
39. What is the role of FSH in spermatogenesis?
- A. It stimulates the secretion of testosterone from the Sertoli cells.
 - B. It inhibits the secretion of testosterone from the interstitial cells.
 - C. It stimulates the action of testosterone on the Sertoli cells.
 - D. It stimulates the secretion of LH from the pituitary cells.
40. What is the difference between spermatogenesis and oogenesis?

	Spermatogenesis	Oogenesis
A.	final cells are a similar size	final cells are not all the same size
B.	cells produced are undifferentiated	cells produced are differentiated
C.	spermatogenesis begins in a boy at birth	oogenesis begins in a girl before she is born
D.	one germinal epithelium cell produces four sperm cells in a testis	one germinal epithelium cell produces one oocyte in the ovary
