CANDIDATE – PLEASE NOTE!

You must sign below and return this booklet with the Answer Sheet. Failure to do so may result in disqualification.

Signature

TEST CODE **02107010**

MAY/JUNE 2014

FORM TP 2014140

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

BIOLOGY - UNIT 1

Paper 01

1 hour 30 minutes

10 JUNE 2014 (a.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 45 items. You will have 1 hour and 30 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Do not be concerned that the answer sheet provides spaces for more answers than there items in this test.
4. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each ite you are about to answer and decide which choice is best.
5. On your answer sheet, find the number which corresponds to your item and shade the spa having the same letter as the answer you have chosen. Look at the sample item below

Sample Item

Which of the following metal atoms is present in a haemoglobin molecule?

(A) Calcium
(B) Magnesium
(C) Copper
(D) Iron

Sample Answer

Ⓐ Ⓑ Ⓒ ●

The best answer to this item is "Iron", so answer space (D) has been shaded.

6. If you want to change your answer, erase it completely before you fill in your new c
7. When you are told to begin, turn to page [illegible] and answer carefully every question. Your score will be the number of correct answers.
8. You may do any rough work in this booklet.
9. Figures are not necessarily drawn to scale.

1. Which three of the following characteristics of water are of biological significance?

I. Excellent solvent properties.
II. Relatively high heat capacity.
III. Lower surface tension than most liquids.
IV. Density decreases below 4 °C.

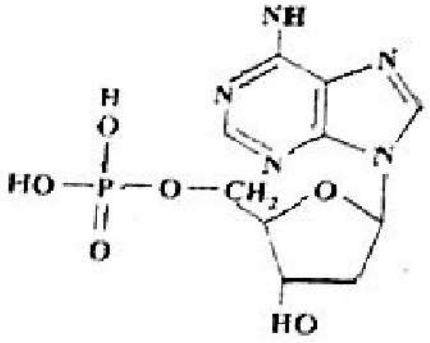
(A) I, II and III
(B) I, II and IV
(C) I, III and IV
(D) II, III and IV

2. Which of the following is NOT a polymer?

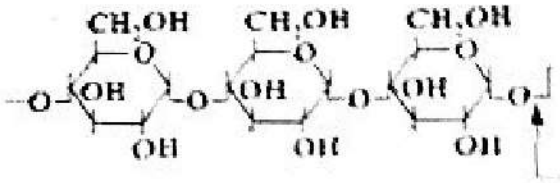
(A) Starch
(B) Glucose
(C) Cellulose
(D) Glycogen

3. Which of the following BEST represents the structure of a triglyceride?

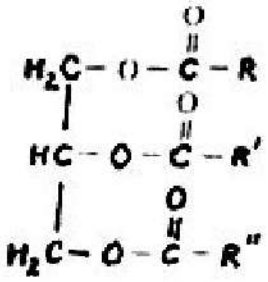
(A)



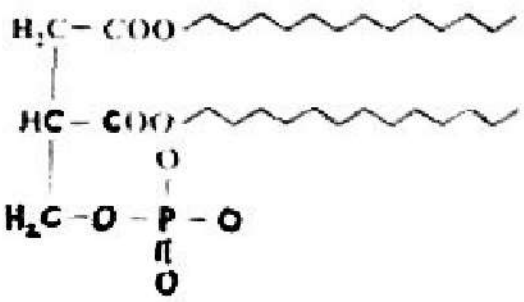
(B)



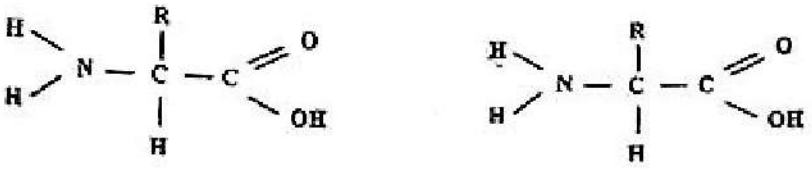
(C)



(D)



Item 4 refers to the following molecules.



4. Which of the following bonds is formed between these two molecules during a condensation reaction?

(A) Ester
(B) Peptide
(C) Hydrogen
(D) Glycosidic

Item 5 refers to the following information.

A student crushes two foods, X and Y, and performs food tests on the extracts. The results are shown in the table below.

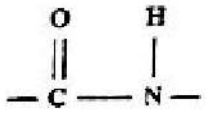
Test	Observation	
	Food X	Food Y
Benedict's	Blue	Orange precipitate
Iodine	Blue-black	Blue-black
Emulsion	Cloudy	Clear
Biuret	Blue	Purple

5. Which of the following combinations indicates which molecules may be present in the foods, X and Y?

	Food X	Food Y
(A)	Fat, starch, sucrose	Protein, starch, sucrose
(B)	Glucose, protein, starch	Fat, protein, sucrose
(C)	Fat, starch, sucrose	Glucose, protein, starch
(D)	Fat, protein, starch	Glucose, protein, starch

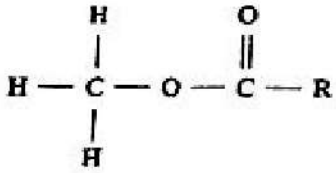
6. Which of the following occurs in the tertiary structure but NOT in the primary structure of a protein?

(A)

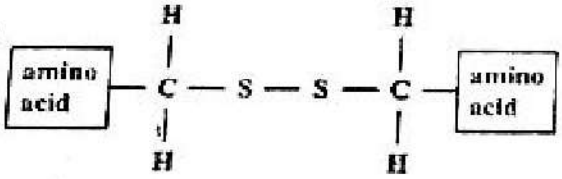


(B)

(C)



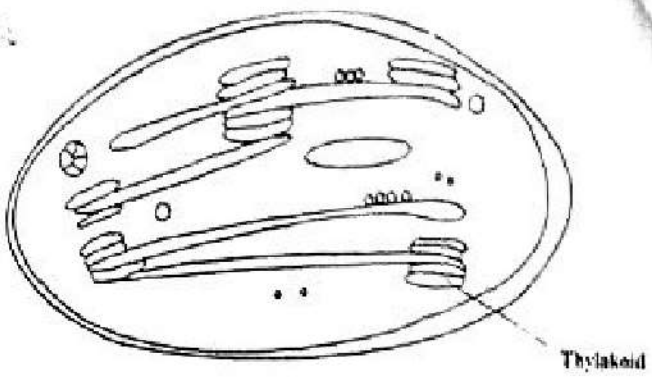
(D)



7. What is the HIGHEST level of protein structure exhibited by haemoglobin?

(A) Primary
(B) Secondary
(C) Tertiary
(D) Quaternary

Item 8 refers to the following diagram showing a chloroplast.



8. Which of the following is true about the thylakoid?

(A) It consists of two membranes.
(B) It manufactures enzymes for the process of photosynthesis.
(C) It is involved in the light-dependent reaction of photosynthesis.
(D) It is involved in the light-independent reaction of photosynthesis.

9. Which of the following is NOT likely to be seen in an electron micrograph of a plant cell?

(A) Tonoplast
(B) Ribosome
(C) Centriole
(D) Golgi apparatus

10. Which structure is found in **BOTH** a prokaryotic and eukaryotic **cell?**

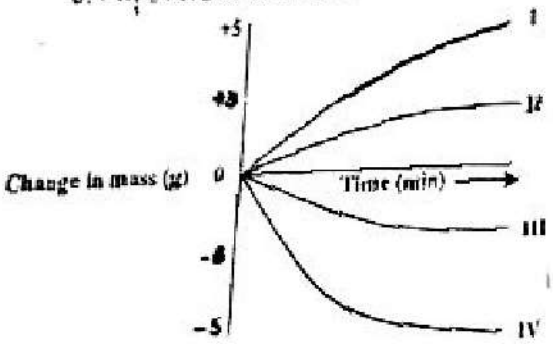
(A) Ribosome
(B) Chloroplast
(C) Mitochondrion
(D) Nuclear membrane

11. The table below shows three processes involved in the movement of substances across cell membranes. Which of the following correctly states whether the three processes shown are active or passive in nature?

	Diffusion	Endocytosis	Osmosis
(A)	Active	Active	Active
(B)	Active	Passive	Active
(C)	Passive	Active	Passive
(D)	Passive	Passive	Passive

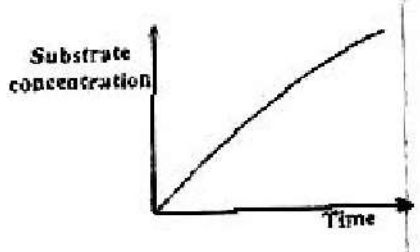
12. Four cylinders of equal mass are cut from a single potato. One cylinder is placed in distilled water and the others in 0.2 M, 0.4 M and 0.8 M sucrose solution, respectively. Each cylinder is weighed at half-hour intervals for six hours. The graph below shows the results obtained.

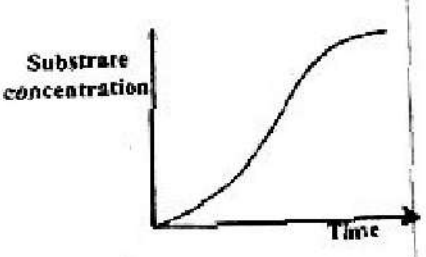
Which curve MOST likely represents the 0.4 M sucrose solution?

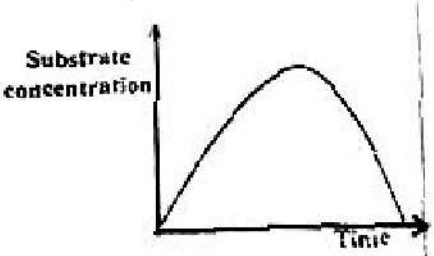


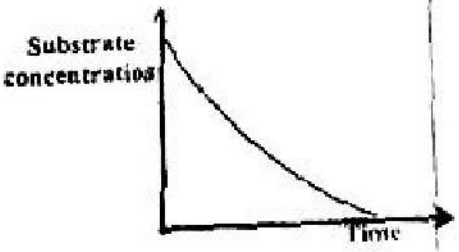
(A) I
(B) II
(C) III
(D) IV

13. Which graph shows the changes in substrate concentration during the course of an enzyme-catalysed reaction?

(A)


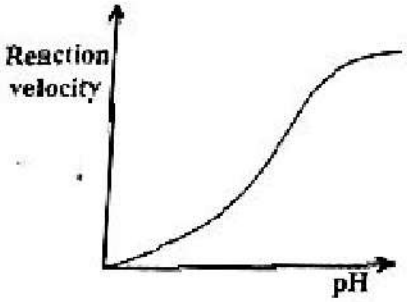
(B)


(C)


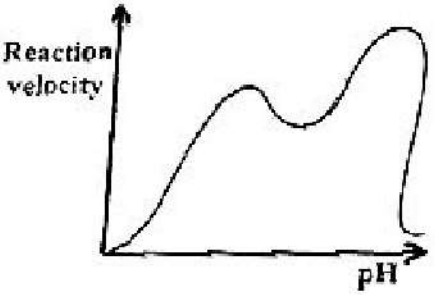
(D)


14. Which of the following graphs BEST shows the effect of pH on the reaction velocity of an enzyme?

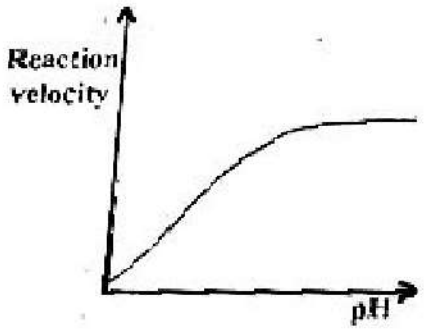
(A)



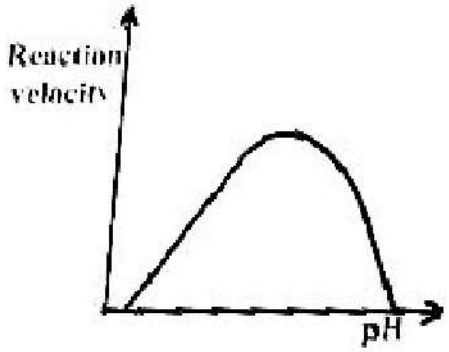
(B)



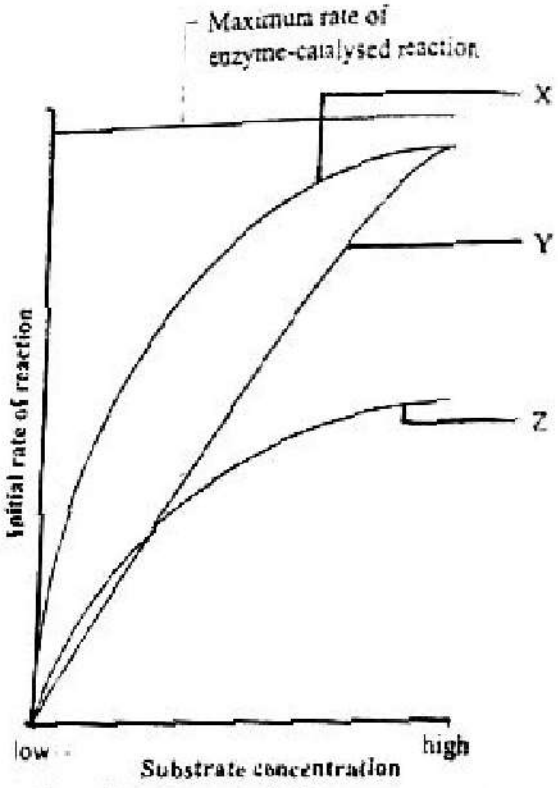
(C)



(D)



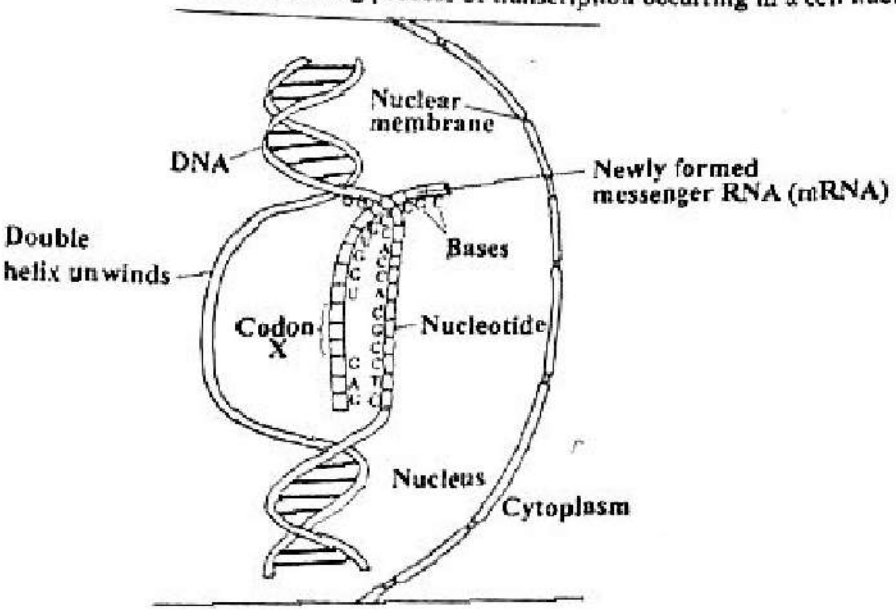
Item 15 refers to the graph below showing the rates of reaction of an enzyme with and without inhibitors.



15. Which of the following describes the reaction represented by the curves, X, Y and Z?

	Reaction with No Inhibitor	Reaction with a Competitive Inhibitor	Reaction with a Non-competitive Inhibitor
(A)	X	Y	Z
(B)	X	Z	Y
(C)	Y	X	Z
(D)	Z	X	Y

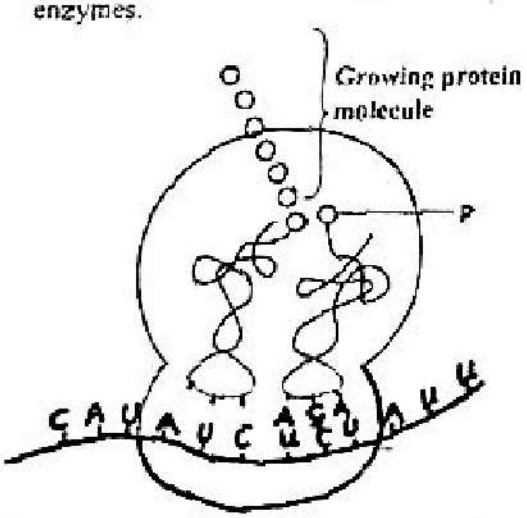
Item 17 refers to the following process of transcription occurring in a cell nucleus.



17. The base sequence of the codon labelled X is

(A) GAG
(B) GCG
(C) GGG
(D) CGC

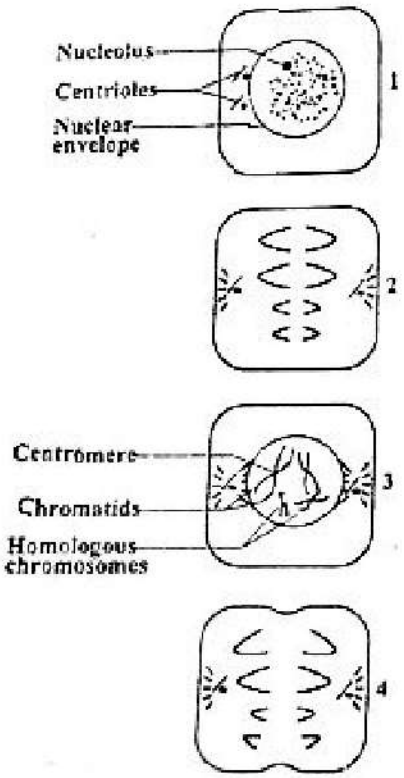
Item 18 refers to the following process of translation occurring at a ribosome in a cell that synthesises enzymes.



18. The structure, P, MOST likely represents

(A) a protein
(B) a ribosome
(C) a nucleotide
(D) an amino acid

Item 19 refers to the following drawings illustrating four stages in mitosis.



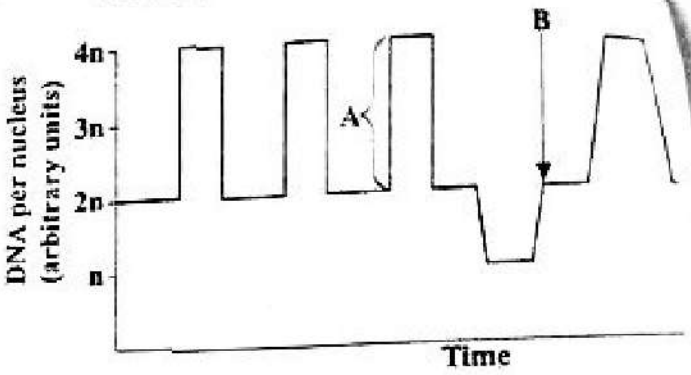
19. The correct order of these mitotic stages is

(A) 1, 3, 2, 4
(B) 1, 4, 2, 3
(C) 3, 1, 4, 2
(D) 4, 2, 3, 1

20. Which of the following is NOT true of homologous chromosomes?

(A) They are the same length.
(B) They contain the same alleles.
(C) They contain the same number of genes.
(D) Euchromatin and heterochromatin bands are the same.

Item 21 refers to the graph below which represents the relative amounts of DNA per nucleus during many cell divisions in an animal cell.



21. Which of the following processes are occurring at A and B?

	A	B
(A)	Fertilization	Cytokinesis
(B)	DNA synthesis	Fertilization
(C)	Fertilization	DNA synthesis
(D)	DNA synthesis	Separation of chromosome

Items 22–23 refer to the following information.

A particular breed of domestic cats can have either black, white or brown fur colour. The dominant allele, B, of one gene gives black fur and the recessive allele, b, gives brown fur.

Many of the white cats carry a dominant allele, P, of a second gene which inhibits all pigment production. The recessive allele, p, has no effect on the colour of the fur.

The two different genes are not linked nor are they on the X chromosome.

22. This type of gene interaction is described as

(A) epistasis
(B) sex-linkage
(C) codominance
(D) dominant/recessive

23. Which of the following pairs of genotypes would BOTH produce cats with white fur?

(A) BbPP, bbPP
(B) BBPP, Bbpp
(C) bbPp, BBpp
(D) bbpp, Bbpp

24. Environmental factors that keep populations in check are called selection pressures. Which of the following is LEAST likely to be an example of selection pressure?

(A) Disease
(B) Predation
(C) Temperature
(D) Height

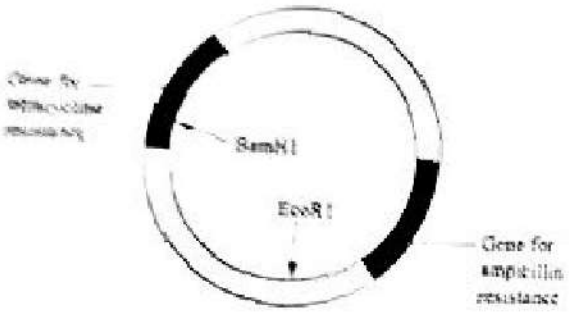
25. Mutations may arise due to non-disjunction of chromosomes. In which of the following would such a mutation be transmitted to the offspring?

(A) During the division of cells in the cambium
(B) During the division of malignant cells in the skin
(C) During the development of the secondary oocyte in an animal
(D) After the fusion of a male nucleus with polar nucleus in a plant

26. A possible benefit of producing transgenic plants is

(A) production of clones
(B) increased use of pesticides
(C) improved human nutrition
(D) determination of human genome

Items 27–28 refer to the following map of a plasmid showing the position of recognition sequences of two restriction enzymes.



27. In an experiment to use this plasmid as a vector for the human insulin gene, for which of the following reasons would the genetic engineer choose BamH1 to cut this plasmid?

(A) BamH1 makes a staggered cut
(B) To allow identification of the recombinant plasmid
(C) The insulin gene is not complementary to the EcoR1 restriction site
(D) The gene for tetracycline resistance is needed for the expression of the insulin gene.

28. In addition to the human insulin gene, which of the following would be required to produce a recombinant plasmid?

(A) ADP
(B) DNA ligase
(C) RNA polymerase
(D) Reverse transcriptase

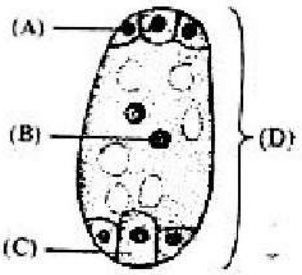
29. Which of the following plays the MOST significant role in allopatric speciation?

(A) Ecological isolation
(B) Temporal speciation
(C) Behavioural isolation
(D) Geographical isolation

30. In sickle-cell anaemia, the sickling of red blood cells is a result of a mutation of

(A) a single base pair in the gene that encodes for the alpha-globin polypeptide
(B) a single base pair in the gene that encodes for the beta-globin polypeptide
(C) two base pairs in the gene that encodes for the alpha-globin polypeptide
(D) two base pairs in the gene that encodes for the beta-globin polypeptide

Items 31–32 refer to the following diagram showing the embryo sac of a flowering plant.



In answering items 31–32, each labelled part may be used once, more than once or not at all.

Which of the labelled structures

31. is the female gamete?

32. develops into the endosperm?

33. Which of the following are formed during the development of pollen grains?

(A) Antipodals
(B) Synergids
(C) Polar nuclei
(D) Tube nuclei

34. Which of the following types of plants use mechanisms which guarantee cross fertilization?

(A) Dioecious plants
(B) Monoecious plants
(C) Plants with cleistogamous flowers
(D) Plants with hermaphroditic flowers

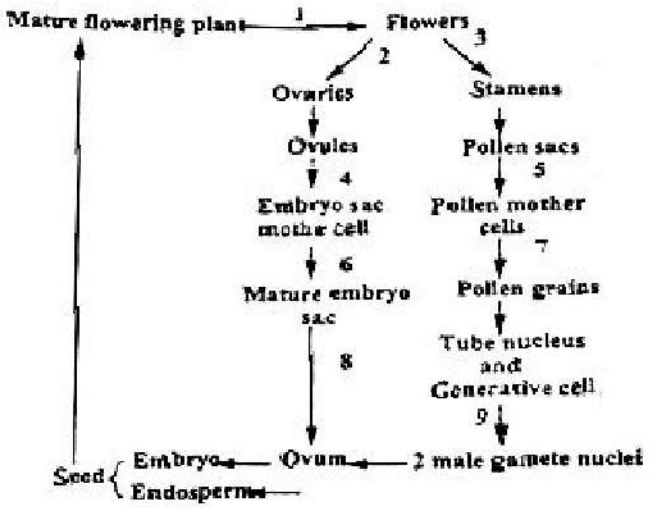
35. A horticulturalist has bred a *Hibiscus* variety which bears violet flowers. Which method of propagation would be MOST appropriate for rapid production of a large number of clonal plants?

(A) Seed
(B) Cutting
(C) Fragmentation
(D) Tissue culture

36. Which of the following occur in asexual reproduction ONLY?

(A) Gametes are never involved and there is fusion of haploid nuclei.
(B) Gametes are never involved and offspring are genetically different.
(C) Offspring are genetically the same and there is fusion of gametes.
(D) Offspring are genetically the same and gametes are almost never involved.

Item 37 refers to the following flow chart which shows the life cycle of a flowering plant.



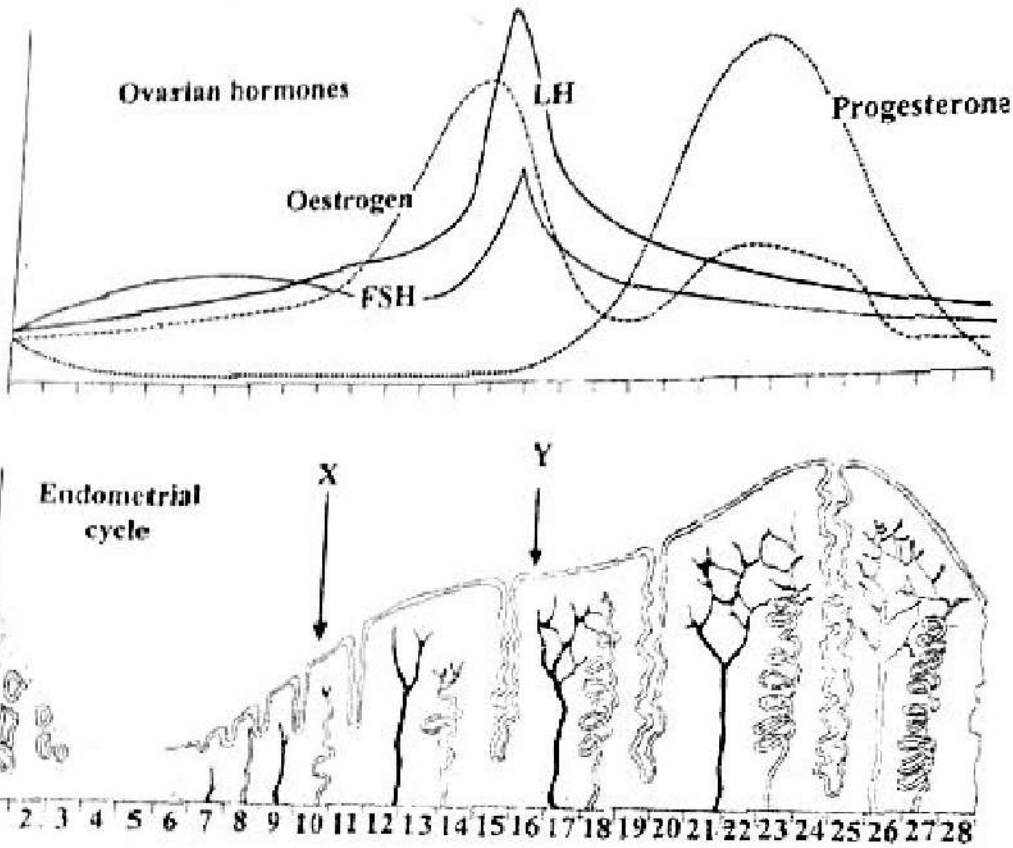
37. Which of the following pairs correctly shows where meiosis takes place?

(A) 2 and 3
(B) 4 and 5
(C) 6 and 7
(D) 8 and 9

38. Which of the following is true about double fertilization in flowering plants?

(A) Two sperm nuclei fuse with one egg cell.
(B) Two sperm nuclei fuse with two egg cells.
(C) One sperm nucleus fuses with an egg cell and a polar nucleus.
(D) Two sperm nuclei fuse with an egg cell and polar nuclei, respectively.

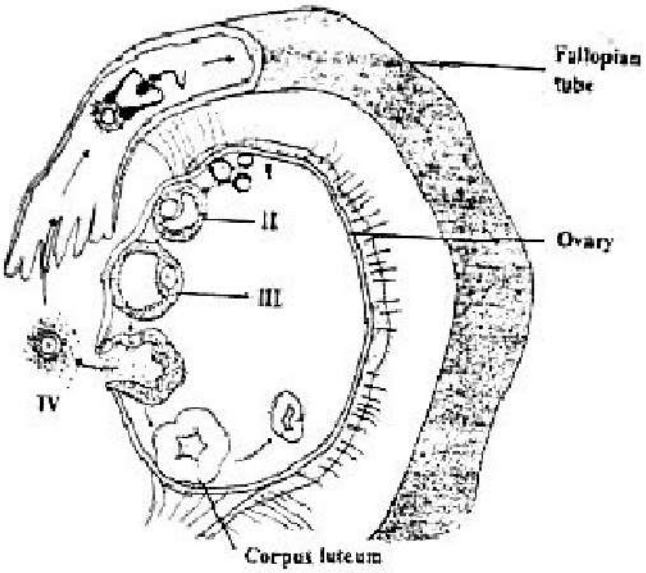
Item 39 refers to the following diagram which shows the changes in the levels of the ovarian hormones which regulate the human menstrual cycle.



39. Which of the following BEST describes the events highlighted by the arrows labelled X and Y?

	X	Y
(A)	Increasing levels of oestrogen promote thickening of the endometrium.	Increasing levels of progesterone prepare the endometrium for implantation of a fertilized ovum.
(B)	Increasing levels of **LH** promote thickening of the endometrium.	A surge in **FSH** concentration prepares the endometrium for implantation of the fertilized ovum.
(C)	Increasing levels of progesterone promote thickening of the endometrium.	**A surge in LH** concentration prepares the **endometrium for implantation of a fertilized ovum**
(D)	**Increasing levels of FSH promote thickening of the endometrium.**	**Increasing levels of oestrogen prepare the endometrium for implantation of a fertilized ovum .**

Item 40 refers to the following diagram showing the key stages of oogenesis.



40. Which of the following shows the correct number of chromosomes for Stages I, II and IV?

	I	II	IV
(A)	n	n	n
(B)	2n	n	n
(C)	2n	2n	n
(D)	2n	2n	2n

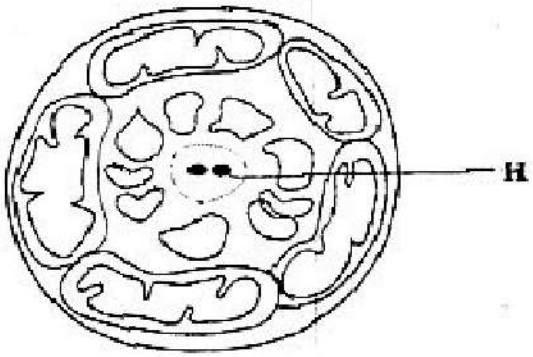
41. The hormone that stimulates spermatogenesis in the seminiferous tubules is

(A) inhibin
(B) testosterone
(C) luteinising hormone
(D) follicle-stimulating hormone

42. Human spermatozoa have to spend several hours in the female genital tract before they can fertilize an oocyte. During this time, they are activated in a process called

(A) capacitation
(B) ejaculation
(C) conception
(D) copulation

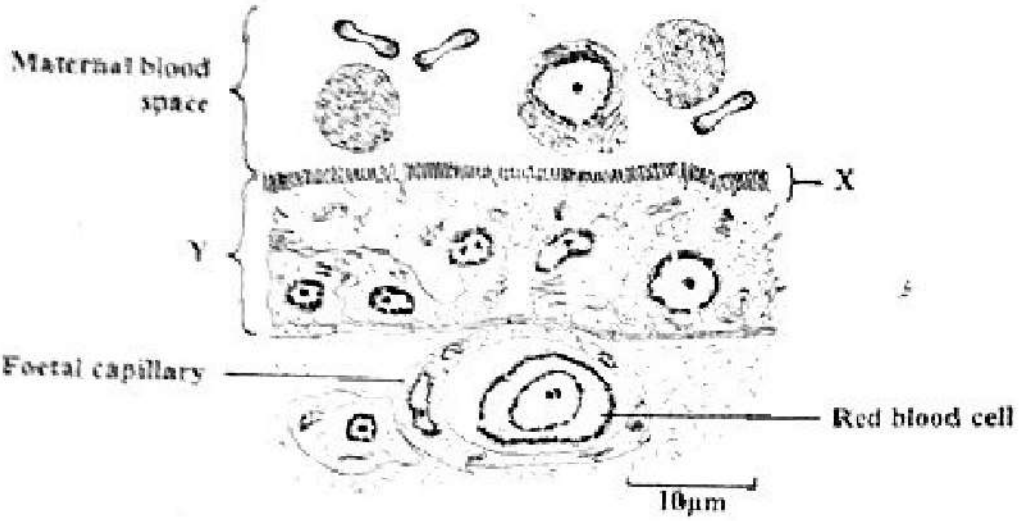
Item 43 refers to the following diagram which shows a transverse section through the middle piece of a spermatozoon.



43. The structure labelled H is MOST likely

(A) a nucleus
(B) an acrosome
(C) a microtubule
(D) a mitochondrion

Items 44–45 refer to the following diagram of a small section of the human placenta as seen in an electron micrograph.



44. Which of the following options is correct for two visible differences between the maternal red blood cell and the foetal red blood cell?

	Maternal Red Blood Cell	Foetal Red Blood Cell
(A)	Larger, enclosed by capillary	Smaller, not enclosed by capillary
(B)	Smaller, not enclosed by capillary	Larger, enclosed by capillary
(C)	Smaller, nucleus seen	Larger, no nucleus seen
(D)	Larger, no nucleus seen	Smaller, nucleus seen

45. Which of the following correctly identifies the structures, X and Y?

	X	Y
(A)	Microvilli	Chorion
(B)	Microvilli	Amnion
(C)	Protective barrier	Chorion
(D)	Protective barrier	Amnion

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.