



KISII UNIVERSITY

UNIVERSITY EXAMINATIONS

MAIN CAMPUS

SECOND / FIRST YEAR EXAMINATION FOR THE AWARD OF THE
DEGREE OF BACHELOR OF SCIENCE IN MEDICAL LABORATORY
FIRST SEMESTER, 2015/2016
(SEPTEMBER - DECEMBER, 2015)

MELS 151: CELL BIOLOGY AND GENETICS

COURSE: B.MELS Y2/Y1 S1

TIME: 3 HOURS

DAY: MONDAY, 9.00-12.00 PM

DATE: 07/12/2015

INSTRUCTIONS

*Do not write anything on this question paper.
This paper consists of three sections. Answer ALL questions in
section A and B [COMPULSORY] and any TWO questions from
section C.*

SECTION A

Answer all the questions from this section. (20 marks)

1. Cellular proteins destined for secretion are sorted and packaged in the
 - A. Lysosomes
 - B. Endospores
 - C. Endoplasmic reticulum
 - D. *trans* Golgi network
 - E. Peroxisomes
2. Virus-mediated transfer of cellular genetic material from one bacteria cell to another by means of virus particles is called
 - A. induction
 - B. transfection
 - C. transformation
 - D. transposition
 - E. transduction
3. True statements about retrotransposons include which of the following?
 - A. They replicate through an RNA intermediate
 - B. They utilize reverse transcriptase for replication
 - C. They may contain introns
4. All of the following contribute to promoter binding by RNA polymerase in *E. coli* EXCEPT the
 - A. rho factor
 - B. -10 consensus sequence
 - C. -35 consensus sequence
 - D. β' subunit of RNA polymerase
 - E. β subunit of RNA polymerase
5. In the cross $AaBb \times AaBb$, Mendel's principle of independent assortment predicts that the ratio of the four phenotypes of the offspring will be
 - A. 2A Bb Aa Bb

- A. 1:1:1:1
- B. 3:2:2:1
- C. 4:2:2:1
- D. 9:3:3:1
- E. 9:7:3:1

✓ Sugar
 ✓ PO groups
 ✓ Purines in Pyrimidines

6. In animals, an enzyme unique to gluconeogenesis is
- A. enolase
 - B. phosphoglyceromutase
 - C. glyceraldehyde 3-phosphate dehydrogenase
 - D. aldolase
 - ✓ E. fructose 1,6-biphosphatase

7. Approximately how many moles of ATP will be generated as a result of the oxidation of one mole of FADH₂ in an actively respiring mitochondrion?
- A. 0
 - B. 2
 - C. 3
 - D. 4.5
 - E. 6

3.2 FADH
 1
 3.2
 1 = 2

3:2
 3'

8. Which of the following is NOT a characteristic of intermediate filaments?
- A They form the nuclear lamina
 - B They provide mechanical stability to animal cells
 - C Their protein composition is tissue specific
 - D They are composed of globular monomers that polymerize to form fibers
 - E They includes the keratin filaments of epithelial cells.

9. All of the following components of a retrovirus are encoded by the viral genome EXCEPT
- A. matrix proteins
 - B. viral RNA's
 - C. capsid proteins
 - D. envelope lipids
 - E. receptor-binding proteins

10. Which of the following is most likely to lead to a loss of a gene function?
- A A missense mutation in the open reading frame
 - B A change from TAA codon to a TAG codon in the coding region
 - C A change from T to C in the promoter region
 - D A frameshift mutation in the coding region
 - E A sequence change in the 3' untranslated region

11. All of the following processes occur in the mitochondria of mammalian cells EXCEPT
- A fatty acid biosynthesis

- B protein synthesis
 - C DNA synthesis
 - D beta oxidation of fatty acids
 - E the citric acid cycle
12. If the M-phase-promoting factor is injected into a *Xenopus* primary oocyte, which of the following occurs?
- A S phase begins
 - B The oocyte enters G_0
 - C Apoptosis begins
 - D The germinal vesicle (nucleus) breaks down
 - E Mitosis is completed
13. Actin filaments are found in all of the following EXCEPT the
- A flagella of bacteria
 - B sarcomeres of skeletal muscle cells
 - C stress fibers of fibroblasts
 - D microvilli of the intestinal brush border
 - E contractile rings of dividing animal cells
14. Which one of the following is associated with bacterial cells?
- a) Ribosomes
 - b) Nucleus
 - c) Chloroplasts
 - d) Lysosomes
15. The overall shape of a bacterial cell is determined by which of the following?
- a) Cytoskeleton
 - b) Cell wall
 - c) Nucleoid
 - d) Cell surface membrane
16. Which of the following statements is correct?
- a) Animal and fungal cells contain chloroplasts.
 - b) Animal and plant cells do not contain mitochondria.
 - c) Plant, animal and fungal cells possess mitochondria.
 - d) All plant cells contain chloroplasts.
17. Which of the following are not found in plant cells?
- a) Mitochondria ✓
 - b) Glyoxysomes
 - c) Centrosomes
 - d) Golgi apparatus ✓
18. Which of the following biomolecules are formed by condensation reactions?
Please select all that apply.
- a) Polypeptides ✓

- b) Polysaccharides ✓
 - c) Steroids ✓
 - d) Nucleic acids
19. Cell was discovered by
- A. Leeuwenhoek
 - B. Robert Hooke
 - C. Robert Swanson
 - D. Robert Brown
20. Which of the following statements are true about Endoplasmic Reticulum? (a) Smooth Endoplasmic Reticulum makes lipids. (b) It is also called the control center of the cell. (c) It processes carbohydrates. (d) It modifies chemicals that are toxic to the cell. ✓
- A. (a), (b) and (c)
 - B. (a), (c) and (d)
 - C. only (a) and (d)
 - D. all are correct

SECTION B

Answer all the questions from this section. (20 marks)

1. Discuss the events occurring during mitosis. (4 marks)
2. Discuss RNA structure. (4 marks)
3. Explain gene mapping. (4 marks)
4. Discuss Mendel's laws of inheritance. (4 marks)
5. Differentiate prokaryotic and eukaryotic cells. (4 marks)

SECTION C

Question 1 is compulsory and any other (30 marks)

1. Discuss organic and biochemistry of the cell. (15marks)
2. Discuss the cell organelles. (15 marks)
3. DNA is regarded as the command centre of the cell why? Explain replication with diagrams where necessary (15 marks)