MOI UNIVERSITY

COLLEGE OF HEALTH SCIENCES
SCHOOL OF MEDICINE
END OF TERM I EXAMINATION (ETE I) 2022/2023
COURSE CODE: MSB 101
COURSE TITLE: CELL BIOLOGY. EMBRYOLOGY AND GENETICS
PROGRAMME: M.B.Ch.B., B.Sc Physiotherapy
YEAR OF STUDY: 1(ONE)

DATE: 28TH APRIL, 2023 TIME: 9.00 A.M. - 12.00 noon

GENERAL INSTRUCTIONS:-

(I) WRITE YOUR UNIVERSITY REGISTRATION NUMBER ON EVERY PIECE OF PAPER YOU USE.

(II) DO NOT WRITE YOUR NAMES ON ANY PIECE OF PAPER YOU USE.

(III) THIS PAPER CONSIST OF THREE (3) SECTIONS, HEADED SECTION A: HUMAN ANATOMY, SECTION B: BIOCHEMISTRY, AND SECTION C: PHYSIOLOGY. ALL TO BE ANSWERED IN A TOTAL TIME OF THREE (3) HOURS.

(IV) QUESTIONS IN EACH SECTION MUST BE ANSWERED IN SEPARATE ANSWER BOOKLETS OR ANSWER SHEETS, SO THAT THEY CAN BE HANDED IN SEPARATELY AT THE END OF THE EXAMINATION.

(V) READ CAREFULLY ANY ADDITIONAL INSTRUCTIONS PRECEEDING EACH STATION OR SUBSECTION.

SECTION A: HUMAN ANATOMY

SECTION A; MCQ TYPE II TRUE OR FALSE
(80 MINUTES)

INSTRUCTIONS

I. EACH OF THE STEM STATEMENT IS FOLLOWED BY FIVE COMPLETION STATEMENTS A-E WHICH ARE EITHER TRUE OR FALSE

II. INDICATE YOUR RESPONSE IN THE ANSWER SHEET BY PRINT AN "X" IN THE T COLUMN IF TRUE AND IN THE F COLUMN IF FALSE

Eg Q concerning the eye

A. Constrictor pupillae is supplied by sympathetic nervous system
B. Bipolar cells make second order of neurons in the visual pathway
C. Rods are absent in fovea centralis
D. Blockage of canal of Schlemm will result in increased intraocular pressure
E. Superior oblique muscle elevate and laterally rotate the eye

		A	B	C	D	E
Q	T		X	X	X	
	F	X				X
1	T					
	F					

1. Concerning gliocytes
   a) Microglia are of mesodermal origin
   b) Processes of oligodendrocytes and endothelial cells form blood-brain barrier
   c) Fibrous astrocytes are in grey mater
   d) Schwann cells are responsible for myelination in central nervous system
   e) They all originate from neural ectoderm except microglia and Schwann cells
2. Related to glandular epithelia
   a) Golgi apparatus of secretory exocrine cells lie above the nucleus
   b) In the mammary gland myoepithelial cells surround the oute part of basement membrane
   c) Goblet cells secrete fluid having a high protein content
   d) Neuroendocrine cells are of neural crest origin
   e) Terminal parts of exocrine glands are secretory portions

3. The following scientists were the first to propose cell theory
   a) Robert Hooke
   b) Leewenhoek
   c) Matthias Schleiden and Theodor Schwan
   d) Zacharias Jansen
   e) kolliker

4. The following organelles are nonmembrane bound organelles
   a) centriole
   b) Endoplasmic reticulum
   c) Ribosome
   d) Lysosome
   e) cilia

5. the direct methods of cytology include
   a) immune-histochemistry
   b) intravital and supravital staining
   c) Exfoiliative histology
   d) tissue and organ culture
   e) Microscopic analysis

6. The following concerns the animal cell membrane
   a) It consists of 5-10% oligosaccharides
   b) The hydrophobic heads of lipids form the extracellular and cytoplasmic domains
   c) Clanthrin a transmembrane protein transport molecule across the membrane
   d) Glycocalyx is attached to the extracellular domain of the cell membrane
   e) Elements in the bilipid layer are spatially fixed

7. Concerning endoplasmic reticulum
   a) It is made up of anastomosing channels, cisterns
   b) That to which ribosomes are attached synthesize protein for repair and enzymes for use internally by the cell
   c) Smooth endoplasmic reticulum synthesizes proteins for extracellular use
   d) Smooth endoplasmic reticulum plays a role in storage and release of calcium in straited muscle tissue
   e) Rough endoplasmic reticulum is continuous with the outer wall of nuclear envelop

8. Concerning cell cycle
   a) Centrioles replicate during interphase and move to opposite side of the cell during prophase
   b) Chromosomes are attached to spindle apparatus at the kinetochore during prophase
   c) During anaphase chromosomes align at the equatorial plate
   d) Reconstitution of the nuclear membrane occurs during late anaphase
   e) The mitotic process is completed within one hour

9. The following cell processes do not use microtubles
   a) Phagocytosis
   b) Mitosis
   c) Endocytosis
   d) exocytosis
   e) pinocytosis

10. The G1 checkpoints ensures
   a) Chromosomes are attached properly to the spindle apparatus
   b) That DNA replication is complete
   c) The cell size and cellular components are adequate
   d) No damage to DNA
   e) That there are adequate growth factors

11. Fertilizations results in
   a) Determination of phenotypic sex
   b) Genetic variability due to crossing over during chiasma formation
   c) Initiation of first meiotic division in the oocyte
   d) Determination of chromosomal sex
   e) Formation of first polar body in the oocyte

12. Concerning blood tissue
   a) Basophils have specific granules containing histaminase and heparin
   b) Plasma forms 55% of the haematocrit
   c) Albumin is the main protein component of plasma
   d) All granulocytes have specific and nonspecific granules
   e) Eosinophils have multilobed nucleus

13. The following events occur following fertilization to just before implantation
   a) Gastrulation
   b) Cleavage
   c) Formation of embryoblast and trophoblast
   d) Hatching of blastula
   e) Folding of the embryo

14. The following structures are correctly matched to their mesodermal origin
   a) Heart → splanchnic part of lateral plate
   b) Dermis in head → dermatome
   c) Nephric → intermediate mesoderm
   d) Ribs → somatopleure
   e) Trunk skeletal muscles → paraxial

15. Concerning bone tissue
    a) The outermost layer of periosteum contains osteoprogenitor cells
    b) Periosteum is anchored to bone by Sharpey's fibres made up of collagen
    c) Haversian canal form the central part of an osteon
    d) Osteogenesis imperfecta results from disruption in collagen type I biosynthesis
    e) During the inflammatory stage of fracture healing formation of fibrocartilaginous callus and angiogenesis occurs

16. Concerning cardiac muscle tissue
    a) The A band of striated cardiac muscle contain only myosin
    b) Cardiac muscle contains a multiple peripherally placed nucleus
    c) Gap junctions are part of the intercalated discs of cardiac muscle
    d) Transverse tubule is narrower than in skeletal muscle
    e) Muscle cells form lateral anastomosis connected by intercalated discs

17. The following is not a function of glycocalyx
    a) Mitosis
    b) Immunity: recognition of "foreign" material by immune cells
    c) Binding of sperm to oocyte during fertilization
    d) Generation of ATP
    e) Regulate vascular permeability

18. Regarding glandular tissue
    a) Mucous producing cells are characterized by round centrally places nucleus
    b) Endocrine glands discharge their secretion to perivascular space
    c) Mammary gland discharges their section by holocrine mode
    d) Rough endoplasmic reticulum is well developed in serous secreting cells
    e) Secretion is stimulated by somatic nervous system

19. The cell inclusions comprise of
    a) Microfilaments
    b) Crystals
    c) Melanin
    d) Lipofuscin granules
    e) centriole

20. The following epithelia are correctly matched to their location
    a) Stratified squamous non keratinized → Esophagus
    b) Transitional → penile urethra
    c) Pseudostratified ciliated columnar → respiratory tract
    d) Simple ciliated columnar → intestines
    e) Stratified columnar → conjuctiva

21. Concerning cartilage
    a) It has very ell developed blood vessel network
    b) Fibrous cartilage contains type II collagen fibres
    c) An intervertebral disc is an example of hyaline cartilage
    d) Hyaline cartilage in the joints is covered by perichondrium
    e) Chondromucoproteins form the ground matrix in cartilage

22. Regarding the neuron
    a) Nissl substance represents aggregates of rough endoplasmic reticulum
    b) A single process emerges from the cell body of pseudounipolar neuron
    c) The axon hillock is devoid of Nissl substance
    d) The node of Ranvier is not covered by myelin sheath
    e) A Schwann cells myelinates several neurons in peripheral nervous system

23. Regarding loose connective tissue
    a) Has a very high proportion of matrix to fibres
    b) Has a poor healing capacity
    c) Forms limina propria of organs
    d) Fibrocytes synthesize and secrete tropocollagen protein that polymerizes outside the cell to form collagen
    e) Hyaluronic acid, a component of ground matrix has a high capacity for water absorption

24. Concerning Golgi apparatus
    a) Transport vesicles attach to the cis phase
    b) The peroxisome is its product
    c) Sialic acid participate in homing of transport vesicles to Golgi apparatus
    d) It participates in post-translation and modification of newly formed proteins
    e) Its outer membrane is more permeable

25. Regarding cilia, microvilli and stereocilia, centriole
    a) Cilia is made up of nine pairs of peripheral microtubules and one central pair
    b) Centriole and cilia originate from foot process of microtubule organizing centre
    c) Actin forms the core of microtubule
    d) Nexin bridges and dynein arms are only in the central pair of microtubules
    e) Stereocilia are nonmotile

26. Concerning cell attachments and surface specialization
    a) Gap junctions containing connexin facilitate passage of small ions between the cells
    b) Spot desmosomes attach cells to basal lamina
    c) Actin microfilaments at the core of microvilli are attached to terminal web
    d) The stereocilia are motile and help propel spermatozoa in epididymis
    e) Tight junctions are located at the most basolateral part of simple columnar epithelia

27. Concerning microtubules
    a) They are made up of monomers
    b) Responsible for chromosome movement during mitosis and meiosis
    c) Responsible for cell – cell communication
    d) Play a role in endocytosis
    e) Has no role in intracellular transport of vesicles

28. Endoderm gives rise to
    a) Epithelia of digestive tract
    b) Liver
    c) Kidney
    d) Epithelia of respiratory tract
    e) Heart

29. Concerning the nucleus and nucleolus
    a) Nucleoplasm has the same composition as the cytosol
    b) Nucleolus is the site for DNA replication
    c) An inactively metabolic cell will contain condensed heterochromatin
    d) An actively metabolic cell will contain dispersed euchromatin
    e) The nucleus is covered by a double envelop (membrane)

30. Concerning basement membrane
    a) Fibronectin, keratan sulphate and laminin are a component of basal lamina
    b) It plays an important role during organ and tissue morphogenesis
    c) The reticular layer consists of type I collagen fibres
    d) Provides scaffolding for migrating cells in regeneration
    e) Is made up of cells

31. With respect to meiosis
    a) One spermatogonia A gives rise to four spermatids
    b) Polar bodies degenerate during oogenesis
    c) Final meiotic division of the oocyte occurs only after fertilization
    d) All spermatids have 46 chromosomes in man
    e) Primary and secondary spermatocytes are held together by intercellular bridges

32. Concerning peroxisome and lysosome
    a) Lysosomes contain lytic enzymes produced by smooth endoplasmic reticulum
    b) Peroxisome uses catalase to oxidize substrate
    c) Peroxisome synthesizes bile acids
    d) Fusion of primary lysosome with phagosome result in formation of secondary lysosome
    e) Residual bodies result from undigested pigments, crystal or lipids by peroxisome

33. Ciliated cells are in the following epithelial cells
    a) Proximal convoluted tubules of kidney
    b) Oviduct
    c) Epididymis
    d) oviduct
    e) Jejunum
34. Concerning fertilization
    a) Only ciliary activity within the oviduct transports the oocyte and zygote in the oviduct
    b) Entry of spermatozoa through oocyte membrane result in release of cortical granules to prevent polyspermy
    c) Fertilization takes place in the ampulla of oviduct
    d) Corona radiata cell that surround the oocyte play no role in fertilization process
    e) Capacitation of spermatozoa occurs within the female reproductive passageways

35. Gastrulation involves the following processes
    a) Invagination of cells
    b) Intercalation of cells
    c) Apoptosis
    d) Ingression of cells
    e) Involution of cells
36. Generally, epithelia
    a) secretes basal lamina and glycocalyx,
    b) has well developed capillary network
    c) has closely packed together
    d) cover surfaces or line ducts and spaces
    e) has cells with low mitotic index
37. Regarding connective tissue in general
    a) A tendon is made up of type IV collagen fibres that impacts tensile strength and resilience
    b) Wharton's jelly is a form of embryonic mucous connective tissue
    c) The dermis contains dense regular connective tissue comprising of elastic fibres, collagen and reticular fibres
    d) Reticular fibres form supportive stroma in lymphoid organs
    e) Fibroblasts are no resident cells in connective tissue
38. The following stains are used in general routine staining
    a) Van Giosin
    b) Alcial blue
    c) Haematoxylin and eosin
    d) Gimsa
    e) Masons Trichrome

39. Concerning types of membranes
    a) Mucous membranes cover cavities that do not open to the outside
    b) Secretory mesothelium lines serous membranes
    c) Pleura and pericardium are covered by serous membranes
    d) Synovial membrane is an example of a specialized serous type membrane
    e) Articular surfaces of bone are not covered by synovial membrane
40. The second embryonic week is characterized by:-
    a) Formation of cytotrophoblast and syncytiotrophoblast
    b) Gastrulation
    c) Formation of epiblast and hypoblast
    d) Formation of notochord
    e) Formation of amniotic cavity and yolk sac
41. With respect to dense regular connective tissue
    a) Has higher fibre content than matrix
    b) Is relatively poorly vascularized
    c) Fibres are arranged in an interlacing manner
    d) Is found in lamina propria of organs
    e) A tendon is an example of dense regular connective tissue
42. Concerning development
    a) Teratogenesis refer to development of abnormalities before birth
    b) Phylogeny recapitulates ontogeny
    c) Ontogeny refer to process of development of the individual
    d) Developmental anatomy covers only embryological development
    e) Phylogeny cover development of the race
43. Concerning mitochondria
    a) Mitochondrial organelles are located between the outer and inner membrane
    b) The inner surface of cristae is studded with elementary bodies (Oxysomes) containing enzymes for Kreb's cycle
    c) Are capable of self-replication
    d) The inner membrane is more permeable
    e) An offspring inherits mitochondrial DNA only from the male
44. Regarding smooth muscle
    a) It does not contain contractile proteins myosin and actin
    b) Cells are normally arranged in sheets
    c) Cells are attached together by desmosomes and pap junctions
    d) They are stimulated by somatic nervous system
    e) Dense bodies represent attachment of actin myofilaments
45. The following structures are not derived from ectoderm
    a) Nervous tissue
    b) Epidermis
    c) Liver
    d) Thyroid gland
    e) Enamel

SECTION B: BIOCHEMISTRY (45 Minutes)

MULTIPLE CHOICE QUESTIONS (MCQs) (15 minutes)
TYPE III

INSTRUCTIONS:-

(I) EACH OF THE QUESTIONS IN THIS SUBSECTION CONSISTS OF A STATEMENT/QUESTION WHOSE MOST APPROPRIATE COMPLETION/ANSWER IS PROVIDED AMONG THE FIVE OPTIONS NUMBERED (a) - (e).

(II) FOR EACH QUESTION SELECT THE MOST APPROPRIATE OPTION AND INDICATE BY PRINTING AN X IN THE APPROPRIATE BOX IN THE ANSWER SHEETS PROVIDED.

(III) A CORRECT RESPONSE EARNS YOU ONE MARK.

1. The double helical structure model of the DNA was proposed by;
   a) Pauling and Corey
   b) Peter Mitchell
   c) Watson and Crick
   d) King and Wooten
   e) Jahanse Louis

2. The sugar moiety present in DNA is;
   a) Deoxyribose
   b) Ribose
   c) Lyxose
   d) Glucose
   e) Ribulose

3. The distance spanned by one turn of B-form DNA is;
   a) 1.0 nm
   b) 2.0 nm
   c) 2.6 nm
   d) 3.0 nm
   e) 3.4 nm

4. In DNA replication the enzyme required in the first step is;
   a) DNA-directed polymerase
   b) Unwinding proteins
   c) DNA polymerase
   d) DNA ligase
   e) Topoisomerase

5. Formation of RNA primer;
   a) Precedes replication
   b) Follows replication
   c) Precedes transcription
   d) Is only important in DNA repair
   e) Follows transcription

6. Which of the following statement does NOT always apply to RNA;
   a) Product of transcription
   b) Variable role depending on type
   c) Single stranded
   d) Less stable compared to DNA
   e) Has uracil

7. The subunit of RNA polymerase that falls off at the start of transcription is called;
   a) α
   b) β1
   c) β
   d) δ
   e) ϖ

8. The correct cellular location for mRNA synthesis is;
   a) Mitochondria
   b) Nucleous
   c) Nucleus
   d) Cytoplasm
   e) Ribosomes

9. The removal of introns is known as;
   a) Alternative splicing
   b) Splicing
   c) Ligation
   d) Splitting genes
   e) Polyadenylation

10. Which of the following enzyme convert RNA to DNA;
   a) DNA primase
   b) Reverse transcriptase
   c) DNA ligase
   d) DNA gyrase
   e) RNA dnase

11. Which of the following best describes the genetic code?
    a) A group of four bases codes for one amino acid
    b) The code is overlapping
    c) Each amino acid can be coded by a single code
    d) The reading frame remains shifted if one base is displaced
    e) The base sequence is read from a fixed starting point with punctuation

12. Which of the following is a stop codon?
    a) UAU
    b) AUA
    c) UAU
    d) UUA
    e) UGA

13. Which of the following amino acids are coded by six codon?
    a) Leu and Ser
    b) Leu and Tyr
    c) Cys and Leu
    d) Ile and Ser
    e) Arg and Tyr

14. Name the molecule that is selected by the ribosome during the initiation step of protein synthesis;
    a) tRNA
    b) mRNA
    c) rRNA
    d) DNA
    e) snRNA

15. The steps involved in the initiation process of eukaryotic protein biosynthesis include the following except;
    a) Dissociation of the ribosome into its 40s and 60S subunits
    b) Binding of a ternary complex consisting of met-tRNAi, GTP, and eIF -2 to the 40S ribosome to form a preinitiation complex
    c) Binding of tRNA to the 40S preinitiation complex to form a 43S initiation complex
    d) Two initiation factors, eiF – 3 and eIF – 1A, bind to the newly dissociated 40S ribosomal subunit
    e) Combination of the 43S initiation complex with the 60S ribosomal subunit to form the 80S initiation complex

MSB 101

SHORT ANSWER QUESTIONS - (30 Minutes)

SAQ 1: Outline the possible causes of DNA damage.

SAQ 2: Describe the following processes involved in mRNA processing;

i. 5' capping - 3 marks
ii. Polyadenylation - 3 ½ marks
iii. mRNA editing - 3 ½ marks

SAQ 3: Explain the characteristic features of the genetic code.

SECTION C:-PHYSIOLOGY (65 MINUTES)
MULTIPLE CHOICE QUESTIONS (MCQs)
TYPE III

INSTRUCTIONS:-

(I) **EACH OF THE QUESTIONS IN THIS SUBSECTION CONSISTS OF A STATEMENT/QUESTION WHOSE MOST APPROPRIATE COMPLETION/ANSWER IS PROVIDED AMONG THE FIVE OPTIONS NUMBERED (a) - (e).**

(II) **FOR EACH QUESTION SELECT THE MOST APPROPRIATE OPTION AND INDICATE BY PRINTING AN X IN THE APPROPRIATE BOX IN THE ANSWER SHEETS PROVIDED.**

(III) **A CORRECT RESPONSE EARNS YOU ONE MARK.**

1. Normal homeostatic conditions require potassium concentrations to be about 1000 times higher inside the cell than in the blood. What mechanism does a cell use to move these small potassium molecules into the cell against the concentration gradient?
   a) Passive transport by osmosis
   b) Passive transport by diffusion
   c) Active transport by endocytosis
   d) Active transport by proteins
   e) b and c

2. The organelle that is not membrane-bound:
   a) Golgi body
   b) Lysosome
   c) Mitochondrion
   d) RER
   e) Ribosome

3. The following statements about the plasma membrane are true except:
   a) It serves as a mechanical barrier to hold in the contents of the cell.
   b) It selectively controls movement of molecules between the ECF and the cytoplasm.
   c) It is the barrier that surrounds the blood vessels and separates the blood plasma from the interstitial fluid.
   d) It contains proteins that provides for various membrane functions.
   e) It consists mostly of lipids and proteins.

4. The rough endoplasmic reticulum:
   a) Is in direct contact with certain nonmembranous organelles
   b) Synthesizes lipids for secretion
   c) Is called the sarcoplasmic reticulum in muscle cells
   d) Transports proteins to its bound ribosomes
   e) Exhibits all of the above characteristics

5. Which of the statements is true?
   a) Mitochondria are primarily sites where anaerobic respiration occurs.
   b) Vaults are inclusions in the cytoplasm that transport DNA.
   c) Peroxisomes are membranous sacs that contain hydrolytic enzymes.
   d) Ribosomes are membranous organelles that synthesize proteins.
   e) None of the statements are true.

6. Which of the following are involved directly in myosin synthesis?
   a) RNA
   b) Actin
   c) DNA
   d) Microfilaments
   e) All of the above

7. The smooth endoplasmic reticulum:
   a) Is most abundant in cells specialized for protein secretion
   b) Gives rise to transport vesicles containing newly synthesized molecules Wrapped in a layer of smooth ER membrane
   c) Consists of stacks of relatively flattened sacs called cristae
   d) Has only a few ribosomes attached to it
   e) Is a primary site for glycolysis

8. The incorrect statement about the smooth ER:
   a) It is abundant in most cell types.
   b) It is found in liver cells.
   c) It specializes in lipid metabolism.
   d) In one type of cell, it is called sarcoplasmic reticulum.
   e) It does not contain ribosomes.

9. Homeostasis is classified under which of the following?
   a) Cell respiration
   b) Cell metabolism
   c) DNA transcription
   d) Cell regulation
   e) Cell transport

10. Cells can function:
    a) In a wide range of pHs and temperatures.
    b) At any temperature and pH.
    c) In rapidly changing temperatures and pHs.
    d) Only in a narrow range of temperature and pH.
    e) a and c

11. The Golgi apparatus helps maintenance of cellular homeostasis by:
    a) Controlling proteins synthesized during the cell cycle.
    b) Generating action potentials to manufacture carbohydrates.
    c) Synthesizing ATP molecules from glucose during glycolysis.
    d) Varying, classifying, and wrapping proteins prior to transport.
    e) Controlling mitochondrion transport chain

12. There are two main ways in which molecules are transported into and out of cells - active transport and passive transport. Which of the following statements is true of passive transport?
    a) Carrier proteins are sometimes used during passive transport.
    b) Molecules move up a concentration gradient during passive transport.
    c) Energy, in the form of ATP, is essential for passive transport.
    d) Endocytosis and exocytosis are two forms of passive transport.
    e) a and b

13. The primary function of carbohydrates attached to the exterior of cell membranes is to:
    a) Identify the cell
    b) Make flexibility of the membrane
    c) Strengthening the membrane
    d) Create channels through membrane
    e) All of the above

14. How does the sodium-potassium pump make the interior of the cell negatively charged?
    a) By expelling anions
    b) By pulling in anions
    c) By expelling more cations than are taken in
    d) By taking in and expelling an equal number of cations
    e) a and d

15. After exocytosis, the vesicle membrane:
    a) Leaves the cell.
    b) Is disassembled by the cell.
    c) Fuses with and becomes part of the plasma membrane.
    d) Is used again in another exocytosis event.
    e) Is broken down by lysosomes

16. Receptor-mediated endocytosis differ from phagocytosis in that:
    a) It transports only small amounts of fluid.
    b) It does not involve the pinching off of membrane.
    c) It brings in only a specifically targeted substance.
    d) It brings substances into the cell, while phagocytosis removes substances.
    e) b and d

17. The property preventing ligands of cell-surface receptors from entering the cell is that:
    a) The molecules bind to the extracellular domain.
    b) The molecules are hydrophilic and cannot penetrate the hydrophobic interior of the plasma membrane.
    c) The molecules are attached to transport proteins that deliver them through the bloodstream to target cells.
    d) The ligands are able to penetrate the membrane and directly influence gene expression upon receptor binding.
    e) The ligands are nonpolar

18. The secretion of hormones by the pituitary gland is an example of :
    a) Autocrine signaling
    b) Paracrine signaling
    c) Endocrine signaling
    d) Direct signaling across gap junctions
    e) Cell to cell signalling

19. DAG and IP3:
    a) Are formed by phosphorylation of cAMP.
    b) Are ligands expressed by signaling cells.
    c) Are hormones that diffuse through the plasma membrane to stimulate protein production.
    d) Are the cleavage products of the inositol phospholipid, PIP2.
    e) Are from cGMP

20. Chromosomes are duplicated during what stage of the cell cycle?
    a) G1 phase
    b) S phase
    c) Prophase
    d) Prometaphase
    e) G2 phase

21. The stage of meiosis where sister chromatids separate from each other is:
    a) Prophase I
    b) Prophase II
    c) Anaphase I
    d) Anaphase II
    e) b and c

22. The structure most important in forming the tetrads is:
    a) Centromere
    b) Synaptonemal complex
    c) Chiasma
    d) Kinetochore
    e) c and d

23. Abnormalities in the number of X chromosomes tends to have milder phenotypic effects than the same abnormalities in autosomes because of:
    a) Deletions
    b) Nonhomologous recombination
    c) Synapsis
    d) X inactivation
    e) All of the above

24. If the sequence of the 5'-3' strand is AATGCTAC, then the complementary sequence has the following sequence:
    a) 3'-AATGCTAC-5'
    b) 3'-CATCGTAA-5'
    c) 3'-TTACGATG-5'
    d) 3'-GTAGCATT-5'
    e) 3'-TTAGCATG-5'

25. Which of the following does the enzyme primase synthesize?
    a) DNA primer
    b) RNA primer
    c) Okazaki fragments
    d) Phosphodiester linkage
    e) a and d

26. The action potential in skeletal muscles
    a) Usually starts in the end plate
    b) Causes the release of calcium from sacroplasmic reticulum
    c) Has no refractory period
    d) Is similar in shape to that of cardiac muscle, but takes less time
    e) Is due to auto-rhythmicity of skeletal muscles

27. How much percent of the mitochondrial inner membrane is protein?
    a) 46 %
    b) 96 %
    c) 86 %
    d) 76 %
    e) 66%

28. Cytoskeleton proteins are associated loosely with the cytosolic face of the bilayer, through which proteins?
    a) Exoplasmic proteins
    b) Cytosolic proteins
    c) Lipid-anchored proteins
    d) Peripheral proteins
    e) a and b

29. Neurons are specialized to receive, conduct and transmit
    a) Electrochemical signals
    b) Action potentials
    c) Electrical signals
    d) Chemical signals
    e) b and c

30. Majority of surface receptors are made up of three distinct topological domains or segments. Which of the following is false?
    a) An extracellular domain facing the extracellular domain
    b) A trans-membrane domain
    c) An intracellular domain facing cytosol
    d) An intracellular domain facing extracellular fluid
    e) None of the above

31. Cell signaling is the ability of cells to:
    a) Receive signals from the environment
    b) Transmit signals to other cells
    c) Process signals within cells
    d) All of the above
    e) a and b

32. All of the following are ligands except:
    a) Nitric oxide
    b) Thromboxane
    c) Carbon dioxide
    d) Carbon monoxide
    e) a and b

33. The back bone of DNA is made up of----------, ---------- and----------,
    a) Nitrogenous base, sugar and phosphate
    b) Phosphate and nitrogenous base
    c) Sugar and nitrogenous base
    d) All of the above
    e) None of the above

34. Which of the is not required for the synthesis of protein:
   a) siRNA
   b) mRNA
   c) rRNA
   d) tRNA
   e) none of the above

35. Which of the following gas was not used by Stanley Miller in his experiment.
   a) Hydrogen
   b) Methane
   c) Amonia
   d) Oxgen
   e) None of the above

36. Which gas was absent in the atmosphere at the time of origin of life:
   a) NH_4
   b) H_2
   c) O_2
   d) CH_4
   e) All of the above

37. Which of the following is an example of paracrine signaling?
   a) T cell proliferation by cytokines
   b) Secretion of IL-1 by macrophages
   c) Synaptic signaling
   d) All of the above
   e) None of the above

38. About cancer cells:
   a) Have mutations whereas their stem cells do not.
   b) Divide to form two different populations of cells whereas their stem cells do not divide
   c) Stem cells can undergo self-renewal whereas cancer cells can not
   d) Are presumably resistant to chemotherapy and radiation
   e) a and c

39. The adaptor molecule in the process of translation is:
   a) siRNA
   b) mRNA
   c) rRNA
   d) tRNA
   e) c and d

40. Ion linked receptors:
   a) Bind with ligands to open a channel through the membrane allows specific ion to pass through
   b) Causes conformational changes in the protein structure that allows ions to pass through the cell
   c) Binds with ligands and activates membranous G protein
   d) Have large extracellular and intracellular domain that are associated with enzymes
   e) a and b

41. Knowing what you know about phospholipid bilayers, if you wanted to build your own membrane protein, what would your amino acids need to have in order to stay in the membrane?
   a) Negatively charged groups
   b) Hydrophilic groups
   c) Positively charged groups
   d) Hydrophobic groups
   e) Glycosylations

42. Which of the following would INHIBIT the onset of mitosis?
   a) Binding of M Cyclin to Cdk
   b) Phosphorylation of Cdk by Wee1
   c) Phosphorylation of Wee1 by Cdk
   d) Dephosphorylation of Cdk by Cdc25
   e) None of the above

43. When ATP binds to the head of myosin II it promotes:
   a) Binding of myosin to a new actin subunit
   b) Pivoting of the myosin head and generation of movement
   c) Release of actin
   d) Formation of myosin filaments
   e) None of the above

44. Dye injected into an epithelial cell might be able to enter an adjacent cell through a;
   a) Tight junction
   b) Microtubule
   c) Desmosome
   d) Adherence junction
   e) Gap junction

45. Which of the following transport processes is involved if transport of glucose from the intestinal lumen into a small intestinal cell is inhibited by abolishing the usual Na+ gradient across the cell membrane?
   a) Simple diffusion
   b) Facilitated diffusion
   c) Primary active transport
   d) Cotransport
   e) Countertransport

46. The functions of tropomyosin in skeletal muscle include
   a) Sliding on actin to produce shortening
   b) Releasing Ca2+ after initiation of contraction
   c) Binding to myosin during contraction
   d) Acting as a "relaxing protein" at rest by covering up the site where myosin binds to actin
   e) Generating ATP, which it passes to the contractile mechanism

47. Initiation of an action potential in skeletal muscle by stimulating its motor nerve
   a) Requires spatial facilitation
   b) Requires temporal facilitation
   c) Is inhibited by a high concentration of Ca2+ at the neuromuscular junction
   d) Requires the release of norepinephrine
   e) Requires the release of acetylcholine

48. Mutations that affect DNA repair often also affect the accuracy of meiosis. This is because;
   a) The proteins involved in the repair of double-strand breaks are also involved in crossing over.
   b) The proteins involved in DNA repair are also involved in sister chromatid cohesion.
   c) DNA repair only occurs on condensed chromosomes such as those found in meiosis.
   d) Cohesin proteins are also necessary for DNA repair.

49. The kinetochore is a structure that functions to
   a) Connect the centromere to microtubules.
   b) Connect centrioles to microtubules.
   c) Aid in chromosome condensation.
   d) Aid in chromosomes cohesion.
   e) All of the above

50. The main difference between bacterial cell division and eukaryotic cell division is that;
   a) Since bacteria only have one chromosome, they can count the number of copies in the cell.
   b) Eukaryotes mark their chromosomes to identify them and bacteria do not.
   c) Bacterial DNA replication and chromosome segregation are concerted processes but in eukaryotes they are separated in time.
   d) All of the above
   e) None of the above

51. Theory which is considered as most fundamental generalizations in biology is the;
   a) cell theory
   b) Darwin Theory
   c) Lamarck Theory
   d) tissue theory
   e) the bang theory

52. Since muscle cells make and utilize an abundance of adinotriphosphate (energy) for muscle activity, each muscle cell most likely has numerous
   a) Peroxisomes
   b) Lysosomes
   c) Mitochondria
   d) All of the above
   e) None of the above

53. During isometric muscle contraction
   a) Muscle does not shorten
   b) Shortening of muscle occurs
   c) Tension on the muscle remains constant
   d) Muscle gets shorter against a fixed band
   e) Actual body movements occur

54. What is the relationship between DNA and proteins?
   a) DNA molecules are the enzymes that maintain chromosomes made of protein.
   b) Proteins make up the individual sugar-phosphate-base units of DNA.
   c) Genes are made of proteins that encode the base sequence of DNA.
   d) DNA encodes for proteins, and protein enzymes replicate and maintain DNA.
   e) DNA makes up the individual sugar-phosphate-base units of a protein.

55. Chromosomes are aligned at the equator of the cell during
    a) Anaphase.
    b) Metaphase.
    c) Interphase.
    d) Prophase.
    e) Telophase

56. What is the initial step in DNA replication?
    a) Breakdown of the nuclear envelope
    b) Attachment of the chromosome to the plasma membrane
    c) Formation of the replication bubble
    d) Formation of the mitotic spindle
    e) Unwinding of the DNA double helix

57. A 2n cell from an organism has 40 chromosomes. How many chromosomes would be in a haploid gamete from this organism?
    a) 40
    b) 46
    c) 80
    d) 20
    e) 10

58. From lack of use, a muscle will lose size, tone, and ability to generate force through the process of:
    a) Recruitment.
    b) Reduction of the number of motor units.
    c) Hypertrophy.
    d) Atrophy.
    e) All of the above

59. Which of the following explains why normal cells grown in a petri dish tend to stop growing once they have covered the bottom of the dish?
    a) The cells lack cyclin.
    b)The petri dish inhibits cell growth.
    c) Contact with other cells stops cell growth.
    d) Most cells grown in petri dishes have a defective p53.
    e) All of the above

60. Individual cells are usually very small because
    a) Small cells contain a greater quantity of enzymes than large cells.
    b) Materials move in and out of small cells less efficiently than for large cells.
    c) The cell membrane encloses the cell and prevents it from increasing in size.
    d) The larger the surface area to volume ratio of a cell, the more efficient it is.
    e) Water enters into small cells by osmosis more slowly than into large cells.

61. The cell walls of bacteria, fungi and plant cells and the extracellular matrix of animal cells are all external to the plasma membrane. Which of the following is a characteristic common to all of these extracellular structures?
   a) They are composed of a mixture of lipids and nucleotides.
   b) They are composed of peptidoglycan or lignin.
   c) They must block water and small molecules to regulate the exchange of matter and energy with their environment.
   d) They are constructed of polymers that are synthesised in the cytoplasm and then transported out of the cell.
   e) They must provide a rigid structure that maintains an appropriate ratio of cell surface area to volume.

62. Transcription factors in eukaryotes usually have DNA binding domains as well as other domains that are also specific for binding. In general,which of the following would you expect many of them to be able to bind?
   a) Repressors
   b) ATP
   c) Protein-based hormones
   d) Other transcription factors
   e) tRNA

63. In eukaryotes, the "start" codon also specifies the amino acid,
   a) Phenylalanine
   b) Valine
   c) Aspartate
   d) Methionine
   e) Glutamate

64. Together with proteins, rRNA
   a) Provides a site for polypeptide synthesis
   b) Transports amino acids to the ribosome
   c) Travels to the ribosome to direct the assembly of polypeptides
   d) Transcribes DNA
   e) Translates DNA

65. Which of the following statements best describes the "fluid mosaic model" of the structure of the cell membrane?
   a) Two layers of protein with lipid layers between the protein layers
   b) Two layers of lipid with proteins between the lipid layers
   c) A double layer of lipid molecules with protein molecules suspended in the layer
   d) A single layer of protein on the outside and a single layer of lipids on The inside
   e) All of the above