

Synoptic Quiz

Choose the response which best completes each of the following statements **or** answers each of the following questions – and so make your tutor smile 😊.

- Plastids bear a striking similarity to mitochondria in that plastids
 - store carbohydrates, fats, and proteins
 - synthesize green, red, and yellow pigments
 - are found in photosynthetic organisms only
 - contain DNA, RNA, and ribosomes
 - Are pretty to look at (i.e. Plasticene)
- Which carbohydrate is usually NOT present in animal cells and tissues?
 - glucose
 - glycogen
 - fructose
 - cellulose
 - lactose
- The evolution of the eukaryotes required the development of
 - free ribosomes
 - functioning mitochondria
 - membrane bound organelles
 - an activated Golgi body
 - Darwinism
- Heredity of *Pneumococcus* (a bacterium) cells can be altered by adding DNA from other cells. This process is known as
 - induction
 - replication
 - mutation
 - duplication
 - transformation
- A protein may be denatured by
 - hydrolysis
 - heat or heavy metals
 - action of enzymes
 - assimilation
 - dehydration synthesis
- There is good evidence of linkage when
 - genes of two different loci segregate independently
 - genes of two different alleles do not segregate independently
 - a gene is invariably associated with a specific characteristic
 - two genes invariably work to control the expression of a single characteristic
 - two genes are located together in a single gamete
- The organelles most closely associated with the intracellular digestion of damaged cellular components are
 - peroxisomes
 - mesosomes
 - glyoxysomes
 - dictyosomes
 - lysosomes

Each of the numbered items refers to the numbered statements that follow. Select the one numbered choice which best fits each statement. A choice may be used once, more than once, or not at all.

Choices for questions 8-9

- a) Pleiotropy
- b) Multiple Alleles
- c) Sex linkage
- d) Linked genes
- e) Independent Assortment

8. This is the mode of inheritance of the ABO blood group. _____

9. This is the mode of inheritance of haemophilia. _____

10. A structure found commonly in animal cells but rarely in plant cells is the
a) Golgi apparatus b) centriole c) nucleus d) endoplasmic reticulum e) mitochondrion

11. A student examining a cell under the microscope noticed the formation of a cell plate in the midline of the cell and the formation of nuclei at the poles of the cell. The cell under examination was probably
a) an animal cell in the M phase of the cell cycle
b) a dividing bacterial cell
c) a plant cell undergoing cytokinesis
d) an animal cell undergoing cytokinesis
e) a plant cell in the anaphase stage

12. Which discovery provides the best evidence to support the belief that DNA carries genetic information?
a) Heritable transformation of bacterial cells is brought about by DNA.
b) The DNA content from cells of different tissues of an organism is the same.
c) The adenine to thymine and guanine to cytosine ratios in DNA are equal to 1.
d) DNA is present in chromosomes.
e) DNA is present in all cells that divide.

13. In guinea pigs, black is dominant. One-half of a particular litter is white. If it is assumed the laws of chance operate, the parent cross was most likely
a) BB x Bb b) Bb x Bb c) Bb x bb d) bb x bb e) BB x bb

14. To determine whether an unknown black guinea pig is pure or hybrid, it should be crossed with
a) a white b) a hybrid black c) a hybrid white d) a pure black e) another unknown

15. Which set of parents could NOT be the parents of a child with type O blood?
a) Father type A, mother type O
b) Father type A, mother type B
c) Father type B, mother type O
d) Father type AB, mother type O
e) Father type O, mother type O

16. Chromosomes do NOT occur in pairs in
a) body cells b) somatic cells c) fertilized eggs d) gametes e) zygotes

17. Which is true of a gene that is dominant?

- a) It is usually detrimental.
- b) It will occur more frequently than its recessive allele.
- c) It will occur less frequently than its recessive allele.
- d) It will have the same phenotypic effect whether it appears in the homozygous or in the heterozygous condition.
- e) It is into whips, chains and S&M

18. Phenylketonuria (PKU) is a disease caused by a single gene defect. Unlike sickle-cell anaemia, it can be treated by

- a) controlling the diet of PKU infants
- b) using vaccines to counteract the effect of the mutant gene
- c) correcting the mutant gene by genetic engineering
- d) applying low-level radiation doses to affected cells
- e) using the "wet nappy" test at stated intervals

19. Osmosis is a process that

- a) involves the movement of particles from saturated solutions
- b) moves water molecules from an area of higher concentration to an area of lower concentration, using energy
- c) equalizes the concentration of particles by the movement of water molecules
- d) continues until the medium on each side of the membrane has become hypertonic
- e) regulates the tonicity on either side of the membrane

20. The endoplasmic reticulum functions as

- a) a network that binds cells together
- b) an ultrastructural framework in the cytoplasm
- c) a secretory and storage syncytium
- d) a network of fibres to which the nucleoli are attached
- e) a control centre for protein synthesis

21. In plants, the plastids which contain pigments that give fruit, flowers, and autumn leaves their orange and yellow colours are known as

- a) epiblasts b) leucoplasts c) amyloplasts d) chloroplasts e) chromoplasts

22. A primary reason for Mendel's success in his studies of pea plant inheritance was that

- a) he was the first person to attempt studies of inheritance
- b) there was plenty of room in his garden
- c) he studied one trait at a time
- d) he concentrated on the whole organism
- e) he was the first to postulate the gene theory

23. A change affecting the base sequence in an organism's DNA is known as

- a) replication
- b) chromosomal mutation
- c) transcription
- d) independent assortment
- e) gene mutation

24. Biologists have discovered that a certain type of poison interferes with protein synthesis. Which cell structure listed is most likely affected by the poison?

- a) cytoplasm b) ribosome c) centrosome d) vacuole e) mitochondrion

The following directions apply to questions 25 to 27 which follow in the question blocks.

Each set of numbered choices refers to the numbered words or statements that follow it. Choose the numbered choice that best fits each word or statement. A choice may be used once, more than once, or not at all.

Choices (25 – 27)

- a) DNA molecules only
- b) mRNA molecules only
- c) Both DNA and RNA molecules
- d) Neither DNA or RNA molecules
- e) ATP molecules only
- f) rRNA molecules only

25. Molecules composed of chains of nucleotides. _____
26. Molecules found in the nucleus of the cell. _____
27. Molecules that carry genetic information from the nucleus to the ribosomes. _____

Choices (28 – 30)

- a) Mutation
- b) Sex Linked recessive
- c) Hybrid vigour
- d) Inbreeding
- e) Co-dominance
- f) gene linkage

28. Radiation can cause clear structural changes in the DNA molecules of chromosomes. _____
29. Haemophilia and colour-blindness are carried on the X chromosome. _____
30. The alleles for two different traits are inherited together on the same chromosome. _____
31. According to the fluid mosaic model of the plasma membrane, proteins are
- a) spread out in a continuous layer over both membrane surfaces
 - b) located in the hydrophilic layer of the membrane
 - c) converted to glycogen by the hormone insulin in the peroxisomes
 - d) capable of leaving the membrane and dissolving in the solution of the external environment
 - e) embedded in the lipid bilayers
32. A couple whose family history suggests chromosomal genetic disorders seeks genetic counselling. Which procedure would provide them with the genetic information that would help them to plan a family?
- a) karyotyping
 - b) electrophoresis
 - c) cloning
 - d) genetic engineering
 - e) amniocentesis
33. The process of transcription occurs in the
- a) mitochondrion
 - b) ribosome
 - c) cytoplasm
 - d) polysome
 - e) nucleus

34. Which is NOT associated with cell division in animals?

- a) Duplication of chromosomes
- b) Constriction of dividing cells
- c) Separation of chromosomes
- d) Spindle fibres
- e) Cell plate formation

35. An enzyme that has two binding sites and exists in two or more conformations is known as

- a) a hydrolytic enzyme
- b) an allosteric enzyme
- c) a catalytic enzyme
- d) a catabolic enzyme
- e) an anabolic enzyme

36. Which disorder is the result of meiotic non-disjunction?

- a) PKU
- b) haemophilia
- c) homosexuality
- d) Down's syndrome
- e) Sickle-cell anaemia

37. Which occurs during meiosis but not during mitosis?

- a) Chromosomes align at the metaphase plate
- b) Chromosomes condense
- c) Chromosomes migrate to opposite poles
- d) A spindle apparatus forms
- e) Synapsis

Base your answers to questions 38 and 39 which follow on the basis of the following paragraph and your knowledge (haha!) of biology.

Sickle-cell anaemia occurs in two forms, major and minor. The major form is usually fatal in childhood while the minor form is much less severe. Normal persons are pure for the normal gene. Persons with the major form are pure for the abnormal gene. Persons with the minor form are hybrid.

38. If both parents have the minor form, what percent of their children are expected to be normal?

- a) 0%
- b) 25%
- c) 50%
- d) 75%
- e) 100%

39. Which type of inheritance is illustrated by this paragraph?

- a) complete dominance
- b) incomplete dominance
- c) co-dominance
- d) sex linkage
- e) multiple genes

40. In garden pea plants, tallness is dominant over shortness, and yellow seeds are dominant over green seeds. If a pea plant which is hybrid for tallness and hybrid yellow seeds is crossed with a pea plant which is heterozygous for tallness and heterozygous for yellow seeds, what proportion of the offspring would be likely to be short with green seeds?

- a) 1/16
- b) 1/8
- c) 1/4
- d) 1/2
- e) 9/16

41. As a result of crossing two hybrid yellow garden peas, 120 offspring are produced. According to the laws of chance, the probable number of yellow offspring is

- a) 0
- b) 30
- c) 60
- d) 90
- e) 120

42. One hundred matings of brown birds with white birds produced speckled offspring. The mating of two speckled birds would probably result in
- 75% white, 25% brown
 - 25% brown, 75% white
 - 100% speckled
 - 25% brown, 50% speckled, 25% white
 - 50% brown, 25% white, 25% speckled
43. When light strikes chlorophyll molecules, they lose electrons, which are ultimately replaced by
- splitting water
 - breaking down ATP
 - removing them from NADPH
 - fixing carbon
 - oxidizing glucose
44. The overall function of the Calvin cycle is
- capturing sunlight
 - making sugar
 - producing carbon dioxide
 - splitting water
 - oxidizing glucose
45. What is RUBISCO?
- the enzyme in C₃ plants that first captures CO₂ to begin the Calvin cycle
 - the enzyme responsible for splitting H₂O to produce O₂ in photosynthesis
 - the enzyme that forms a 4-carbon compound in CAM metabolism
 - the first stable intermediate in CAM metabolism
 - the 5-carbon sugar molecule that reacts with CO₂ to begin the Calvin cycle
46. Which of these wavelengths is **least** useful for photosynthesis?
- green
 - yellow
 - blue
 - orange
 - red
47. What is formed when pyruvate is converted to acetyl CoA?
- CO₂ and ATP are formed
 - CO₂ and NADH are formed
 - CO₂ and coenzyme A are formed
 - one turn of the Krebs cycle is completed
 - (oxidized) NAD is regenerated
48. During respiration in a eukaryotic cell, reactions of glycolysis occur, or are located, in or on
- the cytosol
 - the matrix of the mitochondrion
 - the cristae of the mitochondrion
 - the intermembrane space of the mitochondrion
 - across the inner membrane of the mitochondrion
49. The enzyme ATP synthase forms ATP
- due to the potential energy of a concentration gradient of hydrogen ions across a membrane
 - due to substrate-level phosphorylation
 - from glucose in the absence of oxygen
 - in the absence of chemiosmosis
 - when it feels like it

50. Sports physiologists in the Godalming College PE dept. wanted to monitor athletes to determine at what point their muscles were functioning anaerobically. They could do this by checking for a build-up of

- a) ATP
- b) lactate or lactic acid
- c) carbon dioxide
- d) ADP
- e) oxygen

51. During respiration in a eukaryotic cell, the electron transport chain is located in or on the

- a) cytosol
- b) matrix of the mitochondrion
- c) cristae of the mitochondrion
- d) inter-membrane space of the mitochondrion
- e) none of the previous

52. In the Krebs cycle, the energetic production per glucose molecule is

- a) 2 ATP, 6 NADH, 2 FADH₂
- b) 38 ATP
- c) 4 ATP, 8 NADH
- d) 2 ATP, 6 NADH
- e) ATP, 3 NADH, 1 FADH₂

53. A major reason pH can affect enzyme activity because

- a) most substrates don't function well at high or low pH
- b) high or low pH may disrupt hydrogen bonding and change the shape of the active site
- c) high or low pH may cause the active site to lose its energy
- d) excess hydrogen ions can combine with the substrate and cause the reaction to go more slowly
- e) hydrogen ions absorb energy and thus there may not be enough energy to get the reaction started.

54. Which chemical components make up a nucleotide?

- a) a nitrogenous base, an amino acid, and a pentose sugar
- b) a nitrogenous base, an amino acid, and a phosphate group
- c) a nitrogenous base, a phosphate group, and a pentose sugar
- d) a nitrogenous base, a fatty acid, and an amino acid
- e) a series of nitrogenous bases and a sugar-phosphate backbone

55. Which level of protein structure are best represented by the alpha helix and pleated beta sheet?

- a) primary structure
- b) secondary structure
- c) tertiary structure
- d) quaternary structure
- e) dangerous structure

56. Oestrogen, progesterone, and testosterone belong to which class of molecules?

- a) proteins
- b) amino acids
- c) lipids
- d) carbohydrates
- e) nucleic acids

57. If an intestinal cell in a chimpanzee contains 48 chromosomes, how many chromosomes would a chimpanzee sperm cell would contain?

- a) 3
- b) 6
- c) 12
- d) 24
- e) 48

58. What is meant by the induced fit of an enzyme?

- a) The substrate can be altered so it is induced to fit into the enzyme's active site.
- b) The enzyme is altered so it is induced to fit many different types of substrate.
- c) Several sites on an enzyme can be induced to act on a substrate.
- d) The enzyme changes its shape slightly as it binds to the substrate.
- e) All of the above are correct statements about the induced fit.

59. A competitive inhibitor competes with the _____ at the _____ of an enzyme.

- a) product ... active site
- b) product ... allosteric site
- c) substrate ... active site
- d) substrate ... allosteric site
- e) substrate ... active site and allosteric site

60. Water is a polar molecule. This means that

- a) the opposite ends of the molecule have opposite charges
- b) water molecules are linear, like a pole
- c) water is one of the many hydrophobic molecules
- d) the atoms in water have equal electronegativities
- e) all of the above

61. Water resists temperature change because

- a) large bodies of water cannot store heat
- b) heating water absorbs energy by disrupting the hydrogen bonds before evaporation can occur
- c) evaporation of water heats the surface it leaves
- d) hydrogen bonding increases water's ability to vaporize
- e) none of the above

62. That coastal climates are more moderate than inland climates is due primarily to water's high

- a) heat of fusion
- b) surface tension
- c) density
- d) heat of vaporization
- e) specific heat

63. The fatty acid tail of a phospholipid is _____ because it _____.

- a) hydrophobic ... dissolves easily in water
- b) hydrophobic ... has no charges to which water molecules can adhere
- c) hydrophilic ... consists of units assembled by dehydration synthesis
- d) hydrophilic ... is easily hydrolyzed into its monomers
- e) hydrophobic ... consists of units assembled by dehydration synthesis

64. The overall three-dimensional shape of a polypeptide is called the

- a) double helix
- b) primary structure
- c) secondary structure
- d) tertiary structure
- e) quaternary structure

65. The region of a chromosome holding the two double strands of replicated DNA together is called

- a) chromatin
- b) a centriole
- c) a centromere
- d) a chromatid
- e) an aster

66. DNA replication occurs in

- a) prophase of both mitosis and meiosis
- b) metaphase of meiosis only
- c) the S phase of interphase in both somatic and reproductive cells
- d) the G1 phase of interphase in reproductive cells only
- e) the cytokinesis portion of the cell's life cycle

67. Which is NOT a property of water?

- a) Water is an excellent solvent.
- b) Water has a high heat capacity.
- c) Water has a low surface tension.
- d) Water has cohesive properties.
- e) As water freezes it becomes less dense than when in its liquid form.

68. An amino acid is characterized by which of the following functional groups?

- a) amino and hydroxyl
- b) amino and amino
- c) amino and aldehyde
- d) amino and carboxyl
- e) carboxyl and keto

69. At which phase of the cell cycle does DNA replication occur?

- a) G0 b) G1 c) S d) G2 e) M

70. In decreasing the activation energy for a given reaction, enzymes

- a) increase the likelihood that molecules involved will collide and form products
- b) decrease the likelihood that molecules involved will collide and form products
- c) have no effect on the rate of product formation in a given reaction
- d) increase the concentration of the substrate
- e) increase the activation energy for a given reaction

71. Mitosis occurs in all the following life cycle events EXCEPT

- a) gamete formation b) body cell replacement c) development d) growth e) wound healing

72. When a homozygous recessive organism is crossed with a heterozygous dominant organism, what percentage of the progeny will be heterozygous dominant?

- a) 0% b) 25% c) 50% d) 75% e) 100%

73. A reaction is regulated by regulating its enzyme. In competitive inhibition
- a) An enzyme becomes more receptive to additional substrate molecules after one substrate molecule attaches to an active site.
 - b) The inhibitor binds to an enzyme at locations other than an active or allosteric site.
 - c) An end product of a series of reactions acts as an allosteric inhibitor, shutting down one of the enzymes catalyzing the reaction series.
 - d) The inhibitor changes the shape of the enzyme which disables its enzymatic activity.
 - e) A substance that mimics the substrate inhibits an enzyme by occupying the active site.
74. Which is NOT a property of water?
- a) It has a low heat of vaporization.
 - b) It expands when it freezes.
 - c) It is a useful solvent.
 - d) It has cohesive properties.
 - e) It resists changes in temperature better than most other substances.