Answer the multiple choice questions on the scantron

1. The pigment Chlorophyll a absorbs these wavelength colors:
   A) yellow and green
   B) blue and green
   C) red and blue
   D) red and yellow

2. The structure of chlorophyll is:
   A) two fatty acid chain and a glycerol backbone
   B) one fatty acid chain and a glycerol backbone
   C) a benzene ring structure and a long hydrocarbon chain
   D) a porphyrin ring structure and a long hydrocarbon chain

3. Photosynthetic pigments are found in the
   A) thylakoid membrane
   B) thylakoid lumen
   C) Stroma
   D) Outer membrane of the chloroplast

4. Which layer of the leaf contains the majority of chloroplasts.
   A) Cuticle
   B) Veins
   C) Epidermis
   D) Mesophyll
   E) Stroma

5. In the overall reaction of photosynthesis, which starting molecules will get oxidized?
   A) oxygen
   B) carbon dioxide
   C) glucose
   D) water
6. In photosynthesis, electrons from Photosystem I are passed down an electron transport chain and donated to what?

A) water  
B) NADP+  
C) photosystem II  
D) oxygen  
E) NADPH

7. The electrons that leave Photosystem II are replaced with electrons donated by which of the following?

A) oxygen  
B) carbon dioxide  
C) NADPH  
D) water  
E) photosystem I

8. In photosynthesis, electrons from Photosystem II are passed down an electron transport chain and donated to what?

A) oxygen  
B) carbon dioxide  
C) water  
D) photosystem I  
E) NADP+

9. Which of these molecules is produced during the light dependent stage of photosynthesis:

A) Glucose  
B) Water  
C) carbon dioxide  
D) oxygen  
E) NADP+

10. The wavelength of light that the chlorophyll a pigment found at the reaction center in photosystem I absorbs is:

A) 680 nm  
B) 660 nm  
C) 700 nm  
D) 800 nm
11. Which region of the chloroplast will have a higher pH?

A) Stroma  
B) Lumen of the thylakoid

12. In an experiment studying photosynthesis performed during the day, you provide a plant with radioactive carbon (14C) dioxide as a metabolic tracer. The 14C is incorporated first into oxaloacetate during the day. The plant is best characterized as a:

A) heterotroph.  
B) chemoautotroph.  
C) C4 plant.  
D) C3 plant.  
E) CAM plant.

13. Photorespiration occurs when rubisco reacts with:

A) O2.  
B) CO2.  
C) glyceraldehyde 3-phosphate.  
D) 3-phosphoglycerate.  
E) NADPH.

14. The Calvin (Light independent) cycle takes place in the

A) cytosol  
B) thylakoid membrane

15. Which of the following events happens during the Calvin Cycle (light independent) stage of photosynthesis:

A) Carbon is fixed from CO2 into a biological molecule  
B) H2O is split to produce oxygen  
C) NADPH and ATP are produced  
D) Both A and B  
E) All of the above
16. What is the product of the carbon reduction stage of the Calvin Cycle

A) ribulose bisphosphate  
B) Oxaloacetate  
C) glyceraldehyde-3-phosphate  
D) pyruvate  
E) phosphoglycerate

17. Cell surface receptors generally bind ligands that are:

A) Hydrophilic  
B) Hydrophobic

18. The form of cell signaling which a cell secretes a molecule that binds back onto its own receptor

A) Synaptic  
B) Autocrine  
C) Gap  
D) Endocrine  
E) Paracrine

19. In general, steroid hormone work by:

A) binding to a cell surface receptor and regulates cell activity  
B) binding to an intracellular receptor and regulates cell activity  
C) binding to an intracellular receptor and regulates gene expression  
D) binding to a cell surface receptor and regulates gene expression

20. Which bases are pyrimidines:

A) Adenine and Guanine  
B) Thymine and Cytosine  
C) Adenine and Thymine  
D) Guanine and Cytosine

21. The energy needed to power the formation of the complementary DNA strand is from:

A) NADPH  
B) removing oxygen from the free nucleotides  
C) removing two phosphates from the free nucleotides  
D) removing the base from the free nucleotides
22. During DNA replication, the new complementary DNA strand is built from:

A) the 3’ to the 5’ end (new nucleotides are added to the 5’ end)
B) the 5’ to the 3’ end (new nucleotides are added to the 3’ end)
C) both ends

23. If the original DNA strand was 3’-GCAT-5’ then the complementary DNA strand is:

A) 5’-ATCG-3’
B) 3’-ATCG-5’
C) 5’-CGTA-3’
D) 3’-CGTA-5’

24. What is the result of DNA replication?

A) four new DNA molecules: each with one old and one new strand
B) two new DNA molecules: each with one old and one new strand
C) four new DNA molecules: one with two old strands and the other with two new strands
D) two new DNA molecules: one with two old strands and the other with two new strands
E) the cell’s DNA content is tripled

25. In a DNA molecule, the sugars and phosphates are linked together by this kind of bond:

A) hydrogen
B) phosphodiester
C) ionic
D) phosphoglycosidic
E) ether

26. In a DNA molecule, the complementary bases are linked together by this kind of bond:

A) phosphodiester
B) ionic
C) phosphoglycosidic
D) hydrogen
E) ether
27. In DNA nucleotides, the bases are covalently bound to what molecule:
   A) glucose
   B) phosphate
   C) ribose
   D) deoxyribose
   E) glycerol

28. What is a point mutation?
   A) a mutation in which one chromosome is lost
   B) a mutation that affects only one metabolic pathway
   C) a mutation when one base pair is paired incorrectly during DNA replication
   D) an error in DNA that is caused by misfunctioning of DNA ligase
   E) a mutation that affects a single cell

29. What type of replication is the responsible for DNA replication:
   A) Semiconservative
   B) Conservative
   C) Dispersive
   D) Transcription
   E) Translation

30. Chromosomes are made of a material consisting of both DNA and proteins, the name for this material is:
   A) centromere
   B) nucleosome
   C) centrosome
   D) chromatin
   E) kinetochore

31. The place on the chromosomes where microtubules attach is called the:
   A) centromere
   B) kinetochore
   C) chromatid
   D) chromatin
   E) centrosome
32. The region where the chromatids are tightly associated is called:
   A) chromatid
   B) chromatin
   C) centrosome
   D) centromere
   E) kinetochore

33. The microtubule-organizing center in animal cells is called:
   A) centromere
   B) centrosome
   C) chromatid
   D) chromatin
   E) kinetochore

34. In meiosis, how many mature (viable) eggs are produced from one primary oocyte?
   A) One
   B) Two
   C) Three
   D) Four

35. The fertilized egg, before it begins to undergo mitosis, is called:
   A) Fetus
   B) Zygote
   C) Embryo
   D) Gamete

36. During cell division, the chromosomes are in this state:
   A) Uncondensed
   B) Condensed

37. Which structures are responsible for cytokinesis in animal cells
   A) Myosin filaments
   B) Kinesin and Dynein
   C) Microtubules
   D) Intermediate filaments
   E) Microfilaments (actin)
38. DNA replication takes place during:
   A) Prophase of mitosis
   B) Telephase of mitosis
   C) G1 phase of interphase
   D) S phase of interphase
   E) G2 phase of interphase

39. The genes that code for proteins that stimulate the cycle are:
   A) Tumor suppressor genes
   B) Proto-oncogenes

40. At the end of mitosis in plants, how does the cell wall form?
   A) The new cell wall grows out from old cell wall
   B) Vesicles line up between the cells and join together
   C) Proteins constrict and pinch off the new cell

41. Normal human sperm will contain this type of chromosome for the 23rd pair:
   A) Only a Y chromosome, never a X
   B) Either a X or a Y chromosome
   C) Only a X chromosome, never a Y
   D) Two chromosomes one X and one Y

Fill in the following answers:

42. What enzyme catalyzes the reaction where carbon dioxide (CO2) is fixed into a 3 carbon
    biological molecule during the Calvin Cycle.

43. How many ATP, NADPH and CO2 are required to make on glucose molecule in the
    Calvin Cycle. (3 pts).

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______________________________
44. What is the name of the proteins that increase the signal transduction efficiency by grouping together different proteins that are involved in the same pathway?

___________________________________________

45. What is the benefit of having a cascade response in cell signaling pathways

___________________________________________

46. What is the function of adenylyl cyclase?

___________________________________________

47. What enzyme dephosphorylates proteins, deactivating them?

___________________________________________

48. What enzyme phosphorylates proteins and activates them?

___________________________________________

49. Describe how G proteins are activated, starting with the binding of a ligand to a G Protein Coupled Receptor.

___________________________________________

___________________________________________

___________________________________________

50. What does DAG activate?

___________________________________________

51. How is cAMP deactivated?

___________________________________________

52. What is the function of phospholipase C.

___________________________________________
53. In nucleotide excision repair, what enzyme cuts out and replaces damaged stretches of DNA

54. (3 pts) What are the three domains of intracellular receptors

55. (8 pts) Describe the role of the following proteins in DNA replication:

   A) Helicase: __________________________________________

   B) Topoisomerases (DNA gyrase): _________________________

   C) Primase: ____________________________________________

   D) DNA ligase: _________________________________________

56. Chemicals that damage the DNA and cause mutations in replication are called (what are this type of chemicals called, do not list examples):

57. (4 pts) UV radiation causes a specific mutation to DNA, what is the mutation and what is the repair mechanism
58. The proteins that the DNA molecule coils around are called:

59. (4 pts) What is the function of telomers and telomerase

60. (4 pts) The MPF (maturation-promoting factor) is comprised of what two types of regulatory proteins that control the cell cycle?

61. (4 pts) What are the two events in meiosis that contribute to the genetic diversity of the offspring and during which stages of meiosis do each of these events take place?

62. (6 pts) Describe the MAP kinase pathway starting with the ligand binding to the receptor tyrosine kinase (include in your answer, how the receptor is activated, the series of proteins that are activated, and how the pathway is deactivated.)
63. (8 pts) Describe the process of how ATP is made in the Electron Transport Chain, include in your discussion the role of: the electron transport chain, oxygen, NADH/FADH2, H+, ATP synthase, which molecules are oxidized and which are reduced, where in the cell this is taking place.
Bonus Questions (1 pt each, unless noted)

1. Who discovered the three dimensional structure of proteins know as alpha helixes?
   ____________________________________________

2. What is the name of the researcher who discovered that the amount of adenine = thymine and the amount of guanine = cytosine”
   ____________________________________________

3. Prokaryotes (bacteria and archaea) reproduce by a type of cell division called
   ____________________________________________

4. Which base is pictured below:

   ![Base Image]