Worldwide Youth in Science and Engineering

2012 Academic Challenge

BIOLOGY TEST - SECTIONAL

This Test Consists of 50 Questions

Biology Test Production Team
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GENERAL DIRECTIONS

Please read the following instructions carefully. This is a timed test; any instructions from the test supervisor should be followed promptly.

The test supervisor will give instructions for filling in any necessary information on the answer sheet. Most Academic Challenge sites will ask you to indicate your answer to each question by marking an oval that corresponds to the correct answer for that question. Only one oval should be marked to answer each question. Multiple ovals will automatically be graded as incorrect answers.

Be sure ovals are marked as ● , not ⊙ , ◐ , ◑ , etc.

If you wish to change an answer, erase your first mark completely before marking your new choice.

You are advised to use your time effectively and to work as rapidly as you can without losing accuracy. Do not waste your time on questions that seem too difficult for you. Go on to the other questions, and then come back to the difficult ones later if time remains.

***** TIME: 40 MINUTES *****

DO NOT OPEN TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO!

WYSE – Academic Challenge
Biology Test (Sectional) – 2012

1. Which of the following statements is true?

   a. If a colorblind man marries a woman that is colorblind all their children would be colorblind.
   b. If a colorblind man marries a woman that has normal vision, but is a carrier, their children may have normal vision or could be colorblind.
   c. If two parents have only a 50% chance that their boys will be colorblind, the mom would be a carrier.
   d. If two parents have a 50% chance that their girls will be colorblind, then dad would be colorblind and mom would be a carrier.
   e. All of the above are true.

2. $C_6H_{12}0_6$ is the chemical formula for ____.

   a. glucose
   b. galactose
   c. fructose
   d. all of the above
   e. none of the above

3. Match the disorders in **Column A** with their causes in **Column B**.

Column A	**Column B**
1. Turner Syndrome	i. XXY
2. Klinefelter Syndrome	ii. XO
3. Jacob's Syndrome	iii. Trisomic
4. Down Syndrome	iv. Taller males with an extra Y

   Select the correct matching sequence.

a.	1-iv	2-ii	3-iii	4-i
b.	1-iii	2-i	3-iv	4-ii
c.	1-ii	2-i	3-iii	4-iv
d.	1-ii	2-i	3-iv	4-iii

   e. None of the above

4. The femoral vein is found in the ____ of the human body.

   a. neck
   b. leg
   c. arm
   d. head
   e. hand

5. Which of the following disorders is not caused by an autosomal recessive trait?

   a. cystic fibrosis
   b. Huntington's disease
   c. Tay-Sachs
   d. galactosemia
   e. albinism

6. Which of the following statements is true?

   a. HeLa cells are considered the first cancer cells that were able to be grown in tissue culture in the 1950s.
   b. Lines of HeLa cells are still used in research laboratories to this day.
   c. Henrietta Lacks was from a poor family that could not afford health insurance and a book has recently been published telling of her story.
   d. Both a and b are true.
   e. All the above statements are true.

7. The products of the light dependent reactions of photosynthesis are ____.

   a. CO_2, H_2O
   b. $FADH_2$, ATP
   c. Cyclic AMP, CO_2
   d. ATP, NADPH, O_2
   e. None of the above

8. P is dominant for purple flowered pea plants and p is recessive for white flower color in pea plants. What would be the genotype of the F2 generation of a cross between a pure white flowered and a pure purple flowered pea plant?

   a. 1:2:1
   b. 3:1
   c. 1:1
   d. 1:1:1:1
   e. none of the above

9. Match the organisms in **Column A** with the type of movement in **Column B** that best fits.

Column A	**Column B**
1. *Amoeba*	i. flexing and vector transmission
2. *Paramecium*	ii. flagella
3. *Euglena*	iii. pseudopodia
4. *Plasmodium*	iv. cilia

Select the correct matching sequence.

a.	1-iv	2-ii	3-iii	4-i
b.	1-iii	2-i	3-iv	4-ii
c.	1-ii	2-i	3-iii	4-iv
d.	1-ii	2-i	3-iv	4-iii
e.	1-iii	2-iv	3-ii	4-i

10. DNA polymerase ____.

    a. is only found in eukaryotes
    b. attaches nucleotides to the 3'end
    c. stabilizes the mRNA
    d. has the same function as DNA ligase
    e. cuts DNA at the backbone

11. Match the terms in **Column A** with their definitions in **Column B**.

Column A	**Column B**
1. viviparous	i. reproductive structure of some plants
2. ovoviviparous	ii. live birth
3. oviparous	iii. producing eggs that hatch within their body
4. spore	iv. lays eggs

Select the correct matching sequence.

a.	1-ii	2-iii	3-iv	4-i
b.	1-iii	2-ii	3-iv	4-i
c.	1-ii	2-i	3-iii	4-iv
d.	1-ii	2-i	3-iv	4-iii
e.	1-iii	2-iv	3-ii	4-i

12. Which term does **not** have a similar meaning?

a. primary producer
b. autotroph
c. herbivore
d. lithotroph
e. phototroph

13. Which plant is **not** matched appropriately?

a. corn - monocot
b. peanut – dicot
c. pea – monocot
d. beans – dicot
e. tulip – monocot

14. If an element has an atomic number of 24, the number of valence electrons would be ____.

a. 2 b. 4 c. 6 d. 8 e. 10

15. Parts of the mitochondrion consists of____.

a. cristae
b. matrix
c. ribosome
d. DNA
e. All are found in or part of the mitochondrion.

16. Which cell type is **not** matched to its function?

a. alpha cells – pancreatic amylase
b. beta cell – secretes insulin
c. goblet cell – secretes mucus
d. b cells – produce antibodies
e. parietal cell – secretes gastric juice

17. Match the scientist in **Column A** with their accomplishments in **Column B**.

Column A	**Column B**
1. van Leeuvenhoek	i. the structure of proteins
2. Fleming	ii. helped disprove spontaneous generation
3. Pasteur	iii. father of the modern microscope
4. Pauling	iv. discovered penicillin

Select the correct matching sequence.

a. 1-ii 2-iii 3-iv 4-i
b. 1-iii 2-iv 3-ii 4-i
c. 1-ii 2-i 3-iii 4-iv
d. 1-ii 2-i 3-iv 4-iii
e. 1-iii 2-iv 3-i 4-ii

18. Which of the following would **not** be considered to be a carotenoid color?

a. yellow
b. orange
c. green
d. red
e. All of the above are carotenoids.

19. A/an ____ can be described as a coastal water way where fresh water and salt water meet.

a. estuary
b. bog
c. swamp
d. marsh
e. delta

20. Sickle cell anemia is caused by a/an ____.

a. frameshift mutation
b. silent mutation
c. nonsense mutation
d. missense mutation
e. inborn metabolism error

21. Carbon has ____ bonding sites.

a. 1 b. 2 c. 3 d. 4 e. 6

22. If a cell has a diploid number of 24, then after Telophase I ____ chromosomes would be in each daughter nuclei.

a. 6 b. 8 c. 12 d. 24 e. 48

23. Which of the following is **not** one of the conditions that must to be met for the Hardy-Weinberg theorem to apply?

    a. no selection of mates
    b. no migration
    c. no mutation
    d. no natural selection
    e. no asexual reproduction

24. RNA polymerase will bind to the ____ on DNA during transcription.

    a. enhancer
    b. operator
    c. promoter
    d. operon
    e. repressor protein

25. If the genotype is TtRryy, the possible gametes would be ____.

    a. Tt, Rr, or yy
    b. Try, TRy, tRy, try
    c. TtRryy
    d. TRY, tRY
    e. All of the above are possible gametes.

26. Which larva is **not** correctly matched to its adult form?

    a. maggot – fly
    b. grub – beetles
    c. wriggler – bumble bee
    d. caterpillar – butterfly
    e. nymph – grasshopper

27. Which of the following is **not** in the Phylum Mollusca?

    a. brain coral
    b. octopus
    c. slug
    d. clam
    e. snail

28. The ____ is a membrane sack where light is absorbed by a plant.

    a. stroma
    b. thylakoid
    c. lumen
    d. matrix
    e. cristae

29. Which of the following is **not** true?

    a. Gas exchange in plants occurs through stomata of the epidermis, which open and close with the aid of guard cells.
    b. There are two light absorbing photosystems in plants, PSI and PSII.
    c. NADP is oxidized to NADPH during photosynthesis.
    d. Photolysis, the splitting of water, provides a source of electrons.
    e. The products of photosynthesis include sugar and oxygen.

30. Using the Hardy-Weinberg theorem, determine the expected allele frequency of the recessive allele if the dominant allele frequency is equal to 0.7.

a. 0.51 b. 0.49 c. 0.42 d. 0.3 e. 0.09

31. Which of the following is true?

a. Lipids are non polar molecules and are hydrophobic.
b. Polar molecules are hydrophilic.
c. Hydrogen bonds form between water molecules.
d. Both a and c are true.
e. All of the above are true.

32. The liquid compartment within the thylakoid of the chloroplast is the ____.

a. lumen
b. stroma
c. grana
d. matrix
e. none of the above

33. Match the leaf tissue in **Column A** with its appropriate components from **Column B**.

Column A	**Column B**
1. mesophyll	a. spongy
2. vascular	b. xylem
3. epidermis	c. stomata
	d. palisade
	e. phloem
	f. cuticle
	g. guard cells

Select the correct matching sequence.

a. 1 – b, e	2 – c, f, g	3 – a, d
b. 1 – c, e	2 – a, d	3 – b, f, g
c. 1 – a, d	2 – b, e	3 – c, f, g
d. 1 – c, f, g	2 – a, b	3 – d, e
e. 1 – a, b, e	2 – d, g	3 – c, f

34. Match the disaccharide from **Column A** with the appropriate monosaccharide from **Column B**.

Column A	**Column B**
1. sucrose	a. galactose
2. maltose	b. fructose
3. lactose	c. glucose

Select the most correct matching sequence.

a. 1-b,c	2-c	3-a,c
b. 1-a	2-c	3-b
c. 1-c	2-a,c	3-b,c
d. 1-b	2-b,c	3-a,b
e. 1-a,c	2-c	3-b,c

35. Match the body plan in **Column A** with the organisms in **Column B**.

Column A	**Column B**
1. asymmetrical	a. humans
2. bilaterally symmetrical	b. coral
3. radially symmetrical	c. sponges
	d. jelly fish
	e. sea anemones
	f. dogs

Select the correct matching sequence.

a.	1 – a, f	2 – b, c	3 – d, e
b.	1 – c, d	2 – a, f	3 – b, e,
c.	1 – b, c	2 – d, f	3 – a, e
d.	1 – c	2 – a, f	3 – b, d, e
e.	none of the above		

36. Which of the following is **not** a correct association of instinct versus learned response?

a. bird making a nest – instinct
b. honeybee's dance – instinct
c. joey climbs into its mother's pouch – learned
d. dog's salivate after only hearing a bell, in the past the dog would hear a bell and receive meat – learned
e. riding a bike – learned

37. Hydrogen bonds usually form between hydrogen and ____ or ____.

a. oxygen; nitrogen
b. oxygen; carbon
c. carbon; nitrogen
d. phosphorous; oxygen
e. phosphorous; carbon

38. Which of the following is **not** true?

a. Cyanobacteria can release oxygen into the atmosphere.
b. In the light dependent reactions, ATP is produced.
c. ATP synthase allows for ATP to release energy.
d. Beta oxidation allows for fatty acids to be used in citric acid cycle.
e. Cellular respiration provides energy for the organism.

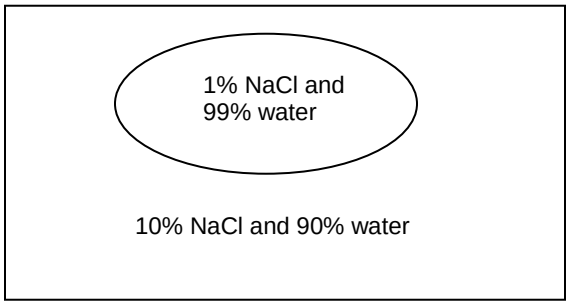
39. Which of the following is an incorrect association?

a. acoelomate – fluke, tapeworm
b. coelomates – clam, snail
c. coelomates – octopus
d. pseudocoelomate – round worm
e. coelomate – flat worm

40. Hypoglycemia is to ____ levels, as hyperglycemia is to ____ levels.

a. low calcium; elevated calcium
b. high glucose; elevated blood sugar
c. low glucose; elevated glucose
d. high oxygen; low oxygen
e. none of the above

41. What will happen to the size of the cell in the figure below?



a. The cell size will remain the same size.
b. The cell size will shrink in size.
c. The cell size will increase in size.
d. The cell size will first increase and then decrease in size.
e. The cell size will first decrease and then increase in size.

42. CAM plants close their stomata during the day to ___.

a. exchange carbon dioxide
b. conserve oxygen
c. conserve water
d. both a and b
e. both b and c

43. Hydrogen has an atomic mass and an atomic number of 1, oxygen has an atomic mass of 16 and an atomic number of 8, and carbon has an atomic mass of 12 and an atomic number of 6. How much would one mole of glucose $C_6H_{12}O_6$ weigh?

a. 24 grams
b. 96 grams
c. 144 grams
d. 180 grams
e. 360 grams

44. Which of the following is the largest mammal?

a. blue whale
b. shrew
c. bat
d. mouse
e. cheetah

45. Which of the following is **not** true about Gram positive bacteria?

a. stain purple
b. thick peptidoglycan layer
c. teichoic acids
d. porin proteins
e. All of the above are true.

46. Mature mRNA is made ____.

    a. using the ribosome
    b. by splicing out the introns
    c. by splicing out the exons
    d. using the tRNA anticodons
    e. by translation

47. If a man with hemophilia has children, which of the following is true?

    a. His daughters could be carriers.
    b. His daughters could have hemophilia depending on their mom's genotype.
    c. His sons would not be affected by his hemophilia allele.
    d. Both a and c are correct.
    e. All of the above are correct.

48. A ____ may be described as: cold, long winters, many conifers, eagles, wolverines, bobcats, and elks.

    a. temperate rain forest
    b. boreal forest
    c. savanna
    d. tundra
    e. chaparral

49. The Calvin – Benson cycle takes place in the ___ of the chloroplast.

    a. matrix
    b. cristae
    c. lumen
    d. thylakoid
    e. stroma

50. Centrioles are ____.

    a. important for digesting worn out cell parts
    b. made up of microfilaments
    c. important for keeping the plant cells shape
    d. made up of microtubules
    e. none of the above