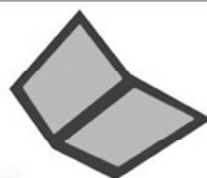


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m a s t e r s



# UPCAT Review

## BIOLOGY

### VOLUME 7

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UPCAT Review – Science Review 2  
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# **PREFACE**

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## **Believe That You Can Pass the UPCAT!**

*by Leopold Laset*

Do you sometimes find it hard to believe that your dream to pass the UPCAT can become a reality? If so, then there is something very important that you need to know.

UPCAT is for dreamers like you.

Every student who passed the UPCAT began thinking or dreaming of passing the UPCAT.

Your near-perfect or perfect score in a quarterly test, your cellphone, PSP, or any gadget, your out-of-town (or out-of-country) vacation, your new pair of shoes, and any other stuff that you desired and now possess - are all the result of your 'dream come true'.

What this means is that throughout your lifetime, you have had an idea, you have desired for many things and worked hard for them, overcome problems and ultimately transformed your dream into reality.

And if hundreds and thousands of students have been able to pass the UPCAT in the past, by starting with a dream, then it stands to reason, that you can do it too.

Often we make the mistake of thinking that UPCAT is for a small number of bright students who have the brains and intelligence that we don't possess.

But this is simply not true.

The fact that thousands of average students have brought their dreams of passing the UPCAT to fruition in the past demonstrates that the opportunity to qualify in the UPCAT is something that is available to each UPCAT aspirant – average or bright.

Right now, hundreds of UPCAT dreamers are taking the steps necessary to achieve the goals of passing the UPCAT. Some are studying this early, some are joining community of fellow dreamers, and some are attending review classes. What is it that you need to do?

In order to achieve your goal of passing the UPCAT, the only things you really need are:

- (1) A crystal clear picture that you already passed the UPCAT
- (2) An unshakeable determination to do whatever it takes to make your dream of passing the UPCAT a reality

As soon as you take these two steps, passing the UPCAT becomes achievable. If you need a help – you look for it. If you encounter a difficult concept – you find a way to understand it. If you can't solve a math problem – you try and try and practice more.

And gradually, step-by-step, you bring your UPCAT dream into reality to join the dreams of the thousands of UPCAT dreamers who have gone before you.

So today I'd like to encourage you to believe in yourself and appreciate the fact that you live in a world where 'dreams do come true'.

Understand that thousands of students have made their UPCAT dream a reality in the past – Thousands more will make their UPCAT dream a reality in the near future and you CAN be one of them.

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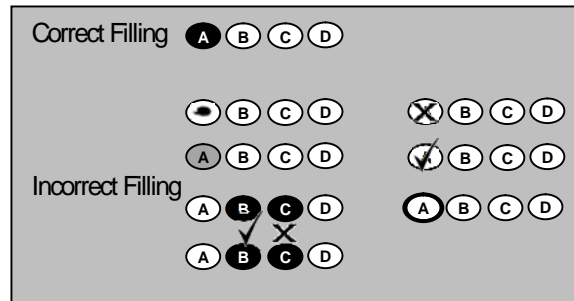
## **BIOLOGY CONTENTS**

- *Ecology*
- *Principles of Classification*
- *Cytology*
- *Plants: Form and Function*
- *Animals: Form and Function*
- *Genetics*
- *Laboratory Procedures*

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## ANSWER SHEET - BIOLOGY



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## BIOLOGY REVIEW TEST

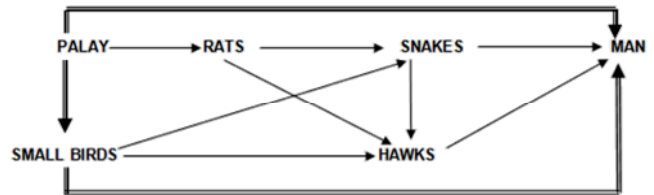
For questions nos. 1 – 4 please refer to the diagram:

1. Of the components in this food web which organism has the least number of alternative food supplies?

A. hawks                                      C. small birds  
B. man                                        D. snakes

2. Which of the following statements is TRUE?

A. the palay will get the most amount of energy from the sun  
B. man belongs to the second trophic level in the biopyramid  
C. hawks can be found in all trophic levels  
D. small birds will have the most chances of survival



3. The diagram shows that hawks can:

A. belong to all the trophic levels                                      C. be a top predator  
B. be a producer and consumer at the same time                                      D. never be a first order consumer

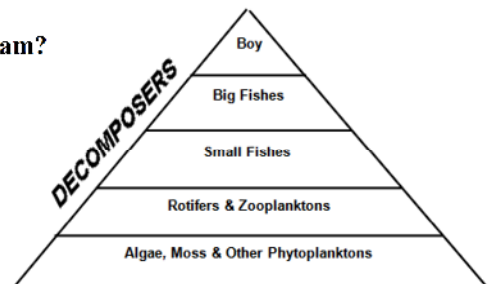
4. This diagram also shows that increase in the population of rats could lead to

A. increase of hawks                                      C. increase of small birds  
B. increase of palay                                      D. no effect in the food web

For questions 5-8 please refer to the diagram to the right:

5. Which of these statements is a correct representation of this diagram?

A. there is a 100 % efficiency of energy transfer from the bottom to the top level of the pyramid  
B. the plant plankton should have the greatest amount of biomass to maintain this food pyramid  
C. the amount of biomass increases as the trophic level increases  
D. the rotifers and zooplankton receive the greatest amount of energy from the sun



6. Which is statement is TRUE about decomposers?

A. they act on all levels in the pyramid                                      C. they do not belong to the food pyramid  
B. they have the greatest biomass                                      D. they include small and big fishes

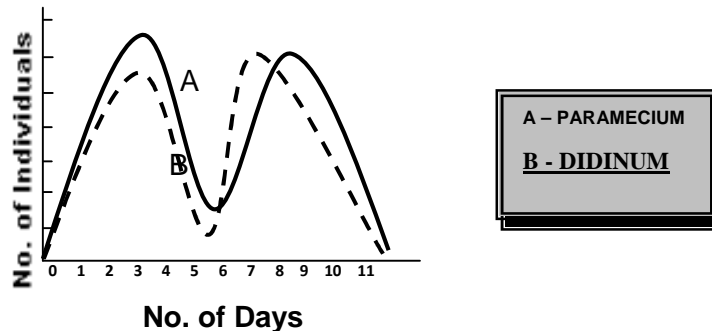
7. Which of the following should be added to both diagrams 1 and 2 to complete the illustration?

A. grasses                                      B. sun                                      C. trees                                      D. water

8. If a certain pesticide is introduced into the body of water where these organisms are found we can say that bio-magnification will occur if:
- A. a rotifer feeding on a mass of 5 algae with 2ppm of pesticide each shows 15ppm of the pesticide
  - B. the boy at the top level of the pyramid gets the least amount of pesticide
  - C. the big fishes will be spared from absorbing the pesticide even if they feed on the small fishes
  - D. a big fish that feed on 50 small fishes with 5ppm pesticide each shows 50ppm of the pesticide in its cells
9. One can very well say that homeostasis is being maintained in:
- A. a zoo
  - B. a flowing fountain
  - C. a classroom aquarium
  - D. a rainforest
10. Plants are considered as producers because:
- A. they are green
  - B. they are in the first level of a food pyramid
  - C. they are photosynthetic
  - D. they are capable of asexual and sexual reproduction
11. Consumers receive their energy in the form of:
- A. chemical energy
  - B. kinetic energy
  - C. mechanical energy
  - D. solar energy
12. In the sea the following food chain is observable: corals → crown-of-thorns → trumpet shells → man  
Since corals are fish nurseries, we could be assured of more fishes if:
- A. man will collect as many corals as possible
  - B. man will collect as many crown-of-thorns as possible
  - C. man will collect as many trumpet shells as possible
  - D. man will do nothing to the ecosystem
13. Which of the following characteristics of trees will make them survive well in temperate countries where winter occurs?
- A. colorful fruits and flowers to attract pollinators
  - B. large canopies for maximum sunlight absorption
  - C. needle-like leaves to prevent water loss thru transpiration
  - D. thorny branches to protect against predators
14. For animals to survive in the tundra, they should possess all of the characteristics except:
- A. thick fur to withstand the cold
  - B. enhanced senses to both seek food and avoid predators
  - C. a body temperature regulated by the environment
  - D. a capacity to utilize both plants and animals for food
15. *Triconympha campanulata* is a flagellate that lives inside the gut of termites. The former digests the cellulose from the wood eaten by the termites while the latter serves as the host. Which of the following pairs of organisms belong to the same kind ecological relationship as the termite and the flagellate?
- A. fleas \_\_\_\_\_ dogs
  - B. zebras \_\_\_\_\_ lions
  - C. remoras \_\_\_\_\_ sharks
  - D. sea anemone \_\_\_\_\_ crab
16. For cactuses to survive well in the desert their stems should be:
- A. broad and expanded
  - B. herbaceous and moist
  - C. green and photosynthetic
  - D. sturdy with thorny leaves

17. Why do trees in deciduous forests shed off their leaves regularly during fall?
- to conserve water
  - because of limited sunlight during winter
  - to enrich the forest floor with nutrients
  - to induce the tree to bear flowers instead

For questions 18, 19, 20 please refer to the diagram below:



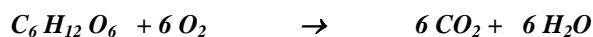
18. From the pattern of the growth curve, what symbiotic relationship is exhibited by the organisms A and B?
- competition
  - predation
  - both A and B
  - no relationship
19. The normal curve growth of Didinium in the culture is clearly shown during the
- 1st, 2nd, 3rd day
  - 4th, 5th, 6th day
  - 7th, 8th, 9th day
  - 10th day
20. Which of the following statements is TRUE?
- rainforests possess the highest diversity among all the biomes
  - taigas support coniferous forests through abundant rainfall
  - deciduous forests experience two seasons a year
  - grasslands contain permafrost
21. The carrying capacity of tilapia in a pond is:
- the sustainable number of tilapia that can be accommodated
  - the maximum number of tilapia that can be accommodated
  - the number of sexually viable tilapia that can be accommodated
  - the economically desirable number of tilapia that can be accommodated
- 22.
- | GROUP A | GROUP B   |
|---------|-----------|
| corn    | beans     |
| bamboo  | gumamelas |
| rice    | mangoes   |
| wheat   | roses     |

Group A was separated from group B because:

- group A plants have more leaves than group B
- group A have parallel venation, group B has netted venation
- group A have woodier trunk than group B
- group A have taproots compared to group B which fibrous roots

23. **Viruses cannot be the first form of life because:**  
A. they are neither prokaryotic nor eukaryotic      C. they need living cells to reproduce  
B. they do not have proteins      D. they do not have cells
24. **From a taxonomist's point of view which organism should be grouped with the sea horse?**  
A. corals      B. sea stars      C. milkfish      D. shrimps
25. **Which of the following best describes organisms of the same species?**  
A. they look alike      C. they cannot hybridize with other species  
B. they also belong to the same genus      D. they share the same environment and eat the same types of food
26. **Which of the following characteristics distinguish mammals from the other vertebrates?**  
A. being warm blooded      C. having red blood cells without nuclei  
B. capability to sexually reproduce      D. having a very high metabolism for more strenuous activity
27. **Which of the following is true regarding photosynthesis?**  
A. it releases carbon dioxide      C. it requires glucose  
B. it releases water      D. it requires oxygen
28. **If an aerobic organism is placed in an anaerobic environment, which of the following organelles will be the first to cease its function?**  
A. endoplasmic reticulum      C. mitochondrion  
B. Golgi apparatus      D. nucleus
29. **Which of the following best explains why the cell is known as the basic unit of life?**  
A. a cell can perform the fundamental life processes      C. the cell contains the DNA  
B. all living things are made up of cells      D. the cell is the smallest unit of life
30. **Which of the following organelles is not present in all cells?**  
A. cell membrane      B. mitochondrion      C. nucleus      D. ribosome
31. **Which of the following will not enter the cell membrane?**  
A. amino acids      B. fatty acids      C. starch      D. glycerol
32. **All of the following explains why oxygen is important to the cell except:**  
A. it is required to generate large amounts of ATP      C. it is used by the cell for energy  
B. it serves as an electron acceptor during respiration      D. it is needed by the mitochondria

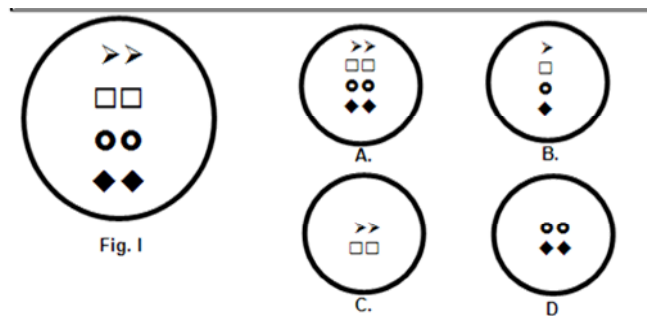
*Consider this reaction in answering nos. 33 and 34:*



33. **What kind of process in the cell is being described in the reaction?**  
A. -oxidation      B. gluconeogenesis      C. photosynthesis      D. respiration

34. The reaction will take place in what specific cell organelle?  
A. chloroplast      B. lysosome      C. mitochondria      D. nucleus

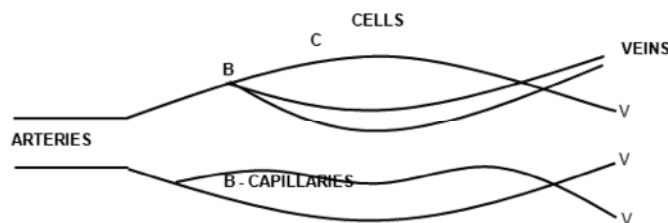
Use the choices below to answer questions 35 and 36:



35. If the cell in Fig. 1 had undergone meiosis, which of the above choices will be seen after the process?
36. If the cell in Fig. 1 had undergone mitosis instead, which of the above choices will be seen after the process?
37. Rice (*Oryza sativa*) has a chromosome number of  $2n = 24$ . How many chromosomes would you find in its leaf cells?  
A. 12      B. 24      C. 48      D. 96
38. Corn (*Zea mays*) has a chromosome number of  $2n = 20$ . How many chromosomes would you find in its pollen?  
A. 12      B. 24      C. 48      D. 96
39. Which of the following is not true about chlorophyll?  
A. it absorbs the blue and red portion of the solar spectrum      C. it is the only pigment in a plant  
B. it reflects the green portion of the solar spectrum      D. it is needed for photosynthesis
40. Stomates are involved in the following processes except?  
A. expiration      B. gas exchange      C. respiration      D. transpiration
41. One form of individual adaptation is tropism. Plant shoots always tend grow upwards, away from the ground. This type of tropism is called:  
A. positive phototropism      C. negative thigmotropism  
B. negative geotropism      D. positive hydrotropism
42. Roots are of great use to plants because:  
A. they anchor the plant to the soil      C. they absorb raw materials for metabolic processes  
B. they absorb nutrients to be used for energy      D. they absorb water
43. Function wise, which of the following animal structures resemble most a plant's root hairs?  
A. blood      B. neurons      C. skin hair      D. villi
44. Auxins affect plants in the same way that hormones affect animals. Which of the following statements is not a function of auxins?  
A. it stimulates plant lengthening      C. it stimulates secondary growth in stems  
B. it stimulates primary growth at the shoot      D. it stimulates ripening in fruits

45. Carbon dioxide fixation in the second phase of photosynthesis results in the production of:  
A. amino acids                      B. carbohydrates                      C. oxygen                      D. water
46. Which of the following best describes the light-independent phase of photosynthesis?  
A. it generates ATP                      C. it generates oxygen  
B. it occurs in the stroma                      D. it occurs in the dark
47. Which of the following best explains the dominance of flowering plants over all the other groups of plants?  
A. they are numerous                      C. they have advanced modes of pollen and seed dispersal  
B. their woody stems protect them from injury                      D. they can survive in different locations and climates
48. Which of the following plant tissues can also be found in animals?  
A. ground tissue                      B. meristematic tissue                      C. vascular tissue                      D. none of these
49. The unicellular amoeba has both marine and freshwater species. The marine species is isotonic with its environment while the freshwater species is hypertonic to its surrounding. It means that:  
A. the marine species could only survive in its environment via osmoregulation  
B. the marine species could undergo hemolysis  
C. the freshwater species has to pump water out of the cell  
D. the freshwater species could live both in the sea and the lake
50. Such condition in no. 49 explains why the freshwater amoeba possesses a special organelle called:  
A. cell membrane                      B. cell wall                      C. contractile vacuole                      D. stone cells
51. Which of the following is not true about osmosis?  
A. it is a form of diffusion  
B. it requires energy  
C. it involves movement of solvent from low solute to high solute concentration  
D. it requires a semi-permeable membrane

*For questions 52, 53, 54 and 55 refer to the illustration below:*



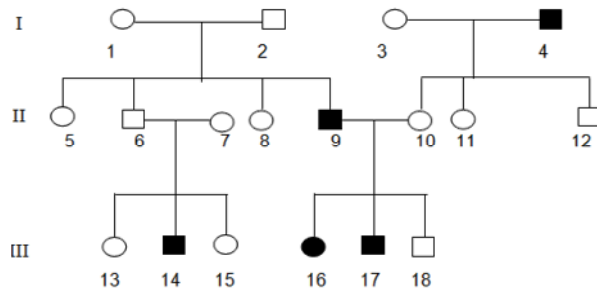
52. If B are the capillaries what specific substances will be abundant in most A?  
A. amino acids                      B. carbon dioxide                      C. glucose                      D. oxygen
53. Which statement best describes veins?  
A. they have smaller diameters than arteries  
B. they have thick walls  
C. they carry deoxygenated blood  
D. they carry blood towards the heart

54. Which of the following is the correct pathway of blood in a human heart?
- A. right atrium → right ventricle → left atrium → left ventricle
  - B. left atrium → right ventricle → right atrium → left ventricle
  - C. right atrium → left atrium → right ventricle → left ventricle
  - D. right atrium → right ventricle → left ventricle → left atrium
55. Capillaries have small diameters because:
- A. capillaries should penetrate body tissues
  - B. capillaries are branching
  - C. capillaries should allow gas exchange between blood and neighboring tissues
  - D. all of the above
56. Which of the following processes is NOT active after a meal?
- A. fatty acid synthesis      B. gluconeogenesis      C. glycolysis      D. glycogen synthesis
57. Which of the following will easily pass thru the villi of the small intestines to the blood vessels?
- A. sucrose      B. galactose      C. fatty acids      D. proteins
58. Which of the following functions is common to both the circulatory and lymphatic systems?
- A. coordination of the immune response      C. transport of nutrients to body cells
  - B. transport of oxygen to body cells      D. removal of carbon dioxide from cells
59. The following question is related to a competent biologist's cancer research. He reasons in part as follows:
- 1. since nearly all cells contain nuclei and
  - 2. since the nuclei contain the genes, then perhaps
  - 3. cancer cells contain the genes that produce enzymes that destroy the growth-regulating hormone
  - 4. thyroxine is a growth-regulating hormone and is secreted by the thyroid gland, which is a part of the endocrine system
- Which of the above statements could be the biologist's hypothesis?
- A. 1      B. 2      C. 3      D. 4
60. One test of the biologist's hypothesis would be to determine:
- A. whether or not enzymes from cancer cells destroy the thyroxine
  - B. whether or not enzymes affect the metabolic rate in the cells
  - C. the effect of cell enzymes on the thyroid gland
  - D. the secretion rate of the thyroid gland
61. A biologist hypothesized that both the pituitary and the ovary influence the uterine cycle in females. Which of the following observations would best support this hypothesis?
- A. removal of the ovary is followed by the degeneration of the uterus
  - B. removal of the pituitary is followed by death
  - C. the pituitary evidently controls a large number of body functions
  - D. uterine development takes place only when pituitary and ovary are present

62. Which best explains why egg cells are generally larger than sperm cells?  
A. egg cells provide stored food for the embryo      C. egg cells solely provide the genetic material of the fetus  
B. egg cells develop into the fetus      D. sperm cells are motile, hence they need to be small
63. After lifting heavy weights, we usually feel pain in our muscles. Which of the following statements best explains this experience?  
A. there is accumulation of acetic acid in the muscles      C. there is accumulation of pyruvic acid in the muscles  
B. there is accumulation of lactic acid in the muscles      D. there is accumulation of carbon dioxide in the blood
64. Which of the following best explains why reptiles cannot survive in the Arctic circle?  
A. reptile have a slow metabolism      C. they cannot survive the low temperatures  
B. there is limited food supply in the Arctic circle      D. all of the above
65. Which of the following does not belong to the group?  
A. cartilage cells      B. blood      C. bone cells      D. neurons
66. Which of the following statements best explains why diabetics should monitor their blood sugar levels?  
A. the glucose in their blood is used up by their cells      C. excessive glucose is poisonous  
B. they cannot use glucose for energy      D. diabetics cannot produce insulin
67. Which of the following organs is both an endocrine and exocrine gland?  
A. adrenals      B. liver      C. pancreas      D. thyroid gland
68. Right-handedness is dominant over left-handedness. Two right handed parents have a son. Is it possible for the son to be left handed?  
A. Yes, if his brothers are left handed.      C. Yes, if his grandparents are left handed  
B. Yes, if his sisters are left handed.      D. No, it is impossible for him to be left handed.
69. Pure red-stemmed plants were allowed to cross with purebred white-stemmed plants. The first filial (F1) generation consisted of 601 plants all of which were pink-stemmed. The gene for red-stems in this case is:  
A. dominant      C. incompletely dominant  
B. recessive      D. codominant with the gene for white stems
70. If the F1 plants will self-fertilize it is possible that the next generation will produce pink stemmed plants which could be:  
A. 100%      B. 75%      C. 50%      D. 25%
71. A man with type A blood marries a woman with type B blood. Which of the following is IMPOSSIBLE?  
A. they have a type A child      C. they have a type O child  
B. they have a type AB child      D. none of the above
72. Which of the following statements is true about the O blood type?  
A. people with blood type O can receive blood transfusions from anybody  
B. people with blood type O can only give blood to people with blood type O  
C. blood type O is the rarest blood type  
D. people with blood type O are homozygotes

73. Purebred tall, yellow-flowered plants were crossed with purebred short, white-flowered plants. The offspring were all tall and yellow-flowered. The offspring were then selfed, producing varied progeny. How much of the progeny is expected to be tall and white-flowered?
- A. 56%                      B. 19%                      C. 6%                      D. 0%
74. Purebreds are:
- A. homozygous              B. true-breeding              C. used as parental              D. all of the these

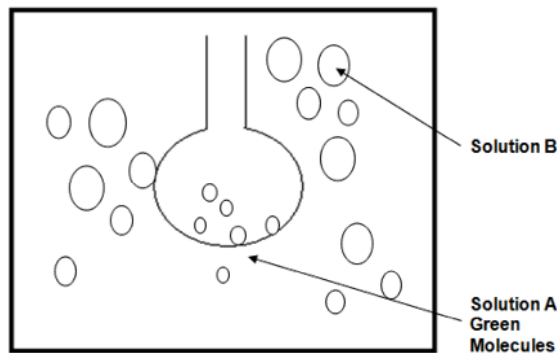
For items 75, 76, 77, 78 refer to the diagram below:



75. If individual 7 in the pedigree is normal, which of the following would probably explain the condition of individual 14?
- A. the child got his colorblind gene from his father alone  
B. the child got his colorblind gene from his mother alone  
C. the child got his colorblind gene from his mother and father  
D. the child must just be a possible carrier
76. Individual 2 is/ has:
- A. homozygous for color blindness                      C. hemizygous for color blindness  
B. homozygous for normal condition                      D. hemizygous for normal condition
77. Which is true about individual 11?
- A. she can have colorblind children                      C. she received a gene for color blindness from her mother  
B. she is homozygous for normal vision                      D. she received a gene for normal vision from her father
78. From the results of the offspring in the F2 generation, we can correctly infer that:
- A. individuals 7 and 10 are carriers for the gene for color blindness  
B. individuals 5 and 8 are homozygous for normal vision  
C. individuals 6 and 14 got their colorblind genes from the father alone  
D. individual 18 could be a possible carrier
79. The hereditary background of an organism depends on the DNA and their products which are:
- A. fatty acids                      B. proteins                      C. simple sugars                      D. starch
80. All of the following are found in a nucleotide except:
- A. peptide bond                      B. nitrogenous base                      C. N-glycosidic bond                      D. phosphate group

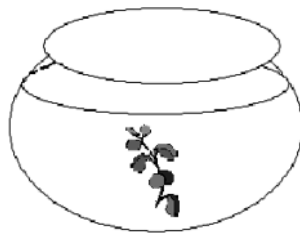
81. Amino acids are to proteins as nucleotides are to \_\_\_\_\_.  
A. nuclein                      B. nuclei                      C. nucleosides                      D. nucleic acids
82. Translation occurs among prokaryotes as well as eukaryotes. This is because both prokaryotes and eukaryotes possess:  
A. cell membranes                      B. cytoplasm                      C. genetic material                      D. ribosomes
83. Why does guanine pair with cytosine and not with adenine?  
A. guanine and cytosine are both purines                      C. guanine and adenine pair would not reach across the double helix  
B. guanine and cytosine are both polar                      D. guanine and adenine would be too wide to fit in the double helix

Questions 84 and 85 refer to the illustration below:



84. If after half an hour solution B become green, all of the following could be true except:  
A. the molecules of solution A are probably smaller than B  
B. the bag is made up of semipermeable membrane  
C. the molecules of solution B probably went inside the bag  
D. the molecules of solution B and A were of same sizes.
85. What would you predict will happen if the set-up will be observed after 24 hours?  
A. solution B will become darker green  
B. water level in the flask with solution A will lessen  
C. all the molecules of solutions A and B will become large  
D. there will be no further changes in the solutions

For question 86 refer to the illustration below: A student took an aquatic plant then cut the tip and completely submerged it in water.

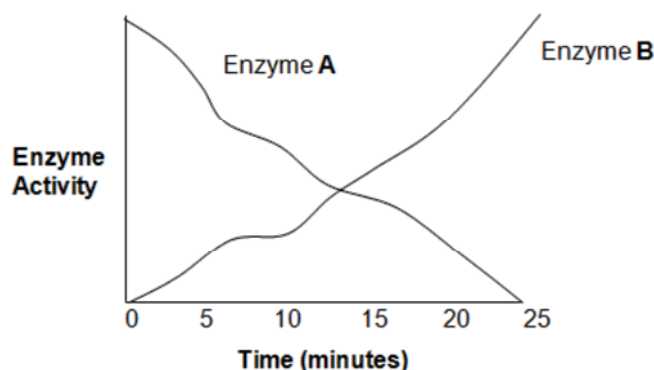


86. After a few minutes bubbles were seen coming out of the cut tip. These bubbles are probably:  
A. oxygen                      B. carbon dioxide                      C. nitrogen                      D. water vapour

The data gathered by the student is shown in this table:	
TIME	NO. OF BUBBLES
8:00	5
8:01	8
8:02	11
8:03	14
8:04	17
8:05	15

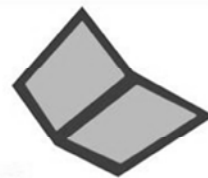
87. Which of the following is a valid observation about the data?
- the no. of bubbles increases per minute
  - the no. of bubbles changes per minute
  - the bubbles are most active after 6 minutes
  - it takes longer time for bubbles to come out of the cut tip
88. The no. of bubbles given off per minute will indicate:
- rate of transpiration
  - rate of respiration and photosynthesis
  - amount of gas intake
  - length of time the plant will survive
89. If this set-up will be placed under direct sunlight for longer period of time, the no. of bubbles per minute will:
- increase
  - decrease
  - remains the same
  - stop
90. A student wanted to test the hypothesis that the rate of respiration in man is dependent upon the amount of available oxygen. He made a face mask which allow him to continually rebreathe the same amount of air supply assuming that the amount of oxygen in the air would progressively decrease. What is the chief error of this procedure?
- the effect of increase carbon dioxide concentration has not been considered
  - the temperature of the air supply will continually increase
  - the pressure exerted by the air supply will continually decrease
  - the amount of oxygen in the sample will remain relatively constant
91. A set-up of bacteria was exposed to radioactive substances. Some offspring were instantly killed and some survived. These survivors were again exposed to radioactive substances, and again the offspring either survived or died. This process was repeated until the dose of radioactive substances was many times as intense as the first dose. This process of producing radioactive resistant bacteria is called:
- budding
  - fission
  - conjugation
  - natural selection
92. Some algae were placed in a jar with radioactive phosphorous. The set-up was placed in the dark. After some days, the algae were found to be radioactive. What does this show?
- algae cells are permeable to radioactive phosphorous
  - algae become permeable to radioactive substances only in the dark
  - the jar affected the permeability of algae cells to radioactive phosphorous
  - radioactivity could take place as long as there algae cells

For questions 93, 94 and 95 refer to the diagram below:



- 93. The graph shows that as time increases enzyme A:**  
A. increases its activity  
B. decreases its activity  
C. remains the same  
D. reaches its maximum activity
- 94. On the other hand enzyme B:**  
A. increases its activity as time increases  
B. decreases its activity as time increases  
C. remains the same  
D. is not affected by time
- 95. The graph also shows that:**  
A. the enzyme activity of A and B will never be the same at all times  
B. it takes 25 minutes for enzyme A to be active  
C. it takes 25 minutes for enzyme B to be active  
D. there is a time when enzymes A and b will have the same activity
- 96. A biologist wanted to evaluate the effect of temperature on the metamorphosis of frogs. An initial step that he should take is to:**  
A. collect as many frogs as possible  
B. determine the duration of each stage of metamorphosis  
C. subject a frog to hot and cold temperature  
D. observe what happens to frogs in the pond when water is hot or cold
- 97. All of the following should vary in this experiment except:**  
A. stages of metamorphosis of the frogs  
B. temperature  
C. species of frogs  
D. laboratory condition of the set-up
- 98. A group of students wanted to find out if brushing newly harvested green mangoes with garlic extract will prevent the growth of molds as they ripen. The students are assuming that garlic:**  
A. possess antibacterial properties  
B. have fungicidal properties  
C. will improve the taste of mangoes  
D. will hasten the ripening of mangoes
- 99. In fact the students succeeded in preventing the growth of molds in carabao mangoes. To make their studies more conclusive, they should:**  
A. perform the same experiment with other varieties of mangoes  
B. add more garlic extracts to the next batch of fruits that they will evaluate  
C. recommend to all mango exporters to use garlic extracts in their products  
D. use extracts from other crops then test their effects on mangoes
- 100. A slide containing a drop of water from a pure algae culture was examined under different microscopes having different objectives and eyepieces. In which of the following microscopes will you be able to see the greatest number of algal cells?**  
A. eyepiece 5x and objective 10x  
B. eyepiece 10x and objective 20x  
C. eyepiece 15x and objective 30x  
D. eyepiece 10x and objective 40x

r e v i e w  
m a s t e r s



# UPCAT Review

## BIOLOGY

### VOLUME 7

***Answers and  
Explanations***

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[www.upcatreview.com](http://www.upcatreview.com)

1. Let's look at the four choices and see the number of alternative food supplies (*indicated by the number of arrows leading to each one of them*):
- A. hawks – *they have at least 3 alternative food supplies: small birds, rats, and snakes*
  - B. man – *based on the food web, he has at least 4 food supplies: palay, small birds, snakes, and hawks*
  - C. small birds – *they only have 1 food supply: palay*
  - D. snakes – *they have 2 alternative food supplies: rats and small birds*

Thus, the answer is **C**.

2.

- A. Trophic levels are usually portrayed as a pyramid, one that places palay on the bottom and man on top—the top is always much smaller than the bottom. Each level implies a loss of energy and efficiency and less life that can be supported by the sun. **Palay** will get the most amount of energy from the sun.
- B. **Man** is an omnivore, therefore he can feed on plants (herbivore or first order consumer) or on other consumers (carnivore or higher order consumer). Thus, man can belong to all the levels of consumer, not just the second trophic level in the biopyramid.
- C. **Hawks** are carnivores. They cannot be first order consumers so they cannot be found in all trophic levels.
- D. The higher the number of alternative food supplies, the higher the chance of survival. Since the **small birds** are just first order consumers, feeding only on palay, they actually have the least chances of survivals among the consumers.

Thus, the answer is **A**.

3. As explained in the previous item, **hawks** are carnivores. They cannot be first order consumers so they cannot be found in all trophic levels (*Choice A*). They cannot be a producer and a consumer at the same time (*Choice B*). They cannot be a top predator since another arrow leading from them to man is still drawn (*Choice C*).

Thus, the answer is **D**.

4. An increase in the population of **snakes** or **hawks** would occur because they now have an increased food supply (**rats**).

Thus, the answer is **A**.

5. Energy from the sun gradually decreases as it passes through the various trophic levels. This is because some of that energy is used by the organisms in their own metabolic and maintenance functions. Afterwards, the remaining energy is transferred to the next trophic level. Thus, *Choice A* is **false**.

The amount of biomass produced for a given amount of solar energy is highest at the first level. Less biomass is produced at the second level, for some energy is lost during the conversion. The more trophic levels there are, the more energy is lost. Thus, *Choice C* is **false**.

As primary producers, the moss, algae and other phytoplanktons receive the greatest amount of energy from the sun. Thus, *Choice D* is **false**.

Thus, the answer is **B**.

6. *All* the organisms in the pyramid could be acted upon by the **decomposers**.

Thus, the answer is **A**.

7. The **sun** is the ultimate source of energy in any ecosystem. It is the **energy source** of photosynthetic producers in the ecosystem.

Thus, the answer is **B**.

8. **Biomagnification** occurs if a certain chemical persists or proliferates in organisms as it passes thru the various levels of a food chain.

Thus, the answer is **A**.

9. **Homeostasis** or **equilibrium** is the balance of certain components in an ecosystem. An example is that the amount of food supply must balance against the number of feeding organisms. This balance is necessary for any ecosystem to sustain itself indefinitely barring any unexpected and sudden natural disaster.

Thus, the answer is **D**.

**10.** *Plants* are called **producers** because they are able to use *light energy* from the **Sun** to produce food (sugar) from carbon dioxide and water through the process called **photosynthesis**. Hence, they are **photosynthetic**.

Thus, the answer is C.

**11.** **Chemical energy** is a form of potential energy or stored energy. It is the energy found in the chemical bonds of compounds. This energy is released when the chemical bonds are broken; when the compound is broken down to its simpler components.

*Producers* utilize light (photosynthesis) or chemicals like ammonia, hydrogen sulphide and methane (chemosynthesis) in order to produce glucose. Glucose is then transferred to the various trophic levels as the food chain progresses. Glucose is ingested, and its chemical bonds are broken down to release energy in the form of ATP.

Thus, the answer is A.

**12.** Reducing the number of crown-of-thorns will reduce the predator population that feeds on corals; increasing the survival chances of the latter.

Thus, the answer is B.

**13.** *Thin needle-like leaves* limits the amount of moisture loss through transpiration and moisture is stored in the tree trunks and roots for use in the winter. Freezing conditions in winter make water availability more difficult, hence the need to conserve moisture.

Thus, the answer is C.

**BIOLOGY TIP:**

Every species has its own **ECOLOGICAL NICHE**. This refers to the organism's place in the ecosystem where it lives, what it consumes, and how it interacts with all *biotic* and *abiotic* factors. If an organism's habitat is its address, the niche is its occupation. An organism's niche is its ecological role – how it “fits into” an ecosystem.

**14.** The *tundra* is located in the Arctic Zone. Polar Bears, for example) have very **thick skin** to keep it warm in the tundra (*Choice A*).

The polar bear's eyesight is about as good as that of a man, but its sense of smell is superb. It is thought that a polar bear can detect prey that is almost 1 km away and up to 1 m under the compacted snow using its **heightened sense of smell** (*Choice B*).

Because food can be scarce even in the arctic summer, most animals have adapted the ability to utilize both plants and animals for food (*Choice D*).

Thus, the answer is C.

**15.** The relationship between *Triconympha* and *termite* is **mutualism**. The flagellate digests cellulose for the termite, while the latter provides shelter and protection for the former.

The same is true for the *sea anemone* and the *crab*. The anemone, with its poisonous tentacles, provides protection for the crab. The crab, being mobile, moves the anemone to other places, providing the latter with a more diversified food supply.

Thus, the answer is D.

**16.** Plants living in desert habitats have several adaptations to survive. One is their characteristics that allow them to **conserve water**.

**Broad and expanded leaves** would have a higher surface area exposed to evaporation. Water loss would then be faster; the plant would lose water rather than conserving.

Thus, the answer is A.

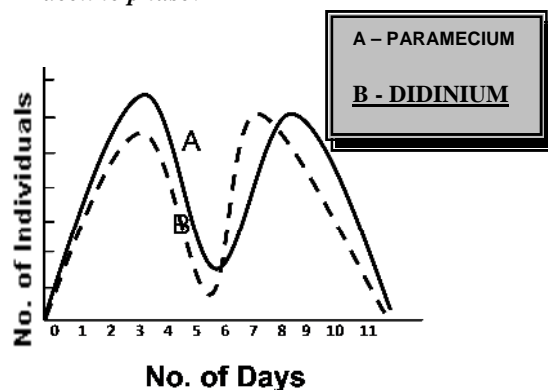
**17.** The presence of the leaves during winter would cause **greater surface area** of the plant to be exposed to cold and dry conditions. They shed their leaves either **to prevent water loss by evaporation** or **to prevent water within the plant from freezing**.

Thus, the answer is A.

18. As *Paramecium* increases, *Didinium* also increases as there would be more food for the latter. As *Paramecium* decreases, the food supply for *Didinium* lessens, therefore the latter would decrease in population. It appears that *Didinium* is feeding on *Paramecium*.

Thus, the answer is B.

19. A *normal curve* is composed of three parts, in the following order: *log phase*, *lag phase* and *decline phase*.



In the graph above, *log phase* indicates an exponential increase in the number of *Didinium* as days pass. The population then slows down its growth, and then maintains a certain number for a certain amount of time. This is the *lag phase*. After the *lag phase*, the population drastically decreases over time. This is the *decline phase*.

Thus, the answer is A.

20. **Taigas** have greater temperature extremes with cold winters and warm summers. The **taiga** experiences relatively low precipitation throughout the year (thus, *Choice B* is false).

**Deciduous forests** are located in temperate regions and so experience four distinct seasons: winter, spring, summer and fall (thus, *Choice C* is false).

**Permafrost** are *permanently frozen soils* found in the **tundra biome**, *not* in the **grasslands** (thus, *Choice D* is false).

Therefore, the answer is A. **Rainforests** possess the *highest diversity* among all the biomes.

21. *Carrying capacity* is the population size that can be supported indefinitely by the resources of a given environment.

Therefore, the answer is A.

22. **Group A** are *monocots*, which are characterized by a single cotyledon in the seed, **parallel venation**, fibrous root system, floral parts in multiples of 3's and the absence of secondary growth (formation of wood is an example of secondary growth).

**Group B** are *dicots*, characterized by the presence of 2 cotyledons in the seed, **netted venation**, taproot system, floral parts in multiples of 4's and 5's and the presence of secondary growth.

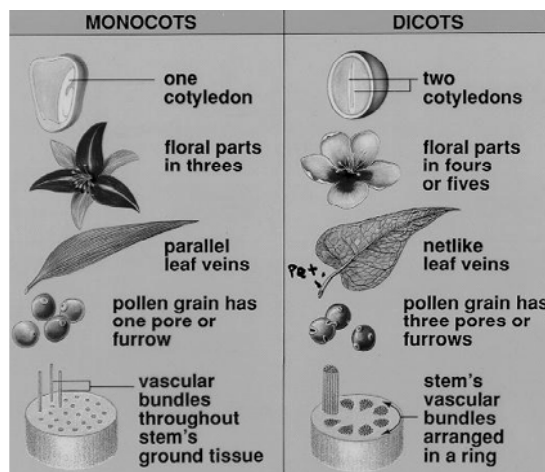


Image from <http://www.agen.ufl.edu>

Therefore, the answer is B.

23. **Viruses** require the genetic material and reproductive mechanisms of *foreign cells* in order to **replicate** themselves. For example, HIV requires a human lymphocyte in order for it to generate a new generation of HIV.

Therefore, the answer is C.

24. **Milkfish** and **sea horses** are both bony fishes (*Class Osteichthyes*) under *Phylum Chordata* of Kingdom Animalia.

Therefore, the answer is C.

## 25. Major Taxonomic Levels

- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species

The classification levels become more specific towards the bottom. Many organisms belong to the same kingdom, fewer belong to the same phylum, and so on, with species being the most specific classification. A species is one group of genetically distinct, interbreeding organisms. The average genetic differences within a species are less than the average differences between that species and a closely related group of organisms.

Thus, organisms that *belong to the same species* automatically belong to the same genus.

Therefore, the answer is **B**.

26. Mammalian erythrocytes (**red blood cells**) are **unique** among the vertebrates as they are **non-nucleated cells** in their mature form.

Therefore, the answer is **C**.

27. **Photosynthesis** is a process of taking inorganic material to make new organic matter through the combining of **carbon dioxide** and **water** using solar energy. This process only occurs in green plants, blue-green algae, and certain bacteria.

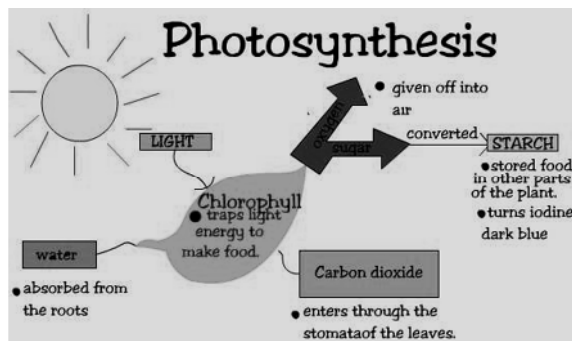


Image from <http://ellerbruch.nmu.edu>

Therefore, the answer is **B**.

28. The main function of oxygen in eukaryotic cells is for aerobic respiration. The mitochondria is the site of aerobic respiration. If a cell becomes depleted with oxygen (**anaerobic condition**), the **mitochondria** will **immediately lose its function**.

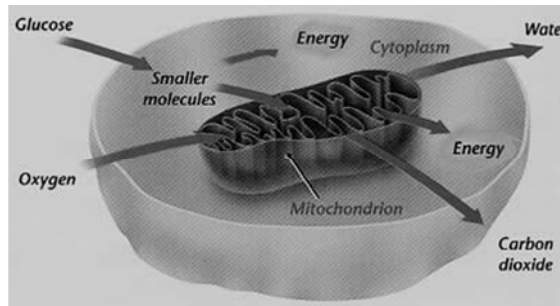


Image from <http://www.mlms.logan.k12.ut.us>

Therefore, the answer is **C**.

29. **Cell** is the **basic structural and functional unit of life**. Cells are the smallest structures **capable of basic life processes** such as *taking in nutrients, expelling waste, and reproducing*. A cell performs functions like respiration, obtaining nutrition, clearing of waste material, forming new proteins, etc.

Therefore, the answer is **A**.

30. As mentioned in **Item#26**, the **red blood cells** of mammals do not contain **nuclei**.

Therefore, the answer is **C**.

31. **Starch** is a **complex molecule**; it is too big to pass through the cell membrane. It must be broken down to its simple sugar components.

Therefore, the answer is **C**.

32. In organisms that undergo aerobic respiration, **oxygen is required to generate ATP** (choice letter A) . It is not the other way around.

Oxygen is necessary, among other things, for the **electron transport chain** (choice letter B) that is part of the respiratory cycle of the cell.

The **mitochondria** are the only place in the cell where oxygen can be combined with the food molecules. After the oxygen is added, the material can be digested (choice letter D).

Therefore, the answer is **C**.

33.

- **-oxidation (Beta oxidation)** is the process by which **fatty acids**, in the form of **Acyl-CoA** molecules, are broken down in **mitochondria** and/or in **peroxisomes** to generate **Acetyl-CoA**, the entry molecule for the **Krebs cycle**.
- **Gluconeogenesis** (abbreviated **GNG**) is a metabolic pathway that results in the **generation of glucose** from **non-carbohydrate carbon substrates** such as **lactate**, **glycerol**, and **glucogenic amino acids**.
- **Photosynthesis** is a process that converts carbon dioxide into organic compounds, especially sugars, using the energy from sunlight.

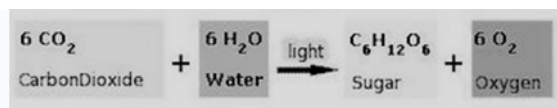


Image from <http://en.wikipedia.org>

- **Respiration** is the name of the general process where organisms **convert sugars and oxygen into biochemical energy**. The process happens in all organisms, including animals, plants, fungi, and bacteria. During respiration, energy is created to fuel the different processes necessary to support life.

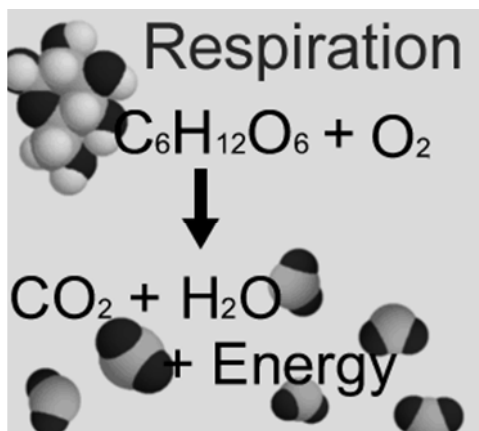


Image from <http://bioweb.wku.edu>

Therefore, the answer is D.

**BIOLOGY TIP:**

**Cellular respiration** in a plant's mitochondria degrades about 50% of the **carbohydrate** made by **photosynthesis**.

34. **Respiration** occurs in the **mitochondria**.

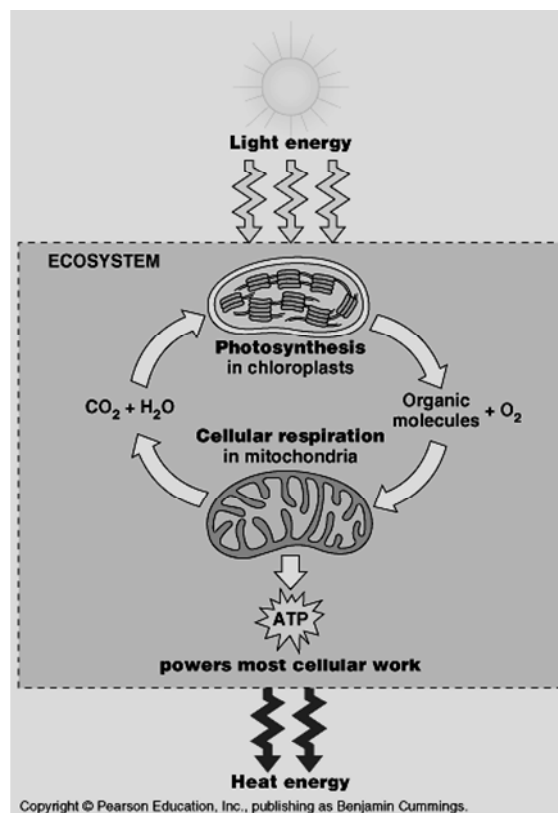


Image from <http://kentsimmons.uwinnipeg.ca>

Therefore, the answer is C.

35. **Meiosis** produces **haploid daughter cells**, wherein only half of the homologous chromosomes are present.

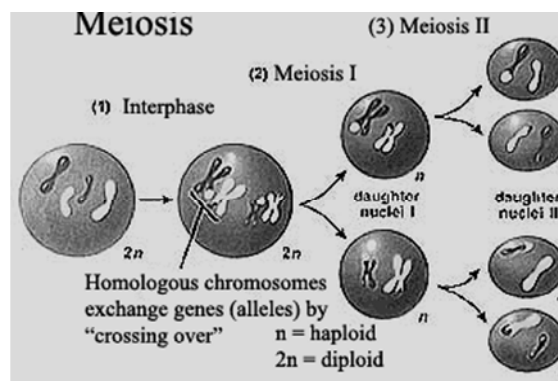


Image from <http://www.palaeos.com>

Therefore, the answer is B.

**36.** Mitosis produces *identical daughter cells*.

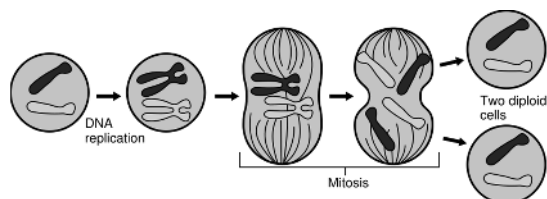


Image from <http://upload.wikimedia.org>

Therefore, the answer is **A**.

**37.** Rice (*Oryza sativa*) has a chromosome number of  $2n = 24$ . The chromosome count in the leaf cells is the *same* as the chromosome number of the plant.

Therefore, the answer is **B**.

**38.** A corn plant is diploid, with 20 chromosomes (the  $2n$  number of chromosomes for corn) in every cell. The chromosome count in a plant's pollen would be the *haploid number*. Usually, the haploid number is half the chromosome number of the plant. But in the majority of plants of the the sugar-corn type, the haploid number was found to be **12**.

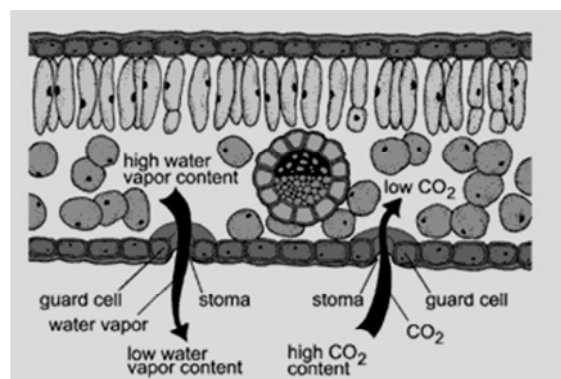
Therefore, the answer is **A**.

**39.**

- Leaves appear green in sunlight (white light) because the **chlorophyll** molecules in the leaves preferentially absorb **blue**, **violet**, and **red** and **uses this energy for photosynthesis**. Light from the **green wavelengths** is not absorbed; rather it is **reflected** and perceived by our eyes.
- The green pigment **chlorophyll** is not the only pigment present in a plant leaf. There are other accessory pigments like **carotenes** and **xanthophylls**. These accessory pigments are usually red or yellow. However, it is chlorophyll that is dominant in terms of amount. This leads to the masking of the other colours by the colour green.

Therefore, the answer is **C**.

**40.** A stomate is a pore, found in the leaf and stem epidermis that is used for **gas exchange**. The pore is bordered by guard cells which are responsible for regulating the size of the opening. Air containing carbon dioxide and oxygen enters the plant through these openings where it is used in photosynthesis and **respiration**, respectively. Oxygen produced by photosynthesis in the spongy layer cells of the leaf interior exits through these same openings. Also, water vapor is released into the atmosphere through these pores in a process called **transpiration**.



Stomata open to allow carbon dioxide (CO<sub>2</sub>) to enter a leaf and water vapor to leave.

Image from <http://www.progressivegardens.com>

Therefore, the answer is **A**.

#### **BIOLOGY TIP:**

**Plants** are *eukaryotes* that are *multicellular* and *photosynthetic*. Some are *aquatic* while most are *terrestrial*. The waxy coat called cuticle of stems and leaves and the stomata, or the microscopic pores on the leaf's surface, are adaptations of land plants for terrestrial life.

**Plants** also undergo *alternation of generation*, the *gametophyte* generation with haploid number of chromosomes and the *sporophyte* generation with the diploid number of chromosomes. Gametophytes form gametes by mitosis; sporophytes produce spores by meiosis. Spores develop directly into organisms, but gametes, the sperm and egg need to unite to form a zygote which in turn gives rise to an organism, which develop into a sporophyte.

41. A **tropism** is **positive** if the plant moves **toward the stimulus**. **Tropism** is negative when the plant **moves away from the stimulus**.

There are different types of tropism depending on the kind of stimulus.

- **Phototropism** is the growth response of a plant in response to light direction. Different parts of a plant exhibit different reactions to light. Stems exhibit positive phototropism while most roots exhibit negative phototropism.
- **Thigmotropism** is the growth response of a plant to physical contact (*touch*). Plants that cling to physical structures such as walls exhibit positive thigmotropism.
- **Hydrotropism** is the growth response of a plant to water. Roots exhibit positive hydrotropism.
- **Chemotropism** is the growth response of a plant to a particular chemical. Roots grow toward useful minerals in the soil but away from acids.
- **Geotropism** is the growth response of a plant in response to gravity. Roots exhibit positive geotropism while **stems and leaves exhibit negative geotropism**.

Therefore, the answer is **B**.

42. Roots tend to grow downwards, away from light and towards water. As a general rule, they bear neither leaves nor buds. Their primary roles are **anchorage, absorption and transport**. However, roots have adapted to fulfil a variety of other functions including **storage, support and aeration**. But the primary importance of roots to plants are their ability to **absorb nutrients to be used for energy**.

Therefore, the answer is **B**.

43. The presence of **root hairs increases the root's surface area for more absorption of water** and minerals. **Villi** are finger-like extensions found at the internal lining of animals' small intestines. They also increase surface area for more absorption.

Therefore, the answer is **D**.

44. The first major step in photosynthesis, the **light reaction**, produces **ATP** and **NADPH** to be used in the **Calvin cycle**.

The **Calvin cycle** then utilizes **ATP**, **NADPH** and **carbon dioxide** in a series of reactions in order to generate **glucose**.

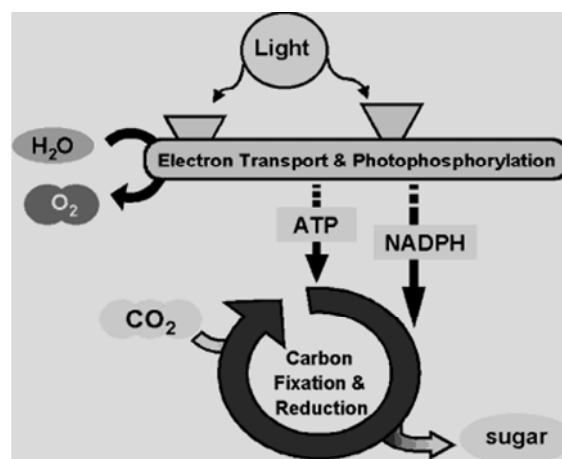


Image from <http://www.ars.usda.gov>

Therefore, the answer is **B**.

45. **Auxin** was the first discovered **plant hormone**. It affects various aspects of plant growth and development, including **cell division, stem elongation, lateral root initiation, gravitropism, apical dominance and cell differentiation as well as regulation of gene expression**.

It is the hormone **ethylene** is responsible for the **ripening of fruits**.

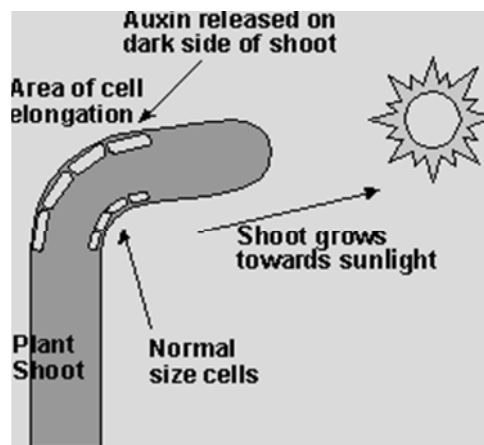


Image from <http://www.easyscience.co.nz>

Therefore, the answer is **D**.

- 46.** The *light-independent phase of photosynthesis (Dark Reactions)* which occur in the **stroma** of the chloroplasts, when the products of the light reaction, ATP and NADPH, are used to make carbohydrates from carbon dioxide (reduction).

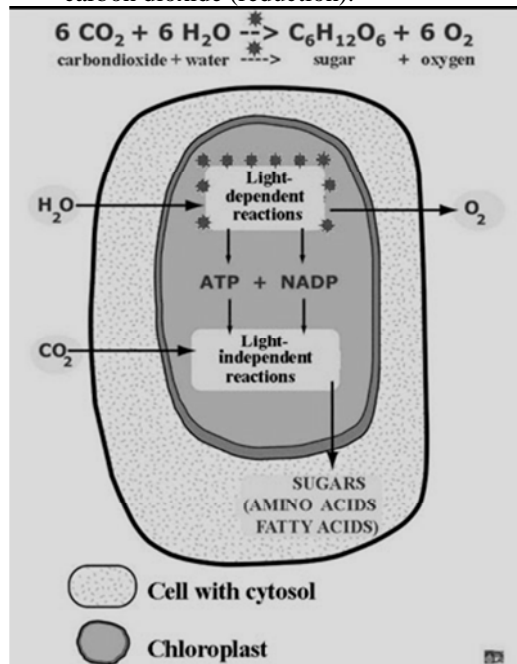


Image from <http://www.vcbio.science.ru.nl>

Therefore, the answer is **B**.

- 47.** By having **advanced modes of pollen and seed dispersal** (*different sexes and thus mating during pollination*), it allows exchange of genetic material, if a good mutation (that gives it a **selective advantage**) were to arise, it would be able to pass it off to other plants' offspring (and increasing genetic variation among the population with the "good mutation"). This allows many good mutations to come together, speeding up evolution. If plants only reproduced asexually, they'll lose this advantage. Because, the good mutation will only stay with the original plant and its offspring. And there is no 'mating', the only genetic mixing will come from recombination within the plant itself. Flowering plants, also allow for **mating across great distances**, and **greater area of distribution of seed**. Whereas asexual plants can only spread themselves locally. Flowering plants produce seeds that are dormant until they sprout and can last through droughts, and can sprout when conditions are right.

Therefore, the answer is **C**.

- 48.** **vascular system** - the *vessels and tissue* that carry or circulate fluids such as blood or lymph or sap through the body of an *animal or plant*

Therefore, the answer is **C**.

- 49.** Since the *marine species* is **isotonic** with its environment, there is **no net flow of water between its body and the surrounding ocean**. Therefore it is not in danger of **crenating** or **lysing**. On the other hand, since the *freshwater species* is **hypertonic** to its surrounding, it **has to pump water out of the cell for it to survive**.

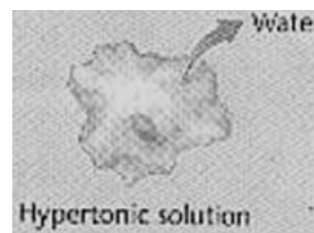
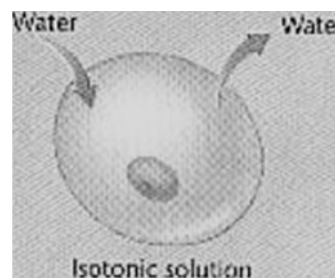
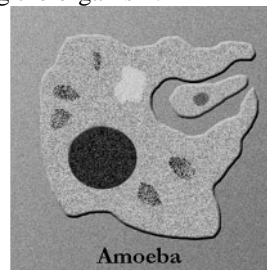


Image from [www.biologyjunction.com](http://www.biologyjunction.com)

Therefore, the answer is **C**.

- 50.** Since the *freshwater species* is **hypertonic** to its surrounding, it has a **higher osmotic concentration** than the surrounding freshwater. Water would rapidly enter its body, which can lead to **lysis**. To prevent this, the **contractile vacuole** expels excess water entering the organism.



Therefore, the answer is **C**.

51. *Osmosis* is passive as it **does not require energy to happen**.

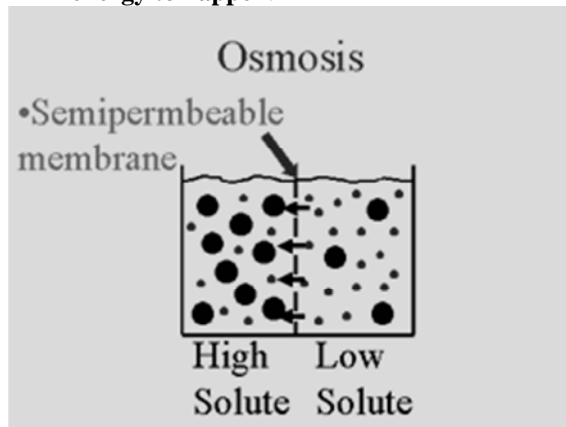


Image from <http://www.occc.edu>

Therefore, the answer is B.

52. The **arteries** deliver the **oxygen-rich blood** to the **capillaries** where the actual exchange of **oxygen** and **carbon dioxide** occurs. The **capillaries** then deliver the **waste-rich blood** to the **veins** for transport back to the lungs and heart.

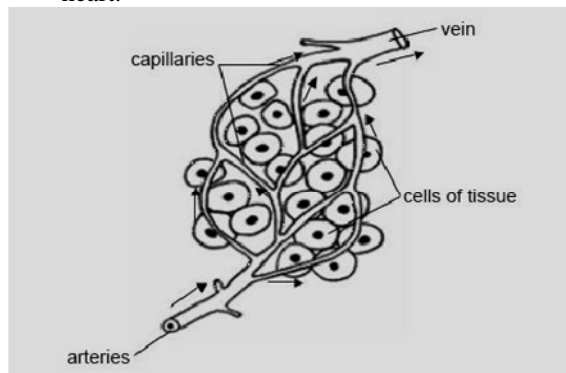


Image from <http://upload.wikimedia.org>

Therefore, the answer is D.

53. As mentioned in the *previous item*, the **veins** **carry blood back to the lungs and heart**.

Therefore, the answer is D.

#### **BIOLOGY TIP:**

The functions of **animal tissues** and **organs** are correlated with their structures. The organization of an animal's body emerges from the grouping of specialized **cells** into **tissues**, **tissues** into **organs**, and **organs** into **organ systems**.

54. As shown in the figure below, blood flows in the following direction:

1. **right atrium**
2. **right ventricle**
3. **left atrium**
4. **left ventricle**

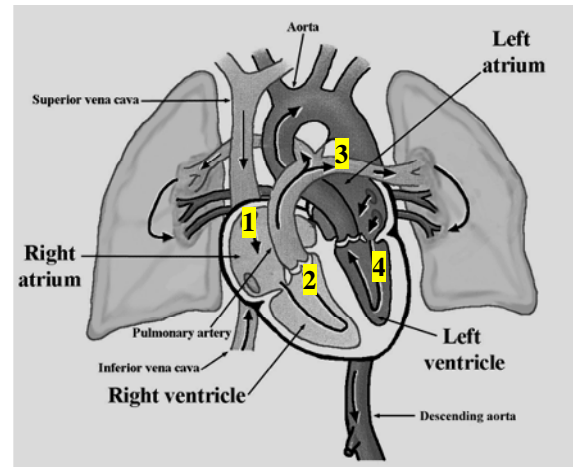


Image from <http://www.vhlab.umn.edu>

Therefore, the answer is A.

55. The smaller diameter is due to the thinness of their vessel walls. **Capillaries** are tiny, extremely thin-walled **branching** vessels that act as a bridge between arteries (which carry blood away from the heart) and veins (which carry blood back to the heart). **The thin walls of the capillaries allow oxygen and nutrients to pass from the blood into tissues and allow waste products to pass from tissues into the blood.**

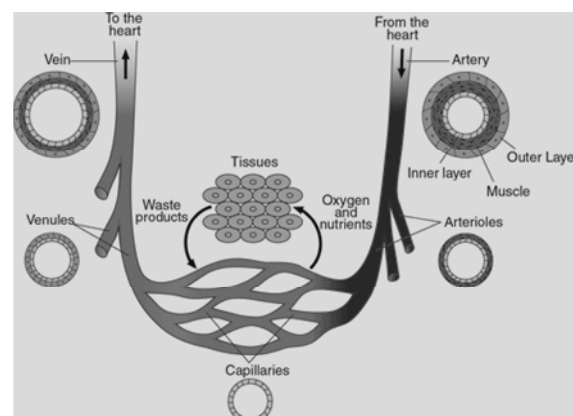


Image from <http://www.merck.com>

Therefore, the answer is D.

- 56. Glucogenesis will not start unless the glucose level returns to normal after a meal.** Blood glucose levels will peak within 1 hour after a meal and return to normal levels within 2 hours after a meal in normal (*non-diabetic*) people. Amino acids from the meal are being converted to glucose in the liver, not to keep the blood glucose at a normal level but simply to get rid of excess amino acids.

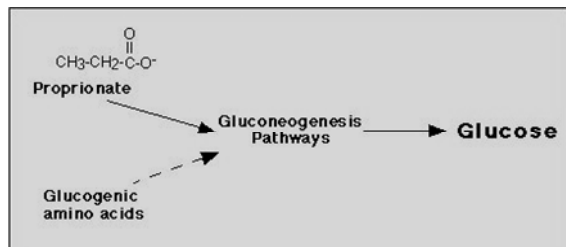


Image from <http://classes.ansci.illinois.edu>

Therefore, the answer is **B**.

- 58.** Both systems have processes that rid the body of waste products, and these processes help to eliminate some of the same detrimental properties common to them both: *old red blood cells, toxic waste* and *pathogens*.

Both is the internal system of capillaries and vessels that basically parallel one another throughout the body: one *working to provide nutrients and oxygen to muscles and organs*; the other *working to rid them of the waste produced*. Although the capillaries and vessels for the *circulatory system* hold *blood*, and the *lymphatic* ones hold *lymph*, both systems work in unison with the same overall objective: *maintaining the body's ability to function at an optimum level without hindrance of pathogens or detrimental waste*.

This means that both systems are utilized in the **coordination of the immune response**.

Therefore, the answer is **A**.

- 57.** Only digested simple nutrients can pass through the *villi*. *Starch* is broken down into *sucrose, lactose* and *maltose* and eventually to *glucose, fructose* and *galactose, fats* to *fatty acids* and *proteins* to *amino acids*.

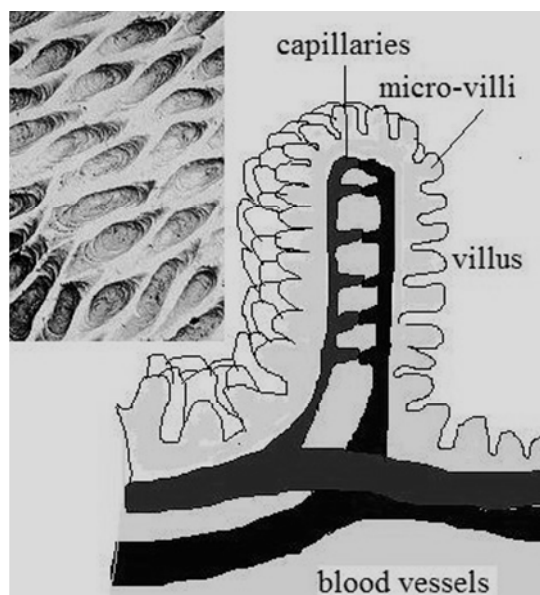


Image from <http://www.jnanobiotechnology.com>

Therefore, the answer is **C**.

- 59.** A *hypothesis* is an *educated guess*. In this case, the scientist is studying *cancer*. **Statement 3** is the only one that provides a *relevant statement to cancer*. It also provides a *possible cause to cancer*.

Therefore, the answer is **C**.

- 60.** Choice **A** provides the *most direct* and *simplest* way to verify the *hypothesis*.

Therefore, the answer is **A**.

- 61.** If the *hypothesis is true*, then the **pituitary and the ovary work hand in hand**. If one is malfunctioning, the uterine cycle would not occur.

Therefore, the answer is **D**.

- 62.** *Egg cells* contain huge amounts of *cytoplasm*. The **stored food**, in the form of yolk, is found in the *cytoplasm*.

Therefore, the answer is **A**.

**63.** During *strenuous activity* like *weight lifting*, the *demand for oxygen* by the body cells *increases*. At a certain point, the oxygen initially present in the blood is not enough to support this demand. *Oxygen* in the blood then *decreases*, while *carbon dioxide* (the waste product in *aerobic respiration*) *accumulates*. That is why *we feel pain in our muscles*.

Therefore, the answer is **D**.

**64.** *Arctic animals* such as polar bears and seals have thick layers of fat to conserve heat and are *warm-blooded*. Reptiles have none of these advantages, and so they **cannot survive the arctic's freezing temperatures**. Reptiles are *poikilotherms*. They have not developed mechanisms for regulating the temperature of their internal environment. Their internal temperature therefore changes with temperature changes in the external environment.

Therefore, the answer is **C**.

**65.** *Cartilage cells, blood, and bone cells* are associated with *connective tissues*. *Cartilage* and *bone* are "*rigid*" *connective tissues*. *Blood* is a *connective tissue* of cells separated by a *liquid (plasma) matrix*.

*Neurons* are associated with *nervous tissues*. *Nervous tissue* is composed of two main cell types: **neurons** and *glial cells*. *Neurons* transmit nerve messages. *Glial cells* are in direct contact with neurons and often surround them.

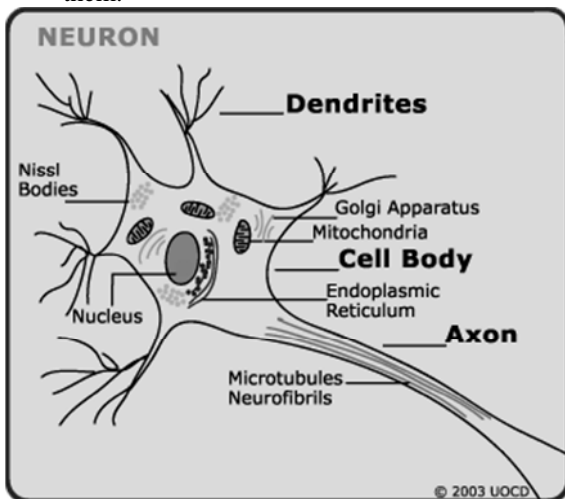


Image from [http://understanding\\_ocr.tripod.com](http://understanding_ocr.tripod.com)

Therefore, the answer is **D**.

**66.** The cells of diabetics cannot take in glucose (the fuel of *respiration*) from the *blood*. *Aerobic respiration* and other metabolic processes are therefore compromised. In the absence of *glucose*, the body then turns to *protein* as a fuel for metabolism.

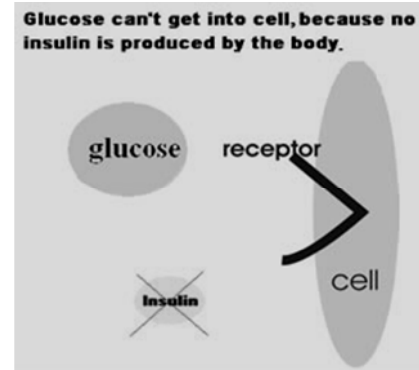


Image from <http://urbanext.illinois.edu>

Therefore, the answer is **B**.

**67.** The **pancreas** secretes the hormones *insulin* and *glucagon* to regulate blood glucose levels. Additionally it secretes enzymes that aid in the digestion of fats and proteins in the small intestine. The **pancreas** is both an *endocrine gland* and an *exocrine gland*. The *endocrine* portion constitutes roughly **2% of the total mass of the pancreas**, the rest being the exocrine part. *Exocrine glands secrete directly to a duct*. *Endocrine glands secrete hormones directly to the blood stream*. The bile duct from the *liver* is shared with the duct from the **exocrine pancreas**, which connects to the *small intestine*.

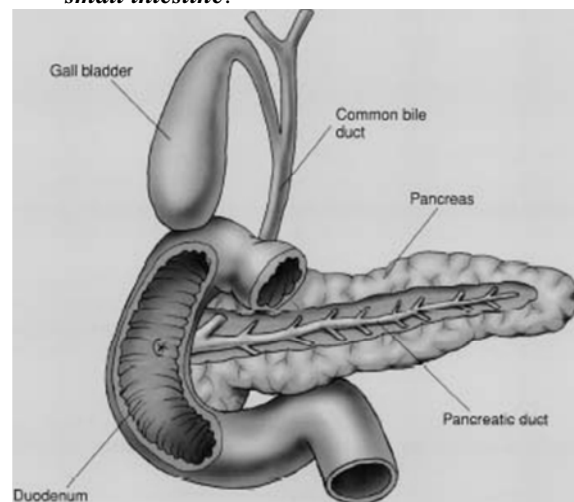
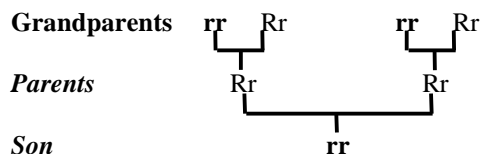


Image from <http://www.the-human-body.net>

Therefore, the answer is **C**.

- 68.** It is **possible** for two right-handed parents to have a left-handed son. Let R = right and r = left.



Therefore, the answer is C.

- 69.** In this case, the offspring of the 2 purebreds have **heterozygous genotypes** (one allele is **dominant**, the other is **recessive**). Therefore the offspring have the alleles for both **red stems** and **white stems**. However, all specimens are **pink**. Therefore the gene for **red stems** is **incompletely dominant**. With **incomplete dominance**, a cross between organisms with two different phenotypes produces offspring with a **third phenotype that is a blending of the parental traits**.

R = red stem  
r = white stem

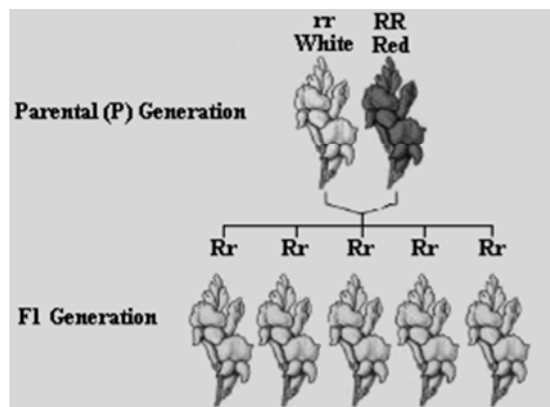


Image from <http://chswb.lr.k12.nj.us>

Therefore, the answer is C.

- 70.** Let's see the results if the  $F_1$  plants (Rr) will self-fertilize:

	R	r
R	RR (Red)	Rr (Pink)
r	Rr (Pink)	rr (White)

The **ratio** of **Red-stemmed** to **Pink-stemmed** to **White-stemmed** in the next generation is **1 : 2 : 1** or **25% : 50% : 25%**.

Therefore, the answer is C.

- 71. ABO blood group genotypes:**

Type A = AA or AO

Type B = BB or BO

Type AB = AB

Type O = OO

If both parents are heterozygous for their respective blood types:

AO (male) x BO (female)

The punnett square technique would result in the couple having offsprings with either: **AB, AO, BO, or O blood type**, all having a **25%** chance of being possible.

	B	O
A	AB	AO
O	BO	OO

Therefore, the answer is D.

- 72.** Blood type O is described as the "**universal blood donor**"; it **can donate to all blood types**. But it **can only receive from blood type O**. O **positive** is the **most common** blood type. And **people with blood type O are homozygotes**.

Blood Type	Genotype	Can Receive Blood From:
A	$i^A i^A$ $i^A i$	AA AO
B	$i^B i^B$ $i^B i$	BB BO
AB	$i^A i^B$	AB
O	$ii$	OO

Image from <http://www.biologycorner.com>

Therefore, the answer is D.

### **BIOLOGY TIP:**

**Homozygous individuals** have **two identical alleles** for a given character and are true-breeding.

**Heterozygous individuals** have **two different alleles** for a given character.

### 73. Parental Cross

		TTYy	
		TY	ty
ttyy	ty	TtYy	TtYy
	ty	TtYy	TtYy

#### F1 Cross

		TtYy			
		TY	Ty	tY	ty
TtYy	TY	TTYy	TtYy	TtYy	TtYy
	Ty	TTYy	TtYy	TtYy	TtYy
	tY	TtYy	TtYy	ttYy	ttYy
	ty	TtYy	TtYy	ttYy	ttyy

$$\text{Tall and white} = \frac{3}{16} \times 100\% = 18.75\% \approx 19\%$$

Therefore, the answer is B.

74. A *purebred*, also called *truebreed* or *pedigreed* is a cultivar of an organism of unmixed lineage (that is, with both parents of the same breed or strain) who, when mated with another purebred with the same characteristics, will always produce purebreds offspring with the same traits; genotypically, *purebreds are homozygous*. Purebreds are used for *Parents of the P (parental) generation*.

Therefore, the answer is D.

#### BIOLOGY TIP:

**Sex** is an inherited phenotypic character usually determined by the *presence or absence* of *special chromosomes*, but the exact mechanism for sex determination varies among different species. In humans and other mammals, an **X-Y system** is operative. The XY *males* apportion either an **X** or a **Y chromosome** to a given *sperm*, which combine with an *ovum* containing an **X chromosome** from an *XX female*.

Thus, the **sex of the offspring** is determined at conception by whether the *sperm cell* bears an **X or Y chromosome**.



### 75. Inheritance Of Color Blindness In Men & Women

*Sex-Linked Genes Located On X Chromosome:*

+ = Normal Vision (Dominant)

o = Color Blindness (Recessive)

Sex	Color-blind	Normal Vision
Male	X <sup>o</sup> Y	X <sup>+</sup> Y
Female	X <sup>o</sup> X <sup>o</sup>	X <sup>+</sup> X <sup>+</sup> X <sup>+</sup> X <sup>o</sup>

From the *pedigree* and the enclosed information, the trait is *X-linked recessive*. *Individual 14* is a boy (genotype XY). Since the gene is on the *X* chromosome, the child got the color blind gene from his mother; as his single *X* chromosome can only come from the mother. The mother (*individual 7*, being normal, is a *carrier of the color blind gene*).

**Cross Between A Homozygous Normal Vision Man (X<sup>+</sup>Y) and Heterozygous Normal Vision Woman (X<sup>+</sup>X<sup>o</sup>)**

	X <sup>+</sup>	Y
X <sup>+</sup>	X <sup>+</sup> X <sup>+</sup>	X <sup>+</sup> Y
X <sup>o</sup>	X <sup>+</sup> X <sup>o</sup>	X <sup>o</sup> Y

Therefore, the answer is B.

76. *Individual 2* has a *genotype XY*. The terms *homozygous* and *heterozygous* applies to identical gene pairs like *Xx* or *BB*. Since gene *X* and gene *Y* are different, such terms do not apply. We just say that he is **hemizygous** (*Describes an individual who has only one member of a chromosome pair or chromosome segment rather than the usual two; refers in particular to X-linked genes in males who under usual circumstances have only one X chromosome*) for normal condition.

Therefore, the answer is D.

77. *Individual 11* is a normal female. But since she received one *X* chromosome from each of her parents, (*4 is an affected male*, *3* might be a carrier or *homozygous for normal vision*), she automatically *carries the gene for color blindness*. Thus, she can have colorblind children.

Therefore, the answer is A.

### **BIOLOGY TIP:**

Certain genes for traits that are unrelated to maleness or femaleness are located on the **sex chromosomes**. These are called **sex-linked traits**. Examples are *hemophilia* and *color-blindness* whose genes are carried on the **X chromosome**.

**78.** As explained in #75, **individual 7** is a *carrier of the color blind gene*. Now, **individual 10**, is in the same position as **individual 11** in 8-7: she also *carries the gene for color blindness*.

Therefore, the answer is **A**.

**79.** In gene expression, the resulting trait is not a direct product of the **DNA**. **DNA** contains the *coded information*; it is the “*software*”. **DNA** is transcribed to **RNA**, and **RNA** is translated into **protein**. The **protein** is the “*hardware*”. As an enzyme or structural protein, polypeptides are the ones directly responsible for expressing a trait.

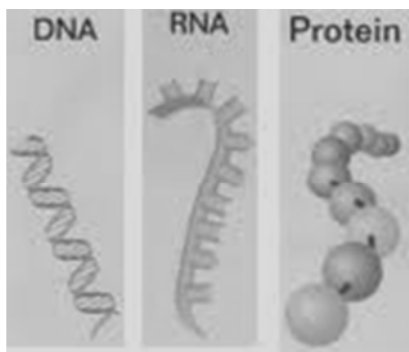


Image from <http://www.truthandscience.net>

Therefore, the answer is **B**.

### **80. Components of nucleotides**

- *phosphate group*
- *pentose sugar (deoxyribose for DNA, ribose for RNA) that includes N-glycosidic bond*
- *nitrogenous bases (ATCG for DNA, AUCG for RNA)*

Therefore, the answer is **A**.

**81.** *Amino acids* are the *building blocks* of *proteins*, while *nucleotides* are the *building blocks* of *nucleic acids*.

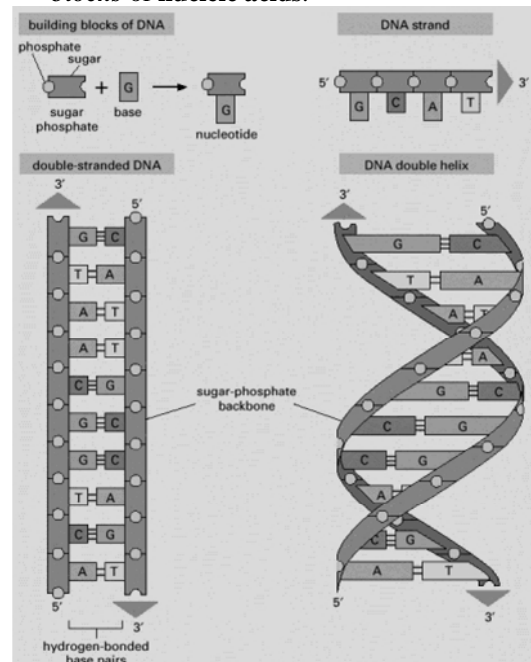


Image from <http://ncbi.nlm.nih.gov>

Therefore, the answer is **D**.

**82.** **Prokaryotic and eukaryotic ribosomes** do not differ in any fundamental way; both perform the same functions by the same set of chemical reactions. The genetic code is the same in all living organism, and it has been demonstrated that eukaryotic ribosomes are able to translate bacterial mRNAs correctly.

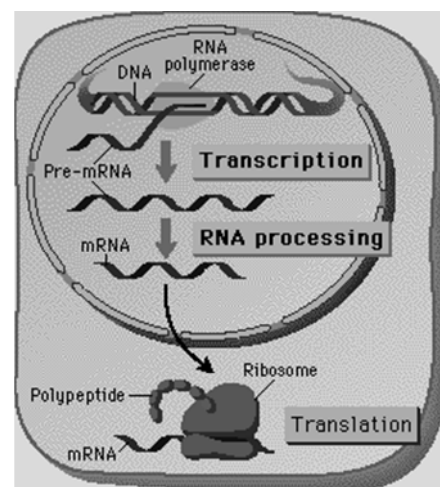


Image from <http://3.bp.blogspot.com>

Therefore, the answer is **D**.

- 83.** *Adenine* and *guanine* are both **purines**. *Cytosine* and *thymine* are both **pyrimidines**. **Purines are larger than pyrimidines. A purine always pairs with a pyrimidine in order for the pair to fit into the double helix. Two purines would be too big to fit in the helix; two pyrimidines would not reach across the helix.**

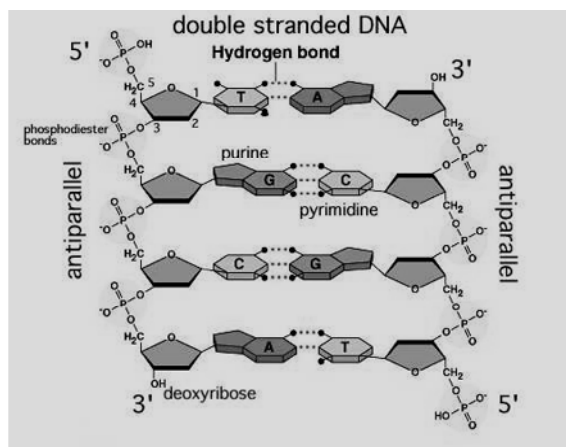


Image from <http://academic.brooklyn.cuny.edu>

Therefore, the answer is **D**.

- 84.** *Molecules of solution A moved outside the bag to solution B.*

Therefore, the answer is **C**.

- 85.** In *making conclusions* or *educated predictions* in any experiment, one must always based their statements on **the available data ONLY**. In this case, it is seen that *solution A moves outside to solution B*. Based on this information, the only acceptable answer from the choices is **choice B**.

Therefore, the answer is **B**.

- 86.** **Oxygen** is released as the aquatic plant **photosynthesizes**.

Therefore, the answer is **A**.

- 87.** Again, *conclusions* must be supported by **accurate data**. In this case (given the above table), the only acceptable answer is choice **B**.

Therefore, the answer is **B**.

- 88.** The released bubbles are most likely **oxygen** (waste of photosynthesis), indicating the **rate of photosynthesis**. Since photosynthesis produces glucose (the fuel of **aerobic respiration**), the **rate of photosynthesis** can also determine **respiration rate**.

Therefore, the answer is **B**.

- 89.** **More sunlight, faster rate of photosynthesis.**

Therefore, the answer is **A**.

- 90.** The student **continually exhales carbon dioxide**. As he takes successive breaths, the gas that he inhales is already a **mixture of carbon dioxide and oxygen**. If he measures the time to consume all the air in the room, he would get a value showing the rate of consumption of both oxygen and carbon dioxide. Since he is aiming to measure the availability of oxygen, his procedure is **erroneous**.

Therefore, the answer is **A**.

- 91.** **Natural selection** is also described as "**survival of the fittest**". Only the organisms with the proper traits and adaptations can survive under pressures from the environment. These surviving organisms reproduce and pass on the advantageous trait to their offspring. Other organisms lacking the traits needed for survival are wiped out and cannot produce their next generation (**start of extinction**).

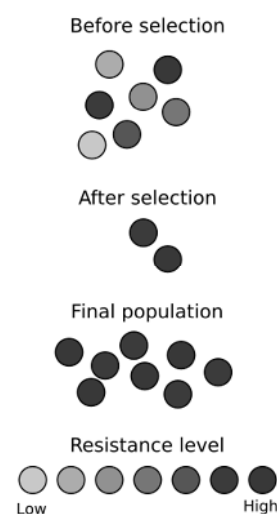


Image from <http://pseudomonas-syringae.org/>

Therefore, the answer is **D**.

92. Only choice **B** is *supported* by the *data given*.

Therefore, the answer is **B**.

93. The line for *Enzyme A* is *sloping downward to the right*. That means *as time increases*, its *activity decreases*.

Therefore, the answer is **B**.

94. The line for *Enzyme B* is *sloping upward to the right*. That means *as time increases*, its *activity also increases*.

Therefore, the answer is **A**.

95. At around *13 minutes*, activities of *enzyme A* and *enzyme B* are the *same*.

Therefore, the answer is **D**.

96. Before any experiment, the researcher *must first study all topics related to the experiment*. This is done before the actual procedures as to ensure that all necessary steps are taken and no resources are wasted.

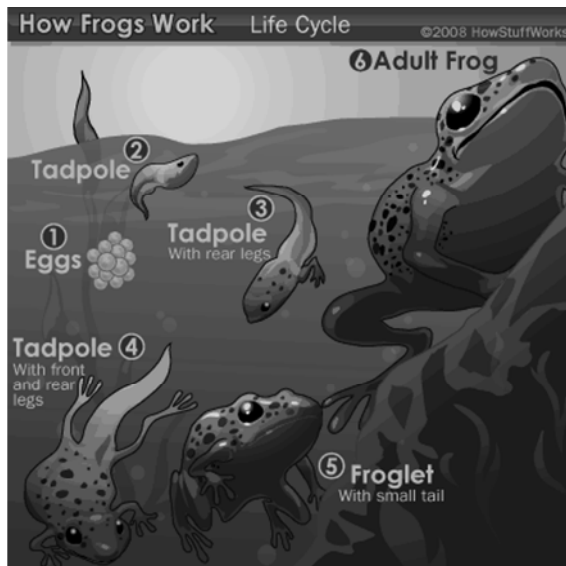


Image from <http://static.howstuffworks.com>

Therefore, the answer is **B**.

97. Only the *specific effect* or *characteristic* under study must be *variable*. In any experiment, all *outside factors* must be *constant* to avoid error in the interpretation of results.

Therefore, the answer is **D**.

98. These students have already done their *preliminary research*, and they found some support that *garlic does have fungicidal properties*. If no support can be found on their proposition, conducting an experiment would prove to be wasteful.

Therefore, the answer is **B**.

99. Since the *objective* of the experiment (*as stated in the previous question*) is *to determine if garlic extract is a fungicide for mangoes* (*no one variety is specified*), *all varieties of mangoes must be included in the experiment*.

Therefore, the answer is **A**.

100. The magnification of choice **A** is *50x* (*5x multiplied by 10x*), the lowest of all the choices. In the question, to see the most number of algal cells, the *field of vision must therefore be large*. There is an *inverse relationship* between *magnification* and *field of vision*. To have a *large field of vision*, the *magnification must be low*.



Image from <http://www.caltextsci.com>

Therefore, the answer is **A**.