# UPCAT FREE *Reviewer*

**SCIENCE**

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The Compiled UPCAT Questions is a collection of UPCAT review questions put together by former UP Proctors and Examiners throughout the years.

It is by no means a leakage… it's just a compilation based on the feedbacks of students about the test. There is no guarantee that the same questions will appear in the next UPCAT. However, studying these questions will give you an idea of what the UPCAT contains and how to go about it.

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Here's what we suggest:

- Print this compiled UPCAT Questions reviewer.
- Give yourself about 80 **minutes** for the test. Answer it as if you are taking the actual exam.

After answering, check your work using the provided answer key. You may visit our Facebook page or the Ka-TOURs group if ever you have questions on some of the items in the compilation.

You may also go to the Online Review Portal to take an automated version of the test.

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All for the best!

- The Review Masters Team -

# SCIENCE (80 mins)

1. In a solution the substance that does the dissolving is called _____.

   A. soluble
   B. the solute
   C. the solvent
   D. an ion

2. Water is a good solvent because _____.

   A. Water is a good solvent because it is a negatively charged ion.
   B. Water is such a good solvent because it repels most molecules.
   C. Water is such a good solvent because it is such a small molecule
   D. Water is a good solvent due to its polarity and small molecular size

3. A solution that cannot hold any more solute at room temperature would be _____.

   A. a dilute solution
   B. a concentrated solution
   C. a saturated solution
   D. a supersaturated solution

4. Ethanol dissolved in water would be an example of _____.

   A. a solution between two miscible liquids
   B. a solution between a solid and liquid
   C. a suspension between two liquids
   D. ethanol and water do not form a solution

5. To form a supersaturated solution requires _____.

   A. reducing the amount of solute
   B. reducing the amount of solute
   C. reducing the amount of solute
   D. none of the above

6. Which one of the following is an example of a physical change?

   A. iron rusting
   B. a steak cooking
   C. sugar dissolving in water
   D. a candle burning

7. Which one of the following is not a physical change?

   A. clothes drying in the dryer
   B. making a cup of coffee
   C. chopping wood
   D. boiling an egg

8. The chemicals after a chemical change _____.

   A. have properties identical to the chemicals before the change.
   B. have properties different to the chemicals before the change.
   C. both A and B
   D. none of the above

9. Heptane is always composed of 84% carbon and 16% hydrogen by mass. What law does this observation illustrate?

   A. The Law of Multiple Proportions
   B. The Law of Definite Proportions.
   C. The Law of Conservation of Mass
   D. The Law of Conservation of Energy

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10. Give the mass number for an atom that has 10 protons, 10 electrons, and 11 neutrons.

    A. 31
    B. 20
    C. 10
    D. 21

For **Numbers 11 and 12**, refer to the following table:

| Substance | Mass before the reaction (g) | Mass after the reaction (g) |
|---|---|---|
| W | 6.0 | 0.0 |
| Z | 3.0 | 0.0 |
| WZ | 0.0 | 9.0 |

11. How much of substance W will react with 9.0 g. of substance Z?

    A. 9.0 g
    B. 12.0 g
    C. 15.0 g
    D. 18.0 g

12. The amount of substance WZ that will be produced from 12.0g of substance Z assuming that substance W is in excess is

    A. 22.5 g
    B. 27.0 g
    C. 31.5 g
    D. 36.0 g

13. Which conditions will increase the rate of chemical reaction?

    A. decreased temperature and decreased concentration of reactants
    B. decreased temperature and increased concentration of reactants
    C. increased temperature and decreased concentration of reactants?
    D. increased temperature and increased concentration of reactants?

14. When a lit match is touched to the wick of a candle, the candle begins to burn. When the match is removed, the candle continues to burn. In this reaction, the match _____.

    A. behaves as a catalyst.
    B. supplies activation energy.
    C. is part of the rate determining step.
    D. lowers the activation energy barrier.

15. Compared to a glass of ice water with ice in it, a glass of plain ice-cold water without ice on a warm day will warm up _____.

    A. faster
    B. slower
    C. in the same amount of time
    D. none of the above

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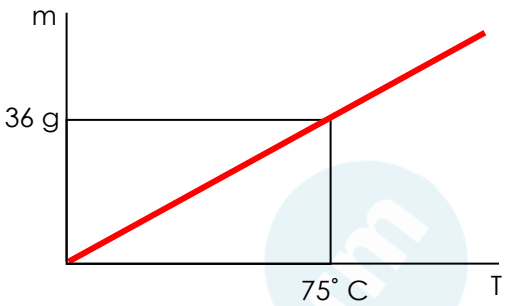
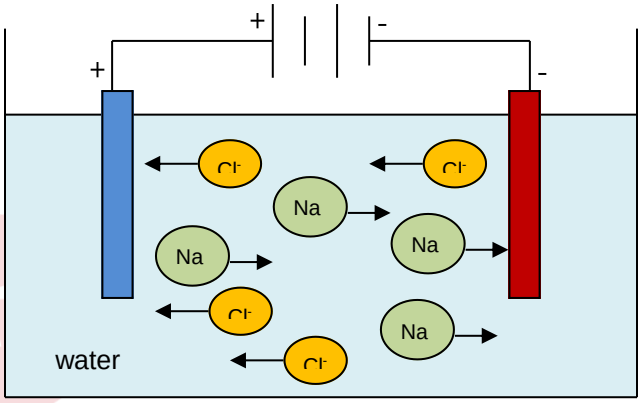
16. The solubility of a substance was determined in 300 $cm^3$ water at different temperatures and the following is part of the graph obtained:




In 150 $cm^3$ water, how much of the substance will dissolve at 75˚ C?

A. 18 g
B. 20 g
C. 36 g
D. 40 g

**Questions 17 and 18** refer to the diagram that follows.




17. After studying the illustration above, one may conclude that _____.

A. water molecules are attracted by the electrodes
B. sodium chloride dissociates when placed in water
C. chlorine ions are attracted to the negative electrode
D. current flow causes an increase in water temperature

18. One may also conclude that _____.

A. only chlorine ions conduct current
B. the solution will not conduct current
C. the closed circuit illustrated results in neutrality
D. when ions are present they are attracted to electrodes having opposite electrical charges

For **questions 19 and 20.**

Jacques Charles was a French hot air balloonist and scientist. He discovered Charles' law by studying the relationship between the volume and temperature of a gas at a constant atmospheric pressure. As the temperature of the gas in a balloon increased, its volume also increased. These increases inflated and lifted the balloon.

In equation form, for the case of a constant pressure:

$$V/T = \text{constant}$$

19. If the volume of a gas at a certain pressure is halved, _____.

A. its temperature is halved
B. its temperature is doubled
C. its temperature remains constant
D. its temperature increases according to a geometric progression

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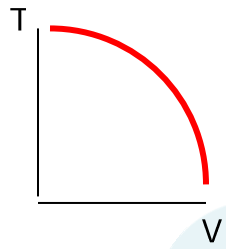
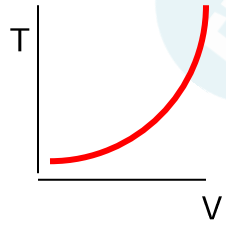
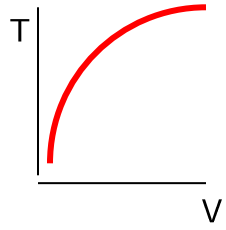
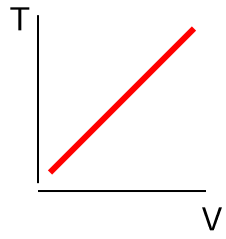
20. Which of the following graphs shows the temperature-volume relationship for a gas? (T = temperature and V = volume)

A.



B.



C.



D.



21. Unless an object at rest is acted upon by a force, it stays at rest due to its _____.

A. matter
B. inertia
C. friction
D. gravity

22. Marlon rode on his bike from 9:00 am to 10:30 am. If he drove at an average speed of 15kph, what was the total distance he covered?

A. 17.5 km
B. 22.5 km
C. 27.5 km
D. 32.5 km

23. A woman exerts a constant horizontal force on a large box. As a result, the box moves across a horizontal floor at a constant velocity. The constant force by the woman _____.

A. has the same magnitude as the weight of the box.
B. is greater than the weight of the box.
C. has the same magnitude as the total force which resists the motion of the box.
D. is greater than the total force which resists the motion of the box.

24. If the woman in question 23 suddenly stops applying a horizontal force to the box, then the box will _____.

A. immediately come to a stop.
B. continue moving at a constant speed for a while and then slow to a stop.
C. immediately start slowing to a stop.
D. continue at a constant speed.

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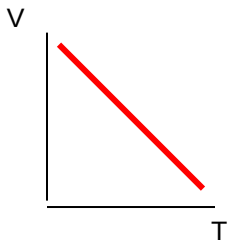
25. The 0.20 kg block is attached to a spring which has a spring constant of 20 N/m. The block is initially stretched 0.10 meters and released at time t = 0 seconds. Complete the following statement: In order to increase the frequency of the motion, one would have to _____.

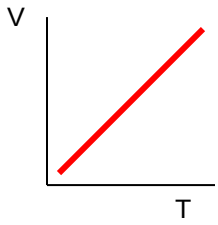
A. reduce the spring constant
B. decrease the mass of the block on the end of the spring
C. increase the length of the spring
D. reduce the distance that the spring is initially stretched

For **questions 26-27**, choose your answers to the next three questions from the velocity-time graphs below.

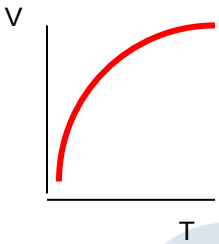
A.



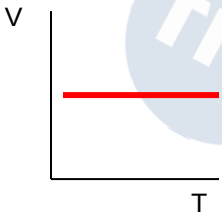

B.




C.




D.




26. Which of the graphs shows a body moving at constant speed?

27. Which of the graphs shows a body moving at high acceleration at the beginning then starts to lose acceleration towards the end?

28. The acceleration in a body is due to

A. balanced force
B. unbalanced force
C. mass
D. electrostatic force

29. Two students are posed to dive off equal height diving towers to a swimming pool below. Student B is twice as massive as student A. Which of the following is true?

A. Student B will reach the water sooner than student A.
B. Both students have the same gravitational potential energy.
C. Both students will have the same kinetic energy just before hitting the water.
D. Student B did twice as much work climbing the tower

30. Which of the following cases is/are NOT a uniformly accelerated motion?
(1) A feather falls from a certain height inside a vacuum tube.
(2) A ball rolls along a frictionless plane at uniform speed.
(3) A coin falls from a certain height in air but air resistance is negligible.

A. (1) only
B. (2) only
C. (1) and (2) only
D. (2) and (3) only

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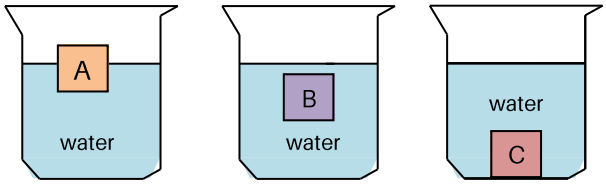
For **questions 31 and 32,** refer to the following diagrams.




31. From the illustration, one can conclude that _____.

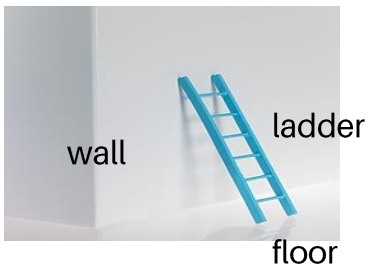
A. cube A has the least weight

B. cube C has the highest density
C. cube A has the highest density
D. water has greater buoyant force than cube A

32. Cube c sinks because _____.

A. it weighs much
B. it displaces much water
C. its weight is less than the weight of the water it has displaced
D. its weight is greater than the weight of the water it has displaced

33. In the figure that follows, what is the direction of the force exerted by the ladder?




A. downward and toward the wall
B. downward and away from the wall
C. upward and toward the wall
D. upward and away from the wall

34. A 200 N box is pushed up an incline that is 5.00 m long and rises 1.00 m. If the incline is frictionless, then the work done by the pushing force is _____.

A. 336 J
B. 305 J
C. 275 J
D. 200 J

35. A 2000 kg car accelerates from rest to a velocity of 20 m/s in 10 seconds. The power of the engine during this acceleration is _____.

A. 200 kW
B. 20,000 kW
C. 4000 W
D. 40 kW

36. A gem or mineral that is red absorbs _____.

A. red light
B. mostly red light
C. most wavelength of the visible spectrum except red
D. more of the visible spectrum than a gem or mineral that is violet

37. When viewed straight down (90° to the surface), an incident light ray moving from the water to air is refracted _____.

A. away from the normal
B. toward the normal
C. not at all
D. about 49°

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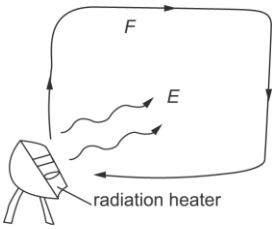
38. Someone is wearing perfume on their wrist. Why can people near them smell it?

A. the particles of perfume spread from an area of higher concentration, their wrist, to areas of lower concentration, the air
B. people can smell the concentrated perfume on the wrist, but it doesn't travel through the air
C. some of the perfume leaves the wrist, mixing with air particles
D. both A and B

39. Your flashlight has three identical 1.5 volt batteries in it, arranged in a chain to give a total of 4.5 volts. Current passes first through battery (a), then through battery (b), then through battery (c), on its way to the bulb. When you operate the flashlight, the batteries provide power to the current and they gradually use up their chemical potential energy. Which battery will run out of chemical potential energy first?

A. All three will run out at the same time.
B. Battery (a) will run out first.
C. Battery (b) will run out first.
D. Battery (c) will run out first.

40. The figure shows a radiation heater. What heat transfer processes are involved at positions E and F?




A. E is radiation and F is conduction.
B. E is conduction and F is convection.
C. E is convection and F is conduction.
D. E is radiation and F is convection.

41. An astronaut picks up a stone on the moon and finds its mass to be 2 kg. If the mass of the earth is 6 times more than the mass of the moon, what will the mass and the weight of the stone be on the earth?

A. 2 kg, 12 N
B. 2 kg, 20 N
C. 12 kg, 120 N
D. 20 kg, 200 N

42. Water is boiled in a flask with a balloon over the top. As the water heats, the balloon expands. What has happened to the weight of this flask and balloon in this experiment?

A. It has increased as the balloon expands.
B. It has decreased as the water boiled away.
C. It has stayed the same.
D. It is unpredictable because the balloon is flexible.

43. A student wishes to find the density of an irregular piece of rock. How will she find volume?

A. length x width x height
B. place it on a triple beam balance
C. put it in a beaker
D. use water displacement

44. A barge filled with scrap iron is in a canal lock. If the barge were to sink what would happen to the water level?

A. It would fall.
B. It would remain unchanged.
C. It would rise.
D. It would depend on its mass.

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45. Suppose you have a pendulum clock which keeps correct time on Earth (acceleration due to gravity = 9.8 m/s$^2$). Without changing the clock, you take it to the Moon (acceleration due to gravity = 1.6 m/s$^2$). For every hour interval (on Earth) the Moon clock will record _____.

A. (9.8/1.6) h
B. 1 h
C. SQRT(9.8 / 1.6) h
D. (1.6/9.8) h
E. SQRT(1.6 / 9.8) h

46. As a star exhausts hydrogen in its core, it _____.

A. becomes hotter and more luminous
B. becomes cooler and more luminous
C. becomes hotter and less luminous
D. becomes cooler and less luminous

47. An upright stick that is allowed to cast a shadow in sunlight is called _____.

A. Almagest
B. Primum mobile
C. Equinox
D. Gnomon

48. A solar or lunar eclipse will occur _____.

A. when the sun is near the line of nodes of the moon and the moon is new or full
B. any time the moon is new or full
C. when the sun is near the solstice and the moon is new or full
D. half way through an eclipse year

49. How much time should it take for a traveling bullet to hit the ground compared to a bullet dropped from rest? Assume the ground remains flat for the entire distance the bullet may travel.

A. The traveling bullet will take longer to hit the ground than the bullet dropped from rest
B. The traveling bullet will hit the ground at the same time as the bullet dropped from rest
C. The traveling bullet will hit the ground before the bullet dropped from rest
D. The traveling bullet moves so fast that it will never hit the ground

50. Bart placed four identical candles on a table and lit them. He covered the first candle with a big jar, the second with a medium-sized jar, and the third with a small jar. He left the last candle uncovered. Which candle probably took the longest time to burn?

A. the lit candle left uncovered
B. the lit candle covered with the biggest jar
C. the lit candle covered with the smallest jar
D. the lit candle covered with the medium-sized jar

51. Which of the following is not considered a simple machine?

A. wedge
B. pulley
C. lever
D. wheelbarrow

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For **questions 52-53.**

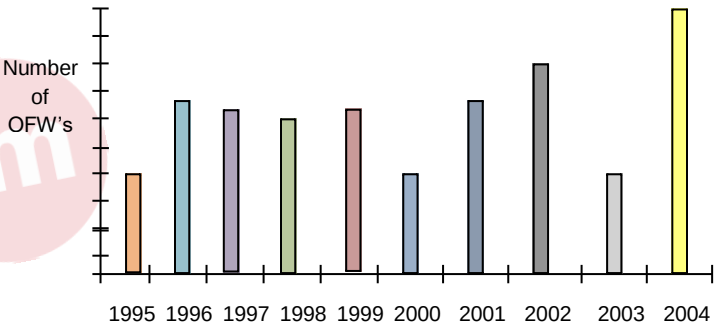
Number of OFW's in four countries:

| Number of OFW's (x1000) | | | | |
|---|---|---|---|---|
| Year | Hongkong | Kuwait | Italy | USA |
| **1995** | 116 | 20 | 19 | 39 |
| **1996** | 120 | 33 | 22 | 50 |
| **1997** | 109 | 31 | 25 | 43 |
| **1998** | 109 | 30 | 20 | 42 |
| **1999** | 111 | 31 | 18 | 61 |
| **2000** | 120 | 25 | 19 | 55 |
| **2001** | 123 | 32 | 30 | 52 |
| **2002** | 122 | 39 | 32 | 60 |
| **2003** | 115 | 24 | 16 | 72 |
| **2004** | 102 | 47 | 19 | 71 |

52. Which country shows the greatest rate of increase over the years?

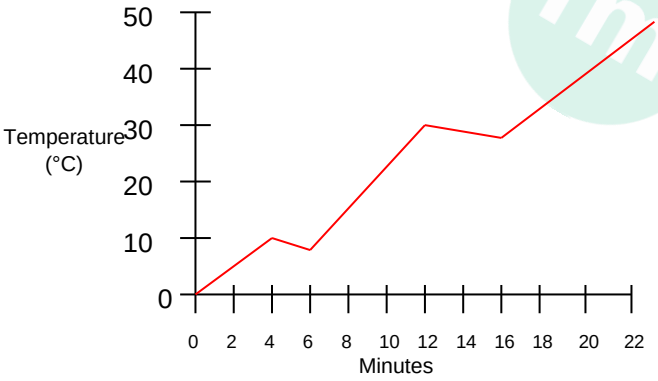
A. Hongkong
B. Kuwait
C. Italy
D. USA

53. The graph below shows the number of OFW's in which country?




A. Hongkong
B. Kuwait
C. Italy
D. USA

For **questions 54-60**, refer to the following graph. A substance is heated by a source supplying 1000 calories per minute.




54. The freezing point of this substance is _____.

A. 0°C
B. 10°C
C. 20°C
D. 30°C

55. The boiling point of the substance is _____.

A. 10°C
B. 20°C
C. 30°C
D. 40°C

56. The substance undergoes a phase change between the _____.

A. $4^{th}$ and $6^{th}$ minutes
B. $6^{th}$ and $14^{th}$ minutes
C. $14^{th}$ and $18^{th}$ minutes
D. $16^{th}$ and $22^{nd}$ minutes

57. How many calories are needed to completely melt the sample at its melting point?

A. 500
B. 1000
C. 2000
D. 3000

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58. How long did it take for the substance to completely turn into gas?

A. 4 min.
B. 6 min.
C. 10 min.
D. 16 min.

59. The substance is solid at _____.

A. 2 min.
B. 5 min.
C. 10 min.
D. 18 min.

60. How many calories are needed to completely change the sample into a liquid?

A. 4000
B. 6000
C. 14 000
D. 16 000

61. What factor distinguishes a suspension from a colloid?

A. light reflects off the particles of a suspension
B. the particles of a suspension will sink out if left over time to rest
C. suspensions are clear
D. suspensions cannot be filtered

62. Lorna placed 1 kg of sandy soil and 1 kg clay soil into Pot A and Pot B respectively. She then poured equal volumes of water into each pot. After a day, it is expected that _____.

A. Pot A will weigh more than Pot B
B. Pot B will weigh more than Pot A
C. Pot A and Pot B will weigh the same
D. Pot A will be wet and Pot B will be dry

63. Hydrogen and oxygen molecules in a gas sample have the same temperature. This means the hydrogen molecules, on the average, have the same _____.

A. speed, but more kinetic energy.
B. kinetic energy, but more speed.
C. kinetic energy, but less speed.
D. speed and the same kinetic energy.

64. Acids are substances that _____.

A. form hydronium ions when dissolved in water
B. turn red litmus paper blue
C. make foods taste bitter
D. react with neutral liquids to form bases

65. Marinades for meat commonly include acids such as vinegar or wine, because the acids can _____.

A. toughen meat
B. tenderize meat
C. preserve meat
D. react with salt

66. The basic requirement for the separation of the components by _____ is that the composition of the vapor be different from the composition of the liquid at the boiling point of the liquid.

A. absorption
B. distillation
C. extraction
D. crystallization

67. Taken by itself, the fact that 8.0 g of oxygen and 1.0 g of hydrogen combine to give 9.0 of water demonstrates what natural law?

A. Multiple Proportions
B. Periodicity
C. Conservation of Mass
D. The Atomic Theory

68. What are the coefficients that will balance the formula equation below?

$$AlCl_3 + NaOH \rightarrow Al(OH)_3 + NaCl$$

A. 1, 3, 1, 3
B. 3, 1, 3, 1
C. 1, 1, 1, 3
D. 1, 3, 3, 1

69. A hydrocarbon that contains one or more double bonds is classified as a(n) _____.

A. alkyne
B. alkene
C. ketone
D. alkane

70. When heat is absorbed by the system from the surroundings, the process is said to be _____, and the sign of process is _____.

A. exothermic, negative
B. endothermic, positive
C. exothermic, positive
D. endothermic, negative

71. Which of the following did not help Darwin formulate his theory of evolution?

A. fossil evidence that species had changed over time
B. closely related species on oceanic islands
C. belief that the earth was several thousand years old
D. evidence of artificial selection in domestic animals

72. Which of the following pairs are analogous structures?

A. the front leg of a horse and a human arm
B. the front leg of a frog and a bat wing
C. the wing of a bird and a bat wing
D. the front flipper of a porpoise and a human arm

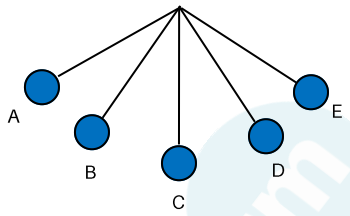
73. Of the following biological levels of organization, which represents the smallest or lowest level?

A. organs
B. organisms
C. cells
D. tissues

74. Which of the following is not a property of life?

A. molding or adapting to one's environment
B. regulating materials that enter or leave the system
C. responding to stimuli
D. reproducing, passing hereditary material to the next generation

For **questions 75 and 76.** Five positions of a swinging pendulum are shown in the following diagram. A and E are the highest positions attained by the pendulum; the lowest is C.




75. The kinetic energy of the pendulum is highest at position(s) _____.

A. C
B. B and D
C. A and E
D. A, C and E

76. Speed is minimum at position(s) _____.

A. C
B. B and D
C. A and E
D. A, C and E

77. The sexually-transmitted disease gonorrhea is becoming difficult to treat because the causative bacteria are evolving resistance to antibiotics. For example, in Hawaii between 1997 and 1999 resistance to fluoroquinolones increased from 1.4 percent to 9.5 percent. Scientists attribute this to natural selection. What does *natural selection* mean in this context?

A. The germs have learned to avoid that particular class of antibiotic.
B. The antibiotic has changed the genetic structure of the germs allowing them to become antibiotic-resistant.
C. The germs changed their genetic code in order to avoid problems with the antibiotic.
D. The antibiotic created an environment in which germs harboring antibiotic-resistant genes could flourish.

78. A slippery outer covering in some bacteria that protects them from phagocytosis by host cells is _____.

A. capsule
B. cell wall
C. flagellum
D. peptidoglycan

79. Differences between eukaryotic and prokaryotic cells include all of the following except _____.

A. eukaryotic cells have mitochondria
B. eukaryotic cells have cilia and flagella with complex structure
C. prokaryotic cells have more complex cell walls
D. prokaryotic cells have no genetic material

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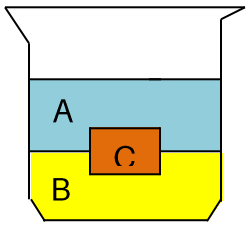
80. The optimum temperature for an organism is the one at which _____.

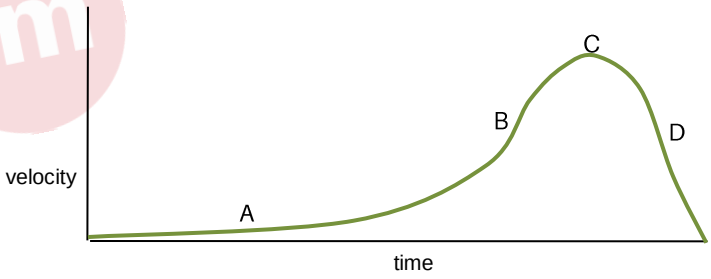
A. it grows with the shortest generation time
B. it has the longest time between cell divisions
C. it is near one extreme of its range of tolerated temperatures
D. its enzymes begin to denature

81. In the illustration below, A and B are liquids while C is a solid. Which of the following is true?




A. C is denser than both A and B.
B. C is less than B but denser than A.
C. C is less dense than A but denser than B.
D. C has just about the same density as both A and B.

For **questions 82 and 83**, examine the following graph of the movement of car.




82. At which point is the car decelerating?

A. A
B. B
C. C
D. D

83. At which point is the car accelerating rapidly?

A. A
B. B
C. C
D. D

84. In a plant, what part stores sugars as starch?

A. leaves
B. roots
C. seeds
D. all of the above

85. ADP energy is used for _____.

A. synthetic reactions
B. active transport
C. all energy-requiring processes in cells
D. none of the above

86. The cytoskeleton of the cell functions to _____.

A. give the cell shape
B. anchor organelles
C. allow organelles to move
D. all of the above.

87. A red blood cell plasma membrane contains _____ different types of proteins.

A. over 10
B. over 20
C. over 40
D. over 50

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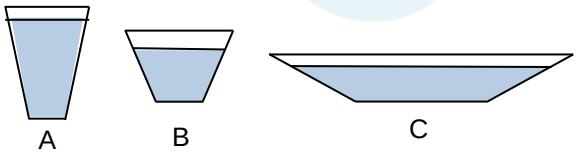
88. During _____, the chromosomes attach to the spindle and align at the metaphase plate of the spindle.

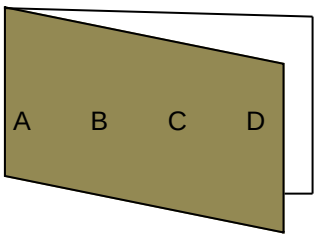
A. prophase
B. prometaphase
C. metaphase
D. anaphase

89. In the diagram, assume that each container contain equal volumes of water. In what container is the pressure at the bottom greatest?



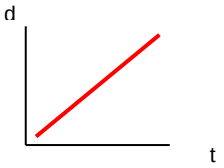

A. A
B. B
C. C
D. The pressure is the same in each container

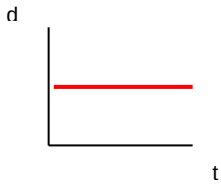
90. At which point on the door will you apply the greatest force to close it?

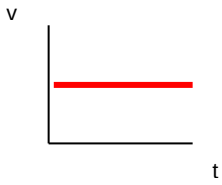


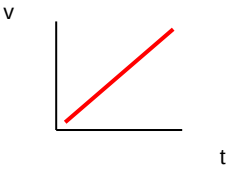

A. A
B. B
C. C
D. D

91. Graphs of distance (d) or velocity (v) of a body against time (t) are shown. Which one shows that of a body is at rest?

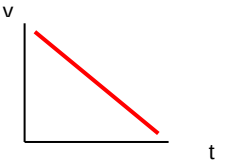
A. 

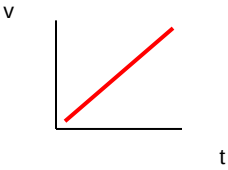

B. 

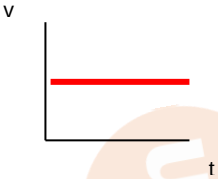

C. 

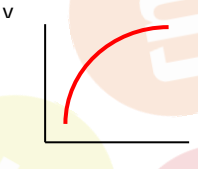

D. 


92. Which of the velocity-time graphs in the figure represents an object falling freely in a vacuum? (v = velocity, t = time)

A. 


B. 


C. 


D. 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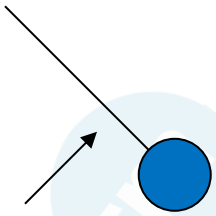
93. In the following illustration, if the pendulum was swinging in the direction indicated by the arrow when its string was suddenly cut, in what direction did the pendulum go?



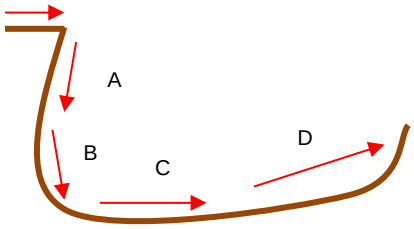
A. 

B. 

C. 

D. 

94. In a river, if the water flows in the direction indicated by the arrows in the illustration below, at which point is the flow fastest?




A. A
B. B
C. C
D. D

95. If two flies heterozygous for wing length and body color are crossed, which of the following are possible results?

A. chance of L, long wings = 3/4
B. chance of l, short wings = 1/2
C. chance of G, grey body = 1/4
D. all of the above are true

96. A cross in which true-breeding plants differ in two traits is known as a _____ cross.

A. test
B. dihybrid
C. multi trait
D. hybrid

97. Which is narrower?

A. fundamental niche of an organism
B. realized niche of an organism
C. habitat of an organism
D. all are the same

98. _____ are protozoa with no means of locomotion.

A. Amoeboids
B. Ciliates
C. Zooflagellates
D. Sporozoa

99. The vertebrate skeleton _____.

A. is a living tissue which grows with the animal.
B. protects internal organs.
C. serves as a place of attachment for muscles.
D. all of the above

100. Protoplasts are cells without _____.

A. a nucleus.
B. a membrane.
C. a wall.
D. cytoplasm.

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**ANSWER KEY:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. C | 11. D | 21. B | 31. B | 41. B | 51. D | 61. B | 71. D | 81. B | 91. B |
| 2. D | 12. D | 22. B | 32. D | 42. C | 52. D | 62. B | 72. D | 82. D | 92. B |
| 3. C | 13. D | 23. C | 33. A | 43. D | 53. B | 63. B | 73. C | 83. B | 93. A |
| 4. A | 14. B | 24. C | 34. D | 44. A | 54. B | 64. A | 74. B | 84. D | 94. B |
| 5. C | 15. A | 25. B | 35. C | 45. D | 55. C | 65. B | 75. A | 85. C | 95. A |
| 6. C | 16. A | 26. D | 36. C | 46. B | 56. A | 66. B | 76. C | 86. D | 96. B |
| 7. D | 17. B | 27. C | 37. C | 47. D | 57. D | 67. C | 77. C | 87. B | 97. B |
| 8. B | 18. D | 28. B | 38. A | 48. A | 58. D | 68. A | 78. A | 88. C | 98. D |
| 9. B | 19. A | 29. D | 39. A | 49. B | 59. A | 69. B | 79. C | 89. A | 99. D |
| 10. D | 20. D | 30. B | 40. D | 50. A | 60. B | 70. B | 80. A | 90. A | 100. C |

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