T M S C A   M I D D L E   S C H O O L

S C I E N C E

T E S T   # 3 ©

N O V E M B E R   4 ,   2 0 1 7

GENERAL DIRECTIONS

1. About this test:
   A. You will be given 40 minutes to take this test.
   B. There are 50 problems on this test.
2. All answers must be written on the answer sheet/Scantron form/Chatsworth card provided. If you are using an answer sheet be sure to use **BLOCK CAPITAL LETTERS**. Clean erasures are necessary for accurate grading.
3. If using a Scantron answer form, be sure to correctly denote the number of problems not attempted.
4. You may write anywhere on the test itself. You must write only answers on the answer sheet.
5. You may use additional scratch paper provided by the contest director.
6. All problems have **ONE** and **ONLY ONE** correct [BEST] answer. There is a penalty for all incorrect answers.
7. On the back of this page is a copy of the periodic table of the elements as well as a list of some potentially useful information in answering the questions.
8. A simple scientific calculator with the following formulas is sufficient for the science contest: +, -, %, ^, log x, e^x, lnx, y^x, sin x, sin^{-x}, cos x, cos^{-x}, tan x, tan^{-x}, with scientific notation and degree/radian capability.

   The calculator must be silent, hand-held and battery operated. The calculator cannot be a computer or cannot have built-in or stored functionality that provides scientific information and cannot have communication capability. If the calculator has memory, it must be cleared. Each student may bring one spare calculator. **NO GRAPHING CALCULATORS ARE PERMITTED.**
9. All answers within ± 5% will be considered correct.
10. All problems answered correctly are worth **FIVE** points. **TWO** points will be deducted for all problems answered incorrectly. No points will be added or subtracted for problems not answered.
11. In case of ties, percent accuracy will be used as a tie breaker.

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Periodic Table of the Elements

1A 1																	8A 18
1 **H** 1.008	2A 2											3A 13	4A 14	5A 15	6A 16	7A 17	2 **He** 4.003
3 **Li** 6.941	4 **Be** 9.012											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.18
11 **Na** 22.99	12 **Mg** 24.31	3B 3	4B 4	5B 5	6B 6	7B 7	8B 8	8B 9	8B 10	1B 11	2B 12	13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.07	17 **Cl** 35.45	18 **Ar** 39.95
19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.87	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.69	29 **Cu** 63.55	30 **Zn** 65.41	31 **Ga** 69.72	32 **Ge** 72.64	33 **As** 74.92	34 **Se** 78.96	35 **Br** 79.90	36 **Kr** 83.80
37 **Rb** 85.47	38 **Sr** 87.62	39 **Y** 88.91	40 **Zr** 91.22	41 **Nb** 92.91	42 **Mo** 95.94	43 **Tc** (98)	44 **Ru** 101.07	45 **Rh** 102.91	46 **Pd** 106.42	47 **Ag** 107.87	48 **Cd** 112.41	49 **In** 114.82	50 **Sn** 118.71	51 **Sb** 121.76	52 **Te** 127.60	53 **I** 126.90	54 **Xe** 131.29
55 **Cs** 132.91	56 **Ba** 137.33	57 **La** 138.91	72 **Hf** 178.49	73 **Ta** 180.95	74 **W** 183.84	75 **Re** 186.21	76 **Os** 190.23	77 **Ir** 192.22	78 **Pt** 195.08	79 **Au** 196.97	80 **Hg** 200.59	81 **Tl** 204.38	82 **Pb** 207.20	83 **Bi** 208.98	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** (226)	89 **Ac** (227)	104 **Rf** (261)	105 **Db** (262)	106 **Sg** (266)	107 **Bh** (264)	108 **Hs** (277)	109 **Mt** (268)	110 **Ds** (281)	111 **Rg** (272)	112 **Cn** (285)						

58 **Ce** 140.12	59 **Pr** 140.91	60 **Nd** 144.24	61 **Pm** (145)	62 **Sm** 150.36	63 **Eu** 151.96	64 **Gd** 157.25	65 **Tb** 158.93	66 **Dy** 162.50	67 **Ho** 164.93	68 **Er** 167.26	69 **Tm** 168.93	70 **Yb** 173.04	71 **Lu** 174.97
90 **Th** 232.04	91 **Pa** 231.04	92 **U** 238.03	93 **Np** (237)	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (257)	101 **Md** (258)	102 **No** (259)	103 **Lr** (262)

OTHER USEFUL INFORMATION

Acceleration of gravity at Earth's surface, $g = 9.81$ m/s^2

Avogadro's Number, $N = 6.02 \times 10^{23}$ molecules/mole

Planck's constant, $h = 6.63 \times 10^{-34}$ J•s

Planck's reduced constant, $\hbar = h/2\pi = 1.05 \times 10^{-34}$ J•s

Standard temperature and pressure (STP) is 0°C and I atmosphere

Gram molecular volume al STP = 22.4 liters

Velocity of light, $c = 3.0 \times 10^8$ m/sec

Absolute zero= 0 K = -273.15°C

Gas constant, R = 1.986 col/K•mole = 0.082 liter•otm/K•mole

One Faraday= 96,500 coulombs (9.65×10^4 C)

Dulong and Pelil's constant= 6.0 amu•col/gram•K

Electron rest mass, $m_e = 9.11 \times 10^{-31}$ kg

Atomic mass unit, $m_u = 1.66 \times 10^{-21}$ kg

Boltzmann constant, $k_B = 1.38 \times 10^{-23}$ J/K

Permittivity of free space $\varepsilon_0 = 8.85 \times 10^{-12}$ C^2/N•m^2

Permeability of free space $\mu_0 = 4\pi \times 10^{-7}$ T •m/A

1 Atmosphere= 1.02×10^5 N/m^2 = 760 Torr = 760 mmHg

1 Electron Volt - 1.6×10^{-19} Joules

Charge of on electron"' -1.6×10^{-19} coulombs (C)

1 horsepower (hp) = 746 W = 550 ft•lb/s

 Neutron Moss= 1.008665 au

Proton Mass= 1.007277 au

1 au= 931.5 MeV

1 calorie= 4.184 Joules (J)

Specific heal of water= 4.18 J/g• °C

1. Carbon dioxide and water are used as reactants for what reaction?
   A) photosynthesis   **B)** cell respiration   **C)** decomposition   **D)** combustion

2. Which of the following is not a characteristic of an angiosperm?
   A) sepals   **B)** anther   **C)** pollen grain   **D)** naked seed

3. The prefix *ichthy-* used in science to form words such as ichthyology means?
   A) fish   **B)** bacteria   **C)** study of   **D)** itchy

4. A monocot can be identified by having such characteristics such as?
   A) parallel veins   **B)** a taproot   **C)** branched veins   **D)** two first true leaves

5. A unit by which power is measured would be?
   A) watt   **B)** joules   **C)** Newtons   **D)** voltage

6. When there is a change in the valence electrons of an atom it can be described as any of the following except:
   A) isotope.   **B)** cation.   **C)** anion.   **D)** chemically bonded.

7. A(n) _____ is what is necessary to change the direction or speed of an object.
   A) balanced force   **B)** unbalanced force   **C)** inertia   **D)** potential energy

8. Which type of rock is formed deep in the earth by extreme pressure and heat and may contain crystals?
   A) metamorphic   **B)** sedimentary   **C)** igneous   **D)** volcanic

9. All of the following could increase the rate at which a solid will dissolve except:
   A) increase of temperature.   **C)** increase of stirring.
   B) increase of surface temperature.   **D)** decrease of temperature.

10. Most phytoplankton must reside what region of the ocean?
    A) limnetic   **B)** abyssal   **C)** photic   **D)** benthic

11. When an individual pushes on a ramp to lift a box this force is called the
    A) resistance force   **B)** exerted force   **C)** potential force   **D)** output force

12. An example of a plant-like protist would be a(n)
    A) sporozoan.   **B)** paramecium.   **C)** euglena.   **D)** water mold.

13. The number of times a wave passes a certain point every second would be referred to as the
    A) wavelength.   **B)** frequency.   **C)** crest.   **D)** trough.

14. The male reproductive organ on a flowering plant is called a(n)
    A) anther.   **B)** pistil.   **C)** carpel.   **D)** sepal.

15. Chemical potential energy can be found in all of the following except
A) food. **B)** wind turbines. **C)** gasoline. **D)** explosives.

16. An increase in the presence of root systems on a river bank can help reduce _____.
A) erosion **B)** weathering **C)** decomposition **D)** succession

17. A plant's _____ can increase the surface area of the root system.
A) root hairs **B)** root cuticle **C)** trichomes **D)** root caps

18. Newton's _____ law describes a body in motion will remain in motion unless acted upon.
A) 1st **B)** 2nd **C)** 3rd **D)** 4th

19. Mitosis will produce ____ daughter cells.
A) 1 **B)** 2 **C)** 3 **D)** 4

20. When a form of water pollution can not be determined it would be a(n)
A) nonpoint source. **B)** point source. **C)** farmland source. **D)** industrial source.

21. The evaporation phase change of water is most similar to what other phase?
A) condensation **B)** freezing **C)** melting **D)** sublimation

22. A change in genetic material that produces a variation in a species may be a result of
A) a mutation. **C)** overproduction of the species.
B) competition. **D)** a struggle for survival.

23. The net movement of molecules into cells is most dependent upon the
A) number of nuclei. **C)** selectivity of the cell wall.
B) number of chromosomes. **D)** selectivity of the plasma membrane.

24. An organism that feeds on the blood of a living bird is a(n)
A) herbivore. **B)** parasite. **C)** producer. **D)** saprophyte.

25. What are the blood vessels responsible for bringing oxygen-poor blood back to the heart?
A) arteries **B)** alveoli **C)** bronchioles **D)** veins

26. Pollen often triggers an allergic response that will cause the body to produce
A) platelets. **B)** red blood cells. **C)** antigens. **D)** antibodies.

27. A basic solution would have a pH of
A) 3. **B)** 5. **C)** 7. **D)** 10.

28. What is the freezing temperature of water °C?
A) 20°C **B)** 100°C **C)** 212°C **D)** 0°C

29. A diagram of a flower is shown below:
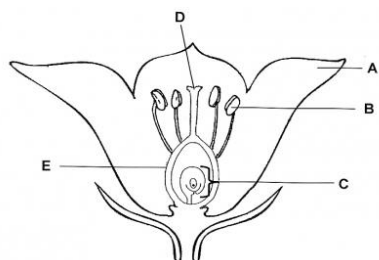
Where does fertilization occur?

A) A   **B)** B   **C)** C   **D)** D

30. A bond that is created by the sharing of a pair of electrons is called

A) a covalent bond.   **C)** a polyatomic bond.

B) an ionic bond.   **D)** a triple bond.

31. What is the total number of electrons in an atom of an element with an atomic number of 18 and a mass number of 40?

A) 40   **B)** 22   **C)** 18   **D)** 58

32. Given the following formula:

$$2Mg_{(s)} + O_{2(g)} \rightarrow 2MgO_{(s)}$$

Identify the product(s)

A) Mg   **B)** O_2 **C)** MgO   **D)** Mg and O_2

33. What two particles have approximately the same mass?

A) neutron and proton   **C)** electron and neutron

B) proton and electron   **D)** none of the above

34. A part of the nervous system would include which of the following:

A) stirrup.   **B)** myelin sheath.   **C)** cartilage.   **D)** alveoli.

35. A substance that is a combination of two or more metals to add strength is called

A) an alloy.   **B)** an element.   **C)** a molecule.   **D)** a compound.

36. The prefix *pseudo-* used in science to form words such as pseudopod means?

A) foot   **B)** phase   **C)** false   **D)** circle

37. Which of the following form diatomic molecules?

A) hydrogen   **B)** barium   **C)** phosphorous   **D)** potassium

38. How many valence electrons does nitrogen have?

A) 3   **B)** 4   **C)** 8   **D)** 5

39. Elements in the same vertical column belong to the same
 A) period.   **B)** niche.   **C)** group.   **D)** pattern.

40. In vascular plants, food in the form of sugar that is created in the leaves moves to the roots by the
_____.
 A) phloem   **B)** xylem   **C)** mesophyll   **D)** sink cells

41. The most prominent photosynthetic organism on Earth is
 A) bacteria.   **B)** trees.   **C)** flowers.   **D)** algae.

42. The phenomenon known as a red-tide is an over growth of
 A) algae.   **B)** fungus.   **C)** moss.   **D)** zooplankton.

43. When the moon is directly between the Sun and the Earth, we will see what phase of the moon?
 A) new moon.   **B)** half moon.   **C)** full moon.   **D)** waxing
                                                                                              gibbons.

44. Many organic compounds must contain what elements?
 A) carbon, hydrogen, and oxygen   **C)** carbon only
 B) carbon, nitrogen, and phosphorous   **D)** calcium and hydrogen

45. As carbon dioxide dissolves in our ocean water it begins to form
 A) carbon monoxide.   **C)** magnesium carbonate.
 B) sodium carbonate.   **D)** carbonic acid.

46. Mitosis creates two daughter cells that are _____ cells.
 A) diploid   **B)** haploid   **C)** polyploid   **D)** tetraploid

47. A flowering plant that has both male and female reproductive structures is a
 A) dioecious.   **B)** bryophyte.   **C)** monoecious.   **D)** monocot.

48. After an infection, your immune system will release _____ that will recognize specific _____
found on a pathogen.
 A) antibodies, receptors   **C)** leukocytes, antibodies
 B) antigens, antibodies   **D)** antibodies, antigens

49. If it takes 1 hour to travel 10 km, your _____ speed is 10 km/h.
 A) constant   **B)** instantaneous   **C)** average   **D)** increased

50. In an experiment, three test tubes containing the same amount of cow liver, in grams, each receive a
varying amount of hydrogen peroxide. Test tube one receives 1 ml, test tube 2 receives 2 ml and test tube 3
receives 3 ml. The result is a varying amount of temperature increase and bubbling. What would be the
independent variable in this lab?
 A) the cow liver   **C)** the amount of hydrogen peroxide added
 B) the temperature change   **D)** the three test tubes

1. A	18. A	35. A
2. D	19. B	36. C
3. A	20. A	37. A
4. A	21. A	38. D
5. A	22. A	39. C
6. A	23. D	40. A
7. B	24. B	41. D
8. A	25. D	42. A
9. D	26. D	43. A
10. C	27. D	44. A
11. B	28. D	45. D
12. C	29. D	46. A
13. B	30. A	47. A
14. A	31. C	48. D
15. B	32. C	49. C
16. A	33. A	50. C
17. A	34. B	

51.