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 # 1 3 ©

M A R C H 1 3 , 2 0 2 1

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.

Periodic Table of the Elements

1A 1												3A 13	4A 14	5A 15	6A 16	7A 17	8A 18
1 H 1.01	2A 2																2 He 4.00
3 Li 6.94	4 Be 9.01											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	8	8B 9	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 65.38	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 138.9	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 (281)	112 Cn (285)	113 Nh (286)	114 Fl (289)	115 Mc (289)	116 Lv (293)	117 Ts (293)	118 Og (294)

58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.0	91 Pa 231.0	92 U 238.0	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 x 10^{23} molecules/mole
Planck's constant, h = 6.63 x 10^{-34} J•s
Planck's reduced constant, $\hbar = h/2\pi$ = 1.05 X 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 x 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 x 10^4 C)
Dulong and Pelil's constant= 6.0 amu•cal/gram•K
Electron rest mass, m_e = 9.11 x 10^{-31} kg
Atomic mass unit, m_u = 1.66 x 10^{-21} kg
Boltzmann constant, k_B = 1.38 x 10^{-23} J/K
Permittivity of free space ε_0 = 8.85 x 10^{-12} C^2/N•m^2
Permeability of free space $\mu_0 = 4\pi$ x 10^{-7} T •m/A
1 Atmosphere= 1.02 x 10^5 N/m^2 = 760 Torr = 760 mmHg
1 Electron Volt - 1.6 x 10^{-19} Joules
Charge of on electron"' -1.6 x 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

2020-2021 TMSCA Middle School Science Test #13

1. What specialized food would a sanguinivore eat?
   A. meat B. blood C. sap from tree D. insects

2. A model rocket was launched straight up into the air from Earth's surface. What forces are acting against upward movement of the rocket to bring it back to Earth?

   A. friction between the rocket and the air on the way up
   B. Earth's gravity
   C. rocket engine thrust
   D. Both A and B

3. How is polarized light different from unpolarized light?
   A. Unpolarized light waves vibrate in one horizontal plane and polarized does not.
   B. Polarized light waves means that the light has been lined up with a magnetic field.
   C. Polarized light waves vibrate in one plane and unpolarized light waves vibrates in more than one plane.
   D. Unpolarized light has been filtered to exclude all visible light waves except for one.

4. The root word "thorac" means what?
   A. head B. abdomen C. foot D. chest

5. If an air mass is dry, cold, and stable, then it is most likely a what?
   A. Maritime polar
   B. Maritime tropical
   C. Continental polar
   D. Continental tropical

6. What causes seasons on Earth?
   A. the indirect and/or direct rays of the sun at different times of the year
   B. the tilt of the Earth and its revolution around the sun
   C. a combination of A and B
   D. the shape of the Earth's orbit around the sun

7. How did the word "radar" originate?
   A. Named after its two inventors, Raymond and Dartmouth.
   B. Came from the French word "radiant" meaning to emit rays
   C. Named from Radio Detection and Ranging
   D. Named from Latin word for sound

8. The oceanic crust is composed mainly of which type of rock?
   A. Granite B. Slate C. Quartzite D. Basalt

9. Susanne was observing a group of stars known as Orion the Great Hunter. The stars form a picture at night if you connect the star points. What is this called?

A. globular star cluster B. nebulae C. galaxy D. constellation

10. A chemical reaction in which a compound (reactant) is broken down into simpler elements or compounds (products) is called what?

A. decomposition B. synthesis C. replacement D. oxidation/reduction

11. What special role do legumes have in the nitrogen cycle?

A. legumes use excessive nitrogen in the soil
B. legumes have nodules that contain nitrogen-fixing bacteria
C. legumes have a parasitic relationship with nitrogen
D. none of these

12. One species of flatworm lives on the gills of horseshoe crabs. The flatworm feeds on leftovers from the horseshoe crabs' meals. This does not benefit or harm the horseshoe crabs at all. This would be an example of what?

A. mutualism B. parasitism C. commensalism D. Both A and C

13. The eggs of brine shrimp can survive extreme conditions. This is an example of what?

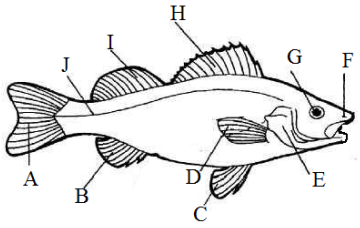
A. Cryptobiosis B. Metabolism C. Cryogenics D. Symbiosis

14. If a bird has a broad rounded wing type, it is most likely good at what?

A. long distance flight
B. speed and endurance
C. short distance flight
D. no flight at all

15. In this diagram of a fish, what would D be labeled?

A. pelvic fin
B. pectoral fin
C. anal fin
D. dorsal fin



16. The hormone, insulin, that helps to control the level of glucose in your blood is produced in what organ?

A. esophagus B. kidney C. pancreas D. liver

17. If an insect belongs to the order Siphonaptera, then it may be a what?

A. beetles B. wasps C. fleas D. scorpions

18. Which of the following insect list all go through incomplete metamorphosis?
    A. grasshoppers, termites, dragonflies, cockroaches
    B. flies, moths, butterflies, mayflies
    C. cockroaches, fleas, wasps, bees
    D. bees, flies, ants, wasps

19. The hard-external skeleton on an adult insect is made primarily out of a substance called what?
    A. collagen B. follicles C. chitin D. keratin

20. Monarch butterflies migrate from Canada to Mexico during the fall to overwinter in warmer temperatures. Researchers want to know what the monarch butterflies use in order to orientate their flight direction. Maybe they use the position of the sun, features of the landscape, the magnetic field, or something that we don't know about yet to help them know which way to fly. What would be the most reasonable testable hypothesis for this investigation?
    A. When monarch butterflies see a body of water, they will fly over it.
    B. Every year, the monarch butterflies come to the same tree in my backyard.
    C. When a monarch butterfly comes near a magnet, it flies in a sporadic manner 75% of the time.
    D. When given several choices of sunlight angles, the monarch butterflies will choose to fly with the sun is at 57 degrees above the horizon at noon.

21. Which statement regarding the environment is true?
    A. Blue carbon is the term used for the carbon absorbed by world's oceans, ecosystems
    B. Green carbon is the term used for the carbon absorbed by world's oceans, ecosystems
    C. Mangroves are not necessarily a part of the carbon sink in the world's oceans
    D. When fewer greenhouse gases are emitted, more pollution is created.

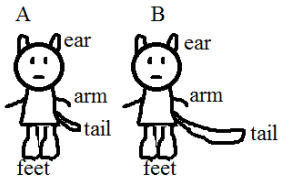
22. Which of the following diseases are directly related to the kidneys?
    A. diabetes B. obesity C. nephritis D. emphysema

23. Which of the following statements about sweat is not true?
    A. a person's feet have about 250,000 sweat glands
    B. there are two types of sweat glands in people – apocrine and eccrine
    C. apocrine glands are smaller than eccrine glands
    D. the human breast is actually an enlarged apocrine gland

24. Why do humans get "goose bumps" or temporarily bumpy skin at certain times?
    A. this happens when small muscles around hair follicles contract
    B. this happens when stress hormones are released when being startled or threatened
    C. this happens when a specialized cell in the skin glands gets swollen
    D. Both A and B

25. What would these imaginary creatures be named using your knowledge of Greek and Latin root words, suffixes, and prefixes?

A. A-microplast B-macroplast
B. A-microstoma B-macrostoma
C. A-microuro B-macrouro
D. A-micropod B-macropod



26. Earth is approximately 93 million miles from the sun. Mars is approximately 142 million miles from the sun. How does this affect the differences in the two planets?

A. Earth has water in all three states of matter.
B. Mars is much warmer than Earth.
C. Mars has a longer revolution around the sun.
D. Both A and C

27. Which of the following elements are known as alkali metals?

A. Hydrogen, Sodium, Potassium
B. Lithium, Sodium, Cesium
C. Oxygen, Carbon, Helium
D. Gold, Silver, Tin

28. On bird skeletons, there is a bone made of 2 joined collarbones. This bone helps to keep the wing joint in the right position when the wing muscles pull downward. What is this bone called?

A. keel B. crop C. pygostyle D. wishbone

29. Which of the following are in human bloodstreams waiting to attack pathogens?

A. neutrophils
B. macrophages
C. natural killer cells
D. all of these

30. What is the function of histamine?

A. causes local blood vessels to dilate
B. increases blood flow to an injured area
C. blocks pathogens from spreading
D. Both A and B

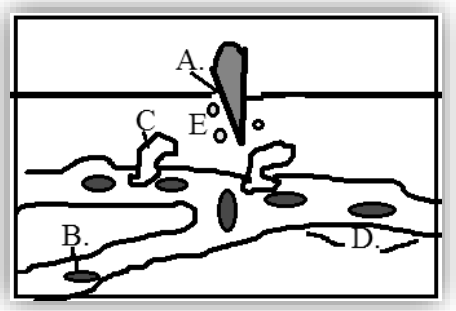
31. Which of the following statements is not true about thunder?

A. Thunder is the sound lightning makes as it strikes.
B. The sound from thunder can bounce off of clouds, mountains, and buildings.
C. In mythology, Thor is the god of thunder.
D. A person will hear thunder just before the lightning strikes.

32. This system is responsible for the production and circulation of cerebrospinal fluid. What system is it?

A. endocrine system
B. lymphatic system
C. ventricular system
D. atrial system

33. In this diagram to the right, letter A shows a thorn that got pushed into Jerry's finger. Letter E shows pathogens that got through his skin because of the wound. What is shown by letter C which is squeezing through the capillary wall and is moving to attack the pathogen?



A. histamine
B. neutrophils
C. plasma
D. antigens

34. What is shown by letter B, which is moving through the blood carrying oxygen to the body?

A. neutrophils
B. red blood cells
C. macrophages
D. antigens

35. One true difference between Earth and Venus is what?

A. Venus has no atmosphere, and Earth does.
B. Earth has 20% carbon dioxide while Venus has 30% carbon dioxide atmosphere.
C. Venus has no strong global magnetic field, Earth does.
D. Earth is closer to the sun than Venus.

36. If an insect belongs to the order Orthoptera, then it may be a what?

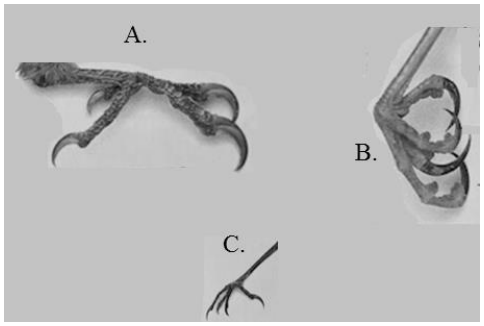
A. beetles B. ants C. wasps D. grasshopper

37. The rabies disease is caused by a what?

A. bacteria B. mucous or saliva C. enzymes D. virus

38. Which of these bird feet types would belong to a bird of prey?

A. A
B. B
C. C
D. none of these



39. Craig's class was creating genetic "monsters" to show how some traits are dominant and recessive. He tossed a coin to determine the traits of his creation. His monster was heterozygous for skin color. (G for green dominant, g for purple recessive). Also, his monster turned out to be homozygous dominant for eye shape. (L for large eyes, l for small eyes) Which phenotype below would show Craig's monster?

A. purple skin, small eyes
B. green skin, large eyes
C. purple skin, large eyes
D. green skin, small eyes

40. Students were measuring pH of the water after a rain. What is pH?

A. A measure of the salts within a solution
B. A measure of the conductivity of water based on hydrogen ions
C. Number from 0-14 describing the acid in the water
D. The relative measure of hydrogen ion concentration within a solution

41. If a solution has a pH of 6, this means the solution is what?

A. Slightly basic
B. Slightly acidic
C. More basic than acidic
D. Dangerously acidic, do not touch

42. Which list below shows the Galilean moons of Jupiter in order from closest to Jupiter to farthest from Jupiter?

A. Io, Europa, Ganymede, Callisto
B. Callisto, Europa, Io, Ganymede
C. Europa, Ganymede, Callisto, Io
D. Ganymede, Io, Callisto, Europa

43. When a satellite orbits a planet in an elliptical orbit, the closest approach to the planet is called the _____ and the farthest point of the satellite orbit is called the _____.

A. apogee, perigee
B. parallax, azimuth
C. azimuth, parallax
D. perigee, apogee

44. When astronomers are looking for exoplanets, they may look for which of the following?

A. the distance of the planet from its sun
B. a planet containing evidence of water
C. a transit of a planet in front of a star
D. all of these

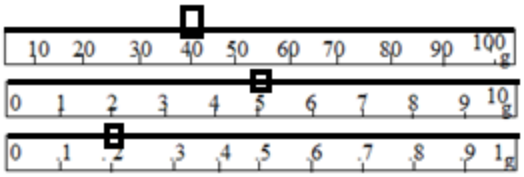
45. Which cloud type below means fair weather (no rain)?

A. cirrostratus B. altostratus C. cumulonimbus D. altocumulus

46. Which reason below best explains why we should keep our ozone layer around Earth?

A. The ozone layer is important in the process of photosynthesis.
B. The layer of ozone gas reflects heat energy back to Earth helping to warm our planet.
C. Ozone is made of oxygen which we need to breathe in order to stay alive.
D. Ozone gas absorbs most of sun's UV radiation which damages DNA in living cells.

47. When finding the mass of a container full of a substance for an experiment, the balance scale read as shown.
The substance's mass was 40.8 g.
What is the mass of the container that held the substance?

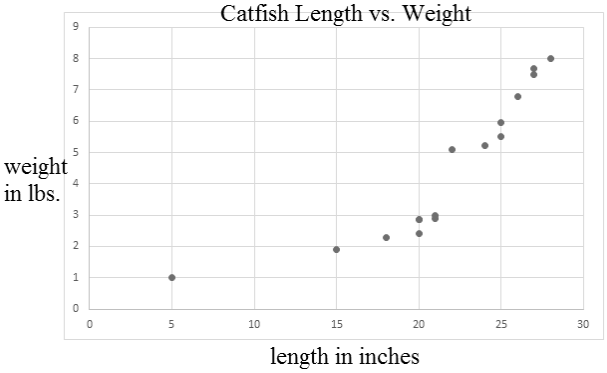


A. not enough information
B. 4.4 g
C. 86 g
D. 44 g

48. The root word "stoma" means what?

A. foot B. tail C. mouth D. body

49. Serena collected data on all the catfish that were caught at a local park one day.
She made a scatter plot of the data as shown here. Which statement below about the graph is reasonable?



A. There were more fish below 15 inches caught that day than above 15 inches.
B. A 10 lbs. catfish would be 25 inches long.
C. Using this data, a 10-inch catfish would probably weigh between 1 to 2 lbs.
D. 25-inch catfish will always weigh more than 6 lbs.

50. The Greek word "planktos" means what?

A. wooden B. person-like C. drifter D. swimmer

2020 - 2021 TMSCA Middle School Science Test #13 - Key

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