2018 TAME High School Practice State Science Test

(1) If the diploid chromosome number of a species is 24, how many chromosomes are there in a sperm cell?
A) 48
B) 36
C) 24
D) 12

(2) How many grams of NH_3 can be made from 30.0 grams of N_2 and 5.0 grams of H_2?
A) 28.3 grams
B) 36.4 grams
C) 42.5 grams
D) 63.8 grams

(3) Different forms of the same element that have different properties because of different atom arrangements are called
A) isotopes.
B) mutations.
C) allotropes.
D) halogens.

(4) A family of elements that has two electrons in its outer energy level is the
A) halogens.
B) actinides.
C) alkaline earth metals.
D) alkali metals.

(5) A wave will travel only if it has what to carry?
A) matter
B) energy
C) mass
D) photons

(6) Which of the following is a physical property?
A) curiosity
B) opinion
C) enamor
D) weight

(7) Why is the cortex important in the hair shaft?
A) It provides a place for scales to grow.
B) It contains pigment that gives hair its color.
C) It provides support and structure to the hair.
D) It provides a time element for calculating time of death.

(8) If Wes applies 100 newtons of force on a 2-meter wrench at a right angle to the wrench and parallel to the plane of rotation, how much torque, in newton-meters (N-m), is he applying to the bolt?
A) 200 N-m
B) 100 N-m
C) 50 N-m
D) 25 N-m

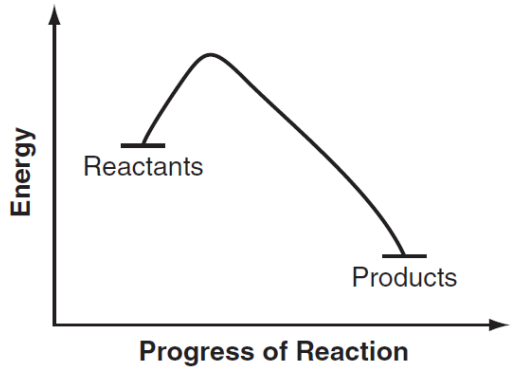
(9) The graph to the right shows the change in energy that occurs during a chemical reaction. Which of the following is most likely to happen as the reaction nears completion?

A) The reaction releases energy to its surroundings.

B) The energy level of the reactants remains constant.

C) The reaction takes in energy from its surroundings.

D) The energy level of the reactants increases gradually.



(10) If a single-celled saltwater organism is placed in freshwater, it will not be able to survive. Which statement explains why this is true?
A) The organism's cell will absorb too much water through osmosis.
B) The organism's cell will absorb too many sodium ions through osmosis.
C) The organism's cell will release too many hydrogen ions through diffusion.
D) The organism's cell will release too much water through facilitated diffusion.

(11) Which statement best describes a relationship between magnetism and electricity?
A) Electric currents weaken magnetic fields.
B) Changing magnetic fields can create electric currents.
C) Electric currents can demagnetize permanent magnets.
D) There can be no magnetic fields without electric currents.

(12) Monarch butterflies are poisonous and bad-tasting to birds. Viceroy butterflies have developed a color pattern like that of monarch butterflies but are tasty to birds. How might the similar appearance of the two types of butterflies be a disadvantage to monarch butterflies?
A) Both types of butterflies will be unable to determine mates in their own species because the two types look so much alike.
B) The increased number of viceroy butterflies will cause a decrease in the food supply available for monarch caterpillars.
C) Birds might develop resistance to the poison in monarch butterflies and start eating both types of butterflies.
D) Birds might mistake monarch butterflies for viceroy butterflies and start attacking more monarch butterflies.

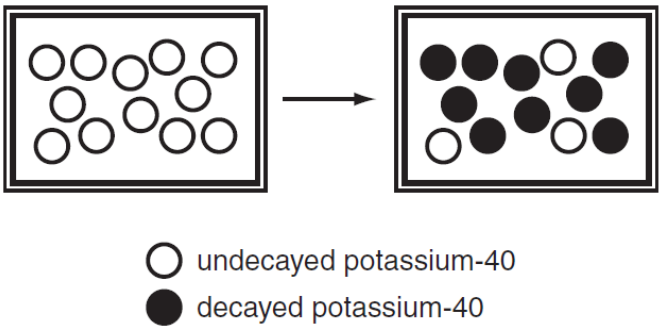
(13) Methane (CH_4) from a local coal mine has successfully been used to power fuel cells. Since the fuel used in these cells is not burned, using methane from the mine will help to
A) increase the concentration of atmospheric ozone.
B) reduce public demand for alternative fuel sources.
C) increase public awareness of global warming issues.
D) reduce pollutants commonly associated with fossil fuel combustion.

(14) *Bacillus thuringiensis* (*Bt*) is a bacterium that contains a gene that results in the production of a natural pesticide that kills insects. Genetic engineers have successfully inserted this *Bt* gene into the DNA of some corn varieties, allowing the corn to produce its own pesticide. What negative consequence could result from this technology?
A) Only corn that is resistant to the *Bt* gene will survive.
B) Individual insects that eat the genetically modified corn will develop resistance to *Bt*.
C) The genetically modified crops will insert this *Bt* gene into the DNA of humans that eat the corn.
D) Only *Bt* resistant insects will survive to reproduce, eventually producing a population of entirely resistant individuals.

(15) What is the primary difference between a liver cell and a skin cell?
A) The cells contain different organelles.
B) The cells undergo different types of cell division.
C) The cells have different shapes and perform different functions in the body.
D) The cells have different numbers of chromosomes and carry different DNA.

(16) Potassium-40 is used to determine the age of rocks. The diagram to the right shows a rock sample in which some of the potassium-40 atoms have undergone radioactive decay. According to the diagram, how many half-lives has the rock sample undergone?

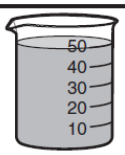
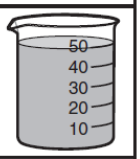
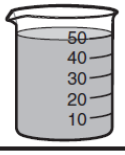
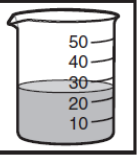
A) 9 half-lives
B) 3 half-lives
C) 2 half-lives
D) 1 half-life



(17) The table to the right shows the amount of evaporation that occurred for two different liquid compounds over the same amount of time. Based on the table, what is the best conclusion about the polarity and hydrogen bonding of the molecules?

A) The water molecules are less polar than the isopropanol molecules and therefore have weaker hydrogen bonding.
B) The water molecules are more polar than the isopropanol molecules and therefore have weaker hydrogen bonding.
C) The water molecules are more polar than the isopropanol molecules and therefore have stronger hydrogen bonding.
D) The water molecules are less polar than the isopropanol molecules and therefore have stronger hydrogen bonding.

Evaporation of Two Compounds

Compound	Molecular Mass (AMU)	Initial	Final
Water	18.0		
Isopropanol	60.1		

(18) What will always happen to a moving object when an unbalanced force acts on it?

A) It will keep traveling at the same speed.
B) It will start to travel in a curved path.
C) It will eventually come to a complete stop.
D) It will have a change in velocity.

(19) What would happen if the genes involved in differentiation were removed from a newly fertilized frog egg?

A) The embryo would develop only one type of cell.
B) The embryo would become a tadpole but not an adult.
C) The adult cells would do every job required by the organism.
D) The adult frog would have cells capable of becoming any other type of cell.

(20) One main function of the kidney is filtering certain minerals from blood and eliminating them from the body. Which two body systems primarily facilitate this function?

A) immune and digestive
B) reproductive and skeletal
C) nervous and respiratory
D) circulatory and excretory

(21) An object with mass 4-kg is moving in a circle with a speed of 2 m/s. What is its linear momentum?

A) 16 kg-m/s
B) 8 kg-m/s
C) 4 kg-m/s
D) 1 kg-m/s

(22) Which of the following best describes how most substances change from a solid to a liquid state?
A) Molecules move closer together.
B) Molecules lose energy.
C) Molecules move farther apart.
D) Molecules slow down.

(23) The likely effect of an increased amount of ozone in Earth's atmosphere is
A) a decrease in the global temperature.
B) an increase in the global temperature.
C) a decrease in the amount of ultraviolet (UV) radiation at the surface.
D) an increase in the amount of ultraviolet (UV) radiation at the surface.

(24) In which population would you expect the most rapid evolutionary change?
A) a small population with a high mutation rate in a changing environment
B) a small population with a low mutation rate in a stable environment
C) a large population with a high mutation rate in a changing environment
D) a large population with a low mutation rate in a stable environment

(25) A surfer paddles out from shore in search of the perfect wave. The surfer has a weight of 500 N and the surfboard weighs 100 N. As a large wave reaches the surfer, she is pushed forward and upward. Which statement about her kinetic and potential energy is correct?
A) There is an increase in her kinetic energy only.
B) There is an increase in her potential energy only.
C) There is no change in her potential or kinetic energy.
D) There is an increase in both her potential and kinetic energy.

(26) Which statement about the offspring that result from sexual reproduction is generally true?
A) The offspring show genetic variation from the parents.
B) The offspring have twice as much genetic material as each parent.
C) The offspring have genetic material identical to that of one another.
D) The offspring have genetic material identical to that of one of the parents.

(27) Which of the following is an example of a nuclear fission reaction?
A) ${}^{8}_{4}\mathrm{Be} + {}^{4}_{2}\mathrm{He} \rightarrow {}^{12}_{6}\mathrm{C}$
B) ${}^{239}_{94}\mathrm{Pu} + {}^{1}_{0}n \rightarrow {}^{137}_{52}\mathrm{Te} + {}^{100}_{42}\mathrm{Mo} + 3\,{}^{1}_{0}n$
C) ${}^{27}_{13}\mathrm{Al} + {}^{4}_{2}\mathrm{He} \rightarrow {}^{30}_{15}\mathrm{P} + {}^{1}_{0}n$
D) ${}^{234}_{90}\mathrm{Th} \rightarrow {}^{234}_{91}\mathrm{Pa} + {}^{0}_{-1}e$

(28) What is the main reason that water can dissolve many different substances?
A) Water has a lower molecular mass than many substances.
B) Water is denser in the liquid phase than in the solid phase.
C) Water molecules attract ions and the charged parts of molecules.
D) Water molecules are larger than the ions or molecules they dissolve.

(29) Why do eukaryotic cells require mitochondria?
A) to break down cell debris for recycling
B) to release stored energy for cell activities
C) to control division for cell reproduction
D) to package materials inside cells for transport

(30) A pebble is dropped from a high vertical cliff. The pebble hits ground below in 1.50 seconds after the pebble is dropped. Ignoring air resistance, with what speed did the pebble hit the ground?

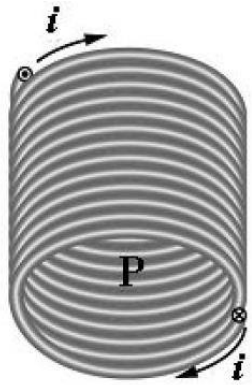
A) 10 m/s
B) 15 m/s
C) 48.6 m/s
D) 100 m/s

(31) A student holds a hand mirror to observe the back of her head while standing in front of and looking into a wall-mirror. If she is standing 4 feet in front of the wall-mirror and she holds the hand-mirror 1 foot behind her head, she will see the back of her head how far behind the wall-mirror?

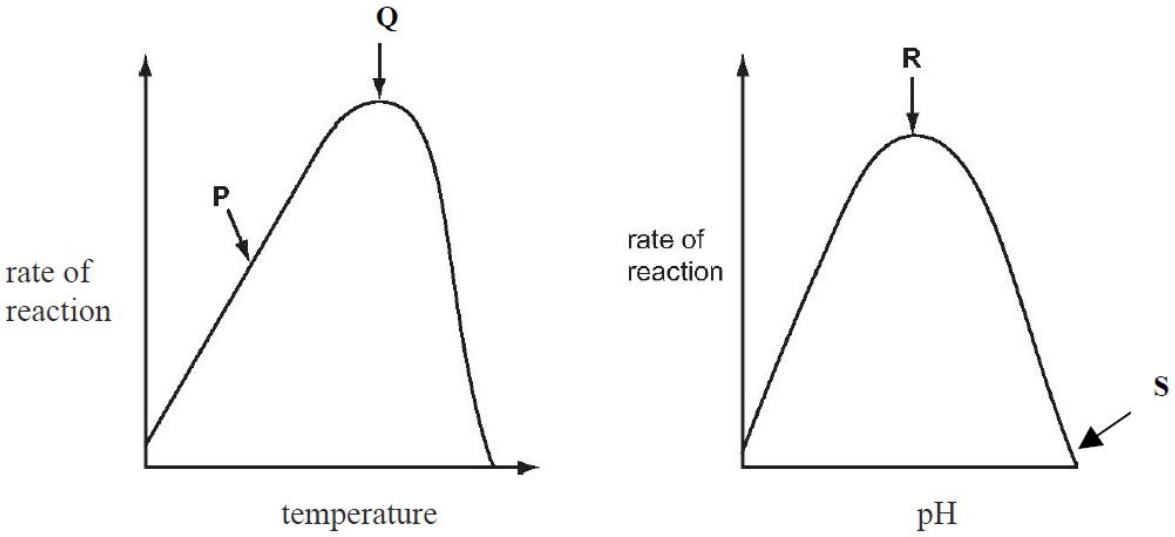
A) 6 feet
B) 5 feet
C) 4 feet
D) 3 feet

(32) The magnetic field line passing through point P inside the solenoid shown to the right is directed

A) to the left.
B) to the right.
C) upward toward the top of this page.
D) downward toward the bottom of this page.



(33) The graphs below show the effects of temperature and pH on enzyme activity. Which statement explains the enzyme activity at the point shown?



A) At P, hydrogen bonds are formed between enzyme and substrate.
B) At Q, the kinetic energy of enzyme and substrate is highest.
C) At R, peptide bonds in the enzyme begin to break.
D) At S, the substrate is completely denatured.

(34) The human body can reduce local blood flow by constricting blood vessels. This is particularly important in
A) thermal regulation.
B) preventing capillary rupture.
C) lengthening the lifespan of red blood cells.
D) absorbing the correct amount of waste carbon dioxide.

(35) The proportion of adenine bases in a sample of DNA was found to be 12%. Which of the following statements is true? The proportion of
A) uracil bases in the sample is 12%.
B) thyroxine bases in the sample is 12%.
C) uracil bases in the sample is 88%.
D) cytosine bases in the sample is 38%.

(36) Removing all lone pairs of electrons on the central atom of ClF_3 would change the geometry from
A) trigonal pyramidal to trigonal planar.
B) from square shaped to trigonal pyramidal.
C) from T–shaped to trigonal planar.
D) from trigonal bipyramidal to trigonal planar.

(37) Select the arrangement below that lists the bonds in order of increasing polarity (that is least polar to most polar).
A) O–F, C–F, Be–F
B) Be–F, O–F, C–F
C) O–F, Be–F, C–F
D) C–F, Be–F, O–F

(38) Which of the following chemical reactions is a decomposition reaction?
A) $3Br_2 + 2FeI_3 \rightarrow 2FeBr_3 + 3I_2$
B) $2Ca + O_2 \rightarrow 2CaO$
C) $BaCO_3 \rightarrow BaO + CO_2$
D) $MgCl_2 + H_2SO_4 \rightarrow MgSO_4 + 2HCl$

(39) The table to the right contains data from one trial in an experiment designed to determine the molar mass of a sample of an unidentified compound X in the gaseous state. Based on the data gathered in this first trial, what is the molar mass of the compound?
A) 19.4 g/mol
B) 28.8 g/mol
C) 32.1 g/mol
D) 144 g/mol

	Trial 1
Mass of gas (g)	6.42
Gas volume (L)	4.48
Density (g/L)	1.43
Temperature (°C)	0.0
Pressure (atm)	1.00

(40) An analysis of a compound used in the production of aluminum is 32.79% sodium, 12.83% aluminum and 54.19% fluorine. What is the empirical formula of the compound?
A) Na_5AlF_8
B) Na_3AlF_3
C) Na_3AlF_6
D) Na_3AlF_5

(41) How many mL of 6.00 M HCl are needed to just react with 10.5 g of metallic zinc to produce H_2?
A) 2.68 mL
B) 535 mL
C) 26.8mL
D) 53.5 mL

(42) The mammalian aorta carries blood away from which chamber(s) of the heart?
A) left atrium
B) left ventricle
C) right atrium
D) right ventricle

(43) Which of the following is present in DNA but not in RNA?
A) adenine
B) uracil
C) thymine
D) guanine

(44) The translational speed of the center of mass of a bowling ball that rolls without slipping along the horizontal section of the ball return is 3.50 m/s. It then moves through a vertical rise of 0.760 m on the way back to the ball rack. If you neglect frictional losses and assume that the mass of the ball is distributed uniformly, then what is the translational speed of the ball at the top of the rise?
A) 1.27 m/s
B) 1.52 m/s
C) 1.52 m/s
D) 4.78 m/s

(45) The first stage of photosynthesis in a chloroplast is
A) light-dependent.
B) glucose-driven.
C) temperature-dependent.
D) ATP-driven.

(46) Which cellular organelle is responsible for packaging the proteins that the cell secretes?
A) cytoskeleton
B) lysosome
C) cell membrane
D) Golgi apparatus

(47) Which of these would be least likely to diffuse across the phospholipid bilayer of a cell membrane?
A) water
B) sodium ions
C) oxygen
D) carbon dioxide

(48) An eagle is flying level to the ground at 8.9 m/s and is carrying a gopher. The gopher manages to break free at a height of 12 m. Disregarding air friction, what is the gopher's speed upon hitting the ground?
A) 8.9 m/s
B) 9.8 m/s
C) 11 m/s
D) 18 m/s

(49) I lack respiratory, excretory, and circulatory systems, have bilateral larva, deuterostome development, and move using a water vascular system. What am I?
A) echinoderm
B) chordate
C) jellyfish
D) mollusc

(50) A population of 100 diploid individuals is in Hardy-Weinberg equilibrium. If there are 16 individuals homozygous for the dominant allele, what is the frequency of the recessive allele?
A) 0.16
B) 0.36
C) 0.40
D) 0.60

(51) Which chemical bonds are considered the strongest, requiring the most energy to break?
A) ionic bonds
B) van der Waals forces
C) hydrogen bonds
D) covalent bonds

(52) Which combination of concurrent forces could not produce equilibrium?
A) 10 Newtons, 20 Newtons, and 50 Newtons
B) 30 Newtons, 40 Newtons, and 50 Newtons
C) 20 Newtons, 30 Newtons, and 50 Newtons
D) 40 Newtons, 40 Newtons, and 50 Newtons

(53) Which of the following is not a unit of energy?
A) kilo-Watt
B) erg
C) Joule
D) Newton-meter

(54) In humans, red-green color-blindness is controlled by a gene on the X chromosome. A man and woman with normal color vision marry. Both of their fathers were color-blind. What is the probability that their first child will be color-blind?

A) $\frac{1}{2}$
B) $\frac{1}{4}$
C) $\frac{1}{3}$
D) $\frac{1}{8}$

(55) Agglutination is the
A) clumping of students in hallways.
B) clumping of platelets to help stop bleeding.
C) clumping of white blood cells around bacteria.
D) clumping of blood cells due to an antibody-antigen reaction.

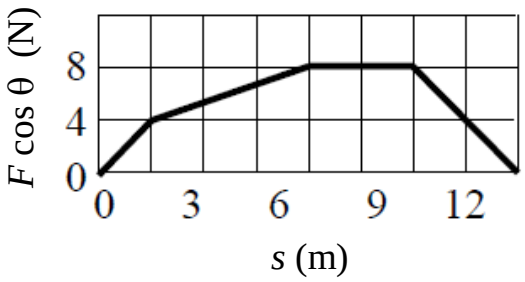
(56) Which field of forensic science involves the scientific study or diagnostic examination of blood serum?
A) odontology
B) anthropology
C) serology
D) toxicology

(57) A block with volume equal to 0.600 m^3 is entirely submerged in water. What is the magnitude of the net – buoyant – force exerted by the water on the block?
A) 0.600 Newtons
B) 9.80 Newtons
C) 5.89 Newtons
D) 5,890 Newtons

(58) The position of a particle moving along the x axis is given by $x = 6.0t^2 - 1.0t^3$, where x is in meters and t in seconds. What is the position of the particle when it achieves its maximum speed in the positive x direction?
A) 16 meters
B) 20 meters
C) 24 meters
D) 32 meters

(59) An astronaut orbits the earth in a space capsule whose height above the earth is equal to the earth's radius. How does the weight of the astronaut in the capsule compare to her weight on the earth?
A) Her weight is equal to her weight on earth.
B) Her weight is equal to one-fourth her weight on earth.
C) Her weight is equal to one-half of her weight on earth.
D) Her weight is equal to one-third of her weight on earth.

(60) The force component acting on an object along the displacement varies with the displacement s as shown in the graph to the right. Determine the work done on the object as it travels from $s = 0.0$ to 12 meters.
A) 48 Joules
B) 57 Joules
C) 66 Joules
D) 72 Joules



2018 TAME High School Practice State Science Test
Answer Key

(1)	D	(21)	B	(41)	D
(2)	A	(22)	C	(42)	B
(3)	C	(23)	C	(43)	C
(4)	C	(24)	A	(44)	A
(5)	B	(25)	D	(45)	A
(6)	D	(26)	A	(46)	D
(7)	B	(27)	B	(47)	B
(8)	A	(28)	C	(48)	D
(9)	A	(29)	B	(49)	A
(10)	A	(30)	B	(50)	D
(11)	B	(31)	A	(51)	D
(12)	D	(32)	C	(52)	A
(13)	D	(33)	A	(53)	A
(14)	D	(34)	A	(54)	D
(15)	C	(35)	D	(55)	B
(16)	C	(36)	C	(56)	C
(17)	C	(37)	A	(57)	D
(18)	A	(38)	C	(58)	A
(19)	A	(39)	C	(59)	B
(20)	D	(40)	C	(60)	C