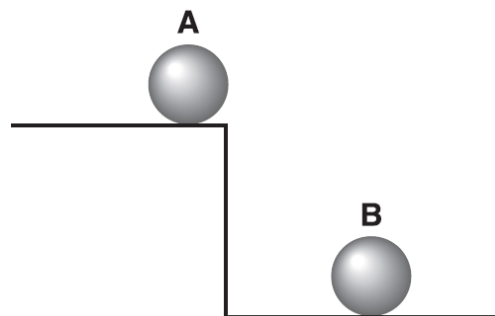


2018 TAME High School Science Test – Official Divisional

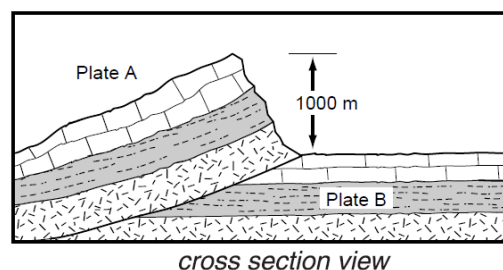
- (1) Which of the following is the most important factor in determining an element's place in the periodic table?
- A) number of protons
B) atomic charge
C) number of neutrons
D) atomic density
- (2) Which of the following trophic levels would have the least amount of available energy?
- A) producers
B) second order consumers
C) first order consumers
D) third order consumers
- (3) Atom X has 9 protons, 10 neutrons and 9 electrons, while Atom Y has 9 protons, 9 neutrons and 9 electrons. Which of the following statements best describes how Atom X and Atom Y are related?
- A) X and Y are isotopes of the same element.
B) X and Y are different elements.
C) X is an ion and Y is a neutral atom.
D) X is neon and Y is fluorine.
- (4) Which of the properties of gold would be most useful to test if an object is made of pure gold, without damaging it?
- A) Gold's melting point is 1065° C.
B) Gold is an excellent conductor of electricity.
C) Gold is one of the few metals that is colored.
D) Gold's density is 19.3 grams per cubic centimeter.

- (5) The diagram to the right shows two bowling balls of equal mass. Ball A is resting near the edge of a shelf. Ball B is resting on the ground below. Which of these statements best describes the diagram above?
- A) Ball A has more kinetic energy than Ball B.
B) Ball B has more kinetic energy than Ball A.
C) Ball A has more potential energy than Ball B.
D) Ball B has more potential energy than Ball A.



- (6) Which statement about the formation of rocks is true?
- A) Weathering and erosion prevent magma from changing into igneous rock.
B) Weathering and erosion can change sedimentary rock into sediment.
C) Heat and pressure cause metamorphic rock to weather and erode.
D) Heat and pressure can change igneous rock to sedimentary rock.

- (7) How was the mountain shown to the right most likely formed?
- A) Plates A and B are moving towards each other.
B) Plates A and B are moving apart from each other.
C) Plate A is moving away, and Plate B is stationary.
D) Plate A is stationary, and Plate B is moving away.



- (8) Water is lost to the abiotic parts of the biosphere from the biotic parts by the process of
- A) transpiration.
B) precipitation.
C) photosynthesis.
D) infiltration.

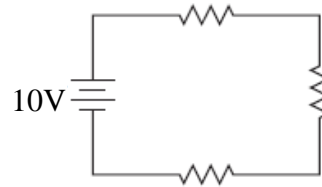
- (9) In what part of photosynthesis, named after its discoverers, is NADPH used to produce 3-carbon sugar phosphate molecules?
- A) Photo Cycle
 - B) Nadine Cycle
 - C) Calvin Cycle
 - D) Phosphate Cycle

- (10) What does an increase of 1°C equate to in degrees Fahrenheit?
- A) 0.9°F
 - B) 1.8°F
 - C) 3.2°F
 - D) -0.9°F

- (11) How many joules are in a single watt-hour?
- A) 3,600 Joules
 - B) 6,000,000 Joules
 - C) 6,000 Joules
 - D) 360 Joules

- (12) Which of the following is a molecule having a nonpolar covalent bond?
- A) bromine gas
 - B) water
 - C) hydrogen fluoride
 - D) hydrogen bromide

- (13) A series circuit is shown in the diagram to the right. What is the total resistance of the circuit if the current is 2 Amps?



- A) 5.0 Ω
- B) 6.6 Ω
- C) 15 Ω
- D) 60 Ω

- (14) Animals such as elk, beavers, and birds depend on quaking aspen trees for survival. Which statement describes how the carbon cycle connects the quaking aspen trees and the animals that depend on the trees for survival?

- A) The trees create carbon that the animals use to make strong bones.
- B) The trees convert carbon from the atmosphere into usable energy for the animals.
- C) The trees trap oxygen in their leaves and release carbon dioxide that the animals breathe.
- D) The trees remove carbon from the animals and transfer it to the soil through the tree roots.

- (15) A scientist detects an electromagnetic wave with a wavelength of 3.0×10^{-4} meters. How do the wavelength and energy of this wave compare to the wavelength and energy of visible light?

- A) This wave has a longer wavelength and lower energy than visible light.
- B) This wave has a longer wavelength and higher energy than visible light.
- C) This wave has a shorter wavelength and lower energy than visible light.
- D) This wave has a shorter wavelength and higher energy than visible light.

- (16) Which information is provided by the binomial nomenclature system when used to name newly discovered organisms?

- A) the age of a species
- B) the relatedness of a species
- C) the ancestry of a species
- D) the environment where a species lives

- (17) Which organelle found in both animal and plant cells can a student see with a light microscope?

- A) cell wall
- B) flagellum
- C) chloroplast
- D) nucleus

- (18) What is a type of learned behavior acquired during a critical sensitive period that is influenced by a significant innate component?
- A) inclusive fitness
B) altruistic behavior
C) imprinting
D) relatedness
- (19) What is a major plant hormone highly concentrated in the apical meristems of shoots and roots and responsible for cell elongation?
- A) bacteroid
B) cytokinins
C) auxin
D) cation
- (20) A rock sample contains 80 g of a potassium-40 (K_{19}^{40}) isotope with a half-life of 1.25 billion years. How much of the potassium-40 isotope will remain after 2.5 billion years have passed?
- A) 0 grams
B) 40 grams
C) 20 grams
D) 80 grams
- (21) Research has led scientists to conclude that fevers help the human body fight infection by elevating body temperatures and causing parts of the immune system to work better. Which statement does this conclusion best support?
- A) Fevers are a disruption of homeostasis.
B) Fevers are rarely caused by bacterial infections.
C) Fevers should immediately be treated with medication.
D) Fevers are a necessary part of maintaining homeostasis.
- (22) Daniel used a portable electric drill to remove screws from a broken wooden table. He noticed that the screws holding the table together were warm to the touch after being removed from the wood. What explains this phenomenon?
- A) Thermal energy from the drill was converted into mechanical energy due to inertia.
B) Mechanical energy from the drill was converted into thermal energy due to friction.
C) Electrical energy from the drill was converted into chemical energy due to resistance.
D) The process of removing the screw concentrated the thermal energy that was already present in the wood.
- (23) What structure is absent in the cells of fungi thereby preventing them from performing photosynthesis?
- A) cilia
B) chloroplasts
C) nuclei
D) mitochondria
- (24) What are two pieces of evidence, which would be the responsibility of the Firearms Unit?
- A) discharged bullets and blood
B) wood and alcohol
C) cartridge cases and discharged bullets
D) ammunition and blood
- (25) If defensive wounds are found on the victim, where would you look for evidence of the identity of the perpetrator and what would you hope to find?
- A) perpetrator's face
B) victim's finger nails
C) perpetrator's finger nails
D) victim's hands
- (26) What is the most important risk for testicular cancer in young males?
- A) smoking
B) non-descent of the testes
C) a diet high in fat
D) sexually transmitted diseases

- (27) What type of RNA is responsible for bringing the amino acids to the "factory" site for protein formation?
A) tRNA
B) sRNA
C) mRNA
D) rRNA
- (28) Which of the following is an example of a physical change?
A) ice melting to become water
B) fermenting grapes to make wine
C) digestion of food
D) the formation of DNA from its building blocks
- (29) Which of the following would cross a cell membrane most easily?
A) amino acid
B) protein
C) starch
D) lipid-soluble substance
- (30) What are cyanobacteria?
A) heterotrophic prokaryotes
B) autotrophic prokaryotes
C) heterotrophic eukaryotes
D) autotrophic eukaryotes
- (31) Which one of the following electron configurations is not possible?
A) $1s^2 2s^2 2p^6$
B) $1s^2 2s^2 2p^6 3s^2$
C) $1s^2 2s^2 2p^5 3s^1$
D) $1s^2 2s^3 2p^5 3s^2$
- (32) How many *d*-electrons does a Cr^{3+} ion have?
A) 3
B) 2
C) 1
D) 0
- (33) What triggers the development of a plant seed from an ovule?
A) fertilization
B) pollination
C) changes in humidity
D) environmental cues such as shortened daylength
- (34) Centrioles
A) hold sister chromatids together during metaphase.
B) are duplicated before cell division.
C) are only present during cell division.
D) consist of DNA and histones.
- (35) Drifting freely in the upper waters of the ocean, a diverse biological community exists, primarily consisting of microscopic organisms called
A) algae.
B) detritus.
C) plankton.
D) bacteria.
- (36) If the net force acting on a 5.0-kg object is 12 Newtons, the object's acceleration is equal to which of the following?
A) 0.24 m/s^2
B) 2.4 m/s^2
C) 0.60 m/s^2
D) 6.0 m/s^2

(37) Which of the following elements is a nonmetal?

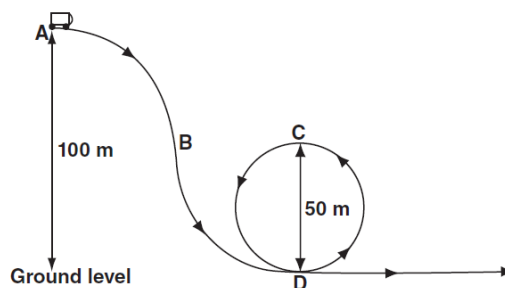
- A) Li
 B) Mn
 C) Se
 D) Ba

(38) Which of the following best describes the chemical equation $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$?

- A) Balanced chemical equation for a combustion reaction
 B) Unbalanced chemical equation for a decomposition reaction
 C) Unbalanced chemical equation for a combustion reaction
 D) Balanced chemical equation for a decomposition reaction

(39) Looking at the illustration to the right, at which two positions will the kinetic energy of the roller coaster car be most similar?

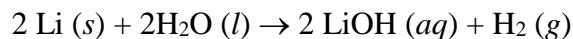
- A) A and B
 B) A and C
 C) B and D
 D) B and C



(40) Which best describes alpha particles?

- A) They are attracted to negative electric fields.
 B) They can penetrate concrete blocks.
 C) They are composed of beta particles.
 D) They are products of chemical reactions.

(41) What type of chemical reaction is represented by the equation below?



- A) decomposition
 B) single replacement
 C) double replacement
 D) synthesis

(42) Which statement best describes the atoms of elements that form compounds by covalent bonding?

- A) They share electrons between them.
 B) They have a large difference in atomic mass.
 C) They are in the same period in the periodic table.
 D) They have a large difference in valence electron number.

(43) Two copper spheres have the following properties. They are identical in size and mass. Sphere 1 is negatively charged, and Sphere 2 is neutral. What will be the result when the two spheres are allowed to touch?

- A) Sphere 1 will become positively charged.
 B) Sphere 2 will become positively charged.
 C) Both spheres will become negatively charged equal to the initial charge of Sphere 1.
 D) Both spheres will become negatively charged less than the initial charge of Sphere 1.

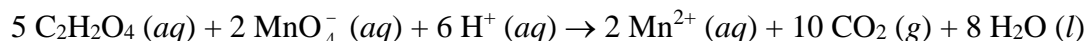
(44) What is the pH of a solution in which 35.0 mL of 0.067 mol L^{-1} of $\text{Ba}(\text{OH})_2$ is mixed with 50.0 mL of 0.050 mol L^{-1} HBr?

- A) 15.00
 B) 12.41
 C) 7.00
 D) 1.59

- (45) A mixed oxide has the formula X_7O_8 . If element X exists as both X^{2+} and X^{3+} in the compound, what is the ratio of $\frac{X^{2+}}{X^{3+}}$?

A) 0.875
B) 1.14
C) 2.29
D) 2.50

- (46) Oxalic acid, $C_2H_2O_4$, reacts with the permanganate ion according to the equation below:



If 25.0 mL of $0.0150 \text{ mol L}^{-1} KMnO_4$ reacts with 25.0 mL of $0.0208 \text{ mol L}^{-1} C_2H_2O_4$, how many moles of carbon dioxide gas will be produced?

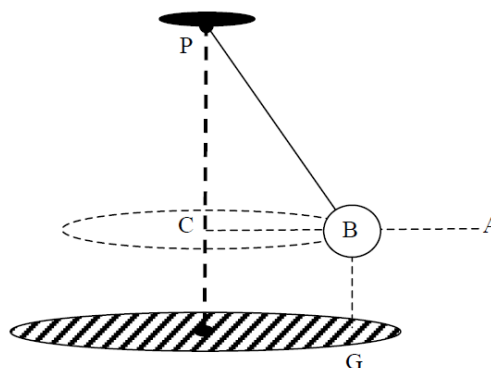
A) $3.75 \times 10^{-4} \text{ mol}$
B) $1.04 \times 10^{-3} \text{ mol}$
C) $8.95 \times 10^{-4} \text{ mol}$
D) $1.88 \times 10^{-3} \text{ mol}$

- (47) Two coplanar forces pull on an object. One has a magnitude of 120.0 Newtons and acts in a direction 145° counter clockwise from the positive x-axis. The other force has a magnitude of 80.0 Newtons (N) and acts in a direction 30.0° clockwise from the positive x-axis. What is the net y-component of force acting on the object?

A) 0.00 Newtons
B) 36.3 Newtons
C) 28.8 Newtons
D) 109 Newtons

- (48) A tetherball moves at constant speed around a circular arc in a horizontal plane as shown in the diagram to the right. At the instant shown, what is the direction of the ball's acceleration?

A) B to G
B) B to C
C) B to P
D) B to A



- (49) Two long straight wires are parallel to each other. One carries a current of 10.0 Amps and the other carries a current of 35.0 Amps in the opposite direction. The magnitude of the magnetic force per length acting on the two wires is $6.61 \times 10^{-3} \text{ N/m}$. What is the distance between the axes of the two wires?

A) 1.06 cm
B) 32.6 cm
C) 6.65 cm
D) 2.05 m

- (50) What is the energy of photons of wavelength 560 nm?

A) 2.21 eV
B) $5.55 \times 10^{-20} \text{ J}$
C) 2.21 J
D) $5.55 \times 10^{-20} \text{ eV}$

- (51) A spring whose spring constant is 675 N/m is compressed until the resisting force in the spring is 832 Newtons. How much elastic potential energy is then stored in the spring?

A) 1.23 Joules
B) 256 Joules
C) 513 Joules
D) $1.03 \times 10^3 \text{ Joules}$

- (52) Two rifles are fired horizontally from the same height. One bullet leaves the barrel with a speed of 350 m/s while the second bullet leaves with a speed of 450 m/s. Ignoring air friction, and assuming that the ground is horizontal and level, what is the ratio of the first bullet's time of flight to the second bullet's time of flight?
- A) 0.60
B) 0.78
C) 1.0
D) 1.3
- (53) Several identical charged particles, each with charge Q and mass M , move in a region of uniform magnetic field B . The only force any of the particles experience is the magnetic force due to this field; consequently, they are all traveling on circular paths of different radii and at different speeds. The speed of any single particle
- A) remains constant.
B) increases at a rate determined solely by the magnitude of B .
C) decreases at a rate determined solely by the magnitude of B .
D) changes in a manner depending on both the magnitude and direction of B .
- (54) An AC generator involving rotating loops of conducting wire cannot operate unless the loops are subjected to
- A) an external electric field.
B) an external magnetic field.
C) both electric and magnetic fields, which are parallel.
D) both electric and magnetic fields, pointing in opposite directions.
- (55) If you triple your distance from a sound source, the ratio of the new intensity that you hear to the old intensity that you heard will be
- A) $\frac{1}{9}$
B) $\frac{1}{3}$
C) $\frac{1}{\sqrt{3}}$
D) 3
- (56) A traveling transverse wave on a string described by the equation $y(x,t) = 6.0 \sin \left[2\pi \left(\frac{t}{0.01} - \frac{x}{25} \right) \right]$, where x and y are in centimeters and t is in seconds. What is the speed of this wave?
- A) 398 cm/s
B) 796 cm/s
C) 2.50×10^3 cm/s
D) 3.77×10^3 cm/s
- (57) What are the most basic types of crime scene recording methods?
- A) note taking, fingerprinting, DNA testing
B) note taking, photography, sketching
C) photography, mass spectrometry, fingerprinting
D) sketching, photography, DNA testing
- (58) What substance is used to recover latent fingerprints and gives a purple print after processing?
- A) Ninhydrin
B) Super Glue Fuming
C) Silver Nitrate
D) Tri-Nitro Toluene

- (59) What is a major advantage of using wind energy instead of coal or nuclear power plants?
- A) Wind is a renewable energy source.
 - B) Wind is consistently available in all locations.
 - C) Windmills reduce the strength of severe storms.
 - D) A single windmill produces more energy than a nuclear plant.
- (60) A student wanted to design an experiment to determine the effect of nitrates on algae growth. Which procedure would create the most valid results?
- A) One needs to vary both the temperature and the amounts of nitrates.
 - B) One needs to keep the temperature constant and vary the amount of nitrates.
 - C) One needs to vary the temperature and keep the amount of nitrates constant.
 - D) One needs to keep both the temperature and the amount of nitrates constant.

2017 – 2018 TAME High School Division Science Test Answer Key

(1) A
(2) D
(3) A
(4) D
(5) C
(6) B
(7) A
(8) A
(9) C
(10) B
(11) A
(12) A
(13) A
(14) B
(15) A
(16) B
(17) D
(18) C
(19) C
(20) C

(21) D
(22) B
(23) B
(24) C
(25) B
(26) B
(27) A
(28) A
(29) D
(30) B
(31) D
(32) A
(33) A
(34) B
(35) C
(36) B
(37) C
(38) C
(39) D
(40) A

(41) B
(42) A
(43) D
(44) B
(45) D
(46) B
(47) C
(48) B
(49) A
(50) A
(51) C
(52) C
(53) A
(54) B
(55) A
(56) C
(57) B
(58) C
(59) A
(60) B