

## NATIONAL DOUBLE ELIMINATION - 3

### TOSS-UP

1. ERSC; Multiple Choice: The A horizon in a soil profile has more of which of the following than the other horizons?

(W) humus  
(X) sediments  
(Y) minerals  
(Z) all of the above

ANSWER: Z- ALL OF THE ABOVE

### BONUS

1. ERSC; Multiple Choice: The minerals found in the B and C horizons were dissolved and carried down to those soil layers by a process called

(W) oxidation.  
(X) leaching.  
(Y) weathering.  
(Z) precipitation.

ANSWER: X- LEACHING

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### TOSS-UP

2. CHEM; Multiple Choice: At chemical equilibrium, which of the following is always true of the concentrations of reactants and products?

(W) They are constant.  
(X) They are equal.  
(Y) Reactant concentration is zero.  
(Z) Product concentration is zero.

ANSWER: W- THEY ARE CONSTANT

### BONUS

2. CHEM; Multiple Choice: Any chemical reaction in which the products can regenerate the reactants is called

(W) a double-replacement reaction.  
(X) a single-replacement reaction.  
(Y) a reversible reaction.  
(Z) an irreversible reaction.

ANSWER: Y- A REVERSIBLE REACTION

TOSS-UP

3. COMP; Multiple Choice: All of the following are pointing devices except

(W) pointer.  
(X) joystick.  
(Y) mouse.  
(Z) trackball.

ANSWER: W- POINTER

BONUS

3. COMP; Multiple Choice: A prescribed set of well-defined instructions for solving mathematical problems is called

(W) a compiler.  
(X) a code.  
(Y) a description.  
(Z) an algorithm.

ANSWER: Z-ALGORITHM

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TOSS-UP

4. BIOL; Multiple Choice: The type of plasma protein that helps regulate osmotic pressure is

(W) albumin.  
(X) globulin.  
(Y) fibrinogen.  
(Z) hemoglobin.

ANSWER: W- ALBUMIN

BONUS

4. BIOL; Multiple Choice: Platelets are formed in bone marrow when small pieces of cytoplasm are pinched off the

(W) white blood cells.  
(X) red blood cells.  
(Y) megakaryocytes.  
(Z) bone cells.

ANSWER: Y- MEGAKARYOCYTES

## TOSS-UP

5. PHYS; Multiple Choice: In a third-class lever, the
- (W) fulcrum is between the effort force and the resistance force.  
(X) effort force is between the resistance force and the fulcrum.  
(Y) resistance force is between the effort force and the fulcrum.  
(Z) none of these

ANSWER: X– EFFORT FORCE IS BETWEEN THE RESISTANCE FORCE AND THE FULCRUM

## BONUS

5. PHYS; Short Answer: A new neutron source is being proposed in which a beam of protons smashes into a target of liquid mercury. What is the term applied to this type of neutron production?

ANSWER: SPALLATION

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## TOSS-UP

6. GENR; Multiple Choice: Which of the following elements was UNKNOWN to ancient civilizations?

- (W) tin  
(X) aluminum  
(Y) mercury  
(Z) sulfur

ANSWER: X– ALUMINUM

## BONUS

6. GENR; Short Answer: Iron is the principal element in steel. What is the second most abundant element in steel?

ANSWER: CARBON

**TOSS-UP**

7. CHEM; Multiple Choice: The reaction quotient is used to determine if a reaction  
(W) is at equilibrium.  
(X) is reversible.  
(Y) occurs rapidly.  
(Z) releases heat.

**ANSWER: W– IS AT EQUILIBRIUM**

**BONUS**

7. CHEM; Multiple Choice: Who first formulated the law of mass action?  
(W) Haber  
(X) Le Chatelier (pron: luh shot-lee-ay)  
(Y) Arrhenius (pron: ar-reen-knee-us)  
(Z) Guldberg and Waage

**ANSWER: Z– GULDBERG AND WAAGE**

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**TOSS-UP**

8. ASTR; Multiple Choice: The term Zodiac means  
(W) Lunar Mansions.  
(X) Twelve.  
(Y) Cycle of Animals.  
(Z) Road of the Sun.

**ANSWER: Y– CYCLE OF ANIMALS**

**BONUS**

8. ASTR; Short Answer: Between the Vernal Equinox and the Autumnal Equinox, within one, approximately how many hours does the Right Ascension of the Sun change?

**ANSWER: 12 (ACCEPT 11-13)**

**TOSS-UP**

9. BIOL; Multiple Choice: In the kidneys, much of the fluid of the blood filters directly into a  
(W) glomerulus.  
(X) loop of Henle.  
(Y) Bowman's capsule.  
(Z) collecting tubule.

ANSWER: Z– COLLECTING TUBULE

**BONUS**

9. BIOL; Multiple Choice: Sugar is removed from the filtrate by  
(W) osmosis.  
(X) active transport.  
(Y) the renal artery.  
(Z) the renal vein.

ANSWER: X– ACTIVE TRANSPORT

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**TOSS-UP**

10. MATH; Multiple Choice: Rene Descartes and Pierre Fermat are credited with the development of what particular area of mathematics?  
(W) analytical geometry  
(X) trigonometry  
(Y) algebra  
(Z) calculus

ANSWER: W– ANALYTICAL GEOMETRY

**BONUS**

10. MATH; Short Answer: What is the square root of  $12 \frac{1}{4}$  (read: 12 and one-fourth)?

ANSWER:  $\sqrt{2}$  OR 3.5 OR  $3\frac{1}{2}$

### TOSS-UP

11. PHYS; Multiple Choice: To create an enlarged real image using a concave mirror, the object must be placed

(W) beyond the center of curvature.  
(X) at the focus.  
(Y) closer than the focus.  
(Z) between the center of curvature and the focus.

ANSWER: Z– BETWEEN THE CENTER OF CURVATURE AND THE FOCUS

### BONUS

11. PHYS; Multiple Choice: A car traveling at a constant velocity of 20 meters per second passes a second car that is initially at rest. The car that was at rest starts accelerating at 10 meters per second squared the moment it is passed by the first car. They will meet again in

(W) 2 seconds.  
(X) 4 seconds.  
(Y) 6 seconds.  
(Z) 8 seconds.

ANSWER: X– 4 SECONDS

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### TOSS-UP

12. CHEM; Multiple Choice: The principle that relates changes imposed on equilibrium systems to equilibrium position is

(W) Haber's law.  
(X) the law of chemical equilibrium.  
(Y) Le Chatelier's principle. (pron: luh shot-lee-ay's)  
(Z) Avogadro's principle.

ANSWER: Y– LE CHATELIER'S PRINCIPLE

### BONUS

12. CHEM; Multiple Choice: The equilibrium constant provides information on all of the following except the

(W) relative concentrations of reactants and products.  
(X) equilibrium position.  
(Y) extent to which reaction proceeds to completion.  
(Z) time required to reach equilibrium.

ANSWER: Z– TIME REQUIRED TO REACH EQUILIBRIUM

**TOSS-UP**

13. COMP; Multiple Choice: A continuous electric signal in the form of a wave is called  
(W) frequency.  
(X) amplitude.  
(Y) analog.  
(Z) modulation.

ANSWER: Y- ANALOG

**BONUS**

13. COMP; Multiple Choice: Circuitry on credit-card-size cards that can be inserted into slots connected to the motherboard are called  
(W) RAM cards.  
(X) flash memory.  
(Y) controller cards.  
(Z) data cards.

ANSWER: X- FLASH MEMORY

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**TOSS-UP**

14. BIOL; Multiple Choice: Prostaglandins are synthesized and secreted by the  
(W) beta cells of the pancreas.  
(X) alpha cells of the pancreas.  
(Y) tissues upon which they act.  
(Z) ovaries and testes.

ANSWER: Y- TISSUES UPON WHICH THEY ACT

**BONUS**

14. BIOL; Multiple Choice: In the action of steroid hormones, the hormone-receptor complex  
(W) activates genes.  
(X) involves a second messenger.  
(Y) acts directly on the blood.  
(Z) acts directly on the liver.

ANSWER: W- ACTIVATES GENES

### TOSS-UP

15. ASTR; Multiple Choice: The phenomena of “retrograde motion” is observed

- (W) when an inferior planet overtakes and passes the Earth.
- (X) when a superior planet is at opposition.
- (Y) when a superior planet is near conjunction with the Sun.
- (Z) for all planets when they reach greatest elongation.

ANSWER: X- WHEN A SUPERIOR PLANET IS AT OPPOSITION

### BONUS

15. ASTR; Multiple Choice: Why are southern hemisphere winters slightly warmer than northern hemisphere winters?

- (W) The Earth is closer to the Sun during that period
- (X) El Nino occurs in the southern hemisphere
- (Y) The southern hemisphere has a greater ratio of ocean to land
- (Z) The southern hemisphere has a greater ratio of land to ocean

ANSWER: Y- THE SOUTHERN HEMISPHERE HAS A GREATER RATIO OF OCEAN TO LAND

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### TOSS-UP

16. PHYS; Multiple Choice: In the fission of U-235 (read: U-235), what is the average number of neutrons produced in the fission reaction?

- (W) 1.5
- (X) 2.5
- (Y) 3.5
- (Z) 4.5

ANSWER: X-- 2.5

### BONUS

16. PHYS; Multiple Choice: When radiation breaks an electron pair bond in a molecule and each fragment of the molecule gets one of the bond electrons, the molecular fragments that are formed are called

- (W) ions.
- (X) free radicals.
- (Y) stable molecules.
- (Z) gases.

ANSWER: X- FREE RADICALS

### TOSS-UP

17. CHEM; Multiple Choice: The process in which an ionic solid dissolves in a polar liquid is called  
(W) ionization.  
(X) precipitation.  
(Y) dissolution.  
(Z) hydrolysis.

ANSWER: Y- DISSOLUTION

### BONUS

17. CHEM; Multiple Choice: Who developed a practical method for converting hydrogen and atmospheric nitrogen to ammonia?  
(W) Haber  
(X) Le Chatelier (pron: luh shot-lee-ay)  
(Y) Arrhenius (pron: ar-reen-knee-us)  
(Z) Guldberg and Waage

ANSWER: W- HABER

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### TOSS-UP

18. ERSC; Multiple Choice: Hawaii's black sands form from  
(W) olivine.  
(X) quartz.  
(Y) basalt.  
(Z) coral and shell fragments.

ANSWER: Y- BASALT

### BONUS

18. ERSC; Multiple Choice: Jamaica's white sands are made of  
(W) olivine.  
(X) quartz.  
(Y) basalt.  
(Z) coral and shell fragments.

ANSWER: Z- CORAL AND SHELL FRAGMENTS

**TOSS-UP**

19. GENR; Multiple Choice: Which of the following is NOT a significant source of methane gas, a powerful “greenhouse” gas

(W) cattle.  
(X) marshlands.  
(Y) wheat farming.  
(Z) termites.

**ANSWER: Y– WHEAT FARMING**

**BONUS**

19. GENR; Short Answer: In humans, how many varieties of twins are there?

**ANSWER: FIVE**

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**TOSS-UP**

20. PHYS; Multiple Choice: In EXTRA-TERRESTRIAL SPACE, heat is transferred by

(W) conduction.  
(X) convection.  
(Y) conduction and convention.  
(Z) radiation.

**ANSWER: Z– RADIATION**

**BONUS**

20. PHYS; Short Answer: The position of a particle with respect to time is given by the equation:  $x = t^3 + 2$ , where  $x$  is in feet and  $t$  is in seconds. What is the acceleration, in feet per second squared, of the particle at a time of 2 seconds?

**ANSWER: 12 (FEET PER SECOND SQUARED)**

**TOSS-UP**

21. BIOL; Short Answer: Sponges are in which phylum?

**ANSWER: PORIFERA**

**BONUS**

21. BIOL; Multiple Choice: Parathyroid hormone regulates the calcium levels of the blood by

- (W) decreasing uptake of calcium from the digestive system.
- (X) increasing reabsorption of calcium in the kidneys.
- (Y) altering the rate of calcium metabolism.
- (Z) increasing the release of calcium from bones.

**ANSWER: X- INCREASING REABSORPTION OF CALCIUM IN THE KIDNEYS**

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**TOSS-UP**

22. CHEM; Short Answer: Who discovered the concept of atomic number?

**ANSWER: MOSELEY**

**BONUS**

22. CHEM; Multiple Choice: What substance is used to improve the clarity of X-rays of the gastrointestinal tract?

- (W) barium sulfate
- (X) barium chloride
- (Y) calcium chloride
- (Z) silver chloride

**ANSWER: W- BARIUM SULFATE**

**TOSS-UP**

23. PHYS; Short Answer: The velocity of a ball tossed vertically into the air is expressed by the equation  $v(t) = -32t + 4$  (read: v at time t equals negative 32t plus 4), where t is given in seconds. Give the velocity of the ball when it reaches its highest point.

ANSWER: 0

**BONUS**

23. PHYS; Multiple Choice: An object is located 1 meter in front of a converging lens having a focal length of 20 centimeters. At what distance behind the lens (whose thickness is negligible) will the image be formed?

- (W) 18 centimeters  
(X) 20 centimeters  
(Y) 22 centimeters  
(Z) 25 centimeters

ANSWER: Z- 25 CENTIMETERS

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**TOSS-UP**

24. MATH; Short Answer: The sum of two numbers is 12. The difference in the two numbers is 2. What is the product of the two numbers?

ANSWER: 35

**BONUS**

24. MATH; Short Answer: Willard charged \$170 on his new credit card. He pays off \$120 of the \$170. Interest is charged on the balance at 2% per month. How much does he need in order to pay off the balance of the debt next month?

ANSWER: \$51

**TOSS-UP**

25. BIOL; Short Answer: The bones known as the malleus and incus are vital to what bodily function?

**ANSWER: HEARING**

**BONUS**

25. BIOL; Multiple Choice: Violent muscular spasms and contractions result from the removal of the

- (W) thyroid gland.
- (X) posterior pituitary.
- (Y) adrenal glands.
- (Z) parathyroid gland.

**ANSWER: Z – PARATHYROID GLAND**