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QUESTION 1

Which of the following, when reacted with benzene, will direct an ortho/para configuration?

- A. -COOH
- B. -Cl
- C. -CH₃
- D. NO₂
- E. 2 of the above

Correct Answer: E

Halogens, such as Cl⁻ and R groups, such as CH₃, both direct benzene in an ortho/para configuration. The other answer choices direct in a meta configuration. Know ortho/para/meta along with activating and deactivating groups from the heart!

QUESTION 2

Which of the following gives the correct order of electromagnetic radiation from the lowest frequency to the highest frequency?

- A. microwaves, UHF radio waves, x-rays, visible light
- B. UHF radio waves, microwaves, visible light, x-rays
- C. microwaves, visible light, x-rays, UHF radio waves
- D. microwaves, x-rays, visible light, UHF radio waves

Correct Answer: B

Radio waves have the lowest frequency and the longest wavelength. Microwaves also have low frequencies and long wavelengths compared to visible light. X-rays are highly energetic and have higher frequencies and smaller wavelengths than visible light.

QUESTION 3

Which of the following is false in regards to food pyramids?

- A. As the pyramid ascends, there is less energy.
- B. As the pyramid ascends, there is less mass.
- C. As the pyramid descends, there is more mass.
- D. As the pyramid descends, there is fewer organisms.

E. Algae would be found at the bottom of the pyramid.

Correct Answer: D

As the pyramid descends, there are more organisms.

QUESTION 4

Which algebraic expression best represents the following statement: the number of books Brian read over the summer (B) is 2 less than 3 times the number of books his brother Adam read over the summer (A)?

A. $B = 3A - 2$

B. $B = 3A + 2$

C. $A = 3B - 2$

D. $A = 3B + 2$

Correct Answer: A

QUESTION 5

Which of the following functions is NOT controlled by the hypothalamus?

A. Hunger

B. Thirst

C. Sex drive

D. Blood pressure

E. Balance

Correct Answer: E

With the exception of the balance, all of the following are controlled by the hypothalamus. Balance is controlled by the cerebellum.

QUESTION 6

The difference between one half of a number and one eighth of a number is 15. What is this number?

A. 32

B. 40

C. 48

D. 56

E. 64

Correct Answer: B

Start with 32. If you half it, that is 16. One eighth of 32 is 4. Thus the difference between these numbers is 12.

Proceed to 40. Half of 40 = 20. One eighth of 40 is 5. Thus, the difference is $20 - 5 = 15$, which is the answer.

QUESTION 7

Which of the following elements do not belong with the others?

- A. Boron
- B. Aluminium
- C. Silicon
- D. Germanium
- E. Arsenic

Correct Answer: B

The answer choices are all metalloids except Aluminium.

QUESTION 8

Which statement best explains why the work done by a gravitational force on an object does not depend on the path the object takes?

- A. Work depends on the path when there is friction. The longer the path the more energy is required to overcome friction.
- B. Gravitational fields that arise from the interaction between point masses always produce elliptical paths of motion.
- C. A falling object experiences a change in potential energy.
- D. When an object falls down the work done by gravity is positive and when an object is thrown up the work done by gravity is negative.

Correct Answer: C

To determine how much work is done by a gravitational force, you should calculate the change in that object's potential energy = mgh , where m = mass, g = the gravitational acceleration 9.8 m/s^2 and h = height. Therefore, the work done only depends on the change in height and not on the path taken. In Answer [Work depends on the path when...], the work done by gravity doesn't have anything to do with friction, so this is not a good explanation. Friction is a separate force. Answer [When an object falls down...], although true, doesn't explain why the work doesn't depend on the path.

QUESTION 9

What is the functional unit of the liver called?

- A. Nephron
- B. Lobule
- C. Osteon
- D. Sarcomere
- E. Alveoli

Correct Answer: B

QUESTION 10

Which of the answer choices represents a group containing a metal, metalloid and nonmetal elements?

- A. Calcium, Nickel, Carbon
- B. Potassium, Neon, Hydrogen
- C. Lithium, Hydrogen, Silicon
- D. Hydrogen, Oxygen, Silicon
- E. Cesium, Boron, Silicon

Correct Answer: C

Periodic trends such as ionization energy, electronegativity, atomic radii, basicity etc. are very important to know as they are commonly tested topics. It is also important to recognize the groups in the periodic table such as the Metals, Non-metals and Metalloids. Only choice (C) provides an element from each group. Lithium (Metal), Hydrogen (Non-metal) and Silicon (Metalloid).

QUESTION 11

On a bad day, have you ever been irritable? Have you ever used a harsh tone or even been verbally disrespectful to your parents or teachers? Everyone has a short temper from time to time, but current statistics indicate that between 16% and 20% of a school population suffer from a psychological condition known as Oppositional Defiance Disorder, or ODD.

ODD symptoms include difficulty complying with adult requests, excessive arguments with adults, temper tantrums, difficulty accepting responsibility for actions, low frustration tolerance, and behaviors intended to annoy or upset adults. Parents of children with ODD can often feel as though their whole relationship is based on conflict after conflict.

Unfortunately, ODD can be caused by a number of factors. Some students affected by ODD suffer abuse, neglect, and severe or unpredictable discipline at home. Others have parents with mood disorders or have experienced family violence. Various types of therapy are helpful in treating ODD, and some drugs can treat particular symptoms. However, no single cure exists.

The best advice from professionals is directed toward parents. Therapists encourage parents to avoid situations that usually end in power struggles, to try not to feed into oppositional behavior by reacting emotionally, to praise positive behaviors, and to discourage negative behaviors with timeouts instead of harsh discipline.

As used in this passage, the word oppositional most nearly means:

- A. Uncooperative
- B. Violent
- C. Passive aggressive
- D. Altruistic

Correct Answer: A

QUESTION 12

PLASTICS

Plastics have long been considered one of the great conveniences of the modern era, but evidence is mounting to indicate that these conveniences have come at an incredible cost. The chief benefit of plastics is their durability, but this benefit turns out to be the same reason plastic has become a significant problem: It takes 200 to 400 years to decompose. All of this plastic has accumulated into a catastrophic mess and has also caused disease in humans.

Between Hawaii and Japan, a giant mass of plastic twice the size of Texas slowly swirls with the currents of the Pacific Ocean. This area has come to be known as the Great Pacific Garbage Patch, and its effects on the ecology of the ocean are unimaginable. According to United Nations researchers, a hundred thousand sea mammals and a million seabirds die each year. They are found with cigarette lighters, syringes, and other plastics that they mistake for food in their stomachs.

Evidence also indicates that the plastic receptacles that people store their food in poses health risks. For instance, phthalates have been shown to have detrimental effects on the reproductive system, yet they are found in many plastic products including baby bottles and water bottles. They have also been linked to various forms of cancer. Additionally, a chemical called bisphenol A that is found in many plastics can mimic the effects of the hormone estrogen, which can also affect the reproductive system.

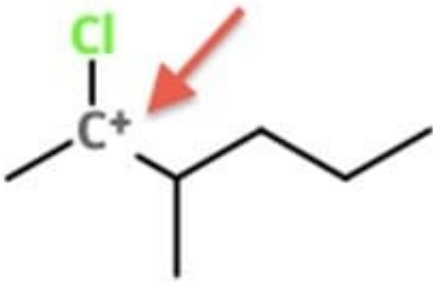
Which of the following statements best summarizes the main idea of this passage?

- A. The benefits of plastics outweigh their risks.
- B. Plastics decompose very slowly.
- C. Plastics pose a significant threat to humans and other living creatures.
- D. Phthalates should not be used in baby bottles.

Correct Answer: C

QUESTION 13

What is the hybridization of this atom?



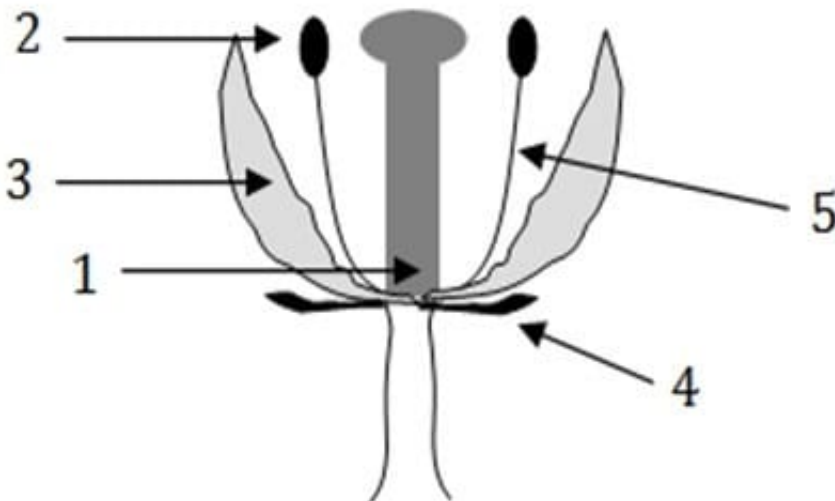
- A. sp
- B. sp²
- C. sp³
- D. s
- E. 2s²

Correct Answer: B

Pay special attention to the '+' symbol indicating a cation. If it lacked a positive or negative sign, it would be a sp³ hybridization.

QUESTION 14

The structure in which microspores are produced: A. 3



- B. 1
- C. 5
- D. 4

E. 2

Correct Answer: E

Anthers produce microspores (the male gametophytes of flowering plants), which undergo meiosis to produce pollen grains.

QUESTION 15

A motorcycle weighs twice as much as bicycle and is moving twice as fast. Which of the following statements is true?

- A. The motorcycle has four times as much kinetic energy as the bicycle.
- B. The motorcycle has eight times as much kinetic energy as the bicycle.
- C. The bicycle and the motorcycle have the same kinetic energy.
- D. The bicycle has four times as much kinetic energy as the motorcycle.

Correct Answer: B

Kinetic energy is the energy of motion and is defined as $\frac{1}{2}mv^2$. Using this equation, if you double the mass and the velocity of an object, you find $KE = \frac{1}{2}(2m)(2v)^2$ or 8 times the original KE. Therefore, the motorcycle has 8 times as much kinetic energy as the bicycle.

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