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Topic Break Down

Topic	No. of Questions
Topic 1, Reading Comprehension	18
Topic 2, Physics	51
Topic 3, Quantitative Reasoning	47
Topic 4, Survey of the Natural Sciences	163
Total	279

QUESTION NO: 1

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.

As used in this passage, the word “chief” most nearly means:

A. Least likely

B. Main

C. Benefit

D. Leader of a Native American tribe

ANSWER: B

QUESTION NO: 2

Which part of the pancreas functions as the endocrine system of the organ?

A. Gall bladder

B. Islets of Langerhans

C. Islets of Granada

D. Calyx

E. Hilum

ANSWER: B

Explanation:

Islets of Langerhans contain the alpha and beta cells, responsible for releasing the hormones glucagon and insulin, respectively.

QUESTION NO: 3

Which statement correctly describes the elastic limit of a metal rod?

A. The elastic limit occurs when a deformed object will no longer return to its original shape.

B. The elastic limit occurs when the rod breaks.

C. The elastic limit occurs when the stress stops producing a strain.

D. The elastic limit assumes that the forces between molecules in a metal act like springs.

ANSWER: A

Explanation:

When an external force deforms a solid material, it will return to its initial position when the force is removed. This is called elasticity and is exhibited by springs. If too much force is applied and the elastic limit is exceeded, the rod won't return to its original shape any longer. As with springs, the deformation is directly proportional to the stress. The elastic limit occurs in rods subjected to a tensile force when the strain stops being directly proportional to the stress. The typical pattern when the force increases is that the strain increases linearly, then it doesn't increase as much, and then it breaks.

QUESTION NO: 4

Two cars driving in opposite directions collide. If you ignore friction and any other outside interactions, which of the following statements is always true?

A. The total momentum is conserved.

B. The sum of the potential and kinetic energy is conserved.

C. The total velocity of the cars is conserved.

D. The total impulse is conserved.

ANSWER: A

Explanation:

In a closed system (when you ignore outside interactions), the total momentum is constant and conserved. The total energy would also be conserved, although not the sum of the potential and kinetic energy. Some of the energy from the collision would be turned into thermal energy (heat) for example. Nor is the total velocity conserved, even though the velocity is a component of the momentum, since the momentum also depends on the mass of the cars. The impulse is a force over time that causes the momentum of a body to change. It doesn't make sense to think of impulse as conserved, since it's not necessarily constant throughout a collision.

QUESTION NO: 5

Which of the following relationships is an example of commensalism?

A. Virus – Host cell

B. Bacteria in intestines of humans

C. Nitrogen-fixing bacteria in legumes

D. Spider crab and algae

E. Suckerfish and shark

ANSWER: E

Explanation:

The sucker fish (also known as Remora) attaches to the shark and eats what the shark discards and gets protection at the same time, all while the shark doesn't get any benefit (nor harm) from this attachment.

The virus and host cell is a form of parasitism, and the other examples are all mutualism, where both organisms involved in the relationship benefit.

QUESTION NO: 6

In a strenuously exercising muscle, NADH begins to accumulate in high concentration. Which of the following metabolic process will be activated to reduce the concentration of NADH?

A. Glycolysis

B. The Krebs cycle

C. Lactic acid fermentation

D. Oxidative phosphorylation

E. Acetyl CoA synthesis

ANSWER: C

Explanation:

Lactic acid fermentation converts pyruvate into lactate using high-energy electrons from NADH. This process allows ATP production to continue in anaerobic conditions by providing NAD+ so that ATP can be made in glycolysis.

QUESTION NO: 7

In the following equilibrium, which of the following actions will shift the equilibrium to the right?

$3H_2(g) + N_2(g) <\ldots> 2NH_3(g)$

A. Adding extra $NH_3(g)$

B. Removing $N_2(g)$

C. Removing $H_2(g)$

D. Increasing the pressure

E. None of the above

ANSWER: D

Explanation:

Answer choices [Adding extra $NH_3(g)$], [Removing $N_2(g)$], [Removing $H_2(g)$] all cause the reaction to shift to the left (towards the reactants). Increasing the pressure shifts the reaction towards the side with the fewer molecules (in this case, the product side). Thus, increasing the pressure shifts the reaction to the right to restore equilibrium.

QUESTION NO: 8

When a population reaches its carrying capacity?

A. The population size begins to decrease.

B. The population growth rate approaches zero.

C. Other populations will be forced out of the habitat.

D. Density-independent factors no longer play a role.

E. Density-dependent factors no longer play a role.

ANSWER: B

Explanation:

Within a habitat, there is a maximum number of individuals that can continue to thrive, known as the habitat's carrying capacity. When the population size approaches this number, population growth will stop.

QUESTION NO: 9

A titration of NaOH and HF is made. Which of the following equivalence points pH can be possible?

A. 7.0

B. 13.5

C. 1.2

D. 4.5

E. 9.3

ANSWER: E

Explanation:

The titration of a strong base with a weak acid produces a basic equivalence point. However, a basic equivalent point is not anything beyond 11 usually.

QUESTION NO: 10

A pizza dough recipe calls for 2 cups of flour and 1 1/2 teaspoons of salt. How much salt would you need if you wanted to triple the recipe?

A. 1 tablespoon

B. 3 teaspoons

C. 6 teaspoons

D. 4 1/2 teaspoons

ANSWER: D

Explanation:

1 1/2 × 3 = 4 1/2.

QUESTION NO: 11

Solution A has a pH of 2, whereas Solution B has a pH for 4.5. How much more acidic is Solution A over Solution B?

A. 10x more acidic

B. 2.25x more acidic

C. 100x more acidic

D. 315x more acidic

E. 1000x more acidic

ANSWER: D

Explanation:

There is a difference of pH of 2.5. We know that difference is acidity can be calculated with 10x, where x = difference in acidity.

102.5 is a number you cannot calculate in your head without a calculator. But you know 102 = 100, and 103 = 1000. Thus, you know the answer relies between 100 and 1000, and there is one answer choice that is in between those 2 values (but not the actual values).

QUESTION NO: 12

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.

Which of the following can be inferred from paragraph one?

A. Between 16% and 20% of the school population has been abused.

B. Most children who speak harshly to their parents have ODD.

C. Most people exhibit symptoms of ODD occasionally.

D. A short temper is a symptom of obsessive-compulsive disorder.

ANSWER: C

QUESTION NO: 13

Which of the following molecules is thought to have acted as the first enzyme in early life on earth?

A. Protein

B. RNA

C. Triglycerides

D. Phospholipids

E. DNA

ANSWER: B

Explanation:

Some RNA molecules in extant organisms have enzymatic activity; for example, the formation of peptide bonds on ribosomes is catalyzed by an RNA molecule. This and other information have led scientists to believe that the most likely molecules to first demonstrate enzymatic activity were RNA molecules.

QUESTION NO: 14

$$\frac{5}{8} = \frac{w}{3}$$

w = ?

A. 5/24

B. 15/24

C. 1 7/8

D. 1 15/8

E. 8

ANSWER: C

Explanation:

This is a simple algebraic problem. Multiply both sides by 3 to get 'w' alone. This results in 15/8, which is equivalent to 1 7/8.

QUESTION NO: 15

What property of a sound wave in air corresponds to the frequency of the sound?

A. pitch

B. high and low

C. timbre

D. overtones

ANSWER: A

Explanation:

The frequency of a sound wave directly determines its pitch. We say the pitch of 480 Hz is higher than the pitch of 440 Hz. High and low are the words we use to describe pitch. Overtones refer to the frequencies above the fundamental frequency in

a musical instrument. Two singers singing the same note at the same loudness will sound differently because their voices have different timbres.

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