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QUESTION 1

A wall that is 9 ft × 10 ft costs \$88 to paint. How much would it cost to paint a wall that is 21 ft × 30 ft?

- A. \$264
- B. \$350
- C. \$593
- D. \$616
- E. \$682

Correct Answer: D

It will cost \$88 to paint an area of 90 square feet (9 ft × 10 ft). The new wall has 630 square feet (21 ft × 30 ft). Thus, the new area is 7x bigger (630 square feet / 90 square feet = 7), and thus, 7x more expensive.

$$7 \times \$88 = \$616$$

QUESTION 2

A bowling ball with a mass of 4 kilograms moving at a speed of 10 meters per second hits a stationary 1 kg bowling ball in a head-on elastic collision. What is the speed of the stationary ball after the collision?

- A. 0 m/s
- B. 10 m/s
- C. Less than 10 m/s, but not 0 m/s
- D. More than 10 m/s

Correct Answer: D

Since this is a head-on elastic collision, you could use conservation of kinetic energy and momentum to actually solve this problem. However, in this case, you only need to think through the answers to arrive at a correct conclusion. Clearly the ball after it's struck won't be going 0 m/s. And since this is an elastic collision, and it is hit by a much larger ball, it must be going faster than the larger ball was originally moving. Therefore, the ball will be moving at more than 10 m/s. If this were an inelastic collision where the balls stuck together, the ball's final velocity would be less than 10 m/s.

QUESTION 3

With a standard deck, what are the odds of drawing a 8 of hearts followed by a 2 of diamonds, without replacement?

- A. 1/2652
- B. 1/2704
- C. 1/50

D. $1/3042$

E. $1/1064$

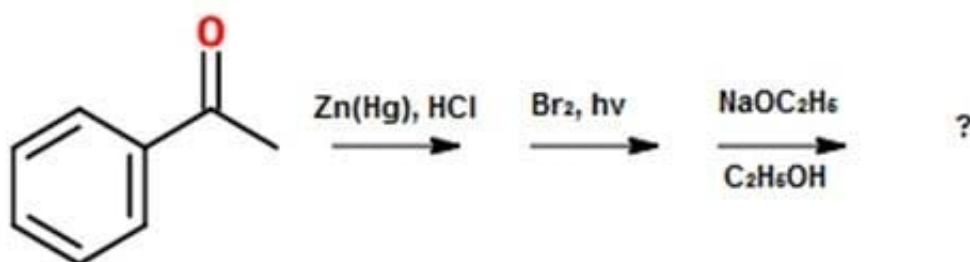
Correct Answer: A

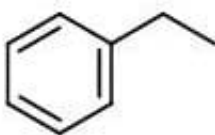

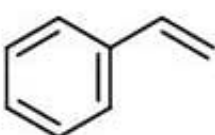
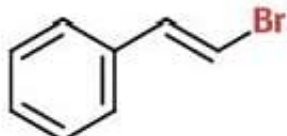
The chance of drawing a 8 of hearts in a standard deck (52 cards) is simply $1/52$. There is only one 8 of hearts in a deck. Without replacement of the 8 of hearts, the chance of drawing a 2 of diamonds is $1/51$ (again, 51 because we did not put the 8 of hearts back in the deck, and there is only one 2 of diamonds in a deck). These 2 events are then multiplied because the questions asks for the chance of BOTH happening, not EITHER happening.

Thus: $1/52 \times 1/51 = 1/2652$

QUESTION 4

What is the end product for the following set of reactions:



- A. 
- B. 
- C. 
- D. 
- E. None of the above

- A. Option A
- B. Option B
- C. Option C
- D. Option D
- E. Option E

Correct Answer: C

The correct answer is C for all the following reactions. Answer choice A illustrates the product after the first reaction. Answer choice B illustrates the product after the second reaction, and finally C shows the product for the last reaction.

QUESTION 5

An electron moves in a uniform electric field in the same direction as the electric field from point A to point

B. Which of the following statements is true?

- A. The potential energy of the electron decreased.
- B. The potential energy of the electron increased.
- C. The potential energy of the electron remained constant.
- D. The potential energy of the electron was converted into kinetic energy.

Correct Answer: B

The direction of the electric field is the same as the direction of the force on a positive test charge. Moving a negative charge in the direction of the electric field requires an external force to oppose the electric field. This would increase the electron's potential energy.

QUESTION 6

If 8 people can eat 6 bags of chips, how many people will it take to eat 15 bags of chips?

- A. 22
- B. 18
- C. 16
- D. 20

Correct Answer: D

Use a proportion to solve the problem. $\frac{8}{6} = \frac{x}{15}$, $60 = 3x$, $x = 20$.

QUESTION 7

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 8

Three consecutive prime numbers add up to 223. What is the smallest of these numbers?

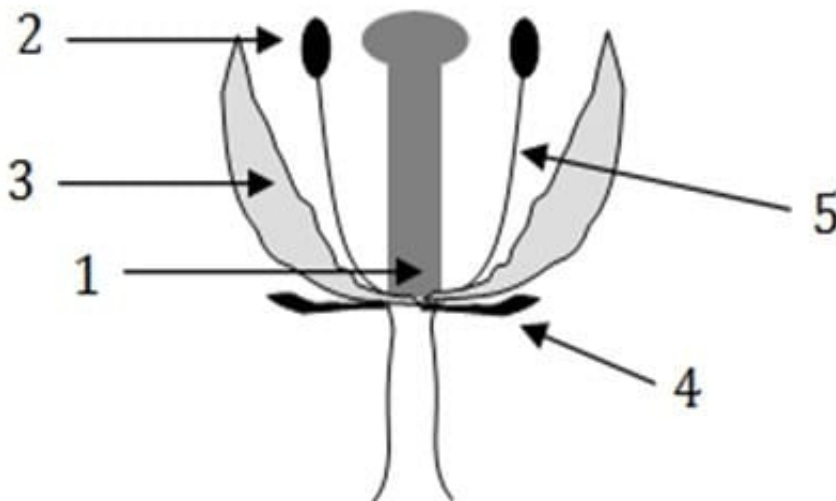
- A. 61
- B. 67
- C. 68
- D. 71
- E. 79

Correct Answer: D

Begin tackling these problems by first looking at the answer choices. One can eliminate '68' immediately because it is not a prime number. From there, pick an answer choice and work from there. Because the question asks for the first number in the set of 3 prime numbers, it means you pick an answer choice, and then figure out the next two prime numbers that follow it. Add them up and see if they add up to 223. With 71, the next two prime numbers will be 73 and 79. $71 + 73 + 79 = 223$.

QUESTION 9

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 10

Which of the following functions to collect and focus the light from the illuminator on to the specimen?

- A. Illuminator
- B. Condenser
- C. Nosepiece
- D. Ocular
- E. Diaphragm

Correct Answer: B

Knowing the compound microscope anatomy and its functions is important for the biology section as it can and is tested.

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

A 10 kg box is sitting on a frictionless inclined plane at an angle 10 degrees above the horizontal. What force must Mark apply to the box to prevent it from moving?

A. $100\sin 10$ N

B. $10\sin 10$ N

C. $10\sin 100$ N

D. $100\sin 100$ N

E. Cannot be determined.

Correct Answer: A

The force Mark must apply to prevent the box from moving is $mg\sin$.

$m = 10$ kg $g = 10$ m/s² (gravity) = 10 degrees

Plugging these in gives: $10 \cdot 10\sin 10$, hence: $100\sin 10$ N.

QUESTION 13

Given this hypothetical compound, $K_2X_2F_2$. Find the atomic weight of the unknown element, X, if the molar mass of the compound itself totals 162 g/mol.

A. 23 g/mol

B. 30 g/mol

C. 35 g/mol

D. 46 g/mol

E. 50 g/mol

Correct Answer: A

Looking at the periodic table, add up the molar mass of the elements that are known. 2K gives $(39 + 39)$, and 2F gives $(19 + 19)$:

$$39 + 39 + 19 + 19 = 116$$

Thus, 116 is 46 short of the total 162, thus there has to be 46 g of the unknown 'X'. Since there are 2 moles of this, the atomic weight of this element has to be 23 g/mol.

QUESTION 14

Which of the following processes is an example of deposition?

- A. $\text{H}_2\text{O}(\text{s}) \rightarrow \text{H}_2\text{O}(\text{l})$
- B. $\text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_2\text{O}(\text{g})$
- C. $\text{H}_2\text{O}(\text{s}) \rightarrow \text{H}_2\text{O}(\text{g})$
- D. $\text{H}_2\text{O}(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$
- E. $\text{H}_2\text{O}(\text{g}) \rightarrow \text{H}_2\text{O}(\text{s})$

Correct Answer: E

QUESTION 15

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

Correct Answer: E

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.

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