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QUESTION 1

What is the total number of orbitals in the third shell (n = 3)?

A. 1

B. 4

C. 9

D. 16

E. 25

Correct Answer: C

The number of orbitals per level can be expressed with the equation: n2

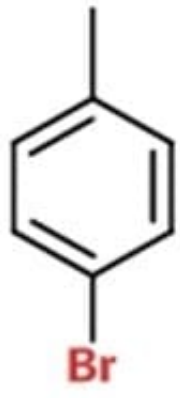
Where n = 3.

32 = 9

9 total orbitals exist. (1 from s-orbital, 3 from p-orbitals, 5 from d-orbitals).

QUESTION 2

Name this compound:



A. m-Bromotoluene

B. o-Bromotoluene

C. p-Bromotoluene

D. p-Bromoxylene

E. m-Bromocyclohexane

Correct Answer: C

QUESTION 3

Identify the missing reagent in the reaction below:

A. 1) BH3, THF; 2) H2O2, OH

B. CH2N2, Heat

C. Cl2, CCl4

D. 1) OsO4; 2) NaHSO3

E. 1) O3; 2) Zn, H2O

Correct Answer: C

QUESTION 4

In IUPAC nomenclature, which of the following functional groups has the highest priority in numbering a parent chain?

A. Alkanes

B. Alkenes

C. Alkynes

D. Amines

E. Esters

Correct Answer: E

QUESTION 5

Which of the following is not associated with the clotting process?

A. Thromboplastin

B. Prothrombin

C. Fibrinogen

D. Fibrin

E. All of the above are associated with the clotting process.

Correct Answer: E

All of the answer choices are involved in the clotting process. Thromboplastin aids in the conversion of prothrombin to thrombin, which then aids in the conversion of fibrinogen to fibrin.

QUESTION 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

Correct Answer: C

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 7

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 statements can be inferred from paragraph 4?

A. Parents of children with ODD are bad parents.

B. ODD is not a real psychological disorder.

C. Medication can worsen ODD.

D. Reacting emotionally to defiant behavior might worsen the behavior.

Correct Answer: D

QUESTION 8

It is most likely that you have never had diphtheria. You probably don\\'t even know anyone who has suffered from this disease. In fact, you may not even know what diphtheria is. Similarly, diseases like whooping cough, measles, mumps, and rubella may all be unfamiliar to you. In the nineteenth and early twentieth centuries, these illnesses struck hundreds of thousands of people in the United States each year, mostly children, and tens of thousands of people died. The names of these diseases were frightening household words. Today, they are all but forgotten. That change happened largely because of vaccines.

You probably have been vaccinated against diphtheria. You may even have been exposed to the bacterium that causes it, but the vaccine prepared your body to fight off the disease so quickly that you were unaware of the infection. Vaccines take advantage of your body\\'s natural ability to learn how to combat many disease-causing germs, or microbes. What\\'s more, your body remembers how to protect itself from the microbes it has encountered before. Collectively, the parts of your body that remember and repel microbes are called the immune system. Without the proper functioning of the immune system, the simplest illness ?even the common cold ?could quickly turn deadly.

On average, your immune system needs more than a week to learn how to fight off an unfamiliar microbe. Sometimes, that isn\\'t enough time. Strong microbes can spread through your body faster than the immune system can fend them off. Your body often gains the upper hand after a few weeks, but in the meantime you are sick. Certain microbes are so virulent that they can overwhelm or escape your natural defenses. In those situations, vaccines can make all the difference.

Traditional vaccines contain either parts of microbes or whole microbes that have been altered so that they don\\'t cause disease. When your immune system confronts these harmless versions of the germs, it quickly clears them from your body. In other words, vaccines trick your immune system in order to teach your body important lessons about how to defeat its opponents.

Which statement is not a detail from the passage?

A. Vaccines contain microbe parts or altered microbes.

B. The immune system typically needs a week to learn how to fight a new disease.

C. The symptoms of disease do not emerge until the body has learned how to fight the microbe.

D. A hundred years ago, children were at the greatest risk of dying from now-treatable diseases.

Correct Answer: C

This passage does not state that the symptoms of disease will not emerge until the body has learned to fight the disease. On the contrary, the passage implies that a person may become quite sick and even die before the body learns to effectively fight the disease.

QUESTION 9

A thermostat with an initial reading of 100? rises up by 50? in 20 minutes. What is the final temperature reading of the thermostat in Celsius?

A. 150° C

B. 423° C

C. 65.6° C

D. 70° C

E. 60° C

Correct Answer: C

This is a simple conversion problem that may appear in either (or both) the physics and QR section. It is important you understand how to convert between Celsius, Fahrenheit and Kelvin.

°K = 273.15 + °C °C = 5/9 × °F ? 32 °F = 9/5 × °C + 32

Using the 2nd equation above, plugging in 150 for F produces ~65.5 °C

QUESTION 10

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What is the main idea of the passage?

A. The nineteenth and early twentieth centuries were a dark period for medicine.

B. You have probably never had diphtheria.

C. Traditional vaccines contain altered microbes.

D. Vaccines help the immune system function properly.

Correct Answer: D

The main idea of this passage is that vaccines help the immune system function properly. Answer choices [The nineteenth and early twentieth...], [You have probably never had diphtheria.] and [Traditional vaccines contain altered microbes.] express details from the passage, but only answer choice [Vaccines help the immune system function properly.] is a comprehensive summary of the author\\'s message.

QUESTION 11

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 can be inferred from paragraph two?

A. No one has determined why sea mammals and seabirds are dying at an alarming rate.

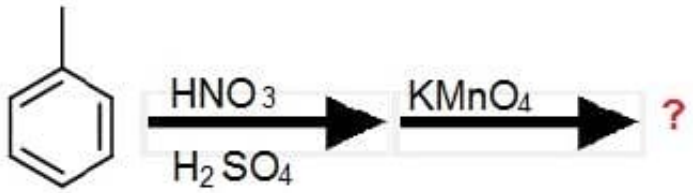
B. The Great Pacific Garbage Patch is not a significant threat to humans.

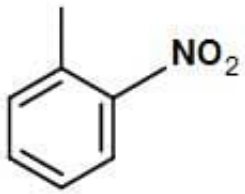
C. The Great Pacific Garbage Patch is too large to be cleaned up by one country.

D. Ocean currents carry the plastic to the middle of the ocean.

Correct Answer: D

QUESTION 12



A.


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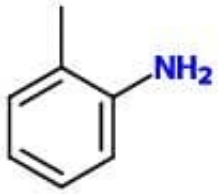
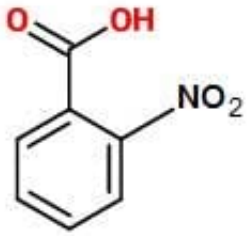
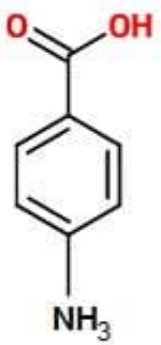


C.


D.


E.


A. Option A

B. Option B

C. Option C

D. Option D

E. Option E

Correct Answer: C

QUESTION 13

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What is the meaning of the word virulent as it is used in the third paragraph?

A. tiny

B. malicious

C. contagious

D. annoying

Correct Answer: B

In the third paragraph, the word virulent means "malicious." The word virulent could in some circumstances mean contagious or annoying. However, since the passage is not talking about transfer of the disease and is referring to a serious illness, malicious is the more appropriate answer.

QUESTION 14

If 500 mL of 0.5M HBr is diluted to 0.4M HBr, what is the final volume?

A. (500) (0.4 / 0.5)

B. (500) (0.5 / 0.4)

C. (0.5 / 500) (0.4)

D. (500) (0.20)

E. (500 - 0.4) (0.5)

Correct Answer: B

This is a simple case of (initial molarity) (initial volume) = (final molarity) (final volume).

QUESTION 15

What is the percent of oxygen by mass in FeCr2O4?

A. 6.4%

B. 12.5%

C. 19.3%

D. 22.4%

E. 28.6%

Correct Answer: E

It necessary to utilize the periodic table (provided in the exam) and adds up the entire molecular weight of FeCr2O4.

Fe = 55.8 Cr = 52 (×2) O = 16 (×4)

Total molecular weight: ~223.85 Divide the oxygen species by this: (16 × 4) / (223.85) = 0.286 Multiply by a 100 to get the percentage form: 0.286 × 100 = 28.6%