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QUESTION 1

Which of the following violates the conditions of a population under Hardy-Weinberg equilibrium?

- A. Population is large.
- B. There are no mutations occurring.
- C. Sexual selection
- D. There is no immigration or emigration occurring.
- E. Random mating

Correct Answer: C

Hardy-Weinberg conditions must satisfy a large population, with no mutations, random mating, no migration and no natural selection. Sexual selection goes against random mating, and thus, is an incorrect answer choice.

QUESTION 2

You are interested in extracting a specific carboxylic acid only in a mixture containing amines, ketones and phenols. Which of the following can be used to accomplish this?

- A. NaOH
- B. HCl
- C. NaHCO₃
- D. H₂O
- E. A and C

Correct Answer: C

This is an organic lab question that deals with extraction. In order to extract the carboxylic acid only, you can only use sodium bicarbonate. Although NaOH is capable of extracting the carboxylic acid, it will also extract the phenol, which is not what the question asks.

QUESTION 3

According to Charles' law:

- A. Volume is proportional to temperature.
- B. Volume is inversely proportional to temperature.
- C. Volume is proportional to pressure.
- D. Volume is inversely proportional to pressure.

E. Volume is proportional to moles.

Correct Answer: A

QUESTION 4

You blow up a rubber balloon and hold the opening tight with your fingers. You then release your fingers, causing air to blow out of the balloon. This pushes the balloon forward, causing the balloon shoots across the room. Which of Newton's laws best explains the cause of this motion?

- A. First law
- B. Second law
- C. Third law
- D. Law of gravity

Correct Answer: C

All three laws are operating, but the third law (forces come in equal and opposite pairs) best explains the motion. The first law (inertia) is shown from the fact that the balloon doesn't move until a force acts upon it. The second law ($F = ma$) is shown because you can see the force and the acceleration. The force comes from the contraction of the rubber balloon. The stretched rubber exerts a force on the air inside the balloon. This causes the air to accelerate in accordance with the second law. You can't see this acceleration because the air is invisible and because it is all the air in the room that the balloon is exerting a force on. However, the air in the room exerts an equal and opposite force on the balloon (this is Newton's third law), which causes the balloon to accelerate in the direction it did.

QUESTION 5

In numbering and naming a chain, which of the following functional groups receives the highest priority?

- A. Carboxylic acids
- B. Aldehydes
- C. Ketones
- D. Amines
- E. Alkynes

Correct Answer: A

Generally, carboxylic acids (and its derivatives like amides, esters etc.) have the highest priority.