

NCFE Physical Science Practice Exam (Sample)

Study Guide



Everything you need from our exam experts!

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Questions

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- 1. What is the result of combined forces known as?**
 - A. Mass**
 - B. Acceleration**
 - C. Net force**
 - D. Friction**
- 2. Which description applies to the components of a heterogeneous mixture?**
 - A. They are chemically bonded**
 - B. They can be separated easily**
 - C. They are of varied composition and visible**
 - D. They are molecularly combined**
- 3. Where is a proton found in an atom?**
 - A. In the electron cloud**
 - B. In the nucleus**
 - C. In the outer shell**
 - D. In the valence layer**
- 4. Which of the following is NOT a type of friction?**
 - A. Static**
 - B. Frictionless**
 - C. Sliding**
 - D. Fluid**
- 5. What type of wave does not require matter to propagate?**
 - A. Mechanical wave**
 - B. Transverse wave**
 - C. Surface wave**
 - D. Electromagnetic wave**
- 6. What is performed when work is done on an object?**
 - A. Transfer of mass**
 - B. Transfer of energy**
 - C. Transfer of speed**
 - D. Transfer of force**

- 7. What does charge by conduction involve?**
- A. The buildup of charge through friction**
 - B. Transfer of electric charge through touch**
 - C. Inducing charge without direct contact**
 - D. Magnetic attraction of charged objects**
- 8. What does diffraction refer to in wave behavior?**
- A. The bouncing back of waves**
 - B. The spreading of waves as they pass through an opening**
 - C. The combination of two waves into one**
 - D. The bending of waves when they change speeds**
- 9. What is the purpose of a transformer in an electrical system?**
- A. To generate mechanical energy**
 - B. To convert electrical energy into heat**
 - C. To increase or decrease voltage**
 - D. To create a magnetic field**
- 10. What happens to an atom when it gains electrons?**
- A. It becomes a cation**
 - B. It becomes an anion**
 - C. It remains neutral**
 - D. It loses protons**

Answers

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1. C
2. C
3. B
4. B
5. D
6. B
7. B
8. B
9. C
10. B

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Explanations

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1. What is the result of combined forces known as?

- A. Mass
- B. Acceleration
- C. Net force**
- D. Friction

The result of combined forces is known as net force. When multiple forces act on an object, they can either add together or cancel each other out, depending on their directions and magnitudes. The net force is the vector sum of all the forces acting on the object. It determines how the object will move according to Newton's second law of motion, which states that the net force acting on an object is equal to the mass of the object multiplied by its acceleration ($F = ma$). For instance, if two people are pushing a car in the same direction, the forces they exert combine to create a greater net force pushing the car forward. Conversely, if one person pushes the car forward while another pushes it backward with equal force, the net force would be zero, and the car would remain stationary. Thus, net force plays a crucial role in understanding the dynamics of motion and how objects interact with each other through various forces.

2. Which description applies to the components of a heterogeneous mixture?

- A. They are chemically bonded
- B. They can be separated easily
- C. They are of varied composition and visible**
- D. They are molecularly combined

In a heterogeneous mixture, the components are not uniformly distributed throughout the mixture, which means they retain their individual properties. This lack of uniformity allows for variations in composition, making some components easily identifiable and visible. For example, when you look at a salad, you can easily see the different ingredients like lettuce, tomatoes, and cucumbers, each maintaining its distinct characteristics. The visible nature of the components is a hallmark of heterogeneous mixtures, as opposed to homogeneous mixtures where the individual substances are blended so thoroughly that they appear as a single phase. Therefore, the description that they are of varied composition and visible accurately reflects the defining traits of heterogeneous mixtures.

3. Where is a proton found in an atom?

- A. In the electron cloud
- B. In the nucleus**
- C. In the outer shell
- D. In the valence layer

A proton is found in the nucleus of an atom. The nucleus is the core central part of an atom, and it is composed of protons and neutrons. Protons carry a positive charge, which plays a crucial role in defining the atomic number of an element. The atomic number determines the identity of the element, as it corresponds to the number of protons found in a neutral atom. The protons in the nucleus are held together by strong nuclear forces, overcoming the repulsive forces between the positively charged protons. In contrast, the electron cloud surrounds the nucleus and contains electrons, which are negatively charged particles that occupy various energy levels or shells around the nucleus. The outer shell and the valence layer are terms that refer to the positioning of electrons rather than protons, highlighting their roles in chemical bonding and reactions. Therefore, the correct location for protons in an atom is indeed within the nucleus.

4. Which of the following is NOT a type of friction?

- A. Static
- B. Frictionless**
- C. Sliding
- D. Fluid

Friction is a force that opposes the motion of objects in contact with one another. There are several recognized types of friction based on the nature of the movement and the interaction between surfaces. Static friction occurs between surfaces that are not moving relative to each other. It is the force that prevents an object from starting to move when a force is applied. Sliding friction, which can also be referred to as kinetic friction, acts between surfaces that are sliding against each other. This type of friction is typically less than static friction, making it easier for objects to continue moving once they are in motion. Fluid friction, or drag, pertains to the resistance experienced by objects moving through fluids, which can be liquids or gases. This force becomes significant when considering objects like boats moving through water or airplanes flying through the air. In contrast, frictionless refers to an ideal scenario rather than a type of friction. In reality, all surfaces experience some level of friction unless they are in a vacuum or otherwise specifically engineered to minimize it. Thus, defining a condition as "frictionless" does not classify it as a type of friction. Understanding these distinctions helps clarify how different interactions between surfaces affect motion in physical science.

5. What type of wave does not require matter to propagate?

- A. Mechanical wave
- B. Transverse wave
- C. Surface wave
- D. Electromagnetic wave**

Electromagnetic waves are unique in that they do not require a medium to travel through; they can propagate through a vacuum, such as the empty space in the universe. This is because electromagnetic waves consist of oscillating electric and magnetic fields that can generate each other, allowing the wave to move through space even in the absence of matter. This characteristic distinguishes them from mechanical waves, which rely on particles of a medium (like air, water, or solids) to transmit energy and cannot travel through a vacuum. Understanding this distinction is crucial in physics and helps clarify the nature of different types of waves and how they interact with the environment.

6. What is performed when work is done on an object?

- A. Transfer of mass
- B. Transfer of energy**
- C. Transfer of speed
- D. Transfer of force

When work is done on an object, there is a transfer of energy. Work is defined in physics as the process of transferring energy to or from an object when a force is applied over a distance. This means that when a force moves an object, energy is transferred to that object, which can then affect its motion or position. For example, when you push a box across the floor, you apply a force and move the box a certain distance. In doing so, you have transferred energy to the box, enabling it to move. This energy transfer can result in kinetic energy, potential energy, or a combination of both, depending on the context of the work being performed. While other choices involve various physical concepts, they do not accurately describe the action taking place during work. The essence of work is intrinsically linked to energy transfer, making it the most appropriate answer in this context.

7. What does charge by conduction involve?

- A. The buildup of charge through friction
- B. Transfer of electric charge through touch**
- C. Inducing charge without direct contact
- D. Magnetic attraction of charged objects

Charge by conduction involves the transfer of electric charge through touch. This process occurs when a charged object comes into direct contact with an uncharged object, allowing the charge to flow from the charged object to the uncharged object. The movement of electrons between the two objects leads to both objects acquiring a similar charge. In this scenario, the charged object effectively shares its surplus or deficit of electrons, resulting in the uncharged object gaining an electric charge as well. The fundamental principle behind this is the tendency for charges to redistribute until equilibrium is reached, meaning that when two conductive objects touch, they will balance out their charge distribution. This process is distinct from charge by friction, which involves the buildup of charge through the rubbing of materials against one another, or charge induction, where a charged object can influence the charge distribution in another object without direct contact. Magnetic attraction of charged objects does not directly relate to the transfer of electric charge through touch, as it involves the interaction of magnetic fields rather than electrical charges.

8. What does diffraction refer to in wave behavior?

- A. The bouncing back of waves
- B. The spreading of waves as they pass through an opening**
- C. The combination of two waves into one
- D. The bending of waves when they change speeds

Diffraction refers to the phenomenon where waves spread out as they pass through an opening or around obstacles. This behavior is most commonly observed with sound waves, light waves, and water waves. When a wave encounters an aperture or an edge, it does not simply travel in a straight line; instead, it bends and spreads out into the region beyond the opening. This spreading effect can be more pronounced with longer wavelengths, allowing the waves to fill the space behind the obstacle. In practical terms, this is why you can hear someone speaking around a corner or why light creates patterns when passing through a narrow slit. The fundamental aspect of diffraction highlights the wave nature of the phenomena involved, which is an essential concept in understanding wave behavior in physical science. The characteristics of diffraction can be observed in everyday life, from the way sound travels through spaces to the patterns of light created by barriers.

9. What is the purpose of a transformer in an electrical system?

- A. To generate mechanical energy**
- B. To convert electrical energy into heat**
- C. To increase or decrease voltage**
- D. To create a magnetic field**

The purpose of a transformer in an electrical system is primarily to increase or decrease voltage levels while maintaining the power (in terms of watts) across the primary and secondary coils, minus any losses. This device operates based on the principles of electromagnetic induction, allowing it to change voltage efficiently. When electricity flows through the primary coil, it creates a magnetic field which then induces a voltage in the secondary coil. By adjusting the number of turns of wire in each coil—more turns on the secondary compared to the primary leads to an increase in voltage, while fewer turns leads to a decrease—transformers are essential in managing how power is transmitted and distributed in electrical systems. This functionality is crucial for ensuring that electricity can be transported over long distances at high voltages and then reduced to safe levels for consumer use.

10. What happens to an atom when it gains electrons?

- A. It becomes a cation**
- B. It becomes an anion**
- C. It remains neutral**
- D. It loses protons**

When an atom gains electrons, it becomes an anion. This process occurs because electrons carry a negative charge, so adding more electrons to an atom increases its overall negative charge. Atoms are usually neutral, having an equal number of protons (which are positively charged) and electrons. When an atom gains one or more electrons, the balance shifts, leading to a net negative charge. It's important to understand that this change in charge is a fundamental part of ionic interactions and plays a critical role in the formation of ionic compounds. For instance, when a chlorine atom gains an electron, it becomes a chloride ion, which is a typical example of an anion. Thus, the transformation into an anion signifies that the atom now has more electrons than protons, resulting in a negatively charged species.