

Name: Keef Per: _____

Standard 3: QUIZ

38

- A 1) How would the measurable properties of a golf ball change if it were moved from Earth to the Moon?
- A. It would have the same mass, but a different weight.
 - B. It would have the same weight, but a different mass.
 - C. It would have the same density, but a different mass.
 - D. It would have the same mass, but a different density.
- B 2) The force of gravity on an object depends primarily on the object's
- A. density.
 - B. mass.
 - C. momentum.
 - D. volume.
- A 3) In the 1700s, French scientist Charles Coulomb discovered the relationship between force, charge, and distance, now known as Coulomb's Law. Modern equipment is much better and allows us to make more precise measurements than Coulomb could. As new equipment is developed we will be able to be even more precise. What does this mean to our knowledge of the electric force?
- A. We will not need to rediscover how distance affects the electric force.
 - B. Future experiments will need a very different value for Coulomb's constant.
 - C. Better machines will make it so that q_1 will be divided by q_2 .
 - D. As we learn more, distance will not have as great an effect on electric force.
- A 4) Newton's law of universal gravitation states that $F = \frac{Gm_1m_2}{d^2}$
- What is the effect on gravitational force if m_1 is doubled?
- A. The force is doubled because force and mass are directly proportional.
 - B. The force is halved because force and mass are directly proportional.
 - C. The force is 4 times greater because force and mass are inversely proportional.
 - D. The force is $\frac{1}{4}$ because force and mass are inversely proportional.
- A 5) Tides, such as those along the coast of Massachusetts, are caused by gravitational attractions acting on Earth. Why is the gravitational attraction of the moon a greater factor in determining tides than the gravitational attraction of the much larger Sun?
- A. Earth is much closer to the Moon than to the Sun.
 - B. The Sun's gravity is a factor only during the day.
 - C. The Moon's core has a much greater density than the Sun's core.
 - D. The Sun's mass is smaller than the mass of the Moon.
- D 6) The equation for electrostatic force, $(F = \frac{kq_1q_2}{d^2})$ is almost identical to the equation for gravitational force $(F = \frac{Gm_1m_2}{d^2})$.
- Which statement below offers the best explanation for this similarity?
- A. Electrostatic and gravitational forces are caused by the same thing so their equations should be similar.
 - B. Natural laws operate now as they did in the past and electrostatic force is a relatively new idea so the older idea of gravitation was adapted.
 - C. Scientific areas of study are related to each other and share the same evidence to explain observations.
 - D. Evidence and observation of these two forces led to similar results.
- A 7) The force between two static charges is +4N. The force is:
- A. repulsive
 - B. attractive
 - C. can't tell
- C 8) The distance of the star Vega from Earth is 1.6 million times greater than the distance of the Sun from Earth. Which of the following best describes the gravitational influence of Vega on Earth?

- A. It is roughly equal to that of the Sun.
- B. Its influence is greater than that of the Sun.
- C. Its influence is small because of its distance.
- D. It influences the magnitude of Earth's mass.

9) Newton's law of universal gravitation states that $F = \frac{Gm_1m_2}{d^2}$

What is the effect on gravitational force if d is halved?

- A. The force is doubled because force and mass are directly proportional.
- B. The force is halved because force and mass are directly proportional.
- C. The force is 4 times greater because force and mass are inversely proportional.
- D. The force is $\frac{1}{4}$ because force and mass are inversely proportional.

10) Geologists and oceanographers understand that tides are the result of gravitational attractions between the moon and the water on the earth. The sun also has an effect on the tides but its influence is less than half that of the moon. What would geology teach about this?

- A. The closer distance of the moon increases its gravity, since geologists use the same evidence as physicists.
- B. The closer distance of the moon increases its gravity, but geologists would not know this.
- C. The gravitational constant is different for the moon than for the sun, since geologists use the same evidence as physicists.
- D. The gravitational constant is different for the moon than for the sun, but geologists would not know this.

11) In a professional automobile paint shop, an electric charge is created on the surface of the automobile, and an electric charge is created on the tiny paint particles that are to be applied. This will help create a better paint job on the automobile. Using what you understand about electric charges, which of the following best explains why this would be done?

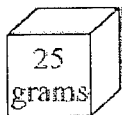
- A. The two electric charges are the same so the paint will be attracted to the car
- B. The two electric charges are different so the paint will be attracted to the car
- C. The two electric charges are the same so the paint will be repelled from the car
- D. The two electric charges are different so the paint will be repelled from the car

12) What is the mass of an object weighing 63 N on Earth?

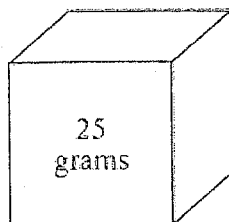
- A. 0.1 kg
- B. 6.3 kg
- C. 73 kg
- D. 617 kg

13) The diagram below shows two blocks composed of different materials.

Block A



Block B



If Block A is located on the Moon and Block B is located on Earth, what property do these two blocks have in common?

- A. They have the same mass.
- B. They have the same weight.
- C. They have the same volume.
- D. They have the same surface area.

14) One 7.0 kg bowling ball is lifted to a storage shelf 1.0 m above the floor. A second 7.0 kg ball is lifted to a storage shelf 2.0 m above the floor.

Which of the following best explains why the measured force of gravity on each ball is nearly identical?

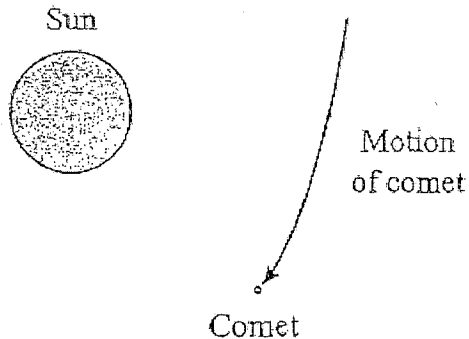
- A. The final potential energy of each ball increased.

- B. The amount of work required to lift each ball is identical.
- C. The distance of each ball from Earth's center of mass is almost identical.
- D. The gravitational force of each ball on the other cancels out the force of Earth's gravity.

B 15) Scientists use Newton's law of universal gravitation to send probes from Earth to Mars. Which statement best explains why this works?

- A. Earth and Mars have about the same mass so the probe can transfer between gravity forces easily.
- B. Natural laws operate the same way on Mars as they do on Earth so the scientists can predict gravity forces in between the two planets.
- C. There is no gravity force in the space between Earth and Mars so the scientists can easily predict the probe's path.
- D. As the probe leaves Earth the gravitational force decreased quickly so that Mars' gravity can be more easily felt by the probe, drawing it in.

A 16) The Sun's gravitational attraction causes a comet's path to curve as shown in the illustration below.

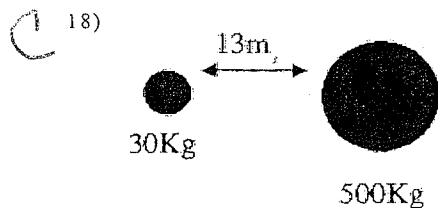


Which of the following statements best explains the fact that the Sun does not appear to move due to the comet's gravitational attraction?

- A. The Sun's mass is much greater than the comet's mass.
- B. The comet is too far away for its gravity to affect the Sun.
- C. In this gravitational interaction only the comet exerts a pull on the Sun.
- D. The path of the comet reduces the Sun's gravity.

A 17) A teenager removes the plastic wrapping from a CD. The pieces of wrap cling to her hand. Which of the following forces causes the wrap to cling to her hand?

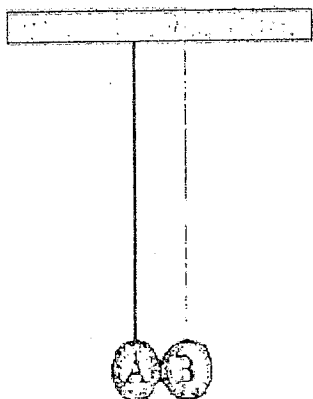
- A. electrostatic
- B. gravitational
- C. magnetic
- D. net



According to Newton's law of universal gravitation, what will have a greater affect on the gravitational force?

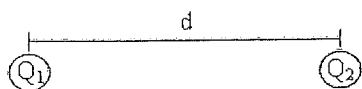
- A. An increase in m_1
- B. A decrease in m_2
- C. An increase in d
- D. A decrease in G

- 19) The diagram below shows two aluminum spheres.

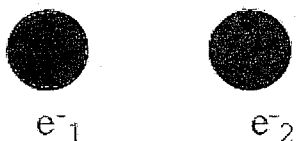


Aluminum sphere A contains a small negative charge and is touched by aluminum sphere B, which has a larger negative charge. Which of the following occurs next?

- A. Protons flow from sphere B to sphere A.
 - B. Protons flow from sphere A to sphere B.
 - C. Electrons flow from sphere B to sphere A.
 - D. Electrons flow from sphere A to sphere B.
- 20) Two electrical charges are shown in the diagram.
How would the strength of the electrostatic force change if d were doubled?



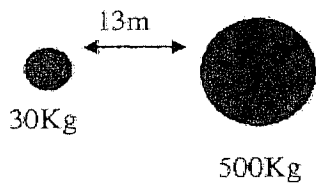
- A. The electrical force would be twice as strong
 - B. The electrical force would be half as strong
 - C. The electrical force would be 4 times as strong
 - D. The electrical force would be $\frac{1}{4}$ as strong
- 21)



Given that the charge on a single electron is approx. 1.6×10^{-19} Coulombs and $k = 9 \times 10^9$, in order for the force between these charges to be 0.001N what would the distance have to be?

- A. 0.001m
- B. 0.001mm
- C. 4.8×10^{-13} m
- D. 4.6×10^{-8} m

- 22)

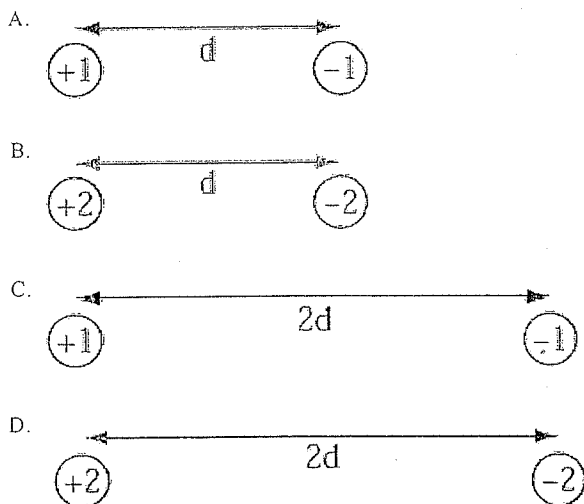


In order for the force to be 1N what would the distance for these objects have to be?

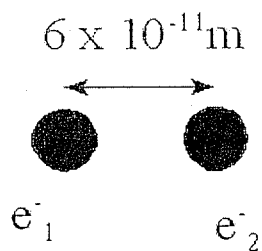
- A. 1.35×10^{11} m
- B. 1.16×10^7 m
- C. 0.001mm

D. .001m

- B 23) The distance between two charges is represented by d . In which of the following diagrams is the attractive force between the two charges the greatest?



- B 24) What will have a greater effect on the electric force?

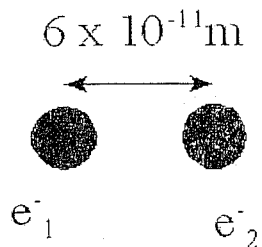


- A. Increasing e_1 by 2
B. Decreasing e_2 by 2
C. Increasing d by 2
D. Decreasing k by 2

- C 25) Which of these equations represents Coulomb's Law?

- A. $E = mc^2$
B. $F = ma$
C. $F = k \frac{q_1 q_2}{d^2}$
D. $F = G \frac{m_1 m_2}{d^2}$

- A 26) Given that the charge on a single electron is approx. 1.6×10^{-19} Coulombs and $k = 9 \times 10^9$, what would be the repulsive force between these two electrons shown?



- A. $6.4 \times 10^{-8} \text{ N}$
B. $4.76 \times 10^{-28} \text{ N}$
C. $3.84 \times 10^{-18} \text{ N}$
D. $2.86 \times 10^{-38} \text{ N}$

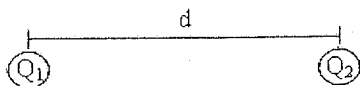
- A 27) Lightning rods let charges leak off of a structure thus preventing a build up of the opposite charge from a cloud. This prevents the dangerous discharge between the structure and the cloud known as lightning. What is this an example of?

A. Knowledge of the science of the electric force affects everyday human life.
B. Nature is in control and it doesn't really matter what we know.
C. The Law of Universal Gravitation affects everyday life.
D. Coulomb's law strictly applies to science fields only.

- A 28) Tides are the result of gravitational forces between the moon and the water on the earth. The sun also has an effect on the tides but its influence is less than half that of the moon even though the sun has so much more mass than the moon. Where does this knowledge come from?

A. Observations by astronomers and physicists give the evidence that geologists use.
B. Observations by astronomers and physicists give the evidence, but geologists would not know this.
C. Each science discipline must do its own research.
D. Physics is the only science that studies such phenomena.

- A 29) Two electrical charges are shown in the diagram. How would the strength of the electrostatic force change if Q_1 were doubled?



A. The electrical force would be twice as strong
B. The electrical force would be half as strong
C. The electrical force would be 4 times as strong
D. The electrical force would be $\frac{1}{4}$ as strong

- B 30) Two oppositely charged objects are separated by a small distance. The objects are then moved three times farther apart from each other.

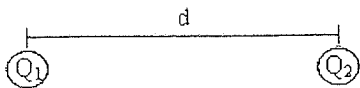
Which of the following statements best describes what happens to the electrical force between the objects?

A. The force of attraction increases.
B. The force of attraction decreases.
C. The force of attraction becomes zero.
D. The force of attraction stays the same.

- C 31) During an experiment, you notice that as you increase the mass on a spring scale (used to measure weight) that the reading on the scale also increases. Which statement best describes the relationship between the variables in this experiment?

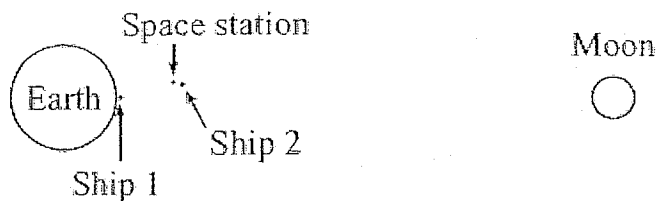
A. Weight directly influences the amount of mass
B. Mass has little influence on weight
C. As mass increases, weight will increase
D. Weight and mass are identical

- C 32) Two electrical charges are shown in the diagram. How would the strength of the electrostatic force change if d were halved?



A. The electrical force would be twice as strong
B. The electrical force would be half as strong
C. The electrical force would be 4 times as strong
D. The electrical force would be $\frac{1}{4}$ as strong

- B 33) The diagram below represents two identical space ships, Earth, a space station, and the Moon.

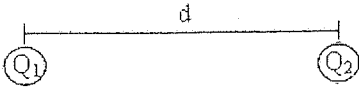


The two ships are launched toward the Moon. Ship 1 is launched from Earth, and ship 2 is launched from the space station. It takes less force to launch ship 2.

Which of the following contributes most to the difference in the forces?

- A. Ship 2 has less inertia in space than ship 1 does on Earth.
- B. Earth exerts less gravitational force on ship 2 than on ship 1.
- C. Ship 2 must travel a shorter distance than ship 1 before reaching the Moon.
- D. The Moon exerts more gravitational force on ship 2 than on ship 1.

- B 34) Two electrical charges are shown in the diagram.
How would the strength of the electrostatic force change if Q_2 were halved?



- A. The electrical force would be twice as strong
- B. The electrical force would be half as strong
- C. The electrical force would be 4 times as strong
- D. The electrical force would be $\frac{1}{4}$ as strong

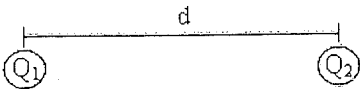
- A 35) Which example best describes how knowledge of the science of the electric force affects everyday human life?

- A. Lightning rods let charge leak off of a structure, thus preventing a build up of the opposite charge from a cloud and preventing the dangerous discharge between them known as lightning.
- B. Doorbells and CD player motors use magnetism to move objects in a linear or rotational fashion.
- C. The mass of a skydiver and the mass of the earth, both affect the force between them during the dive.
- D. In the 1700's, Charles Coulomb made intricate measurements on charged spheres to discover a relationship between force, charge, and distance now known as Coulomb's Law.

- B 36) Can Newton's law of universal gravitation be used to calculate your weight on Jupiter (if you could actually stand on the surface)?

- A. Yes – the value of gravity is the same everywhere.
- B. Yes – the natural laws operate the same everywhere.
- C. No – the value of gravity changes from place to place.
- D. No – natural laws operate differently in different places.

- B 37) Two electrical charges are shown in the diagram.
How would the strength of the electrostatic force change if Q_2 was doubled and d was also doubled?



- A. The electrical force would be twice as strong
- B. The electrical force would be half as strong
- C. The electrical force would be 4 times as strong
- D. The electrical force would be $\frac{1}{4}$ as strong

- D 38) If an astronaut took a rocket ship to Mars what would change?

- A. Width of astronaut
- B. Mass of astronaut
- C. Height of astronaut
- D. Weight of astronaut

