

AP Physics 2: Algebra Based Practice Test Unit 3: Electric Force, Field and Potential

Question 1

What do we call the electrode attached to the positive terminal of a voltage source?

- A. Cathode
- B. Anode
- C. Charge
- D. Atom

Question 2

Imagine you have a neutral balloon. If you remove 16,000 electrons from it, what is the net charge on the balloon? Use:  $e=1.6 \times 10^{-19} \text{ C}$

- A.  $6.55 \times 10^{-14} \text{ C}$
- B.  $-6.55 \times 10^{-14} \text{ C}$
- C.  $-2.56 \times 10^{-15} \text{ C}$
- D.  $2.56 \times 10^{-15} \text{ C}$

Question 3

Two small spheres spaced 35.0cm apart have equal charge. How many excess electrons must be present on each sphere if the magnitude of the force of repulsion between them is  $2.20 \times 10^{-21} \text{ N}$  ?

- A.  $N_e=1062$
- B.  $N_e=931$
- C.  $N_e=3214$
- D.  $N_e=1917$

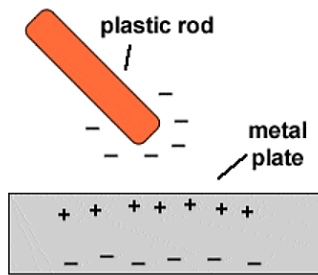
Question 4

A total electric charge of 8 nC is distributed uniformly over the surface of a metal sphere with a radius of 27 cm. If the potential is zero at a point at infinity, find the value of the potential at a distances of 52 cm from the center of the sphere.

- A. 138 V
- B. 266 V
- C. 100 V
- D. 220 V

Question 5

A method to create or generate static electricity in a material by bringing an electrically charged object near it.



- A. Induction
- B. Neutralization
- C. Polarization
- D. Conduction

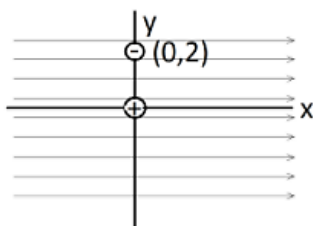
Question 6

What is the force experienced by a  $20\mu\text{C}$  point charge 5m away from a  $30\mu\text{C}$  point charge?

- A. 1.08 N
- B. 0.108 N
- C. 5.4 N
- D. 0.216 N

Question 7

In a region of space, there is a uniform electric field whose magnitude is  $E=1500 \frac{\text{N}}{\text{C}}$  directed to the right as diagrammed above. There are two charged particles in the field: a positive particle at the origin with charge  $q=1.3 \times 10^{-6} \text{ C}$  and another at point (0, 2) meters with charge  $q=2.4 \times 10^{-6} \text{ C}$  as shown. What is the net force on the  $2.4 \times 10^{-6} \text{ C}$  particle located at (0, 2) meters?



- A.  $7.9 \times 10^{-3} \text{ N}$
- B.  $3.4 \times 10^{-3} \text{ N}$
- C.  $1.06 \times 10^{-2} \text{ N}$
- D.  $3.6 \times 10^{-2} \text{ N}$

Question 8

The equation for Coulomb's Law is shown below. It is used to calculate the force between two objects.

$$F = k \frac{q_1 \times q_2}{d^2}$$

- A. Strong

- B. Dipole
- C. Electromagnetic
- D. Gravitational

Question 9

Which of the following is true about gravitational forces?

- A. Gravitational forces are larger between objects that have small masses.
- B. Gravitational forces are smaller between objects that have large masses.
- C. Gravitational forces increase as the distance between two objects decreases.
- D. Gravitational forces decrease as the distance between two objects decreases.

Question 10

A sphere of radius 1.5 cm carried a charge of 10 nC which is uniformly distributed throughout the sphere. Determine the charge density of the sphere.

- A.  $\rho = 0.0025 \frac{C}{m^3}$
- B.  $\rho = 0.00071 \frac{C}{m^3}$
- C.  $\rho = 0.0368 \frac{C}{m^3}$
- D.  $\rho = 0.00014 \frac{C}{m^3}$

Question 11

Calculate the force exerted between two charged objects separated by a distance of 0.6 m. One object has a charge of -5 C and the other has a charge of +2.0 C.

- A.  $-2.5 \times 10^{11}$  N
- B.  $-7.5 \times 10^{10}$  N
- C.  $7.5 \times 10^{10}$  N
- D.  $2.5 \times 10^{11}$  N

Question 12

Find the unit tangent vector for the given curve  $\vec{r}(t) = t\vec{i} + 2t^2\vec{j} - t^3\vec{k}$  at the point (1, 2, -1).

- A.  $\frac{1}{\sqrt{26}}(-\vec{i} - 4\vec{j} + 3\vec{k})$
- B.  $\frac{1}{\sqrt{26}}(\vec{i} + 4\vec{j} - 3\vec{k})$
- C.  $\frac{1}{\sqrt{8}}(\vec{i} + 4\vec{j} - 3\vec{k})$
- D.  $\frac{1}{\sqrt{8}}(-\vec{i} - 4\vec{j} + 3\vec{k})$

Question 13

What is the value of minimum force acting between two charges placed at 1 m apart from each other?

- A.  $\frac{Ke^2}{9}$
- B.  $9Ke^2$
- C.  $Ke^2$
- D.  $\frac{Ke}{4}$

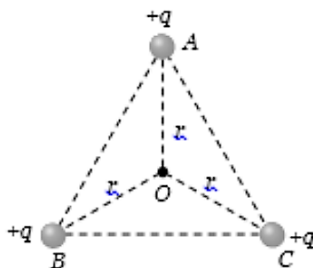
Question 14

Which of the following is an application of conduction?

- A. Thermal energy from the Sun to Earth
- B. Vacuum flasks having silver bodies
- C. Air conditioners cooling down the room
- D. Pots having metal bodies and plastic handles

Question 15

ABC is an equilateral triangle. Charges  $+q$  are placed at each corner. The electric intensity at O will be?



- A. Zero
- B. Maximum
- C. Minimum
- D. Unidentified

Question 16

If an ionic crystal is subjected to an electric field of  $1000 \text{ Vm}^{-1}$  and the resulting polarization  $4.3 \times 10^{-8} \text{ cm}^2$ . Calculate the relative permittivity of NaCl.

- A.  $\epsilon_r = 6.61$
- B.  $\epsilon_r = 3.48$
- C.  $\epsilon_r = 5.86$
- D.  $\epsilon_r = 1.56$

Question 17

The distance between the two charges  $25 \mu \text{ C}$  and  $36 \mu \text{ C}$  is 11 cm. At what point on the line joining the two, the intensity will be zero?

- A. At a distance of 10cm from  $25 \mu \text{ C}$

- B. At a distance of 5cm from  $25 \mu C$
- C. At a distance of 5cm from  $36 \mu C$
- D. At a distance of 11 cm from  $36 \mu C$

Question 18

What is the energy possessed by a charge due to its position in an electric field?

- A. Electrical potential difference
- B. Electrical potential energy
- C. Electrical mechanical energy
- D. Electrical kinetic energy

Question 19

Two charges  $3 \times 10^{-5} C$  and  $5 \times 10^{-4} C$  are placed at a distance 10 cm from each other. Find the value of electrostatic force acting between them.

- A.  $13.5 \times 10^{10}$
- B.  $40 \times 10^{11}$
- C.  $180 \times 10^9$
- D.  $13.5 \times 10^{11}$

## Answer Key

1. B
2. C
3. A
4. A
5. A
6. D
7. A
8. C
9. C
10. B
11. D
12. B
13. C
14. D
15. A
16. C
17. B
18. B
19. D