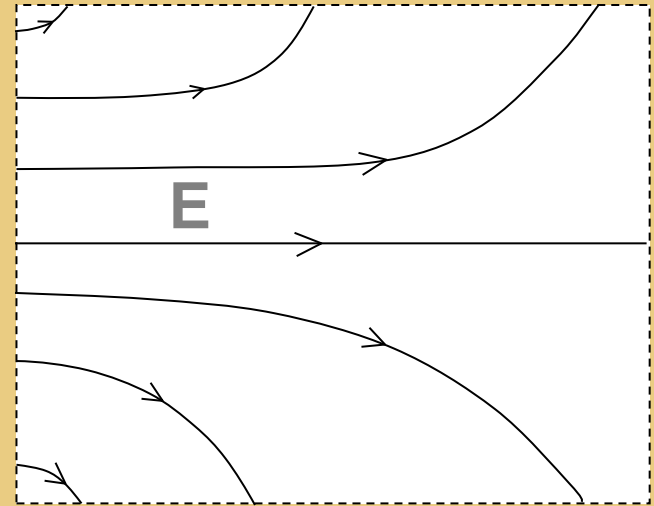


A spherical object having a positive charge of a billion coulombs is in the vicinity of a proton (a particle that has a positive charge of  $1.6 \times 10^{-19}$  coulombs). Which object exerts the greater electrostatic force on the other?

- a) The spherical object.**
- b) The proton.**
- c) Neither.**

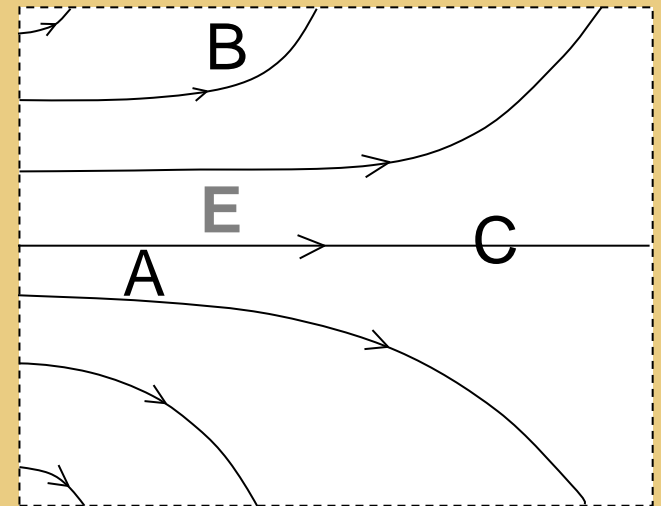
Depicted at right is the electric field in a region of space. In that region of space, is the electric field uniform?



**a) Yes**

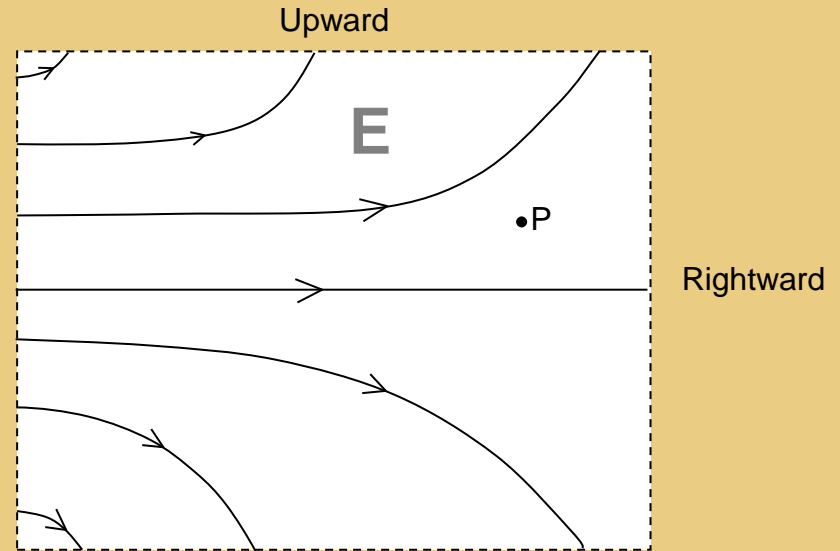
**b) No**

Depicted at right is the electric field in a region of space. Among the three labeled points, where is the electric field strongest?



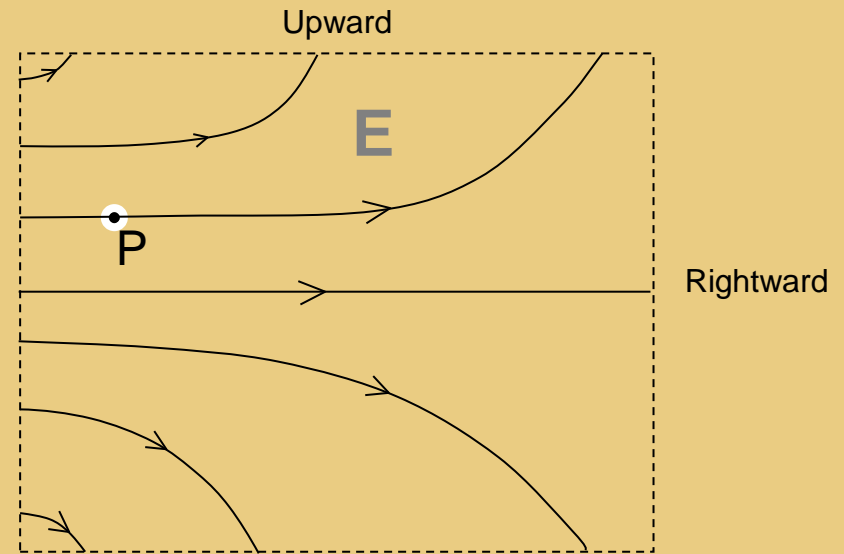
- a) A
- b) B
- c) C

Depicted at right is the electric field in a region of space. What is the direction of the electric field at point P?



- a) Up and to the right.
- b) Down and to the left.
- c) There is no electric field at point P.

Suppose that a positively charged particle is released from rest at point P. Will the particle move along the electric field line on which it lies?



- a) **Yes. It will stay on the “line”.**
- b) **No. It will depart from the “line”.**

A student states that the motion of a positively charged particle in a uniform electric field is essentially the same as projectile motion near the surface of the earth. Is the student correct?

**a) Yes.**

**b) No.**

At time zero, a negatively charged particle is moving rightward in a uniform, rightward-directed, electric field. It is always in the uniform electric field. Describe the subsequent motion of the particle.

- a) It moves rightward at an ever decreasing speed until it achieves, just for an instant, a speed of zero. Then it starts moving leftward at an ever increasing speed.**
- b) It moves rightward at an ever increasing speed.**

Two charged particles of opposite charge are placed in a uniform, rightward, external electric field and released from rest. Assuming no forces act on the particles other than the electrostatic force, is it possible for the particles to accelerate away from each other?

- a) No. Unlike charges attract.**
- b) Yes. Unlike charges repel.**
- c) Yes, if the positive particle is to the right of the negative particle.**
- d) Yes, if the positive particle is to the left of the negative particle.**



The effect of an electric field is to exert a force on any charged particle that finds itself at a point in space at which the electric field exists.

**a) True**

**b) False**

The direction of the electric field at a point in space is the direction of the force that would be exerted on any charged particle that might find itself at that point in space.

**a) True**

**b) False**

The electric field is a vector field.

**a) True.**

**b) False.**

The electric field is a vector.

**a) True.**

**b) False.**

Is the electric field a characteristic of a particle or is it a characteristic of space?

**a) Particle.**

**b) Space.**

Can an electric field exist in the absence of a charged particle for it to exert a force on?

**a) Yes.**

**b) No.**

Assuming no force besides that due to the electric field, is it possible for a charged particle to be in an external electric field without its kinetic energy changing?

**a) Yes.**

**b) No.**

At time zero, a charged particle is moving in an electric field. (No force other than that of the electric field acts on the particle.) Is it possible for the particle to, at some later time, have the same kinetic energy as it had at time zero?

**a) Yes.**

**b) No.**



Assuming no force besides that due to the electric field is it possible for a charged particle to be in an external electric field without its momentum changing?

**a) Yes.**

**b) No.**