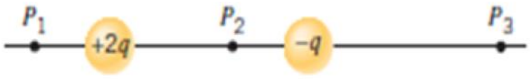
**Answer on Question #42358-Physics-Electromagnetism**

Two point charges are fixed in place, as in the figure below. The positive charge is +2q and has twice the magnitude of the negative charge, which is -q. On the line that passes through the charges, three spots are identified, P1, P2, and P3. At which of these spots could the potential be equal to zero? (a) P2 and P3 (b) P1 and P3 (c) P1 and P2 ……Give reason

**Solution**




Reasoning

The total potential is the algebraic sum of the individual potentials created by each charge. It will be zero if the potential due to the positive charge is exactly offset by the potential due to the negative charge. The potential of a point charge is directly proportional to the charge and inversely proportional to the distance from the charge.

Answers (b) and (c) are incorrect.

The total potential at cannot be zero. The positive charge has the larger magnitude and is closer to than is the negative charge. As a result, the potential of the positive charge at dominates over the potential of the negative charge, so the total potential cannot be zero.

Answer (a) is correct.

Between the charges there is a location at which the individual potentials cancel each other. The charges have unequal magnitudes, so the cancellation point does not occur at the midpoint. Instead, it occurs at the location which is closer to the charge with the smaller magnitude—namely, the negative charge. At since the potential of a point charge is inversely proportional to the distance from the charge, the effect of the smaller charge will be able to offset the effect of the more distant larger charge. To the right of the negative charge there is also a location at which the individual potentials exactly cancel each other. All places on this section of the line are closer to the negative charge than to the positive charge. Therefore, there is a location in this region at which the potential of the smaller negative charge exactly cancels the potential of the more distant and larger positive charge.

**Answer: (a) P2 and P3.**