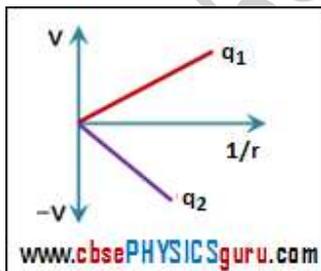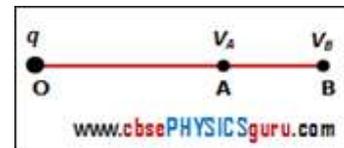# Assignment- Electric Potential

1. Define one electron-volt (eV).

2. An electron approaches another fixed electron. What happens to: (a) the kinetic energy of the approaching electron (b) the electric potential energy of the system and (c) the total energy of the system?

3. Show diagrammatically a system of three point charges separated by finite distances that has zero electric potential energy.

4. What is the work done by the electric field of a nucleus in a complete circular orbit of an electron? Will the answer be different if the orbit is elliptical?

5. A charge of 1 C travels between two plates maintained at a potential difference of 1 volt. What is the energy gained by the charge?

6. Three point charges of 1 C, 2 C and 3 C are placed at the corners of an equilateral triangle of side 1 m. Find the work done to move these charges to the corners of a similar equilateral triangle of side 0.5 m.

7. Two point charges A and B of value +5 μC and +6 μC are kept 12 cm apart in air. Calculate the work done when charge B is moved by 2 cm towards charge A.

8. You are given four charges +Q, +Q, -Q and -Q. How can you arrange all charges on the four corners of a square so that the potential at the centre of the square be zero?

9. Can electric potential be calculated if only electric field at a point is known and can electric field be determined if only electric potential at a point is known?

10. The electric field and potential at a point due to a point charge are 100 N/C and 40 V, respectively. Calculate the magnitude of the charge and the distance of the point from the charge.

11. A point charge q is placed at point O. Is (V_A -V_B) positive, negative or zero, if q is a: (i) positive (ii) negative charge?


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12. The two graphs givenn in figure show the variation of electric potential (V) with 1/r (r being the distance of the field point from the point charge) for two point charges q_1 and q_2. (i) What are the signs of the two charges? (ii) Which of the two charges has a larger magnitude and why?

13. A sphere of charge −10q is placed at the centre of a hollow spherical metal shell. The spherical shell has a net charge of −20q. What is the charge on the shell's (a) inner surface and (b) outer surface?

14. An infinite plane sheet of charge density 10^{-6} C/m²is placed in air. What will be potential difference between two equi-potential surfaces having a separation of 10 mm?

15. A proton is initially at rest at point P as shown in figure. Does it move if released? If yes, in which direction does it move? If no, why does it remain stationary? What will be the answers if proton is replaced by an electron?

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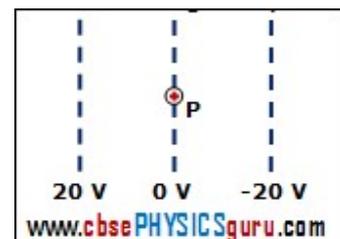
16. There is an equilateral triangle with one point charge at each vertex. The charges are−Q, +3Q and −4Q respectively. The length of one side of the triangle is L. Determine an expression in simplest form for the electric potential at a point halfway between the − Q and +3Q.

17. Two charges of +30 nC each are placed on diagonally opposite corners of a square with sides 1.0 m long, and a third charge of -30 nC is placed at a third corner. (a) Find the potential energy of this system of charges assuming it was assembled from charges initially at infinity. (b)Determine the potential at the 4th corner of the square, assuming V = 0 at infinity.

18. Protons at rest initially are located where the electrical potential has a value of 8.35 MV. On being released they travel through a vacuum to a region where the potential is zero. (a) Find the final speed of the protons. (b) Find the electric field strength if the potential changed uniformly over a distance of 2.00 m.

19. The potential around a point (1m, 2m, 3m) is given by $V = 2x^2 – 6$. Determine the electric field at this point.

20. Three charges of 0.1 C each are placed at the vertices of an equilateral triangle of side 1.0 m. If energy is supplied at the rate of 1.0 kW, how many days will be required to transfer one of the charges to the mid-point of the other two?

21. There is an equilateral triangle with one point charge at each vertex. The charges are−Q, +3Q and −4Q respectively. The length of one side of the triangle is L. Determine an expression in simplest form for the electric potential at a point halfway between the − Q and +3Q.

22. In a uniform electric field of strength 5×10^5 N/C, find the potential difference between the (i) points A and B, (ii) points A and C, as shown in the given figure. Given AC = 5 cm, BC = 3 cm. Explain your answers.

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23. An electron is liberated from a hot filament and attracted by an anode of potential of 1200 Volt with respect to the filament. What is the speed of the electron when it strikes the anode? (e/m = 1.76 x 10^{11} C kg^{-1})?

24. What would be the work done if a point charge +q, is taken from a point A to the point B on the circumference of a circle drawn with another point charge −q at the centre as shown in figure?

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