Item Number	Task	Basis of Assessment	Sample Response	Score
(a)	Explain charge production in Van de Graaff generator.	Analysis of the mechanism (friction, induction, corona discharge).	The operation of the generator relies on the **action of points** (corona discharge) and the property that charges on a conductor reside on its outer surface. A high-voltage power source is connected to the lower pointed comb. The high electric field at the sharp points causes a **corona discharge**, ionizing the air molecules around it. Positive ions are repelled from the points and sprayed onto the moving insulating belt. (**Accept;** The motor drives a rubber belt against a lower comb/pulley, causing charging by friction (triboelectric effect)). The belt carries these positive charges upward into the hollow metal sphere. Inside the sphere, the upper pointed comb is placed very close to the belt. The positive charges on the belt induce a negative charge at the sharp points of the comb. This creates another **corona discharge**, which neutralizes the charge on the belt and transfers the resulting positive charge to the exterior of the metal sphere. Because the charge is transferred to the *inside* of the conducting sphere, it immediately moves to the *outside* surface due to electrostatic repulsion. This allows the sphere to continue accumulating charge and increasing its potential to millions of volts until the air around the sphere begins to break down (sparking)	06
(b)	Calculate initial and final electrostatic forces.	Application of Coulomb's Law and the principle of charge conservation.	Initial Force: $F = k\frac{q_1 q_2}{r^2}$ $F = 9.0 \times 10^9 \times \frac{(5 \times 10^{-6}) \times (3 \times 10^{-6})}{(15 \times 10^{-2})^2}$ $F = 6.0\ N\ (Repulsive)$	08

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			Upon touching: Total charge = +8.0 μC. Since spheres are identical, each gets +4.0 μC. New Force: $F' = 9.0 \times 10^9 \times \frac{(4 \times 10^{-6}) \times (4 \times 10^{-6})}{(20 \times 10^{-2})^2}$ $F' = 3.6\ N\ (Repulsive)$	
(c)	Explain the 'hair standing' phenomenon.	Analysis of force implications in everyday life (repulsion).	When the person touches the dome, they become part of the conductor and acquire the same positive charge. The charge spreads to the individual hairs. Since each hair carries a like charge (positive), an electrostatic force of repulsion acts between adjacent hairs. This force pushes the hairs away from each other and the head, causing them to stand on end and spread out.	06

Total Score: 20