Question 1

An isolated spherical conductor of radius $R$ has a total charge of $-Q$ on it. If we set the electric potential to be 0 at infinity, $V(\infty) = 0$, what is the electric potential a distance $r = R/3$ from the center of the sphere?

A) $V = \frac{3kQ}{R}$
B) $V = \frac{kQ}{r}$
C) $V = 0$
(D) $V = -\frac{kQ}{R}$
E) $V = -\frac{3kQ}{R}$

Answer: D

Question 2

Three air filled parallel plate capacitors all have the same plate area $A$ and also have the same charge $Q$. In capacitor 1 the plates are separated by a distance $d$. In capacitor 2 the plates are separated by a distance $2d$, and in capacitor 3 the plates are separated by a distance $d/2$. For each capacitor the distance between the plates is much smaller than the size of the plates. Which of these three capacitors has the greatest electric potential difference across it?

A) Capacitor 1
B) Capacitor 2
C) Capacitor 3
D) 2 or more of the capacitors have the same potential difference across
E) There is not enough information given to say for sure.

Answer: B

$C = \frac{A\varepsilon_0}{d}$  
smaller $d$ means larger $C$  
larger $d$ means smaller $C$  

$C = \frac{Q}{V}$

$V = \frac{Q}{C}$  
smallest $C$ gives largest $V$  

$C_1$ is smallest  
$C_3$ is largest