The solutions are in order of the questions for version 1.

(1). Correct answer A

The electric fields in C and D are zero, In A, B, the x-component cancels and we just have a y-component. In A the y-component resulting from each of the charges points down and hence these all add; in B, some point down and some point up, partially canceling the field strength.

(2). Correct answer is B

The force Q E must equal ma; hence Q= (.275)(13)/5 = .72 C

(3). Correct answer is B

The field due to a large plate in independent of the distance from the plate. Hence the field contributions from the negative and positive charges exactly cancel, giving zero.

(4). Correct answer is D

Plugging in the numbers, the electric force if

$$\frac{(9 \times 10^9)(20 \times 10^{-6})^2}{(150)^2} \simeq 1.5 \times 10^{-4}$$

The gravitational contribution is almost completely negligible

(5). Correct answer is B

There is no y-component from the $Q = -1\mu C$ charge; using the fact that the distance is 2m and that the y-component is proportional to sine of the angle between the x-axis and the vector to the charge location, the other charge gives a negative y-component with magnitude

$$\frac{(9 \times 10^9)(2 \times 10^{-6})}{(2)^2} \frac{1.6}{2} \simeq 3600$$

(6). Correct answer is D

The force is just

$$\frac{(9 \times 10^9)(2 \times 10^{-6})(1^{-6})}{(1.6)^2} \simeq .007$$

(7). Correct answer is E

This is the field pattern for an electric dipole; the two charges are equal and have opposite signs and there are field lines (and hence non-zero field values) at the two points. Hence the answer is E.

(8). Correct answer is A

By Gauss' law, there must be a total of -300 nC spread around the inner surface; the charge density is then this charge, divided by the surface area of $4\pi(.8)^2$.

(9). Correct answer is D

The field is always zero inside a conductor

(10). Correct answer is C

The total charge interior to r= 1.5 is -200nC. The field is therefore

$$\frac{(9 \times 10^9)(-200 \times 10^{-9})}{(1.5)^2} \simeq -800$$