Mark scheme for Support Worksheet – Topic 5, Worksheet 4

1 Originally we have that $F = \frac{GMm}{(2R_E)^2} = \frac{GMm}{4R_E^2}$. Now, $F' = \frac{GMm}{(3R_E)^2} = \frac{GMm}{9R_E^2}$ and so

$F' = \frac{4}{9}\left(\frac{GMm}{4R_E^2}\right) = \frac{4}{9}F$, so **D**. [1]

2 From $F = k\frac{q_1 q_2}{r^2}$ if one charge doubles the force doubles on both charges, **D**. [1]

3 From $F = k\frac{q_1 q_2}{r^2}$ if both charges double and the separation doubles then

$F' = k\frac{2q_1 2q_2}{(2r)^2} = k\frac{4q_1 q_2}{4r^2} = k\frac{q_1 q_2}{r^2} = F$ so the force stays the same on both charges, **A**. [1]

4 The definition requires that the point charge *q* be a small charge, so **D**. (Notice that since the answers involve the vector force it is not necessary to demand that *q* be positive.) [1]

5 Finding the electric field from each charge separately and then adding the vectors gives **B**. [1]