Gravitational and Electric Field Problems 1

1. Jupiter has a mass of \(1.9 \times 10^{27}\) kg and a radius of \(7.2 \times 10^7\) m. The gravitational field strength on the surface of Jupiter is

2. Earth's gravitational field strength is 7.83 N/kg at a certain point in space. The force of attraction between the Earth and a 55.0 kg student at this point in space is ____ N.

3. Luke Skywalker and R2D2 are in orbit at a distance of \(2.00 \times 10^7\) m from the centre of a planet. The gravitational field strength at this distance is 1.08 N/kg. What is the mass of the planet?

4. The diagram below shows four different locations of a satellite in its elliptical orbit about Earth.

   ![Diagram of satellite orbit](image)

   At which location is the magnitude of the gravitational force acting on the satellite the greatest?

   a. A
   b. B
   c. C
   d. D
   e. The force is constant
Biofilm bacteria cause a variety of medical and industrial problems. This bacteria grows as a thin organic layer on many types of inert surfaces, from water pipes to prosthetic implants. Under certain circumstances, the bacteria may develop into an infection or cause structural damage. When this happens, the biofilm grows a protective slime. Researchers are testing low-level electrical fields to force antibodies or biocide solutions through the biofilm’s protective slime in order to directly attack the underlying bacteria.

5. In order to force a biocide solution through the slime, the biocide solution is positively charged and placed in an electric field. The arrangement that would be used to move the biocide through the slime is

A. 

\[ \text{Charged plate} \quad + \quad \text{Biocide} \quad + \quad \text{Charged plate} \]

B. 

\[ \text{Charged plate} \quad - \quad \text{Biocide} \quad + \quad \text{Charged plate} \]

C. 

\[ \text{Charged plate} \quad + \quad \text{Biocide} \quad - \quad \text{Charged plate} \]

D. 

\[ \text{Charged plate} \quad - \quad \text{Biocide} \quad + \quad \text{Charged plate} \]

6. An object has a charge of \( +7.5 \times 10^{-6} \) C. Determine the electric field strength at the point P 0.20 m away.

\[ Q_1 = 7.5 \times 10^{-6} \text{ C} \]

\[ P \]

\[ 0.20 \text{ m} \]

<table>
<thead>
<tr>
<th>Field strength</th>
<th>Direction</th>
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</thead>
<tbody>
<tr>
<td>A. 3.4 x 10^5 N/C</td>
<td>pointing away from the charge</td>
</tr>
<tr>
<td>B. 3.4 x 10^5 N/C</td>
<td>pointing towards the charge</td>
</tr>
<tr>
<td>C. 1.7 x 10^6 N/C</td>
<td>pointing away from the charge</td>
</tr>
<tr>
<td>D. 1.7 x 10^6 N/C</td>
<td>pointing towards the charge</td>
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