National Exams. May 2016

04-Geol-A6, Soil Mechanics

3 hours duration

NOTES:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.

2. This is a CLOSED BOOK EXAM. Candidates may use one of two calculators, the Casio or Sharp-approved model. A compass and ruler are also required.

3. SIX (6) questions constitute a complete exam paper. YOU MUST ANSWER QUESTIONS 1 TO 5. Candidates must choose three (3) more questions out of the five (5) options in Question 6. Where stated in the examination, please hand in any additional pages with your exam booklet.

4. The marks assigned to the subdivisions of each question are shown for information. The total number of marks for the exam is 100.
Question 1. Classification

1. Plot the grain-size curves and classify soils A and B according to the Unified Soil Classification System. Soil A no plasticity. Soil B has a liquid limit of 70% and a plastic limit of 25%.

15 marks

Table Q1

<table>
<thead>
<tr>
<th>Metric Sieve Size</th>
<th>US Sieve Size</th>
<th>Soil A</th>
<th>Soil B</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 mm</td>
<td>3 in</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>50 mm</td>
<td>2 in</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>25 mm</td>
<td>1 in</td>
<td>95</td>
<td>100</td>
</tr>
<tr>
<td>19 mm</td>
<td>0.75 in</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>0.375 in</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>4.76 mm</td>
<td>No. 4</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>2.38 mm</td>
<td>No. 8</td>
<td>55</td>
<td>100</td>
</tr>
<tr>
<td>0.84 mm</td>
<td>No. 20</td>
<td>35</td>
<td>97</td>
</tr>
<tr>
<td>0.042 mm</td>
<td>No. 40</td>
<td>25</td>
<td>92</td>
</tr>
<tr>
<td>0.015 mm</td>
<td>No. 100</td>
<td>15</td>
<td>82</td>
</tr>
<tr>
<td>0.007 mm</td>
<td>No. 200</td>
<td>7</td>
<td>75</td>
</tr>
</tbody>
</table>

Figure Q1
Question 2.  Soil Physical Properties  
15 marks

1. For a given soil, e =0.70, w = 15%, and G_s =2.70. If any assumptions are required, state them clearly.

Calculate:
   a) The porosity
   b) Moist unit weight
   c) Dry unit weight
   d) degree of saturation
   e) the mass of water to be added to 10 m³ of soil for full saturation

2. An embankment for a highway is to be constructed from a soil compacted to a dry unit weight of 16.5 kN/m³ at water content of 19%. The clay has to be trucked to the site from a borrow pit. The bulk unit weight of the soil in the borrow pit is 14 kN/m³ and its natural water content is 4.5%. Calculate:

   a) The volume of clay from the borrow pit required for 1 m³ of embankment. Assume G_s =2.7.
   b) The amount of water required per cubic meter of embankment, assuming no loss of water during transportation.

Question 3.  Shear Strength  
20 marks

1. Two consolidated and drained (CD) triaxial compression tests (tests A and B) were conducted on dense dry sand at the same void ratio. Test A had a cell pressure of 150 kPa, while in test B the cell pressure was 600 kPa (u=0kPa). These stresses were held constant throughout the test. At failure, they had maximum principal stress differences of 600 and 2550 kPa, respectively. You are asked to:

   a) Plot the Mohr circles for both tests at initial conditions and at failure.
   b) Determine shear strength of this soil.
   c) Determine the shear stress on the failure plane at failure for both tests?
   d) Determine the orientation of the failure plane in each specimen (use equations or graphical solution).
   e) Determine the orientation of the major principal plane at failure.
   f) Determine the orientation of the plane of maximum shear stress at failure.
   g) If these soil samples were tested in direct simple shear, would the soil exhibit compression or dilation?
Question 4. Consolidation

20 marks

1. A foundation is to be constructed at a site where the soil profile is as shown in Figure Q-4. A sample of overconsolidated clay was obtained from the midheight of the clay layer. The initial in-situ void ratio \( e_0 \) of the overconsolidated clay layer is 0.72. The compression index \( C_r = 0.28 \), recompression index \( C_r^* = 0.054 \), the coefficient of consolidation \( C_v = 2.68 \times 10^{-4} \text{ cm}^2/\text{s} \) and preconsolidation stress, \( \sigma'_{pc} = 180 \text{ kPa} \). The net consolidation pressure at the mid-height of the clay layer under the center of the foundation (\( \Delta \sigma \)) was calculated to be 65.4 kN/m². You are asked to:

a. Plot the total and effective stress profiles before construction.
b. Calculate the primary consolidation settlement for the clay layer.
c. How many years will it take for 50% of the total expected primary consolidation settlement to take place?
d. Calculate the final total and effective stresses at mid-height of the overconsolidated clay layer.
e. Compute the amount of primary consolidation settlement that will occur in 1 year.
f. It is suspected that there might be a layer of sand at the bottom of the overconsolidated clay layer. What would be the answers to questions 3 and 5 in this case?

\[ \Delta \sigma = 65.4 \text{ kN/m}^2 \]
\[ \gamma = \gamma_{sat} = 17 \text{ kN/m}^3 \]

Figure Q-4
Question 5. Seepage

Two configurations are shown in the Figures below for a concrete dam constructed on a saturated homogeneous clay layer. The conductivity of the clay layer is $4 \times 10^{-6}$ m/s. For BOTH configurations you are asked to:

1. Label the boundary conditions at A and B.
2. Calculate total head, elevation head and pressure head for points 1 and 2.
3. Plot the distribution of pore pressure head along the bottom of the dam.
4. Calculate the flow under the dam.
5. Without any calculation, show which of the two dams is subject to the highest uplift forces?

![Figure Q5-1. Configuration A](image)

![Figure Q5-2. Configuration B](image)
Question 6. Optional Questions

Answer three of the following five questions. Only the first three answers will be marked.

5 marks each

1) List the equation for Darcy's law and describe its components. Use a diagram to help explain your answer.

2) Draw the conceptual model for effective stress between two grains of sand and provide a brief derivation for the effective stress equation. Use a diagram to help explain your answer.

3) Describe capillary rise in a capillary tube and relate it to water retention curves for unsaturated soils. Use a diagram to help explain your answer.

4) You are an earthwork construction control inspector checking the field compaction of a layer of soil. When you conducted the sand cone test, the volume of soil excavated was 1165 cm$^3$. It weighed 2600 g wet and 1645 g dry.
   a) What is the field compacted dry density?
   b) What is the field water content?

5) Define the term groundwater table and plot the components of total head for the case of a 5 m thick sand layer with the groundwater table 1.5 m below the surface. Use a diagram to help explain your answer.
USEFUL INFORMATION

\[ C_s = \frac{D_{so}}{D_0} \]
\[ C_c = \left( \frac{D_{so}}{D_0} \right)^2 \]
\[ N_{\text{corrected}} = 100\% \frac{N - N_{\text{fmax}}}{100 - N_{\text{fmax}}} \]

\[ \rho_I = 0.73(\text{LL-20}) \]
\[ \rho_P = 0.73(\text{wL-20}) \]

\[ I_D = \frac{e_{\text{max}} - e}{e_{\text{max}} - e_{\text{min}}} \]
\[ I_L = \frac{w - w_p}{w_L - w_s} \]
\[ \text{Activity} = \frac{w_L - w_p}{\%\text{clay}} \]

\[ \rho_w = \frac{\rho_s}{(1 + w)} \]
\[ \rho' = \rho_{\text{sat}} - \rho_w \]
\[ h_i = h_e + h_p = z + \frac{u}{\gamma_w} \]

\[ t = \frac{\Delta h}{L} \]
\[ v = k_i \]

\[ k = \frac{\gamma_w K}{\eta} \]
\[ v_i = \frac{v}{n} \]
\[ q = vA = kiA \]

\[ q = k\Delta h \frac{N_f}{N_d} \]

\[ k = \frac{aL}{A\Delta t} \ln \left( \frac{h_1}{h_2} \right) = 2.3 \frac{aL}{A(t_2 - t_1)} \log \frac{h_1}{h_2} \]
\[ k = \frac{QL}{hA} \]

\[ k_N = \frac{H}{\left( \frac{H_1}{k_1} + \frac{H_2}{k_2} + \frac{H_3}{k_3} \right)} \]

\[ \kappa_p = k_1H_1 + k_2H_2 + k_3H_3 \]
\[ p = \frac{\sigma_1 + \sigma_3}{2} \]
\[ q = \frac{\sigma_1 - \sigma_3}{2} \]

**Force** → Newton (N) → 1 N = 1 kg m/s²

**Pressure** → Pascal (Pa) → 1 Pa = 1 N/m² → 1 kPa = 1 kN/m²

\[ \Delta u = B[\Delta \sigma_3 + A(\Delta \sigma_1 - \Delta \sigma_3)] \]
\[ \tau_{\text{max}} = c' + \sigma'\tan \phi' \]
\[ \sigma' = \sigma - u \]
\[ \psi' = \arctan (\sin \phi') \]
\[ a = c'\cos \phi' \]

\[ T = \frac{c_d}{H^2_{\text{or}}} \]
\[ c_v = \frac{k}{m\gamma_w} \]

\[ \Delta H = C_o \left( \frac{H_s}{1 + e_o} \right) \log \frac{\sigma_{\text{or}}}{\sigma_{\text{or}}} + C_v \left( \frac{H_s}{1 + e_o} \right) \log \frac{\sigma'_{\text{or}}}{\sigma'_{\text{or}}} \]

\[ T = \frac{\pi}{4} \left( \frac{U}{100} \right)^2 \]

\[ U < 60\% \]

\[ T = 1.781 - 0.933 \log(100 - U) \quad U > 60\% \]

\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

\[ \sigma_{\text{eff}} = (\sigma_{1f} + \sigma_{3f})/2 - ((\sigma_1 - \sigma_3)\sin \phi)/2 \]
\[ \tau_{\text{eff}} = \sigma_{\text{eff}}\tan \phi \]
\[ \alpha_{\text{eff}} = 45^\circ + \frac{\phi}{2} \]
\[ N\phi = \sigma_{1f}/\sigma_{3f} \]
\[ n = e/(1+e) \]
\[ \psi' = \arctan (\sin \phi') \]
\[ a = c'\cos \phi' \]
**Fine Grained Soils**

- More than half of material is smaller than 0.002 mm.

- Color, odor, and spongy feel can be identified.

- Identification procedures for fraction smaller than 4.75 mm.

- Plasticity index

- Use grain size curve in identifying the fractions as given under field identification.

**Laboratory Classification Criteria**

- Plasticity index, I_p (%)

- A-Line Plot

- C_s:

- C_p:

- C_t:

- Recommended treatment:

- Recommended usage:

- Recommended compaction:

- Recommended drainage:

- Recommended foundation:

- Recommended retentive:

- Recommended excavation:

- Recommended fill material:

- Recommended embankments:

- Recommended construction:

- Recommended foundations:

- Recommended pavements:

- Recommended cut-off walls:

- Recommended retaining walls:

- Recommended earthworks:

- Recommended caissons:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:

- Recommended slope stability:
TABLE 8.4 Influence Values for Vertical Stress Under Corner of a Uniformly Loaded Rectangular Area*

<table>
<thead>
<tr>
<th>Bandwidth Case</th>
<th>/l</th>
<th>0.1</th>
<th>0.2</th>
<th>0.4</th>
<th>0.6</th>
<th>0.8</th>
<th>1.0</th>
<th>2.0</th>
<th>∞</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.005</td>
<td>0.009</td>
<td>0.017</td>
<td>0.022</td>
<td>0.026</td>
<td>0.028</td>
<td>0.031</td>
<td>0.033</td>
<td>0.035</td>
</tr>
<tr>
<td>0.2</td>
<td>0.010</td>
<td>0.016</td>
<td>0.023</td>
<td>0.030</td>
<td>0.035</td>
<td>0.038</td>
<td>0.041</td>
<td>0.044</td>
<td>0.046</td>
</tr>
<tr>
<td>0.4</td>
<td>0.017</td>
<td>0.033</td>
<td>0.060</td>
<td>0.100</td>
<td>0.131</td>
<td>0.161</td>
<td>0.191</td>
<td>0.221</td>
<td>0.251</td>
</tr>
<tr>
<td>0.6</td>
<td>0.022</td>
<td>0.043</td>
<td>0.092</td>
<td>0.151</td>
<td>0.210</td>
<td>0.269</td>
<td>0.328</td>
<td>0.387</td>
<td>0.446</td>
</tr>
<tr>
<td>0.8</td>
<td>0.026</td>
<td>0.056</td>
<td>0.108</td>
<td>0.166</td>
<td>0.224</td>
<td>0.282</td>
<td>0.340</td>
<td>0.400</td>
<td>0.458</td>
</tr>
<tr>
<td>1.0</td>
<td>0.028</td>
<td>0.055</td>
<td>0.101</td>
<td>0.156</td>
<td>0.211</td>
<td>0.266</td>
<td>0.321</td>
<td>0.376</td>
<td>0.431</td>
</tr>
<tr>
<td>2.0</td>
<td>0.031</td>
<td>0.061</td>
<td>0.115</td>
<td>0.169</td>
<td>0.223</td>
<td>0.278</td>
<td>0.333</td>
<td>0.388</td>
<td>0.443</td>
</tr>
<tr>
<td>4.0</td>
<td>0.032</td>
<td>0.062</td>
<td>0.115</td>
<td>0.155</td>
<td>0.205</td>
<td>0.254</td>
<td>0.304</td>
<td>0.354</td>
<td>0.404</td>
</tr>
</tbody>
</table>

Wedge-shaped Case

<table>
<thead>
<tr>
<th>/l</th>
<th>0.1</th>
<th>0.2</th>
<th>0.4</th>
<th>0.6</th>
<th>0.8</th>
<th>1.0</th>
<th>2.0</th>
<th>∞</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.006</td>
<td>0.008</td>
<td>0.014</td>
<td>0.020</td>
<td>0.026</td>
<td>0.031</td>
<td>0.037</td>
<td>0.043</td>
</tr>
<tr>
<td>0.2</td>
<td>0.009</td>
<td>0.013</td>
<td>0.023</td>
<td>0.034</td>
<td>0.045</td>
<td>0.055</td>
<td>0.065</td>
<td>0.075</td>
</tr>
<tr>
<td>0.4</td>
<td>0.016</td>
<td>0.026</td>
<td>0.053</td>
<td>0.090</td>
<td>0.127</td>
<td>0.16</td>
<td>0.193</td>
<td>0.226</td>
</tr>
<tr>
<td>0.6</td>
<td>0.019</td>
<td>0.032</td>
<td>0.060</td>
<td>0.101</td>
<td>0.142</td>
<td>0.183</td>
<td>0.224</td>
<td>0.265</td>
</tr>
<tr>
<td>0.8</td>
<td>0.021</td>
<td>0.035</td>
<td>0.071</td>
<td>0.123</td>
<td>0.175</td>
<td>0.227</td>
<td>0.279</td>
<td>0.331</td>
</tr>
<tr>
<td>1.0</td>
<td>0.022</td>
<td>0.036</td>
<td>0.076</td>
<td>0.130</td>
<td>0.185</td>
<td>0.241</td>
<td>0.296</td>
<td>0.352</td>
</tr>
<tr>
<td>2.0</td>
<td>0.023</td>
<td>0.039</td>
<td>0.083</td>
<td>0.137</td>
<td>0.192</td>
<td>0.247</td>
<td>0.302</td>
<td>0.358</td>
</tr>
<tr>
<td>4.0</td>
<td>0.024</td>
<td>0.042</td>
<td>0.092</td>
<td>0.147</td>
<td>0.202</td>
<td>0.257</td>
<td>0.312</td>
<td>0.368</td>
</tr>
</tbody>
</table>

*After Elgamal and El-Sayed (1960).