

Total Marks = 70 [questions values as marked]

1. Estimate the ratios of cross-sections or branching ratios given below. Explain clearly what principles you are applying in each case [15 points]:

$$\begin{array}{ll} \text{a) } \frac{\sigma(e^+e^- \rightarrow \mu^+\mu^-\gamma)}{\sigma(e^+e^- \rightarrow \mu^+\mu^-)} & \text{b) } \frac{Br(K^{*+} \rightarrow K^+\pi^0)}{Br(K^{*+} \rightarrow K^0\pi^+)} \\ \text{c) } \frac{Br(\bar{B}^0 \rightarrow \pi^+\pi^-)}{Br(\bar{B}^0 \rightarrow D^+\pi^-)} & \text{d) } \frac{Br(\Lambda_c^+ \rightarrow p\Lambda^0\pi^0)}{Br(\Lambda_c^+ \rightarrow pK^-\pi^+)} \\ \text{e) } \frac{Br(\Omega^- \rightarrow \Xi^0 K^-)}{Br(\Omega^- \rightarrow \Lambda K^-)} & \text{f) } \frac{Br(\Upsilon(4s) \rightarrow B^+B^-)}{Br(\Upsilon(4s) \rightarrow B^0\bar{B}^0)} \end{array}$$

2. Griffiths problem 6.7 [5 points]

3. Griffiths problem 6.9 [10 points]

4. Griffiths problem 6.14: You can ignore the part about the ultra-relativistic limit, or do it for extra credit. [10 points]

5. Griffiths problem 7.17 [10 points]

6. Griffiths 7.48 (Please be sure to read the explanation that precedes this, from the bottom of page 272). [10 points]

7. The branching ratio for the decay $B^0 \rightarrow e^+\nu_e + \text{anything}$ is about 10%. Discuss whether this is about what one naively expects, and explain your reasoning. [10 points]