2. **B)** a) The concept of *antiparticles* arises in different ways in particle physics. Comment briefly on the way in which the relativistic wave equation and the Pauli Exclusion Principle have both suggested the possible existence of antiparticles.

Illustrate the way in which antiparticles are considered in the Feynman Diagram approach. Consider any reaction of your choice, draw the appropriate Feynman Diagram at the quark level and discuss.

Explain why mesons are expected to have corresponding antiparticles even although they do not obey the Pauli Exclusion Principle. Why are some mesons their own antiparticles while others are not? Illustrate by giving one example of each case and explain. **{12}**

b) Antiparticle–particle colliders have played a significant role in the development of experimental particle physics. Discuss the advantages and disadvantages of such machines when compared with fixed target experiments; where possible, give quantitative detail in your explanations.

Discuss the relative merits of electron–positron colliders with proton–antiproton colliders. Illustrate your answer by reference to two significant experiments, one from each type of collider. (Do not give a detailed account of the analysis; only identify the collider-dependent features upon which each experiment depends, and briefly discuss).**{12}**