

Particle physics

James Hooke

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Topic	Concept	Example 1	Example 2
1. Historical introduction	✓		
2. Fermions	✓		
2.1 Theory			
2.2 Experiment			
3. Bosons	✓	✓	
3.1 Theory			
3.2 Experiment			
4. Baryons	✓	✓	
4.1 Theory			
4.2 Experiment			
5. Mesons	✓	✓	
5.1 Theory			
5.2 Experiment			
6. Hadrons			
6.1 Theory	✓		
6.2 Experiment			

1. Historical introduction

1. Picture an electromagnetic wave. What is its energy?
2. Picture yourself moving with an electromagnetic wave. What is its energy?
3. When a photon hits a mirror and bounces back, is its velocity instantaneously zero as it turns around?
4. What are some different types of energy?
5. What are some different types of energy density?
6. What is the Maxwell-Hertz equation for free space?
7. What is the energy density of an electromagnetic wave?

8. What is the energy density of space? (May be more than one correct answer)
9. What is vacuum energy density?
10. How did Einstein derive $\Delta E \approx \Delta mc^2$?
11. How could we make a better and better approximation for $\Delta E \approx$?

2. Fermions

1. What are the six quarks?
2. When was the first quark discovered?
3. When was the last quark discovered?
4. Do quarks have integer charges?
5. How were some of the quarks discovered?
6. What are the six leptons?
7. When was the electron discovered?
8. How was the electron discovered?
9. When was the muon particle discovered?
10. How was the muon particle discovered?
11. When was the tau particle discovered?
12. How was the tau particle discovered?
13. Do fermions have integer or half-integer spin?
14. Do leptons have integer charges?

3. Bosons

1. What are the five most common bosons?
2. Do bosons have integer or half-integer spins?
3. Do bosons have integer or half-integer charges?
4. When were some of the bosons discovered?

4. Baryons

1. What is a baryon?

2. List a few examples.

5. Mesons

1. What is a meson?
2. List a few examples.

6. Hadrons

1. What is a hadron?
2. List a few examples.