2001 HIGHER SCHOOL CERTIFICATE EXAMINATION

Physics

Centre Number

Section I (continued)

Student Number

Part B – 60 marks
Attempt Questions 16–26
Allow about 1 hour and 45 minutes for this part

Answer the questions in the spaces provided.

Show all relevant working in questions involving calculations.

Marks

Question 16 (4 marks)

Muons are very short-lived particles that are created when energetic protons collide with each other. A beam of muons can be produced by very-high-energy particle accelerators.

The high-speed muons produced for an experiment by the Fermilab accelerator are measured to have a lifetime of 5.0 microseconds. When these muons are brought to rest, their lifetime is measured to be 2.2 microseconds.

(a) Name the effect demonstrated by these observations of the lifetimes of the muons.

Zeeman effect ~~accompanied~~ ~~proton decay effect~~

1

(b) Calculate the velocity of the muons as they leave the accelerator.

3

$\frac{5/0}{1} / \frac{2.2}{1}$

3.00×10^{8} ms^{-1}/a

3.00×10^{8} ms^{-1}

Marks

Question 17 (6 marks)

A rocket was launched vertically to probe the upper atmosphere. The vertical velocity of the rocket as a function of time is shown in the graph.
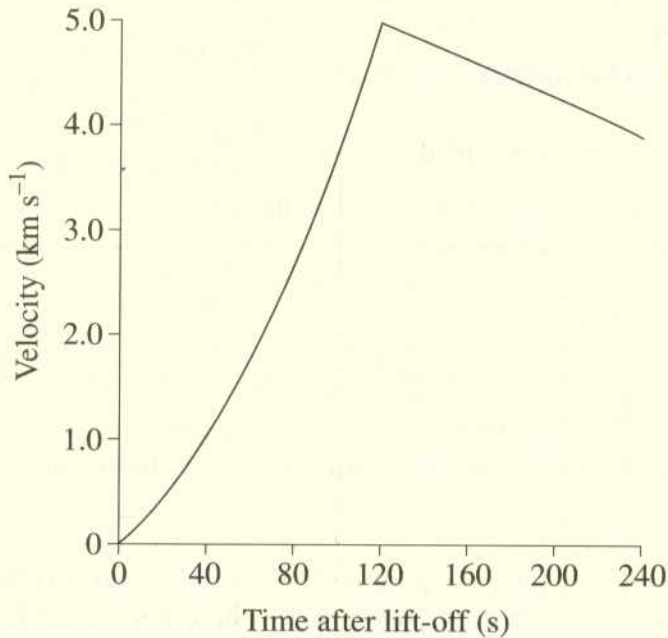
(a)   Using either words or calculations, compare the acceleration of the rocket at $t = 20$ s with its acceleration at $t = 100$ s.   **2**

When the rocket was launched vertically, then
reaching t=20s, it appeared to have achieved less
Velocity as it ~~has~~ then it did at 100s.

(b)   Account for the shape of the graph over the range of time shown.   **4**

The acceleration grew and increased over time
until break point of 120s where the ~~acc~~ acceleration
was decreased. The maximum height ∝ was approximately
5.Kms⁻¹ in velocity

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