

Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Mark Schemes

Q1.

Question Number	Acceptable answers	Additional guidance	Mark
	<ul style="list-style-type: none"> Correct equation ignoring charges (1) Charge on pion + (1) (1) 	$p + p \rightarrow p + n + \pi^+$	2

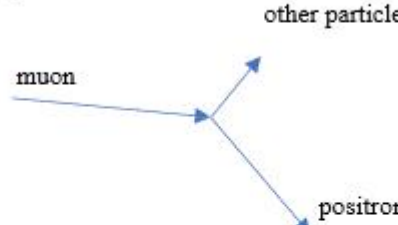
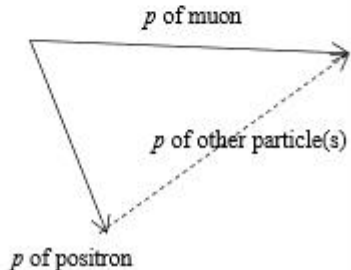
Q2.

Question Number	Acceptable answers	Additional guidance	Mark
(i)	<ul style="list-style-type: none"> Leaves no track (1) Or the tracks present are opposite curvatures 		1
(ii)	<ul style="list-style-type: none"> proton is positive (1) conservation of charge means pion is negative (1) Or opposite curvature to proton means pion is negative 	both marks can be given for $0 = +1 -1$ with pion identified as negative.	2
(iii)	<ul style="list-style-type: none"> $(\Delta^0) \rightarrow p^{(+)} + \pi^-$ (1) 	Allow ecf if pion was stated as positive in (ii)	1
(iv)	<ul style="list-style-type: none"> baryon number conserved Or baryon number is +1 on both sides of equation Or proton is baryon and the pion is not a baryon (1) 		1
(v)	An explanation that makes reference to the following points: <ul style="list-style-type: none"> The radius of the proton path is (very) large (compared with the pion) (1) According to $p = BQr$ (1) The momentum of the proton is larger than the momentum of the pion. (dependent on MP2 or MP1) (1) 	Allow proton path is less curved Allow $p \propto r$	3

Q3.

Question Number	Acceptable answers	Additional guidance	Mark
	<ul style="list-style-type: none"> Correct symbols for positive muon and positron (1) Correct symbols for neutrino and antineutrino (1) 	$\mu^+ e^+$ $(\mu^+ \rightarrow e^+) + \nu_e + \bar{\nu}_\mu$	2

Q4.

Question Number	Acceptable answers	Additional guidance	Mark
	<ul style="list-style-type: none"> The path of the positron has a different direction to that of the muon (1) Or radius of curvature of each path is different (1) Momentum of positron is different to that of muon (1) Momentum is conserved (1) So a further particle(s) must be produced (1) <p>MP4 depends on MP3</p>	<p>MP1 and 4 accept a sketch showing other particle direction eg</p>  <p>The labelled sketch below would gain 4 marks</p> 	4

Q5.

Question Number	Acceptable answers	Additional guidance	Mark
	<p>Maximum of 4 marks for MP1,3,5 and any one of MP2,4 or 6</p> <ul style="list-style-type: none"> a few alpha's reflect straight back (1) can be represented by the ball bearing being directly aimed at the centre of the "hill" (1) some alpha's slightly deflected/through small angles (1) can be represented by the ball bearing being aimed close to the centre line of the hill (1) Many/most alpha's undeflected (1) can be shown by aiming the ball bearing so that it touches/misses the edge of the hill (1) 	<p>accept deflect through large angles/more than 90°</p> <p>MP2 dependent on being linked to MP1</p> <p>MP4 dependent on being linked to MP3</p> <p>MP6 dependent on being linked to MP5</p>	<p>4 Max</p>