Particle Physics and The Standard Model (MCQ Only)

Q1.

Which of the following particles is an example of a fundamental particle?

- ☒ **A** nucleus
- ☒ **B** neutrino
- ☒ **C** pion
- ☒ **D** proton

(Total for question = 1 mark)

Q2.

A particle has a mass of 1 u and a charge of -1.6×10^{-19} C.

Which of the following could be the particle?

- ☒ **A** antiproton
- ☒ **B** electron
- ☒ **C** neutron
- ☒ **D** positron

(Total for question = 1 mark)

Q3.

A proton has a mass of 1.67×10^{-27} kg.

Which of the following shows the conversion of this mass to GeV/c^2 ?

☒ **A** $\frac{1.67 \times 10^{-27} \times 1.60 \times 10^{-10}}{(3.00 \times 10^{8})^2}$

☒ **B** $\frac{1.67 \times 10^{-27} \times 1.60 \times 10^{-19}}{(3.00 \times 10^{8})^2}$

☒ **C** $\frac{1.67 \times 10^{-27} \times (3.00 \times 10^{8})^2}{1.60 \times 10^{-10}}$

☒ **D** $\frac{1.67 \times 10^{-27}}{1.60 \times 10^{-10} \times (3.00 \times 10^{8})^2}$

(Total for question = 1 mark)

Q4.

Which of the following particle equations is correct for the decay of a proton within a nucleus?

☒ **A** $p \rightarrow n + \beta^+$

☒ **B** $p \rightarrow p + \beta^+$

☒ **C** $p \rightarrow n + \beta^+ + \nu$

☒ **D** $p \rightarrow p + \beta^+ + \nu$

(Total for question = 1 mark)

Q5.

A high-energy proton can interact with a photon to produce two particles.

Which of the following could be the two particles produced?

☒ **A** $n + \pi^0$

☒ **B** $n + \pi^+$

☒ **C** $\pi^0 + \pi^+$

☒ **D** $\pi^- + \pi^+$

(Total for question = 1 mark)

Q6.

Which row of the table summarises the mass and charge of an antineutron?

	Mass / u	Charge / e
☒ **A**	0	0
☒ **B**	0	−1
☒ **C**	1	0
☒ **D**	1	+1

(Total for question = 1 mark)

Q7.

The π^- particle has a mass of 140 MeV / c^2.

Which row of the table is correct for the antiparticle of a π^- ?

	Particle classification	Mass / MeV/c^2
☒ **A**	Baryon	+140
☒ **B**	Baryon	−140
☒ **C**	Meson	+140
☒ **D**	Meson	−140

(Total for question = 1 mark)

Q8.

Which of these is **not** made from quarks?

☒ **A** proton

☒ **B** neutron

☒ **C** lepton

☒ **D** meson

(Total for question = 1 mark)

Mark Scheme - Particle Physics and The Standard Model (MCQ Only)

Q1.

Question Number	Acceptable answers	Additional guidance	Mark
	B		1

Q2.

Question Number	Acceptable answers	Additional guidance	Mark
	The only correct answer is A *B is not correct because an electron has a much smaller mass* *C is not correct because a neutron has no charge* *D is not correct because a positron has a much smaller mass and is positive*		1

Q3.

Question Number	Acceptable answers	Additional guidance	Mark
	The only correct answer is C $\frac{1.67 \times 10^{-27} \times (3.00 \times 10^{8})^{2}}{1.60 \times 10^{-10}}$	A,B and D all contain numerical errors	1

Q4.

Question Number	Acceptable answers	Additional guidance	Mark
	The only correct answer is C A *is not correct because lepton number is not conserved* B *is not correct because charge conservation is not obeyed* D *is not correct because charge conservation is not obeyed*	$p \rightarrow n + \beta^{+} + \nu$	1

Q5.

Question Number	Acceptable answers	Additional guidance	Mark
	The only correct answer is B $n + \pi^+$	A, C and D do not follow conservation laws	**1**

Q6.

Question Number	Acceptable answers	Additional guidance	Mark
	The only correct answer is C **1** | **0**	A and B are incorrect as a neutron has mass D is incorrect as a neutron is neutral	**1**

Q7.

Question Number	Acceptable answers	Additional guidance	Mark
	The only correct answer is C A is not correct as the particle is a meson B is not correct as the particle is a meson D is not correct as the mass cannot be negative		**1**

Q8.

Question number	Acceptable answers	Additional guidance	Mark
	C		**1**