7.3 The Structure of Matter

Question Paper

Course	DP IB Physics
Section	7. Atomic, Nuclear & Particle Physics
Topic	7.3 The Structure of Matter
Difficulty	Easy

Time allowed: 20

Score: /10

Percentage: /100

Question 1

Using conservation of charge, determine which of the following is the correct quark composition of a proton?

A. sss

B. uud

C. ddd

D. uds

[1 mark]

Question 2

Which of the following particles has a baryon number of zero?

A. antineutron

B. neutron

C. kaon

D. proton

[1 mark]

Question 3

Beta-minus decay can be represented in terms of fundamental particles

$$d \rightarrow u + e^{-} + X$$

What type of particle is particle X?

A. quark

B. photon

C. lepton

D. hadron

[1 mark]

Question 4

Which of the following is a meson?

A. udd

B. $\overline{uds}$

C. ν_e

D. $u\bar{d}$

[1 mark]

Question 5

Which of the following was not an observation made by the Rutherford-Geiger-Marsden experiment?

A. Most of the α-particles went straight through the foil

B. Some α-particles deflected through small angles of less than 10°

C. Only a small number of α-particles deflected straight back at angles greater than 90°

D. The gold foil emits alpha particles

[1 mark]

Question 6

Which of the following is a correct statement about Feynman diagrams?

A. The vertical axis represents time

B. Gauge bosons are represented by a wavy/dashed line, or a helix

C. Only three particles may go into or out of a vertex

D. Particle lines can cross over

[1 mark]

Question 7

Which of the following is not conserved during weak interactions?

A. Baryon number

B. Lepton number

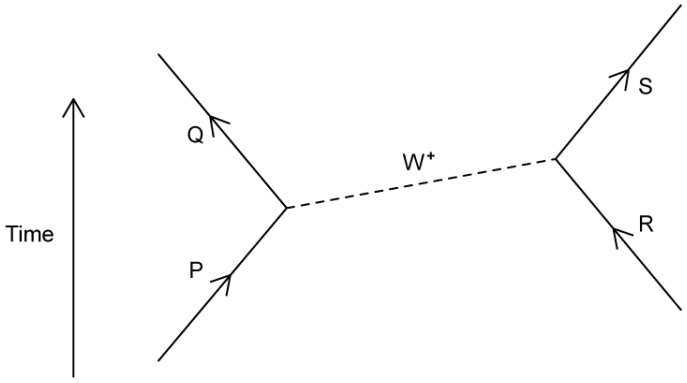
C. Strangeness

D. Charge

[1 mark]

Question 8

The Feynman diagram shows a particle interaction involving a W^+ boson.



Which two particles are the products of the interaction?

A. Q and S

B. P and Q

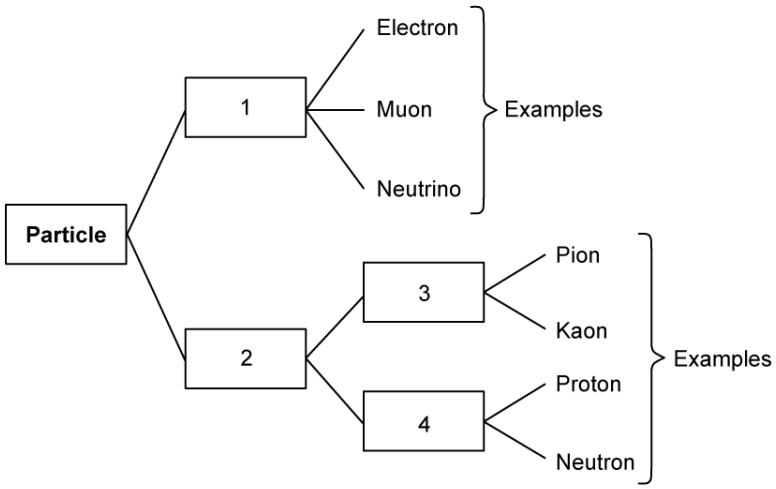
C. P and S

D. R and S

[1 mark]

Question 9

The standard model classifies particles into hadrons, leptons, mesons and baryons. The diagram below shows some examples of these types of particles.



Which row shows the correct position of each type of particle in the diagram?

	Hadrons	Baryons	Leptons	Mesons
A	1	2	3	4
B	2	4	1	3
C	4	3	2	1
D	3	1	4	2

[1 mark]

Question 10

Which answer is not a feature of the strong nuclear force?

A. The strong nuclear force is repulsive at nucleon separations closer than around 0.5 fm

B. The strong nuclear force is attractive up to around 3.0 fm

C. The strong nuclear force has an infinite range

D. The strong nuclear force reaches a maximum attractive value at around 1.0 fm

[1 mark]