Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 8_ Nuclear and Particle Physics

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Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Q1.

Rutherford's alpha-scattering experiment gave evidence that changed our understanding of the structure of the atom. Alpha particles were fired at a thin sheet of gold foil and their paths observed.

Explain how the observations of the different paths taken by the alpha particles as they passed through the gold foil led to a new model of the atom.

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(Total for question = 4 marks)

Q2.

According to astronomers in Denmark and Australia a common type of active galactic nucleus (AGN) could be used as an accurate "standard candle" for measuring cosmic distances. The technique has been used to measure distances corresponding to redshifts significantly larger than was previously possible.

(a) (i) State what is meant by a standard candle.

(1)

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(ii) Explain how a standard candle is used to measure cosmic distances.

(2)

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(b) (i) State what is meant by redshift.

(1)

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(ii) Calculate the distance to a galaxy with a redshift $z = 0.12$

$H_0 = 2.1 \times 10^{-18}\ s^{-1}$

(2)

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Distance to galaxy = ...

*(c) Discuss how astronomers were led to propose the existence of dark matter and the consequences of its existence for the ultimate fate of the universe.

(3)

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(d) Explain why the observable universe has a finite size.

(2)

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(Total for Question = 11 marks)

Q3.

The neutral lambda Λ^0 particle is a baryon of mass 1116 MeV/c^2 and contains one strange quark.

The table shows quarks and their relative charge.

Quark	Charge / *e*
u	+2/3
d	−1/3
s	−1/3

State, with justification, the quark content of a Λ^0 particle.

(2)

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(Total for question = 2 marks)