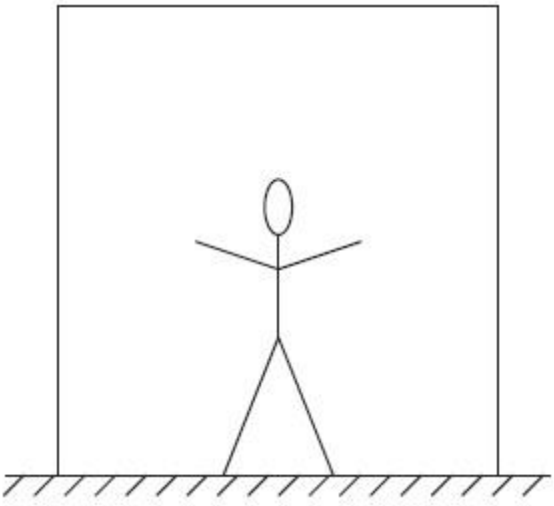
Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 2 (Mechanics)

Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

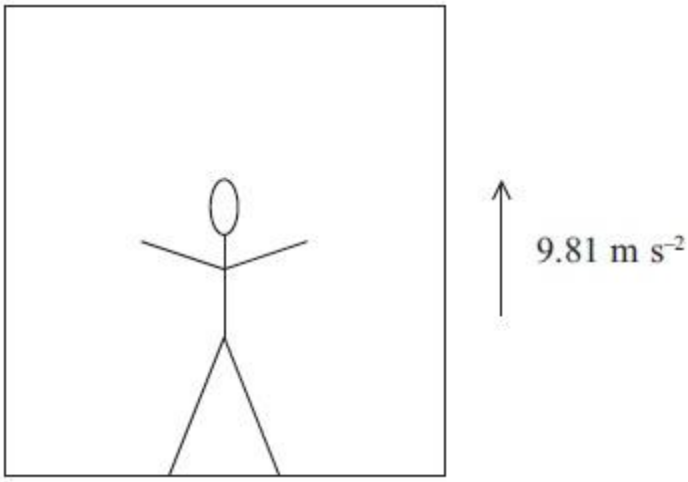
Q1.

* Einstein imagined a person in a large box without windows. He suggested that, with no way to see outside, the person could not tell whether they were:

- experiencing gravity on Earth
- in deep space far away from any effects of gravity but being accelerated at a rate of 9.81 m s^{-2}.



Stationary on Earth



Accelerating in deep space

Account for Einstein's suggestion by explaining in each case what a person standing in the box would feel through their feet. It may help to assume the person has mass *m*.

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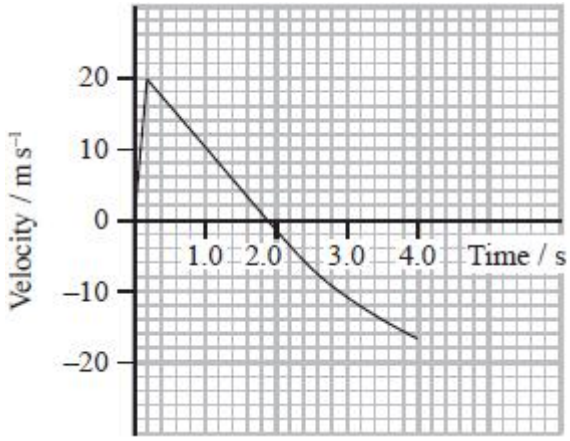
(Total for question = 6 marks)

Q2.

A physics class made a toy rocket. A drinks bottle was partially filled with water and inverted over a valve. An air pump delivered air to the bottle until the pressure forced the bottle from the valve and the water was ejected from the bottle at high speed.

A velocity-time graph for the bottle for the first 4 s after take-off is shown.



Sketch the corresponding acceleration-time graph on the axes below.

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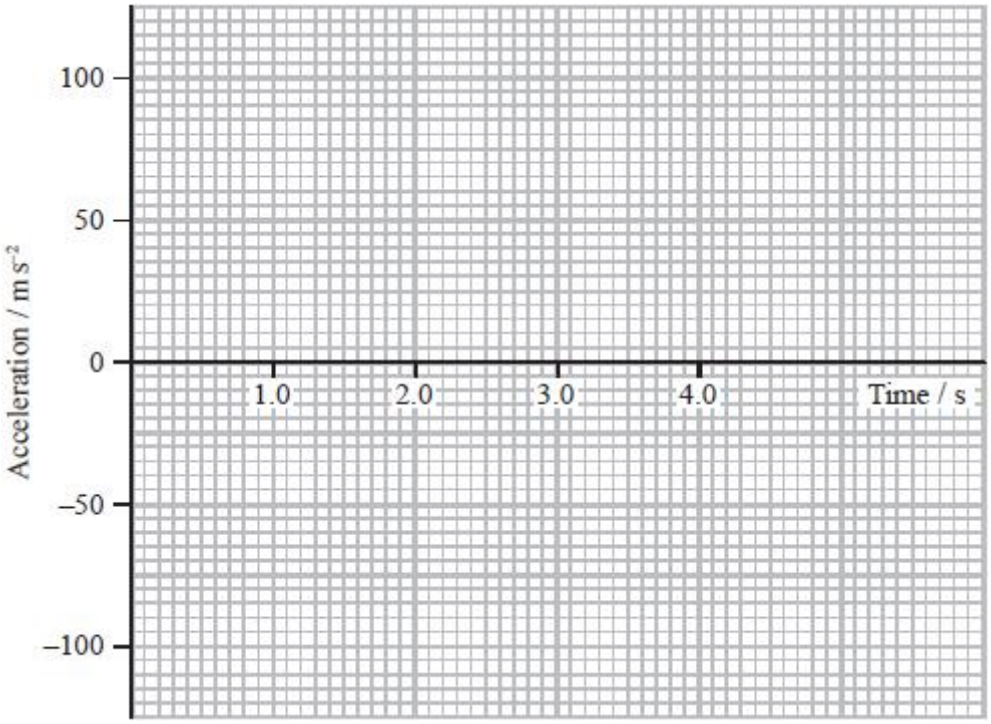

(Total for question = 5 marks)

Q3.

The photograph shows a vase made of uranium glass. Uranium glass is radioactive.

Uranium glass usually contains a maximum of 2% uranium. Uranium glass made in the early part of the 20th century can contain up to 25% uranium.

A uranium nucleus decays to thorium by emission of an alpha particle.

It can be assumed that all the energy of the decay is transferred to kinetic energy of the alpha particle.

Calculate the speed of the emitted alpha particle.

mass of uranium nucleus = 238.0003 u
mass of thorium nucleus = 233.9942 u
mass of alpha particle = 4.0015 u

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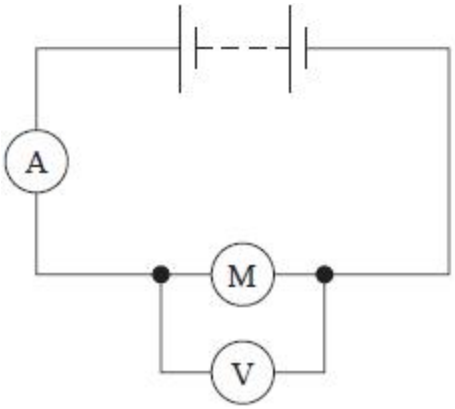
Speed of alpha particle = ...

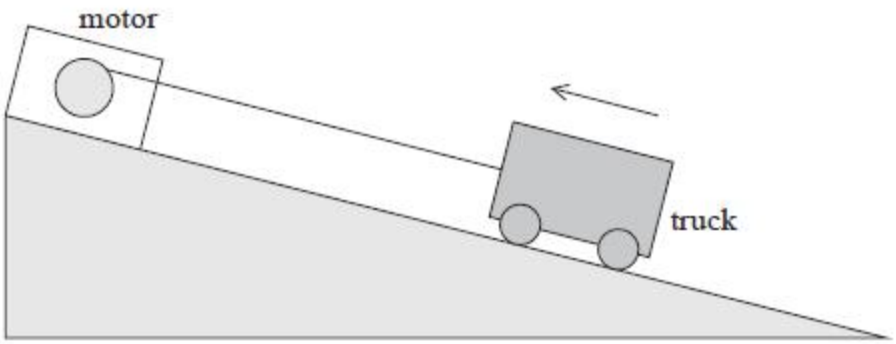
(Total for question = 5 marks)

Q4.

An electric motor is used to pull a truck up a slope at a constant speed.

The electric motor circuit includes a battery with no internal resistance, an ammeter and a very high resistance digital voltmeter as shown.





The truck moves through a vertical height of 0.20 m in 15 s. The current in the motor is 8.1 mA and the potential difference across the motor is 12 V.

mass of truck = 550 g

Calculate the efficiency of the motor.

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Efficiency = ...

(Total for question = 4 marks)