18 In January 2023, the asteroid 2023 BU came close to the Earth. The closest distance of the asteroid from the surface of the Earth was 3590 km.

(a) Calculate the force between the asteroid and the Earth at the closest distance. You may assume the asteroid is a sphere.

asteroid diameter = 5.65 m
asteroid density = 1950 kg m^{-3}
mass of Earth = 5.98×10^{24} kg
radius of Earth = 6380 km

(4)

Force between asteroid and Earth = ...

(b) Calculate the change in gravitational potential energy of the asteroid if it had fallen to the surface of the Earth from a height of 3590 km.

Assume that the mass of the asteroid remains constant.

(3)

Change in gravitational potential energy = ...

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(c) Explain why the mass of the asteroid would **not** remain constant as the asteroid fell to the surface of the Earth.

(2)

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(Total for Question 18 = 9 marks)