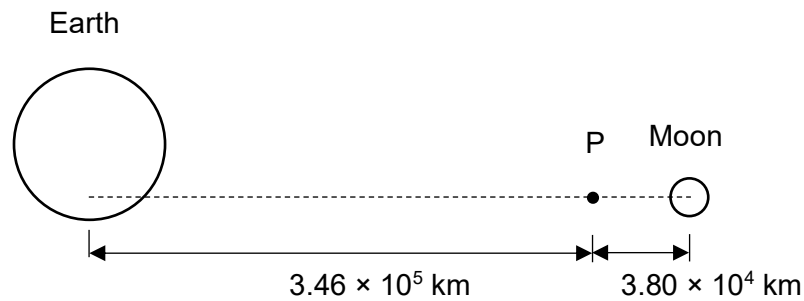**5** A space rocket on Earth is fired for a few minutes to provide it with the necessary kinetic energy for it to travel directly to the Moon. Along the line joining the centres of the Earth and Moon, there is a point P where the rocket does not experience any gravitational force. P is 3.46×10^5 km from the centre of the Earth and 3.80×10^4 km from the centre of the Moon as shown in Fig. 5.1.

Earth

P   Moon

3.46×10^5 km 3.80×10^4 km

Fig. 5.1

(a) Explain why the rocket does not experience any gravitational force at P.

………………………………………………………………………………………………………..

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……….…………………………………………………………………………………...…… [1]

(b) Suggest two reasons why a return rocket from the Moon would need much less fuel than that required for the outward journey from the Earth.

………………………………………………………………………………………………………...

....

....

.... [2]

(c) Given that the mass of the Earth is 5.97×10^{24} kg, calculate the mass of the Moon.

mass = ... kg   [2]

(d) A meteorite of mass 7.5 kg moves towards P under the gravitational attraction of the Earth and Moon. It is initially at rest at a large distance away from P.

(i) Define gravitational potential at a point.

....

....[1]

(ii) Calculate the kinetic energy of the meteorite when it reaches P.

kinetic energy = …………………….…… J [3]

[Total: 9]