

## Section A

Answer **all** the questions in the spaces provided.

- 1 (a)** Define *gravitational field strength*.

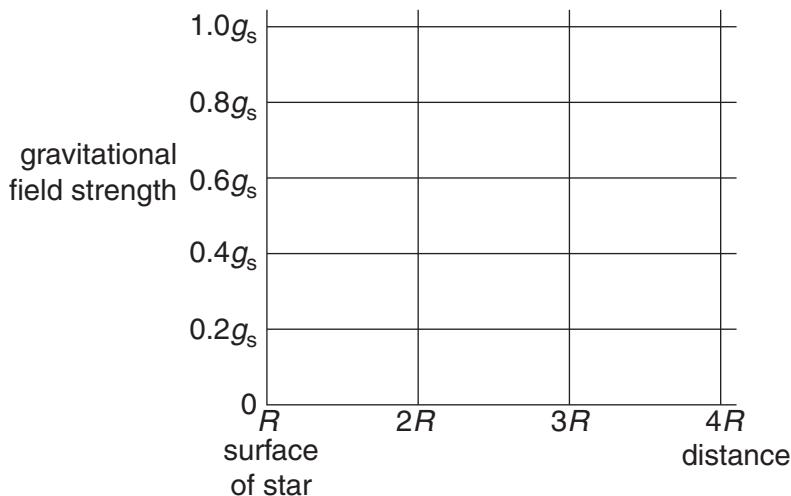
.....  
.....

[1]

- (b)** An isolated star has radius  $R$ . The mass of the star may be considered to be a point mass at the centre of the star.

The gravitational field strength at the surface of the star is  $g_s$ .

On Fig. 1.1, sketch a graph to show the variation of the gravitational field strength of the star with distance from its centre. You should consider distances in the range  $R$  to  $4R$ .



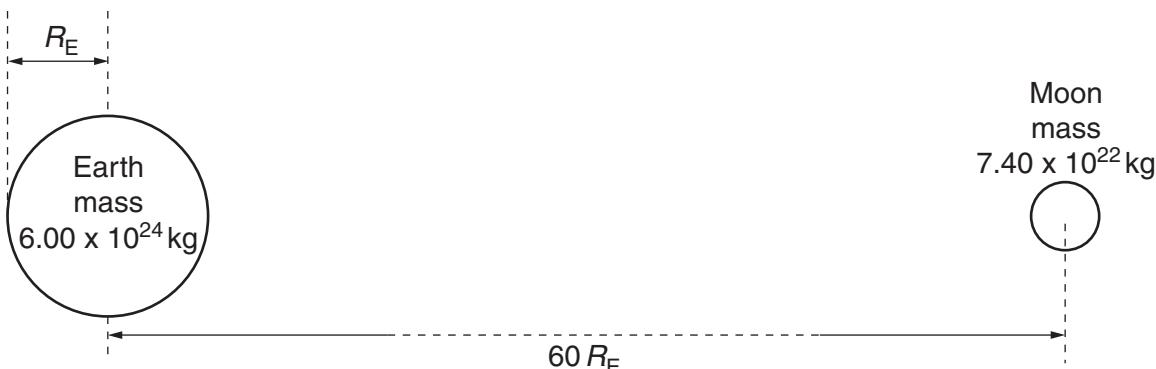
**Fig. 1.1**

[2]

- (c)** The Earth and the Moon may be considered to be spheres that are isolated in space with their masses concentrated at their centres.

The masses of the Earth and the Moon are  $6.00 \times 10^{24} \text{ kg}$  and  $7.40 \times 10^{22} \text{ kg}$  respectively.

The radius of the Earth is  $R_E$  and the separation of the centres of the Earth and the Moon is  $60 R_E$ , as illustrated in Fig. 1.2.



**Fig. 1.2** (not to scale)

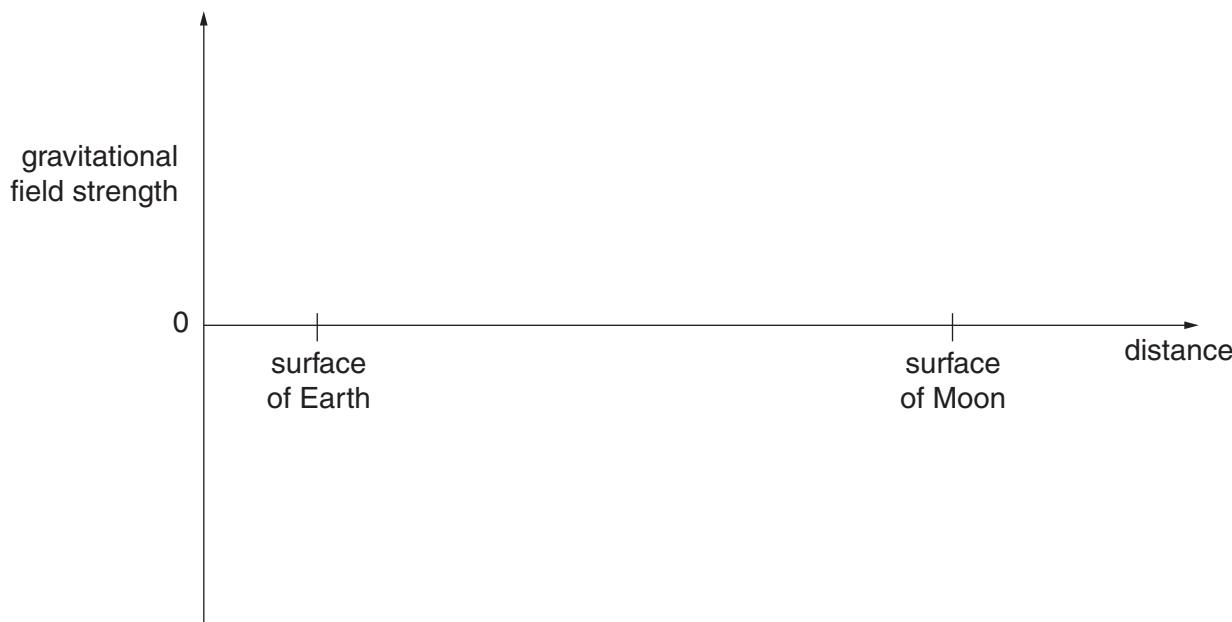
- (i) Explain why there is a point between the Earth and the Moon at which the gravitational field strength is zero.

.....  
 .....  
 ..... [2]

- (ii) Determine the distance, in terms of  $R_E$ , from the centre of the Earth at which the gravitational field strength is zero.

$$\text{distance} = \dots R_E \quad [3]$$

- (iii) On the axes of Fig. 1.3, sketch a graph to show the variation of the gravitational field strength with position between the surface of the Earth and the surface of the Moon.



**Fig. 1.3**

[3]