Section A

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

1 **(a)** An object Q of weight 30.0 N is supported by two ropes A and B as shown in Fig. 1.1.
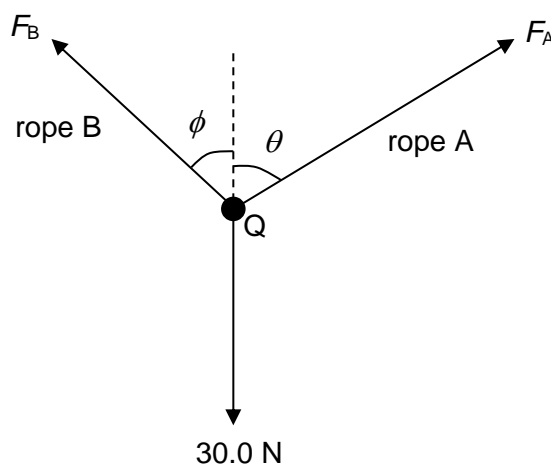

Fig. 1.1

Rope A is at an angle θ to the vertical and exerts force F_A on Q. Rope B is at an angle ϕ to the vertical and exerts a force F_B on Q.

The angle ϕ of rope B is varied from 0° to 90°. The force F_A is varied in magnitude and direction to keep Q in equilibrium.

(i) Determine the magnitude of force F_A when the angle ϕ is 35° and F_B is 20.0 N.

magnitude of F_A = ……………………………… N   [3]

(ii) Explain why angles ϕ and θ cannot be 90° at the same time.

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.... [2]

(b) A uniform metal rod AB is freely pivoted at end A as illustrated in Fig. 1.2. The end B is suspended by a light spring. The other end of the spring is supported at Z.
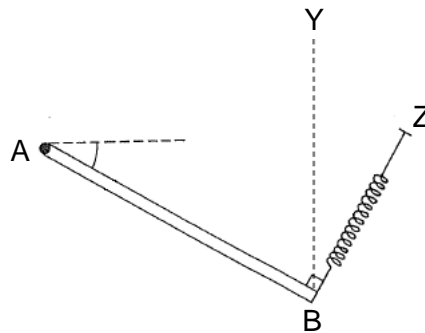
The rod is in equilibrium.

Fig. 1.2

The spring is now aligned vertically along YB so that the angle between the rod and the spring is no longer 90°. The rod remains in equilibrium in the same position.

Explain why the spring force increases.

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.... [3]

[Total: 8]

[Turn over