2 Fig. 2.1 shows a uniform pole of weight 3.0 N hinged to a wall at point X and tied to a spring at point Y, which is at a distance one-quarter its length.

The pole is inclined at 10° to the horizontal and the spring makes an angle of 20° with the wall.

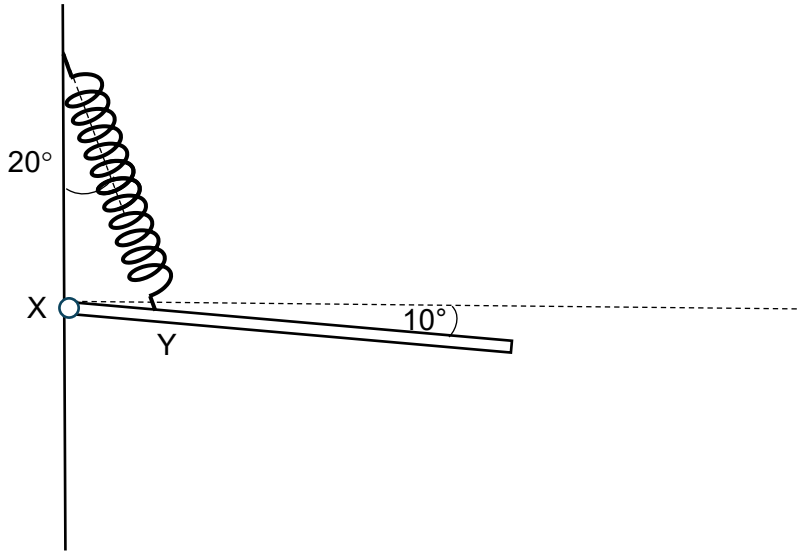

Fig. 2.1

(a) Show that the tension in the spring is 6.8 N.

[2]

(b) A student measures the length of the extended spring in Fig. 2.1 to be 38.0 cm. The unextended spring measures 30.0 cm.

(i) Determine the force constant of the spring.

force constant = ... N m^{-1} [2]

(ii) The uncertainty in each measurement of the length of the spring is ±1 mm. Given that the percentage uncertainty of the tension is 2.0 %, determine the percentage uncertainty in the force constant calculated in **(b)(i)**.

percentage uncertainty = …….. % [2]

(c) **(i)** The hinge exerts a force on the pole at point X. Draw an arrow on Fig. 2.1 to show the direction of this force.

[1]

(ii) Calculate the magnitude of this force.

force = …… N [2]

[Total: 9]