6   (a)(i)   A 5.0 kg mass is hung with a long string from a frictionless, massless pulley of radius 0.10 m as shown in Figure 6. The axis of the pulley is attached to a 10-turns, rectangular loop in the horizontal plane which carries a current of 5.0 A in the direction shown. The entire loop has negligible mass and is in a uniform, horizontal magnetic field of flux density 0.50 T directed towards the left.
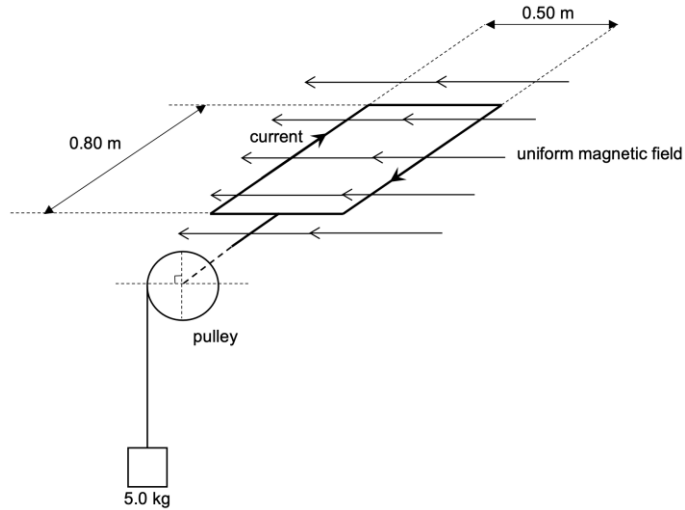
Figure 6

Determine the magnitude of the magnetic dipole moment.   [2 marks]

(a)(ii)

Determine the magnitude of the initial magnetic torque on the loop.

[2 marks]

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(b)   Calculate the net torque acting on the pulley.   [2 marks]

(c)(i)   The magnetic torque causes the rectangular loop to rotate to a vertically upright position and the mass to move upwards.

Calculate the change in potential energy of the magnetic dipole.   [2 marks]

(c)(ii)   Calculate the speed of the mass at this position.   [2 marks]