5 **(a)** A 5.0 mg particle rotates counterclockwise in a circle of radius 3.00 m with a constant period of 0.785 s. At t = 0, the particle has an x-coordinate of +2.00 m and is moving to the right.

Take rightward as positive.

(i) The x-coordinate of the particle can be expressed in the form of

$$A\cos(\omega t - B)$$

Determine the values of A, ω and B.

A = …….…….. m

ω = …….. rad s^{-1}

B = …..…..…… rad [3]

(ii) Hence or otherwise, determine the maximum velocity and acceleration of the particle.

maximum velocity = …..…….. m s^{-1}

maximum acceleration = …..…….. m s^{-2} [2]

(iii) In Fig. 5.1. sketch the variation with time of the kinetic energy E_k of the particle along the x-axis.

Indicate in your sketch, the magnitude of the maximum kinetic energy.

[2]

(b) With reference to the energy of the system, state and explain how the amplitude of a damped oscillating system will vary with time when at resonance.

.....

.....

..... [2]