Q1. A particle moves in a straight line and at time seconds has velocity m s–1, where ,

(a) Find an expression for the acceleration of the particle at time *t*.

(2)

(b) The mass of the particle is 3 kg. Find the resultant force on the particle when = 4.

(2)

(Total 4 marks)

Q2. A particle moves in a straight line so that at time seconds it has velocity m s–1, where .

(a) Find an expression for the acceleration of the particle at time .

(2)

(b) Find the value of when the acceleration is zero.

(1)

(Total 3 marks)

Q3. A particle moves in a straight line and at time has velocity , where ,

(a) (i) Find an expression for the acceleration of the particle at time .

(2)

(ii) State the range of values of the acceleration of the particle.

(3)

(b) When , the particle is at the origin. Find an expression for the displacement of the particle from the origin at time .

(4)

(Total 9 marks)

Q4. A particle, of mass 400 grams, is initially at rest at the point *O*. The particle starts to move in a straight line so that its velocity,  m s −1, at time seconds is given by for

(a) Find an expression, in terms of *t*, for the force acting on the particle.

(3)

(b) Find the time when the particle next passes through *O*.

(5)

(Total 8 marks)

Q5. A particle moves along a straight line through the origin. At time , the displacement, , of the particle from the origin is given by . Find the velocity of the particle at time .

(Total 3 marks)

Q6. A stone, of mass 5 kg, is projected vertically downwards, in a viscous liquid, with an initial speed of 7 m s−1. At time seconds after it is projected, the stone has speed m s−1 and it experiences a resistance force of magnitude 9.8 newtons.

(a)     When , show that

(2)

(b) Find *v* in terms of *t*.

(5)

(Total 7 marks)

Q7. A particle, of mass 3 kg, moves along a straight line. At time seconds, the displacement,  metres, of the particle from the origin is given by

(a) Find the velocity of the particle at time .

(2)

(b) Find the magnitude of the resultant force acting on the particle when = 2.

(4)

(Total 6 marks)

Q8. A particle moves in a straight line. At time seconds, it has velocity m s−1, where and .

(a) (i) Find an expression for the acceleration of the particle at time .

(2)

(ii) Find the acceleration of the particle when = 0.5.

(2)

(b) The particle has mass 4 kg. Find the magnitude of the force acting on the particle when = 0.5.

(1)

(c)  When = 0 , the particle is at the origin. Find an expression for the displacement of the particle from the origin at time .

(4)

(Total 9 marks)

Q9. Alice places a toy, of mass 0.4 kg, on a slope. The toy is set in motion with an initial velocity of 1 m s−1 down the slope. The resultant force acting on the toy is newtons, where m s−1 is the toy’s velocity at time seconds after it is set in motion.

(a) Show that

(2)

(b) By using , find in terms of .

(5)

(c) Find the time taken for the toy’s velocity to reduce to 0.55 m s−1.

(3)

(Total 10 marks)

Q10. A car accelerates from rest along a straight road for 5 seconds. At time seconds, its acceleration, m s– 2, is given by

(a) By integrating, find an expression for the velocity of the car at time *.*

(3)

(b) Find the velocity of the car at the end of the 5 second period.

(2)

(c) Find the distance travelled by the car during the 5 second period.

(4)

(Total 9 marks)