

CIE A-Level 數學 9709 Paper 4

A-Level 數學 | 時限：75 分鐘 | 總分：50 分 | 共 9 題

甲部 運動學、動量與力 (25 分)

全部題目必須作答，須展示計算步驟並註明單位。

1. A particle P moves along a straight line. Its velocity is $v = 3t^2 - 12t + 9$ m/s at time t seconds. (a) Find the two values of t at which P is instantaneously at rest. (b) Find the distance travelled by P in the first 4 seconds.
2. A train travelling at 30 m/s decelerates uniformly and comes to rest in 200 m. Find (a) the deceleration, (b) the time taken to stop.
3. Particle A of mass 3 kg moves at 5 m/s towards particle B of mass 2 kg, which is moving at 2 m/s in the opposite direction. The particles coalesce. Find (a) their common velocity, (b) the kinetic energy lost.
4. A ball is projected vertically upwards from ground level with speed 14 m/s. Taking $g = 9.8$ m/s² and ignoring air resistance, find (a) the greatest height reached, (b) the total time before the ball returns to the ground.
5. A lift of mass 800 kg is pulled upwards by a vertical cable with tension 9000 N. Find (a) its acceleration, (b) the tension needed for the lift to move upwards at constant speed.

乙部 力學應用 (25 分)

全部題目必須作答；取 $g = 9.8$ m/s²。

6. A block of mass 5 kg rests on rough horizontal ground. The coefficient of friction is 0.3. A horizontal force of 25 N is applied to the block. (a) Show that the block moves. (b) Find the friction force on the block. (c) Find its acceleration.
7. A uniform rod AB has length 6 m and mass 20 kg. It rests horizontally on two supports, one at A and one at C, where $AC = 4$ m. Find the normal reaction at each support.
8. A car of mass 1200 kg travels at a constant 25 m/s on a level road with the engine working at 30 kW. (a) Find the total resistance. (b) The car then climbs a straight slope with $\sin \theta = 0.05$, the power and the resistance being unchanged. Find the steady speed up the slope.
9. Particles of mass 4 kg and 2 kg are connected by a light inextensible string which passes over a smooth fixed pulley. Both particles hang freely. Find (a) the acceleration of each particle, (b) the tension in the string.