InkPhysics

QUESTION WORKBOOK

Newton's laws and the resultant force

Mechanics · Year 12

AQA 3.4.1.5 · CIE 3.1 · OCR A 3.2.1, 3.5.1

10 questions · 31 marks

PRINT EDITION

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SECTION A · Warm-up

A1 State Newton's first law of motion. [2]

A2 A mass of 2.0 kg has an acceleration of 3.0 m s^{-2}. Calculate the resultant force acting on it. [2]

A3 Explain what is meant by the resultant force on an object. [2]

SECTION B · Standard

B1 A 4.0 kg block on a smooth surface is pushed by a 12 N force to the right while a 4.0 N frictional-style force acts to the left. Calculate the resultant force and the acceleration of the block. [3]

B2 A person of mass 70 kg stands in a lift. Taking $g = 9.81\ \text{m s}^{-2}$, calculate (a) their weight and (b) the force the lift floor exerts on them when the lift accelerates upwards at $2.0\ \text{m s}^{-2}$. [4]

B3 A 3.0 kg block and a 2.0 kg block are in contact on a smooth surface. A horizontal force of 10 N pushes the 3.0 kg block, which pushes the 2.0 kg block. Calculate (a) the acceleration of the blocks and (b) the contact force between them. [4]

B4 A book rests on a table. Identify the Newton's third-law pair to the force of the table pushing up on the book, and explain why the book's weight is not that pair. [3]

SECTION C · Stretch

C1 A 2.0 kg block slides down a smooth slope inclined at 30° to the horizontal. Taking g = 9.81 m s^{-2}, calculate its acceleration down the slope. [3]

C2 A 3.0 kg mass hangs from a light string that passes over a smooth pulley and connects to a 2.0 kg mass on a smooth horizontal table. Taking g = 9.81 m s^{-2}, calculate (a) the acceleration of the system and (b) the tension in the string. [5]

C3 When you stand still on the ground, explain using Newton's third law why you do not sink into it or fly off it. [3]