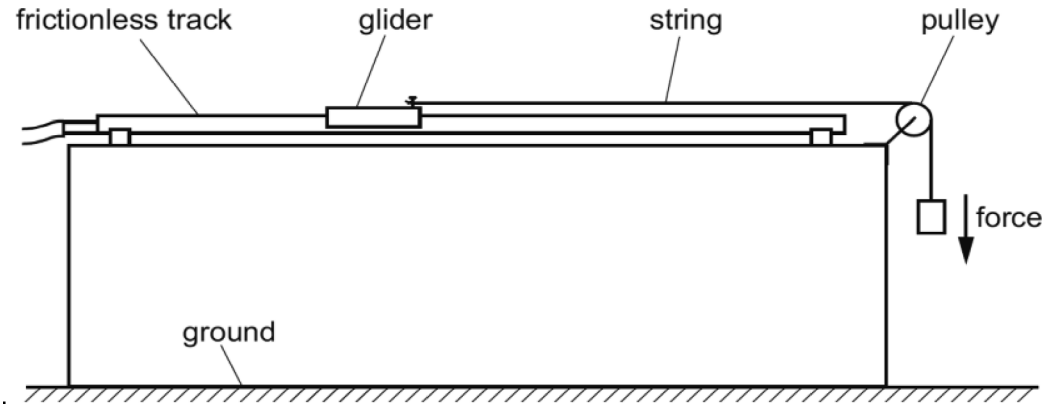
Oxford Cambridge and RSA

GCSE Physics A (Gateway)

J249/03 Physics A P1-P4 and P9 (Higher Tier)

Question Set 20

20 A student investigates the motion of a glider on a frictionless air track using the apparatus shown below.



(a) **(i)** Explain how the student can use this apparatus to demonstrate Newton's Second Law.

Include details of any additional equipment required.

at the bottom of the page

[3]

(ii) A 0.25 kg glider is pulled by a 1.0 N force.

Calculate the acceleration of the glider using the formula:

force = mass × acceleration

$1 = 0.25\ a$

$4 = a$

4

Answer = ... m/s^2

[1]

(iii) Suggest reasons why the recorded value was less than your calculated value.

In reality the track will not be completely frictionless and there will also be friction from the pulley causing the gliders speed to not be as high and therefore have a reduced value for the acceleration recorded.

[2]

a) i)

Newton's 2nd law: $F = ma$.

The student could change the force applied or mass of glider, then measure the final speed of the block using light gates. Using the final speed they can calculate the acceleration and see if it follows $F = ma$.

(b) The student repeats the experiment for 4 more forces.

The results are shown in the table.

Force (N)	Acceleration (m/s^2)			
	Attempt 1	**Attempt 2**	**Attempt 3**	**Mean**
1.0	3.8	3.9	3.7	3.8
2.0	7.8	7.7	7.7	7.7
3.0	11.2	11.4	11.6	11.4
4.0	12.0	14.9	15.1	13.8
5.0	19.0	18.9	19.1	19.0

There is an anomaly in the results.

Identify the anomaly and explain how the student could have dealt with it.

The anomaly is 12.0 and the student could have removed it then calculated the mean. **[2]**

(c) Explain what is meant by a reproducible experiment.

That another person / group could come and carry out the experiment with different equipment and achieve similar results. **[1]**

Total Marks for Question Set 20: 9