NAME	**INDEX NUMBER**
SCHOOL	**DATE**

NEWTON'S LAWS OF MOTION

1. **1995 Q21 P1**

State Newton's first law of motion (1 mark)

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2. **1998 Q22 P1**

A body of mass M is allowed to slide down an inclined plane. State two factors that affect its final velocity at the bottom of the incline.

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3. **1998 Q34 P1**

Fig 12 shows a body of weight 50N placed on a surface which is inclined at an angle of 30^0 to the horizontal. The body experiences a maximum frictional force of 29N with the surface.

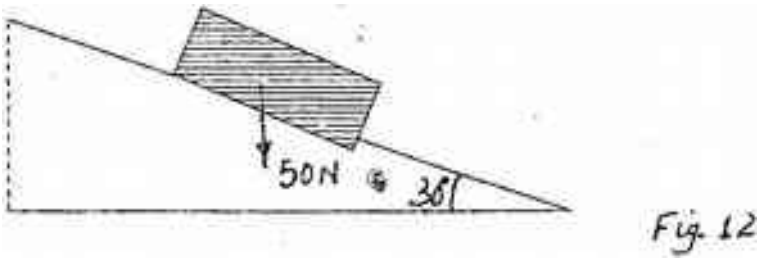

Fig. 12

Determine the force required to move the body, up the inclined with constant velocity.

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4. 1999 Q24 P1

A bullet is fired horizontally at a target. Neglecting air resistance give a reason why the horizontal acceleration of the bullet is zero.

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5. 2000 Q2 P2

a) Two identical spherical steel balls are released from the top of two tall jars containing liquids L_1 and L_2 respectively. Fig 3 shows the velocity – time graph of the option of the balls.

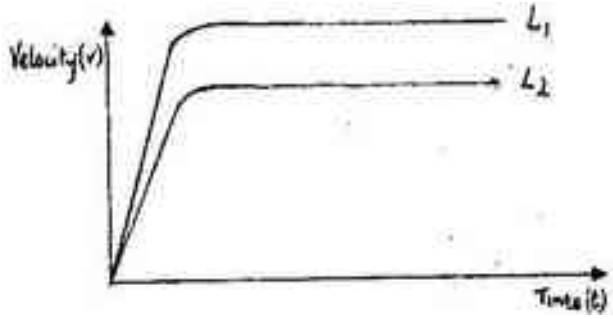

Fig. 3

Explain the nature of the curves and state why they are different.

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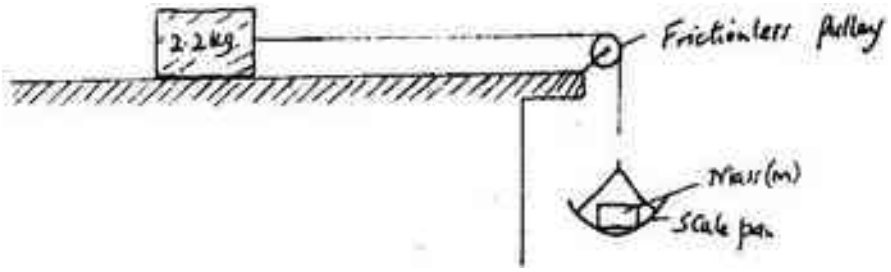
b) In an experiment to determine the proportionality constant, μ between two wooden surfaces sliding on each other, a block of mass 2.20kg was placed on a horizontal bench. The block was then made to slide by adding mass 'M' On the scale as shown in Fig 4. The experiment was repeated for other values of 'm'.The acceleration of the block was measured for each mass added.



The results are shown in table 1.

Table 1

Mass, m (kg)	0.70	1.00	1.50	2.00	2.50
Acceleration, a,(m/s^2)	0.38	1.74	4.02	6.29	8.56

i) Name and indicate on figure 4 the forces acting on the 2.20kg mass.
ii) Plot the graph of acceleration, a against the mass m
iii) Given that $a = \frac{mg}{2.20} - \mu g$, where g = 10ms-2, use the graph to
Determine μ.

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6. 2001 Q14 P1

A bullet moving at a velocity of $300ms^{-1}$ hits a tree trunk of diameter 50cm. It emerges from the opposite side with a velocity of $150ms^{-1}$. Determine the average deceleration of the bullet in the trunk.

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7. 2001 Q6 P2

a i) State one of the Newton's law of motion

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ii) A body resting on a horizontal surface is given an initial velocity V so that it slides on the surface for some distance before coming to a stop. Table 1 shows the distances d moved by the body of various values of μ.

Velocity ($ms\_^{-1}$)μ	0.20	0.40	0.60	0.80	1.20	1.20
Distance, d (m)	0.007	0.027	0.027	0.110	0.170	0.200

Given that v^2 is 20μd where μ is a constant for the surface, plot a appropriate graph and use it to determine μ. Determine values of μ on table.

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b) A train of mass 200 tonnes starts from rest and accelerates uniformly at $0.5ms^{-2}$ determine its momentum after moving 100m.

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8. 2002 Q20 P1

A high jumper usually lands on thick soft mattress. Explain how the mattress helps in reducing the force of impact.

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9. 2002 Q3 P2

Fig. 4 shows a block of a mass 30.0 kg being pulled up a slope by a force P at a constant speed. The friction force on the block is 20.0N.

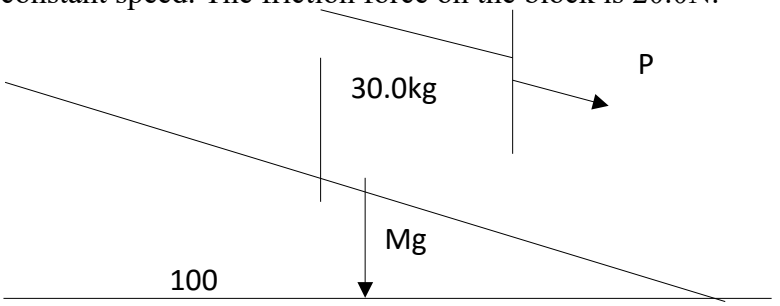

Fig. 4

a i) On the same figure name and indicate the other forces acting on the block.

ii) Determine the component of the weight acting on the trolley down the slope

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iii) Determine the value of P.

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b) On reaching the top of the slope, the block is left to run freely down the slope.

i) Which one of the forces previously acting on the block would then act in the opposite?

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ii) Determine the acceleration of the block down the slope.

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iii) What is the effect of increasing the angle of slope on your answer in (ii) above.

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10. 2003 Q30 P1

A resultant force F acts on a body of mass m causing an acceleration a1 on the body. When the same force acts on a body of mass 2m, it causes an acceleration a_2. Express a_2 in terms of a.

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11. 2004 Q25 P1

A trolley is moving at a uniform speed along a track. A piece of plasticine is dropped on the trolley and sticks on it.
Explain why the trolley slows down.

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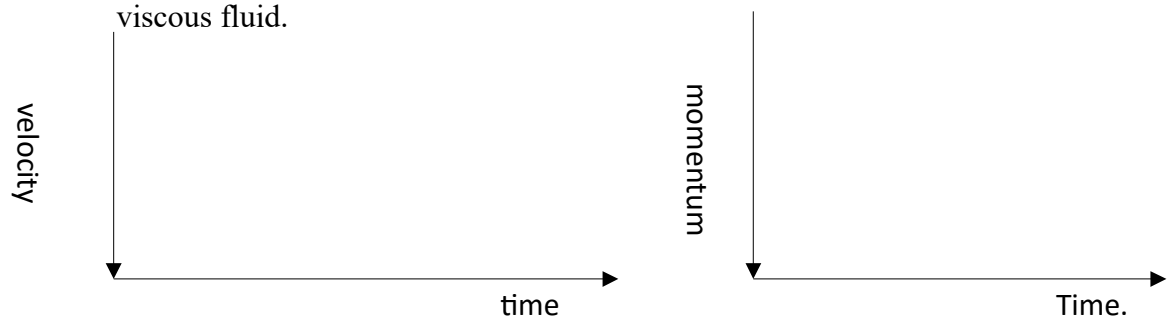
12. 2005 Q25 P1

Fig 14 shows the velocity- time graph for a small metal sphere falling through a viscous fluid.



On the axes provided sketch the graph of momentum against time for the same mass.
(1 mark)

13. 2006 Q13 P1

A footballer kicks a ball of mass 0.6 kg initially at rest using a force of 720N. If the foot was in contact with the ball for 0.1 seconds, what was the take off speed of the ball? (3 marks)

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14. 2007 Q16 P1

(a) State Newton's first law of motion (1 mark)

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(b) A wooden block resting on a horizontal bench is given an initial velocity, u, so that it slides on the bench surface for a distance d, before coming to a stop. The values of d were measured and recorded for various values of initial velocity. Figure 10 shows the graph of u^2 against d.

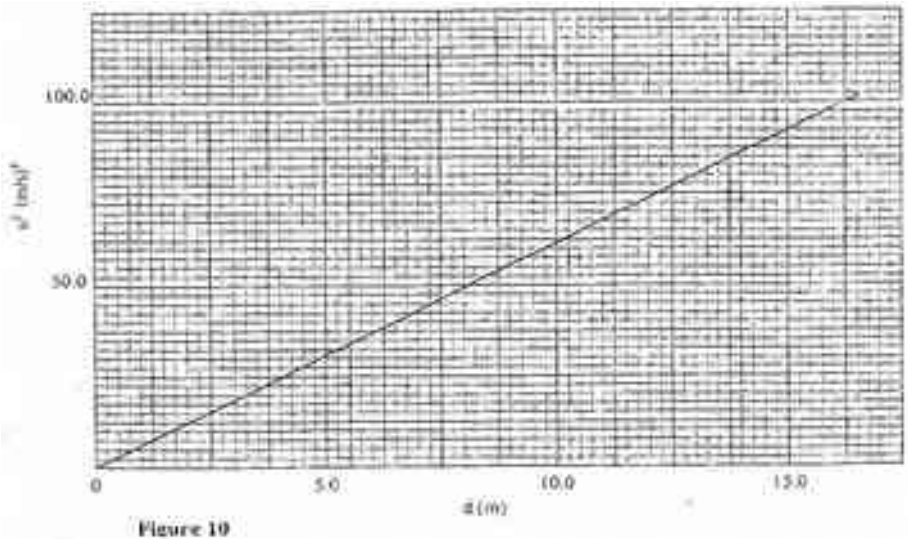

Figure 10

(i) Determine the slope, S of the graph (3 marks)

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(ii) Given that $u^2 = 20\ kd$, where k is a constant for the bench surface, determine the value of k from the graph (2 marks)

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(iii) State how the value of k would be affected by a change in the roughness of the bench surface (1 mark)

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(c) A car of mass 800 kg starts from rest and accelerates at 1.2 ms^{-2}. Determine its momentum after it has moved 400 m from the starting point (4 marks)

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15. 2008 Q15 P1

a) State Newton's second law of motion. (1 mark)

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b) A matatu starts from rest and accelerates to cover a distance of 49m in 7 seconds.

Determine

(i) Its acceleration; (3 marks)

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(ii) Its velocity, after 7seconds (2 marks)

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c) A trolley moving on a horizontal bench of height 1.2m, strikes a barrier at the edge of the bench. The brass mass on the top of the trolley flies off on impact and lands on the ground 2.5m from the edge of the bench.

Determine:

(i) The time taken by the brass mass to reach the ground; (2 marks)

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(ii) The speed at which the trolley struck the barrier. (2 marks)

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16. 2011 Q2 P1

State the constant force that opposes the motion of a stone initially at rest, as it falls through air from a tall building. (1 mark)

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17. 2012 Q16 P1

(a) Figure 9 shows a trolley on a smooth surface being pulled by a constant force F.

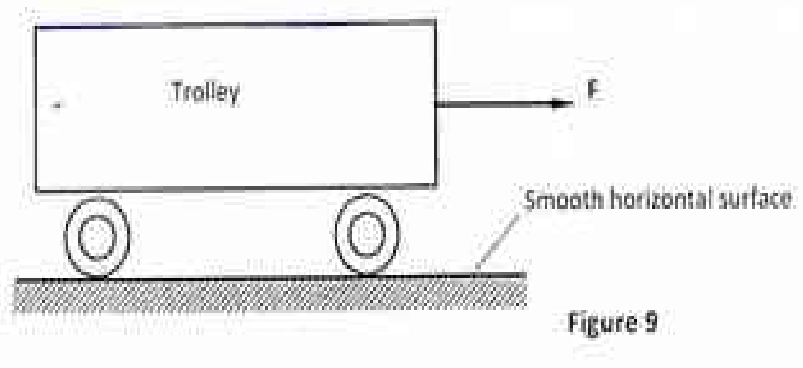
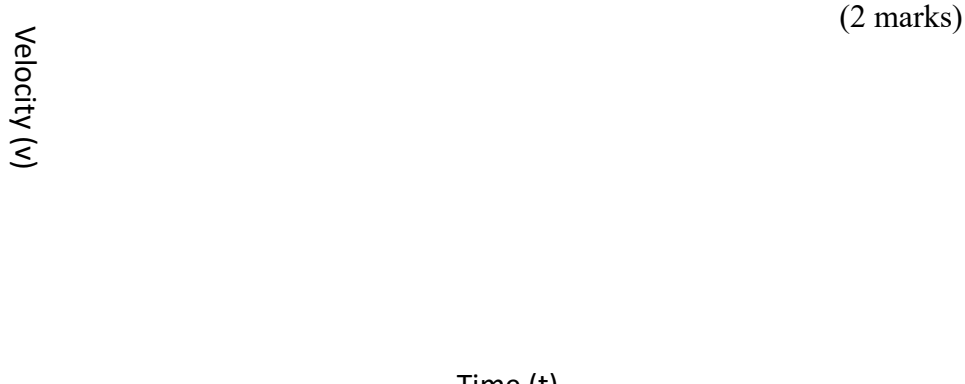


Figure 9

(i) On the axis provided, sketch the velocity-time graph for the motion of the trolley.

(2 marks)



(ii) A parachute falling through the air attains terminal velocity after a short- time. State the reason why it attains terminal velocity. (1 mark)

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(b) A ball of mass 200g is thrown vertically upwards with velocity of $5ms^{-1}$.The air resistance is 0.4N.
Determine;

(i) The net force on the ball as it moves up;
(take acceleration due to gravity g = ms^{-2}) (2 marks)

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(ii) The acceleration of the ball (3 marks)

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(iii) The maximum height reached by the ball. (3 marks)

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