Nil Mediocriter

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KULLEĠĠ SAN ĠORĠ PRECA

HALF YEARLY EXAMINATIONS 2011

FORM 4	**PHYSICS**	**TIME: 1h 30 min**

NAME: _____ **CLASS:** _____

For the examiner's use only:

Total mark	***Written paper (85 marks)***	***Experiments (15 marks)***	***Total mark (100 marks)***
Actual mark			

Answer all questions.

All working must be shown. The use of a calculator is allowed.
Where necessary, take the acceleration due to gravity, g, to be 10m/s^2.

You might find the following list of formulae useful:

$v = \frac{s}{t}$	F = m a
v = u + at	p = m v
$s = ut + \frac{1}{2}at^2$	
$s = \frac{(u+v)t}{2}$	
$v^2 = u^2 + 2as$	

SECTION A: ANSWER ALL QUESTIONS.

1. Maria rubs a polythene strip with a duster.
   a) The polythene strip becomes _____ charged. (1)
   b) The duster becomes _____ charged. (1)
   c) Unlike charges _____each other, while _____ charges repel. (2)
   d) Charge does not flow through an _____ but flows through a _____ like copper.

e) When Maria touches the polythene strip from the charged end, some _____ will flow to _____. (2)

2. A small rubber ball is dropped from the top of a tall building and falls freely to the ground.

(i) What is the initial velocity of the rubber ball? _____ (1)

(ii) What is the acceleration of the rubber ball as soon as it is released? (1)

_____

(iii) Draw and label the two forces acting on the rubber ball on its way down. (2)

(iv) Describe how the forces acting on the rubber ball change as it falls down until it reaches terminal velocity. (2)

_____

_____

_____

(v) What is the acceleration of the rubber ball as soon as it reaches terminal velocity? (1)

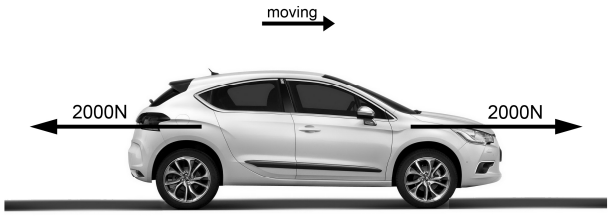
_____

(vi) What happens to the velocity of the rubber ball after the terminal velocity is reached? **Underline the correct answer.**

(i) increases (ii) decreases (iii) remains the same (1)

3. Abigail is driving her car along a straight horizontal road.

(a) She is driving with an engine force of 2000N. The total opposing forces acting on the car add up to 2000N as well.



(i) Calculate the resultant force acting on the car. (1)

_____

(ii) Describe the motion of the car at this point. (1)

_____

(iii) What happens to the motion of the car if the engine force increases? (1)

_____

(b) Suddenly, Abigail applies the car brakes and the car stops. However, the passengers in the car keep moving forward.

(i) Explain why the passengers do not stop immediately. (1)

_____

(ii) Name one safety feature of the car which prevents the passengers from moving forward. (1)

_____

(c) When the car is parked, the tyres push the ground with a force of 18 000N.

(i) What is the value of the force that the ground exerts on the tyres? (1)

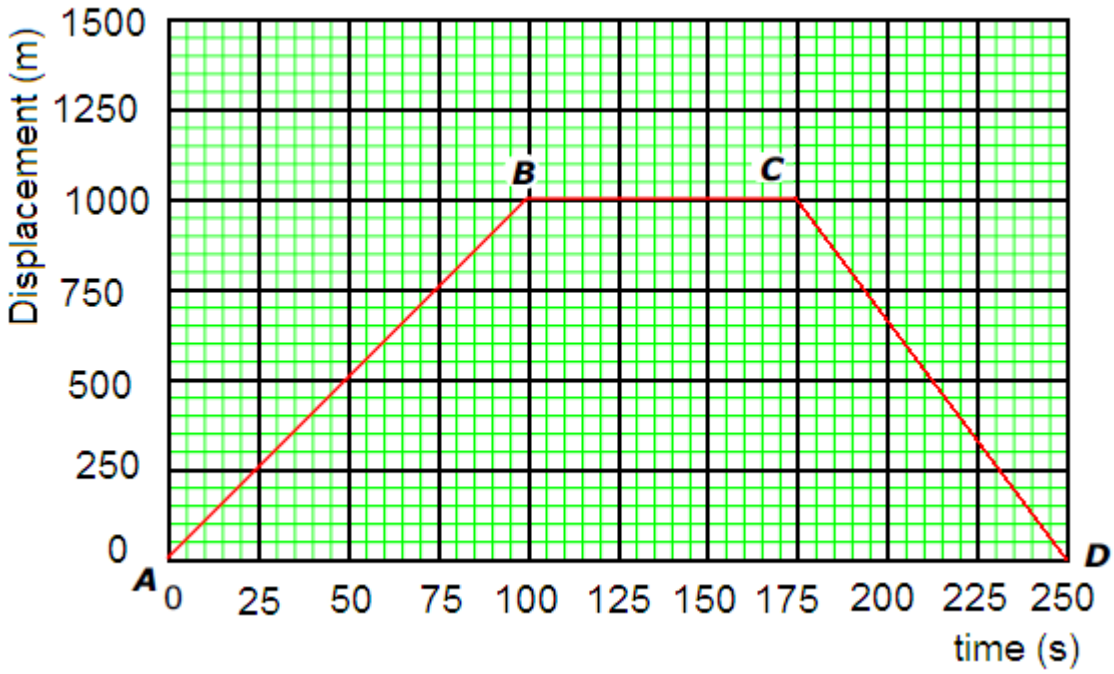
_____

(ii) State Newton's Third Law of Motion. (2)

_____

_____

4. John cycles from home to a nearby newsagent to buy the newspaper for his parents. The displacement-time graph below shows John's journey to the newsagent and back.



a) From the above graph, find:

i) how long John takes to arrive to the newsagent _____ (1)

ii) how far the newsagent is from home _____ (1)

iii) how long John takes to cycle from the newsagent back home.

_____(1)

b) Calculate John's velocity during his journey from home to the newsagent.

_____

_____(2)

c) What happened between the 100th and 175th second?

_____(1)

d) During which part of the journey did John cycle faster? Give one reason for your answer.

_____(2)

5. Johann has just bought a brand new car for his birthday. He decides to go for a ride. The car was initially parked in the drive but when Johann pressed the accelerator he reached a velocity of 30m/s in 8s.

a) Calculate his acceleration. (1)

_____

_____

b) Calculate the distance that Johann travelled in the first 8s of his ride. (2)

_____

_____

c) While travelling at a constant speed of 30m/s, Johann notices an obstruction in the middle of the road 50 metres ahead. If he has a reaction time of 0.61s and it takes 2.5 seconds for the car to stop from the moment the brakes are applied,

(i) calculate the thinking distance (2)

_____

_____

(ii) calculate the braking distance (2)

_____

_____

_____

iii) Will the car be able to stop in time? (1)

_____

SECTION B: ANSWER ALL QUESTIONS.

6. *This question is about a velocity time graph.*

A car moves along a level road. The following table shows the velocity of the car.

Velocity (m/s)	0	5	10	15	20	20	20	20	10	0
Time (s)	0	10	20	30	40	50	60	70	80	90

a) Plot a graph of velocity in m/s (y-axis) against time in s (x-axis). (5)

b) From your graph or otherwise find:

i. the maximum velocity of the car. (1)

_____

ii. the time the car moved with constant velocity. (1)

_____

iii. the total distance moved by the car. (4)

_____

_____

_____

iv. the acceleration of the car. (2)

_____

_____

v. Use your answer in (iv) above to calculate the resultant force acting on the car if its mass is 1500kg. (2)

_____

_____

7. *This question is about the acceleration due to gravity.*

Isaac and Elise were required to investigate the relationship between the distance fallen by an iron ball and the time it took to fall the distance. They were provided with the following apparatus:

Stand, electromagnet ,iron ball, millisecond timer, switch, trapdoor, connecting wires, metre ruler

a) Describe how they should have carried out the investigation properly. Your answer should include:

i) a fully labelled diagram of the experimental set-up (4)

ii) the method they would use to carry out the experiment (4)

_____

_____

_____

_____

_____

b) Explain how they can get an accurate reading of the **time** taken to fall the distance. (2)

_____

_____

c) Isaac and Elise performed this experiment and their results show that it takes 0.54s for the iron ball to fall a distance of 1.5m

i) Explain how for falling objects the formula s = $ut + \frac{1}{2}at^2$ becomes s = $\frac{1}{2}gt^2$ (2)

_____

_____

ii) Calculate a value of g, the acceleration due to gravity, from their results (2)

_____

_____

iii) Give one possible reason why their value was not totally accurate at $9.81 m/s^2$. (1)

_____

_____

8. This question is about Momentum.

a) Daniela of mass 40kg is travelling on her roller blades with a velocity of 4m/s. She joins Mario, of mass 50kg who is momentarily at rest. After joining, Daniela and Mario travel together for a distance with the same velocity.

i) Calculate Daniela's momentum before joining Mario. (2)

_____

ii) What is their momentum after joining? Explain. (2)

_____

iii) With what velocity will Daniela and Mario move once they join together? (3)

_____

_____

_____

_____

b) Daniela and Mario come to rest. They now want to see what happens if they try to push each other apart. On doing so, Daniela moves with a velocity of 3m/s to the right and Mario moves with a different velocity to the left.

i) What is their total momentum just before they push each other apart? (1)

_____

ii) What is Daniela's momentum as she moves away from Mario? (2)

---

iii) What is Mario's momentum as he moves away from Daniela? (1)

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iv) Calculate Mario's velocity as he moves away from Daniela. (2)

_____

_____

_____

c) Daniela and Mario wore knee and elbow pads while they were playing with their roller blades. What happens to the time of impact and the force when they accidentally fall? (2)

_____

_____