

**IN THEIR OWN INTERESTS STUDENTS ARE REQUESTED TO WRITE LEGIBLY.
THIS PAPER CONSISTS OF 5 PAGES. PLEASE SEE THAT YOU HAVE THEM ALL.**

STUDENT NUMBER: _____

SHORT QUESTIONS

Answer these questions **on this paper**.

1. A **cube** of wax has sides which are $5.00\text{cm} \pm 0.05\text{cm}$ in length and a mass of $100.0\text{g} \pm 0.1\text{g}$. The density of the cube is 0.800g/cm^3

- 1.1 What is the percentage error of its:

- (a) length? _____ [2]
(b) volume? _____ [1]
(c) mass? _____ [1]
(d) density? _____ [1]

- 1.2 What is the uncertainty of its density?

_____ [2]

2. Convert the following **and** write the answer in standard scientific notation.

- (a) $236\mu\text{m} =$ _____ mm [2]
(b) $0.0325\text{km} =$ _____ cm [2]
(c) $87.64\text{cm}^3 =$ _____ mm^3 [2]
(d) $163.52\text{cm}^3 =$ _____ dm^3 [2]
(e) $0.24\text{dm}^3 =$ _____ ml [2]

3. Write down the answers to the following, giving the correct significant figures

(a) $16.02 \div 2.0 =$ _____ [1]

(b) $6.20 - 0.025 =$ _____ [1]

4. You are given the following objects, **all** made of brass (drawn to scale).



(a) Which one has the smallest volume? _____ [2]

(b) Which one has the greatest density? _____ [2]

(c) Which one has the greatest mass? _____ [2]

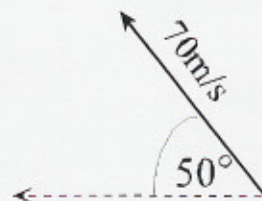
5. Answer the following questions for the vector shown on the right:

(a) Give this vector's direction of as a bearing : _____ [1]

(b) Give the direction of this vector as a compass direction :

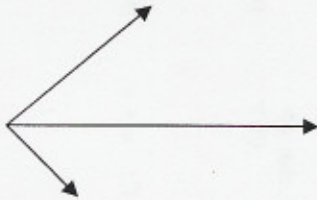
_____ or _____ [2]

(c) Calculate the x- and y-components of this vector. [4]



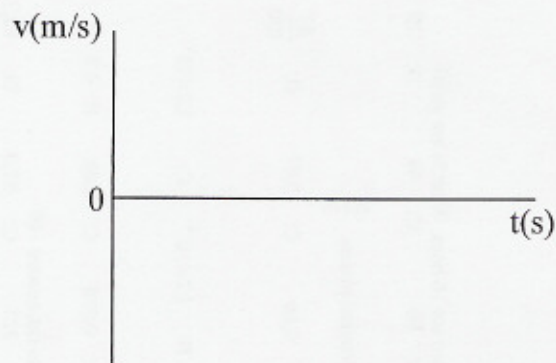
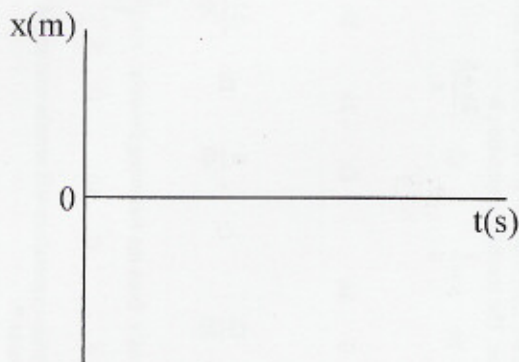
(d) What are the x- and y-components of the equilibrant vector? [2]

6. Redraw the vectors below and show their resultant. [3]



7. A child throws a ball vertically upwards towards his friend who is standing on a roof. The ball goes past the friend, reaching a height of 13.8m above the thrower's hand before falling down again. The friend catches it on its way back down at a height of 12.5m above the point that it was thrown from. Take the **downward direction** as **positive**, and the point that the ball is **thrown from** as the **zero position**. Answer the following questions:

- (a) What is the position of the ball at its maximum height? _____ [1]
- (b) What is the displacement of the ball at the point where it is caught? _____ [1]
- (c) What is the total distance covered by the ball? _____ [1]
- (d) What is the acceleration of the ball
- on its way up _____
 - at the top of its movement _____
 - on its way down _____ [3]
- (e) On the sets of axes below sketch the position-time and velocity-time graphs for this motion. [5]



MULTIPLE CHOICE QUESTIONS

Answer these questions **on this paper** by putting a circle around the correct answer.

- Two forces of 5.0N and 3.0N, when added together, could NEVER produce a resultant of: [3]
(a) 1.5N (b) 3.0N (c) 4.0N (d) 7.5N
- A runner runs around a circular track that has a length of 400m. The runner runs two laps in the clockwise direction, and then one lap in the anticlockwise direction. What is the runner's final displacement? [3]
(a) 400m (b) -400m (c) 1200m (d) 0m

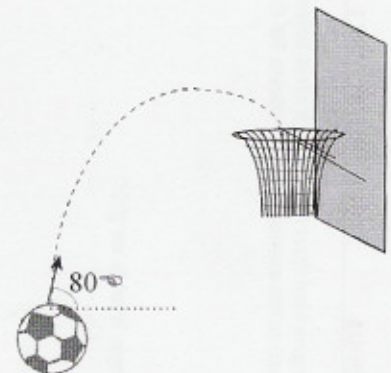
TOTAL (SHORT QUESTIONS) = 54

LONG QUESTIONS

Answer these questions **in the answer book provided**. You may write in pencil. Show all your working and explanations.

- A engineer has found that the metal he uses for a piece of apparatus has a volume of 0.11cm^3 per gram. He designed a new part which has a volume of 1.452cm^3 . For the following questions, explain all your calculations. No credit will be given for simply using a formula.
(a) What is the mass of this new part? Use a diagram to explain your answer. [5]
(b) What is the density of the metal? [3]
- A forensic scientist was investigating a crime scene. An important piece of plastic was found to have a density of $1.103 \pm 0.002\text{g/cm}^3$. Another piece of plastic was found in the car of the accused person. The density of the second piece of plastic was measured in another laboratory to be $1.1025 \pm 0.0010\text{g/cm}^3$. Can the lawyers say that these pieces of plastic have the same density? Draw a number line to illustrate these results. Use a pair of examples from this line to justify your answer. [8]

3. A food scientist is designing a new sweet made of chocolate and nuts. She has 205.8g of plain chocolate and 85.3g of chopped nuts. Their volumes are measured to be 171.5cm^3 and 106.6cm^3 respectively. The new sweet needs to have a mass of 100g and a volume of 120cm^3 . Find the mass of chocolate and the mass of nuts that will be needed for each new sweet. [9]
4. A boy throws a tennis ball upwards with an initial velocity of 5m/s. Instead of catching the ball he lets it fall down to the ground, which is 0.63m below the point that he threw it from. If you take the upward direction to be positive, calculate the velocity of the ball just before it hits the ground. [5]
5. A car accelerates away from you for 50m in 4 seconds, travels at a constant speed for another 100 m in 4 seconds, and then slows down to a stop in 4 seconds while covering a further 50m. It then accelerates towards you covering 40m in 4 seconds, and then travels with a constant velocity and passes its starting point after another 4 seconds.
- Draw a position-time graph of the car's motion until it passes its starting point again. (NOTE: you will need to put time and position values onto your axes). [7]
 - Calculate the car's acceleration during the first 4 seconds. [4]
 - What is the car's acceleration between 4 and 8 seconds? [1]
 - Calculate the car's acceleration between 12 and 16 seconds. [4]
6. A swimmer needs to swim with a velocity of 2.5m/s to the East in order to win a race. There is a water current that is pushing the swimmer to the South with a velocity of 0.8m/s.
- Draw a neat, labeled vector diagram to show how the swimmer should aim. [3]
 - Calculate the **direction** in which the swimmer must aim. [4]
 - Calculate the **magnitude** of the velocity with which the swimmer should travel. [2]
7. A basketball player throws a ball with an initial velocity of 12.0m/s at an angle of 80.0° to the horizontal. After 2.12 seconds the ball enters the basketball hoop on its way back down towards the ground.
- What is the height of the hoop? [7]
 - What is the horizontal displacement between the thrower's hand and the hoop? [4]



TOTAL (LONG QUESTIONS) = 66