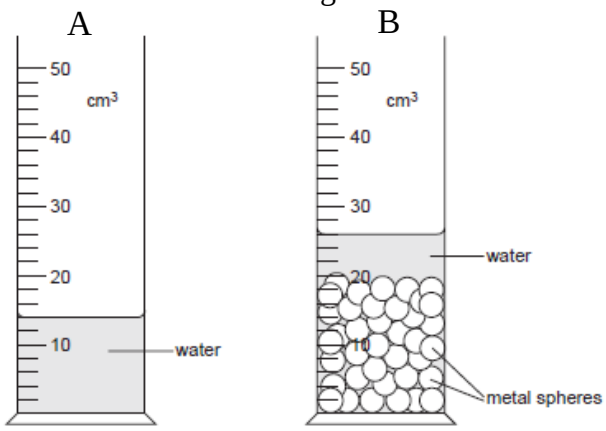
NAME: ..... STREAM: .....

END OF TERM II EXAMINATIONS
S.3 PHYSICS
1 Hour 45 Minutes

INSTRUCTIONS

- Answer all the questions in this paper.
- Use only the spaces provided to answer the questions.
- Where necessary, assume $g = 10ms^{-2}$

1. Figure A shows a measuring cylinder that contains some water. Fifty metal spheres are dropped into the water and the level rose as shown in figure B.



(a) (i) Explain why the spheres sunk in water.

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(01 mark)

(ii) Calculate the volume of a single metal sphere.

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(03 marks)

(b) The mass of each sphere is $648mg$.

(i) What is the meaning of the above phrase?

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(01 mark)

(ii) Determine the density of the material from which the spheres were made.

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(03 marks)

(c) State two applications of the knowledge of density.

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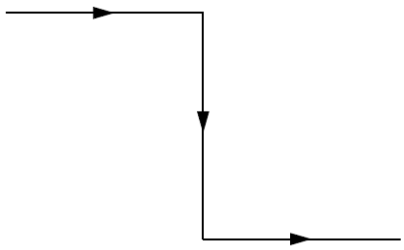
(02 marks)

2. (a) Two plane mirrors are used to reflect light. A ray of light follows the path shown in the diagram below.



(i) What is the meaning of the them ray?

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(01 mark)

(ii) Draw the two mirrors in their right positions. (02 marks)

(iii) State the practical application of the arrangement above.

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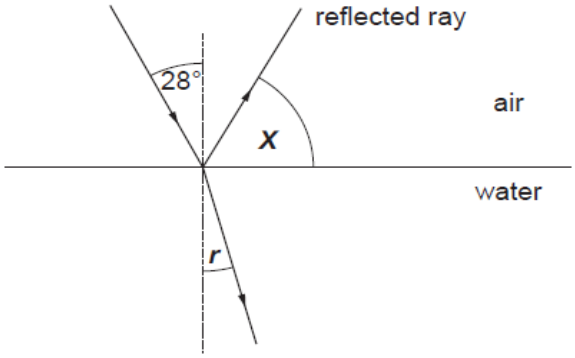
(01 mark)

(b) A ray of light is incident at an angle of 28° on a water surface. The ray is partly reflected and partly refracted as shown in the figure below.



(i) What name is given to angle X?

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(01 mark)

(ii) Determine the value of angle X.

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(02 marks)

(iii) If the refractive index of water is 1.33, calculate the value of angle r.

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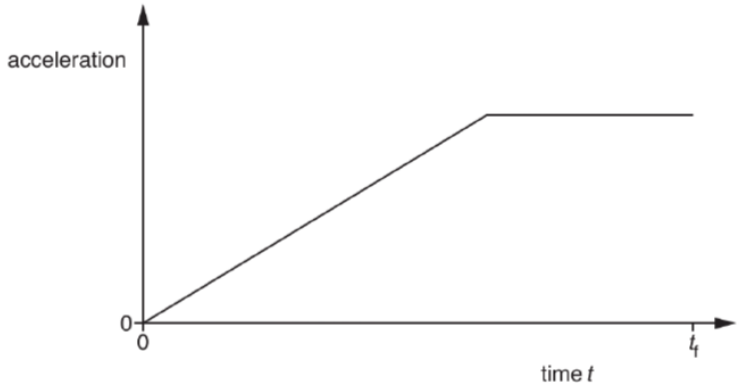
(03 marks)

3. (a) A rocket is stationary on a launchpad. At a time $t = 0$, the rocket engines are switched on and exhaust gas is ejected from the nozzles of the engines causing the rocket to accelerate upwards. The figure below shows how the acceleration of the rocket varies from time $t = 0$ to time $t = t_f$.



(i) Define the term acceleration.

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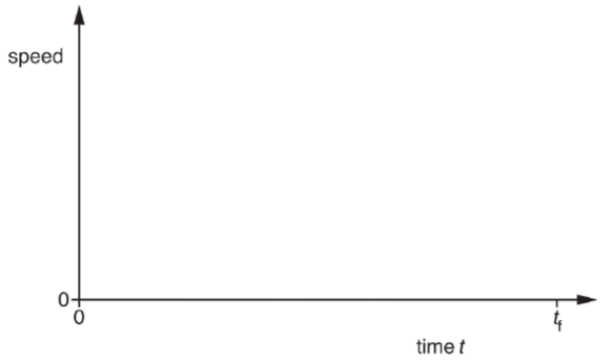
(01 mark)

(ii) On the figure below, sketch a graph to show how the speed of the rocket varies between $t = 0$ to time $t = t_f$.



(02 marks)

(b) A car initially travelling at $72kmh^{-1}$ uniformly retards to rest in 5 seconds. Calculate the:

(i) retardation of the car.

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(02 marks)

(ii) distance travelled in this time interval.

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(03 marks)

(iii) explain why the car eventually came to rest.

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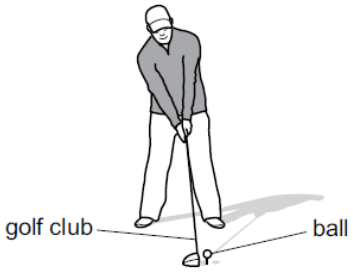
(02 marks)

4. (a) Complete the following definitions by giving the name of each quantity.

(i) mass x acceleration = ... (01 mark)

(ii) force x time = ... (01 mark)

(b) The figure below shows a man using a golf club to hit a ball of mass $0.046kg$.



The club is in contact with the ball for a duration of $5.0 \times 10^{-4}s$ and the ball leaves the golf club with a velocity of $65ms^{-1}$.

(i) Calculate the momentum of the ball as it leaves the golf club.

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(02 marks)

(ii) What is the resultant force acting on the ball while it is in contact with the golf club?

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(02 marks)

(iii) While the ball is in contact with the golf club, it becomes compressed and changes shape. State the energy stored in the ball during its contact with the golf club.

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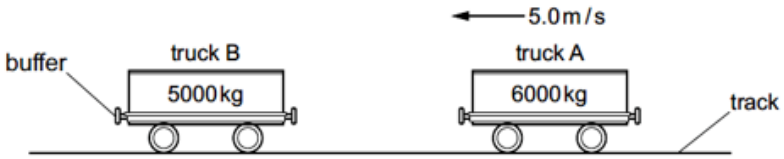
(01 mark)

(c) The figure below shows two railway trucks A and B on a track. Truck A of mass $6000kg$ is moving at a velocity of $5.0ms^{-1}$ towards a stationary truck B of mass $5000kg$.



The trucks collide, their buffers compress and bounce off each other undamaged. After collision, truck B has a momentum of $2700kgms^{-1}$. What is the velocity of truck A after collision? State any assumption made.

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(03 marks)

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