# Item 1

She **should install a large convex mirror** in a place where **such areas form part of field of view.** 

This is because convex mirrors have a **wider field of view**, the images formed are **upright** which the **shopkeeper can easily interpret**.

Mary is suffering from **shortsightedness(myopia**)

When she looks at far objects, their images are formed in front of the retina and appear not clear. This is because she has <u>a long eyeball and</u> the <u>eye lens is thicker (short focal length)</u>



*x*100%

To improve her vision, Mary should <u>wear spectacles with a concave lens</u>.

<u>The concave lens diverges the rays of light further</u> making an image to be formed on the retina.



Period,  $T = 0.005s \lor$ 

1

$$f = \frac{1}{T}$$
  
 $f = \frac{1}{0.005} = 200 \text{Hz}$ 

Since the frequency of the sound played by the bar is within the recommendable range, Mary *should not report the bar operators to the authorities*.

# The lamp gives out ultra violet radiations

Other use of the radiation include;

- Sterilization of drinking water
- Production of vitamin D

Item 2

- (a)  $W = 23 \times 10 = 230N$   $230 \times 0.45 = F \times 1.45$  F = 71.379N(b) (i) Letter when the theorem is the state of the sta
- (b)(i) In the morning the wheelbarrow loses almost all its heat to the surroundings since it is a good conductor of heat.In the afternoon, the sun heats up the wheelbarrow making it become hot.
  - (ii) By placing <u>bricks or pieces of timber on the sand</u>. This <u>increases the surface</u> <u>area</u> over which the <u>weight of the wheelbarrow and the load is spread</u>.
- (c) <u>Make the handles of wheelbarrow longer</u>. With <u>longer perpendicular distance a</u> <u>smaller force can produce the same moment to balance that produced by the</u> load.

#### Item 3

(a) Speed limit on the road  $=\frac{72 \times 1000}{3600} = 20 m s^{-1}$ 

Kinetic energy of the car =  $\frac{1}{2}mv^2$ 

$$\frac{1}{2}mv^2 = 129600$$
 V

$$\frac{x}{13}$$

Speed of the car as it approaches the traffic officer  $v = 18ms^{-1}$  The speed of the car is less than the speed limit, therefore the car was not stopped.

- (b) During day the sun heats up the land more than the sea.  $\checkmark$ 
  - The air above the land <u>heats up</u>, becomes less dense and rises up.
  - It is replaced by the cold dense air from the sea toward the land.
  - This is called the sea breeze.  $\checkmark$
- (c) Potential energy lost by water = heat energy gained by water.

$$mgh = mc\Delta\theta$$

$$h = \frac{c\Delta\theta}{g}$$

$$h = 84m$$

#### Item 4



## KOJJA SECONDARY SCHOOL END OF TERM ONE EXAMINATIONS,2025 SENIOR FOUR PHYSICS TIME: 2 hours 15 minutes

#### INSTRUCTIONS

- Attempt 4 items in total.
- Section A is compulsory
- Attempt any 3 items from section B.

#### **SECTION A**

#### Item one is compulsory

#### Item 1.

Mary owns a big supermarket. She is unable to see some parts of the supermarket as she couldn't afford to install cameras.

Mary could see near objects clearly but whenever she looked at an object that was far, it was not clear.

In the supermarket Mary uses a small lamp which produces electromagnetic radiations used to detect fake bank notes.

In the neighbourhood of the supermarket, there is a bar which plays music throughout the day. This sound has a displacement time graph shown in **figure 1**. The local authorities recommend that music whose sound of frequency **250Hz and below** be played during the day, and if it exceeds 250Hz those who play it must be reported to the authorities.



## Task;

Use your knowledge of physics to;

- (i) advise Mary on what she can install in the supermarket to be to view all areas in the supermarket.
- (ii) explain why Mary could not see far objects clearly and what she could do to improve her vision.
- (iii) determine whether the bar owner should be reported to the authorities or not.
- (iv) name the radiations emitted by the device used to detect fake banknotes and state two other uses of this radiation.

#### **SECTION B Answer three (3) items from this section.**

## Item2.

On a building site a wheelbarrow and its contents have a total mass of 23kg. The centre of gravity of the wheelbarrow is G, and the wheelbarrow is supported in equilibrium by a vertical force F that acts at the end of the handles as shown in figure 2.



The shade of some buildings on this site has hollow beams.

The builders complained about;

- wheelbarrow always being very cold in the morning and very hot at midday when the sun is up.
- the wheelbarrow sinking into the sand whenever they carry heavy loads on it.
- the need to have some modification on the design of the handles of the wheelbarrow so that the same load can be lifted with a force that is smaller in magnitude than that of F.

## Task;

As a student of physics,

(a) calculate the force F.

(b) explain to the builders;

- (i) why wheelbarrow is cold in the morning and hot at midday when the sun is up?
- (ii) what should be done to avoid the wheelbarrow from sinking into the sand?
- (iii) why hollow beams are used on such buildings on the site.
- (c) with a reason, advise the builders on the modifications they can make on the handles of the wheelbarrow.

## Item 3.

Alex drives a car of mass **800kg** on an uphill road on a sunny day. On this road a driver is stopped by a traffic officer if his speed exceeds **72kmh**<sup>-1</sup>. At one point in the motion of the car it approaches the traffic officer with kinetic energy **29600J**.

The occupants of the car found out that the inside of the car was too hot and had to make a stopover at a beach. They were surprised that a cold breeze blew towards them from a calm sea to the land where they were standing. They got relieved of the excessive heat even when there was too much sunshine.

Next to the beach was a waterfall. Alex got interested in determining the height of the waterfall. He had carried a small science kit and from it he picked a thermometer which he used to find the temperature difference between the temperature of water at the top and bottom of the waterfall. This difference was **0.2°C**.

#### Hint

- Acceleration due to gravity  $= 10 \text{ms}^{-2}$
- Specific heat capacity of water = 4200Jkg<sup>-1</sup>K<sup>-1</sup> Task:

As a student of physics;

- (a) find out whether the car was stopped by the traffic officer or not.
- (b) explain to the occupants of the car what causes the cold breeze from the calm sea.
- (c) help Alex to calculate the height of the waterfall.

#### Item 4.

Senior one students had an investigation in class during a lesson towards break. They were given solid A with dimensions 4cm by 4cm by 4cm. One of its corners (solid B) got chipped off. One of the students submerged solid B of mass 4.32g in a measuring cylinder containing water and volume of water increased from 25.3cm<sup>3</sup> to 28.9cm<sup>3</sup> as shown in **figure 3(i)**.



Fig. 3(i)



The school serves out hot water at break time. Each student then dissolves tea powder into the hot water. John a student of this school was left with few minutes to the end of break but the tea was still very hot. He poured tea from one mug to another and at the same time pulls the tea to increase its length between the two mugs as shown in **figure 3(ii)**. John was able to take his tea comfortably and was in time for the next lesson.

## Task;

The students are required to;

- (a) Find the
  - (i) volume and density of solid B.
  - (ii) mass of the remaining solid A after being chipped off.
- (b) (i) use kinetic theory of particles to describe the motion of the tea powder in the tea , and also state the cause of this motion.
  - (iii) explain why the pulling action of the tea made John's tea to cool faster.

## Item 5.

Officials from the district visited at noon a certain primary school. The slabs of the latrines in this school had collapsed in. The officials noted a bad smell coming from the latrines. A week later the district officials sent a team of engineers to take a sample of iron bars that were used to reinforce the concrete that had collapsed. The engineers reported that 140cm of the iron bar extend by 0.7cm under a 2000N load. The cross-sectional area of each iron bar was  $0.00848m^2$ . The engineers recommended using iron bars with young's modulus of at least  $4.0x10^7$  Nm<sup>-2</sup>.

# Task

Having acquired some physics knowledge, help the

- (a) builders to;
  - (i) understand why reinforcing concrete is necessary for strength of a structure.
  - (ii) know if the iron bars that were used meet the required standards for construction of the slab.
- (b) school administration to know why the bad smell spreads more in hot weather and suggest ways to reduce it.