RESPONSES: ITEM 1.

1(a) (i) The phenomenon above is rainbow
Rainbows are formed when white light from the Sun is incident on the water droplets in the atmosphere.
Light is then refracted and dispersed by the water droplets forming Spectrum.
The Spectrum undergoes total internal reflection and is seen opposite side of the Sun.

(ii) The rainbow appears curved because of the combination of light refraction through the Spherical water droplets and the observers position on the earth in that a person can only view the upper part of the circle.
The rainbow appears on the opposite side of the Sun due to the double refraction of the Spectrum.

(b) (i) Electromagnetic waves.

(iii) They are used for lighting
- Communication
- Vision
- Treatment.

(iv) The pattern is decreasing wavelength and increasing frequency.

(c) ii. amplitude = 10 cm

= 0.1 m.

iii) $V = f\lambda$

20 cm = 2λ.

$\lambda = 10\,cm.$

$\lambda = 0.1\,m.$

$V = 330\,ms^{-1}$

$\frac{330}{0.1} = \frac{f(0.1)}{0.1}$.

$f = 3300\,Hz$

RESPONSES ITEM 2

(a) (i) The patient will be discharged after 47 hours.

(ii) - Radiations cause skin burns
- Damage eye sight
- Cause genetic mutations
- Causes Cancer.

(b) (i) - wearing protective gears
- Using long pair of tongs
- Avoid unnecessary exposures
- Putting on clothes made of thick lead sheets.

(ii) - To prevent skin burns
- To prevent damage of eye sight
- To prevent genetic mutation.

Graph of activity against time.

RESPONSES: ITEM 3

(a) Seasons are caused due to the earth rotation as it revolves around the Sun. This causes different regions to recieve different amounts of solar energy which results into climatic and weather changes.

When the Northern hemisphere tilts towards the Sun, it experiences Summer while the Southern hemisphere experiences winter and as the Southern hemisphere experiences winter tilts towards the sun it experiences Summer while the northern hemisphere experiences winter.

(b). - Communication:-

This relays and amplifies radiotelecommunication signals via a transponder and creates a communication Chanel between transmitter and the reciever at different locations on the earth.

✓ Weather forecasting: Such as GEOS and landsat for monitoring the earth's atmosphere and Climate.

✓ Navigation eg GPS and GLONASS are used for providing location and

timing information.

- Scientific research such as TERRIERS and hoble telescopes can be used for conducting research.

SECTION. B. Part 1.

ITEM .4.

$C_s = 900 J kg^{-1} K^{-1}$ $\quad \theta_1 = 100°c$

$C_w = 4.200 J kg^{-1} K^{-1}$ $\quad \theta_2 = 0°c$

$L_f = 336000 J kg^{-1}$ $\quad m_s = 0.2kg$

$f_w = 1000 kgm^{-3}$ $\quad P = 4.22kW$

$= 4220W.$

$5L = \frac{5}{1000} m^3$ but $m = fV$

$= \frac{5}{1000} \times 1000$

$= 5kg$

Electrical energy Supplied = Heat used ~~to~~ melt ice + heat used raise temp of ice + heat used to raise temp of the Sauce pan

$$Pt = M_i L_f + M_i C_w (\theta_1 - \theta_2) + M_s C_s (\theta - \theta_2)$$

$$\Leftrightarrow 4220t = 5 \times 33600 + 5 \times 4200(100-0) + 0.2 \times 900(100-0)$$

$$4220t = 3798000$$

$$t = 900s$$

$$\therefore t = 15 mins$$

It took ~~two~~ 15 minutes.

(b). New time

7:00 am
+ 15
7:15 am.

She didnot leave late for work.

ITEM 5. $a = \frac{v-u}{t}$.

(a). $a_1 = \frac{90-0}{1.2}$

$= 75 \text{ km h}^{-2}$.

$a_2 = \frac{v-u}{t} = \frac{18-90}{1} = -72 \text{ km h}^{-2}$

$a_3 = \frac{0-18}{1.2} = -15 \text{ km h}^{-2}$.

A car started from rest and accelerated uniformly to 90km h^{-1} at a rate of 75 km h^{-2} for 1 hour and 20 minutes, it then maintained the Speed of 90km h^{-1} for 2 hours and decelerated to 18 km h^{-1} at a rate of 72 km h^{-2} for 1 hour and further decelerated to rest for 1.2 hours at a rate of 15 km h^{-2}.

(b). Total Distance Covered (TDC) = Area under the Curve.

$= \frac{1}{2}hb + L \times W + \frac{1}{2}h(a+b) + \frac{1}{2}b \times b$

$= \frac{1}{2} \times 90 \times 1.2 + 90 \times 2 + \frac{1}{2} \times 1 (18+90) + \frac{1}{2} \times 18 \times 1.2$

$= 298.8 \text{ km}$.

1 km = 2,500f

298.8 = 2,500 (298.8)

= 747,000f

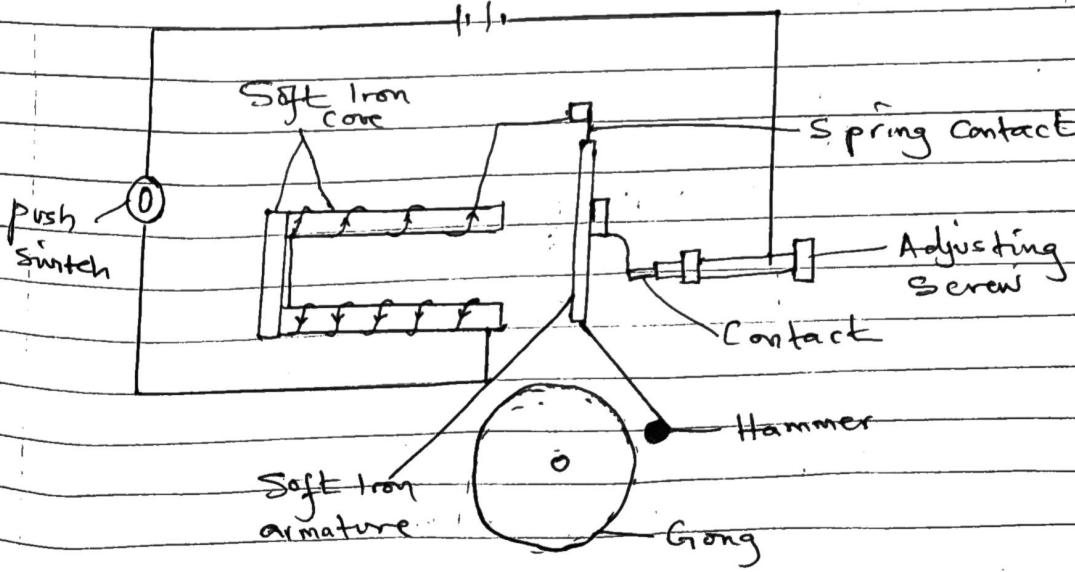
PART 2.

ITEM 6.

The wiring plan: The bulbs and all appliances must be connected in parallel so they operate on the same voltage and different currents.

This helps switching each appliance differently without affecting the others and also there is low resistance thus saving energy.

Electric bell



- When the switch is pressed, the current flows through the circuit making the electromagnet to become magnetised thus attracting the soft iron armature causing the hammer to hit the gong.
- As the armature is attracted, the contact is lost thus cutting the flow of current hence the electromagnets becomes demagnetised.
- This makes the armature to return back thus making contact again and the process of hitting the gong is repeated until the switch is put off.

$n = P(kW) \times time(hrs)$.

bulb $P = 5W$

$= \frac{5}{1000} = 0.005kW$.

time $= 3hrs \times 7 days$

$= 35 hrs$

$\therefore n = 0.005 \times 35$

$= 0.175 kWhr$

Kettle $P = 2kW$

$t = 3/60 = 0.05 hrs$.

$P = 2 \times 0.05 \times 7$

$= 0.7 kWhr$

$n = 0.7 + 0.175 = 0.875 kWhr$

$1 kWhr = 1000f \Rightarrow 0.875 kWhr = 0.$

1 kWh = Sh1000

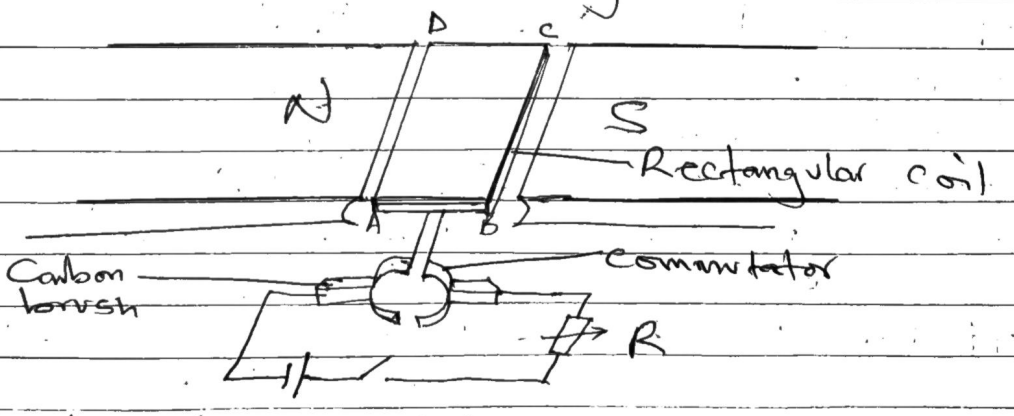
0·875 kWh = 0·875 × 1000

= Shs. 875.

ITEM 7.

Structure of a d.c motor.

- It consists of a rectangular coil which can rotate in a magnetic field provided by the permanent magnets.
The ends of the coil are connected to the commutators.
- Two carbon rods press against the commutators so that when the circuit is connected to the battery, the coil rotates.



Mode of operation:

- When the switch is closed, current flows through a rectangular coil ABCD.
- Side CD experiences an upward force while side AB experiences a downward force in accordance with Fleming's left hand rule.
- The two forces form a couple of forces which causes the coil to rotate in the anticlockwise direction.

- As the coil rotates and reaches the vertical position the carbon brushes lose contact with the commutators and current is cut off but the coil continues to rotate due to the momentum gained.
- The two commutators interchange contact with the Carbon brushes and the process is repeated hence causing continuous rotation.
- This reverses the direction of current in the coil and the forces experienced at the sides of the coil.
- This makes the coil to continue rotating as long as current is flowing.

Energy losses:

Energy loss	How to minimise it
1. Friction between Carbon brushes and commutators	- By lubricating
2. Heating effect due to resistance in the coil	- Using thick copper wires of low resistance
3. Eddy currents	- By winding the coil on a laminated iron core.