Current I

1. (a) Distinguish between natural and forced convection currents

(b) Draw the cross-section of a basic solar heating panel that uses heat from the sun to warm
water which flows through pipes

(b) Explain the following as regards to the solar heater:-
(i) Why the pipe is made of copper

(ii) How the green house effect occurs and aids the working of the panel

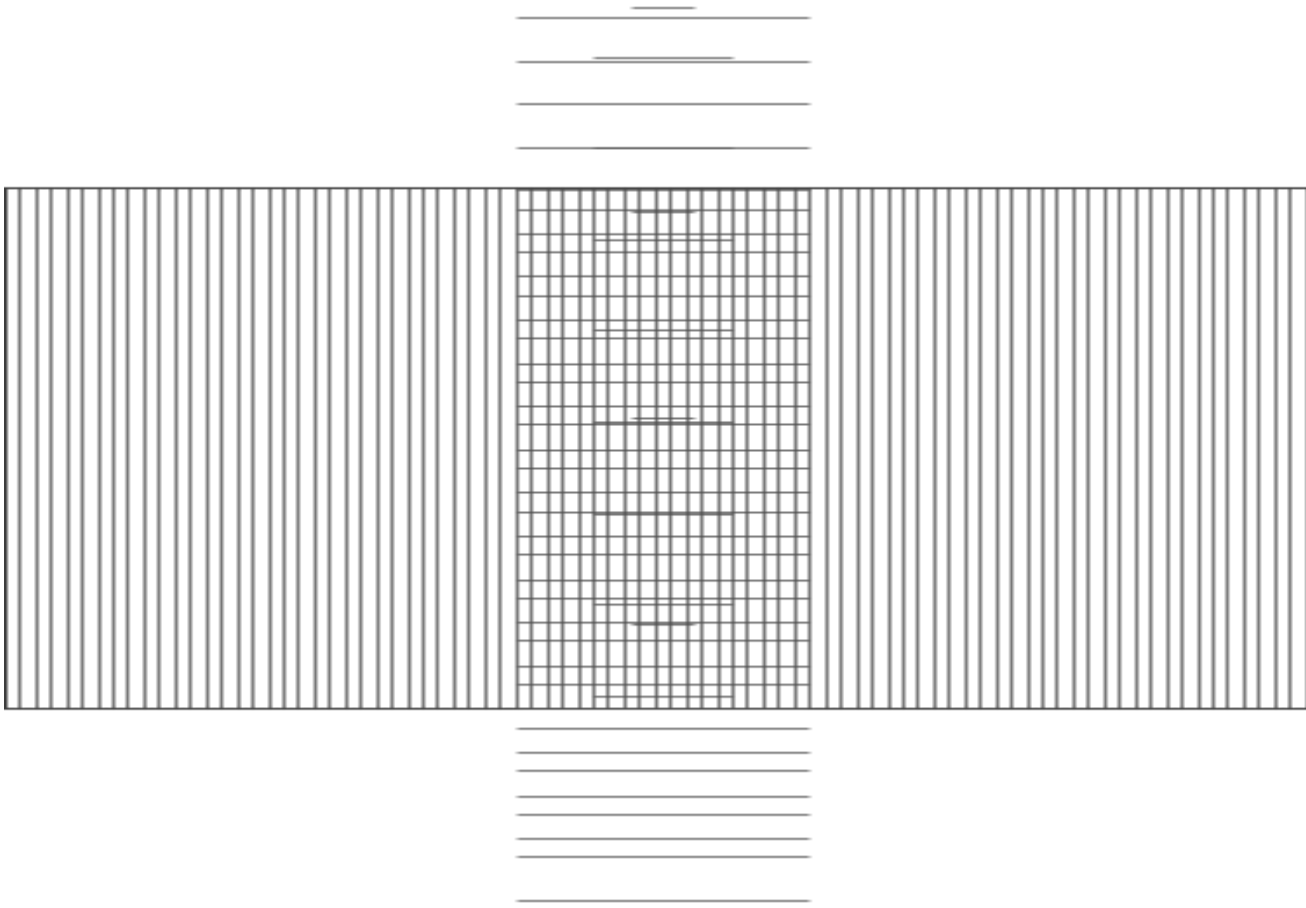
2. State **two** advantages of generating an alternating current (a.c) to direct current (d.c) in a
power station.

3. The table below shows results obtained in an experiment to determine the internal resistance
of a cell

V(V)	0.4	0.5	0.6	0.7	08	1.3
R(Ω)	0.45	0.65	0.80	1.05	1.40	2.4
$^1/_V$ **(V^{-1})**						
$^1/_R$**($Ω^{-1}$)**						

i. Complete the table for values of $^1/_V$ and $^1/_R$ giving your answers to 3 d.p

ii. Plot a graph of $^1/_V$ against $^1/_R$



iii. Use the graph to determine the e.m.f **E** and the internal resistance **r** of the cell given that

$$\frac{E}{V} = \frac{r}{R} \quad 1$$

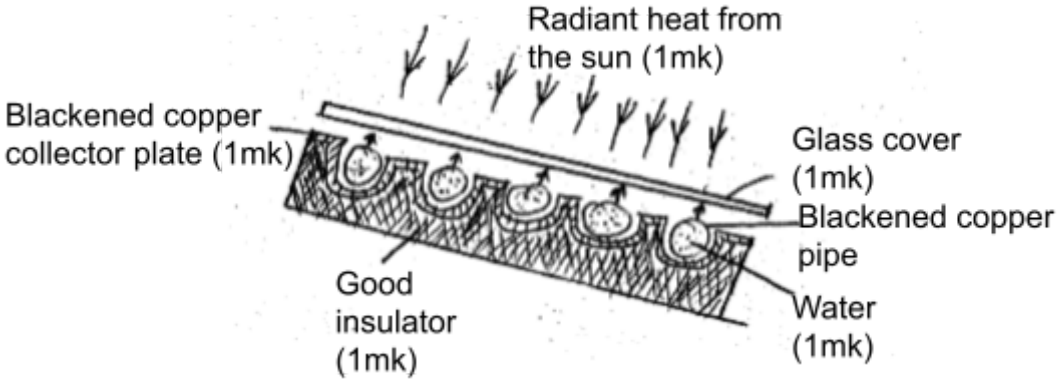
(4mks)

Current I

1. (a) natural convection – involves change in density of the fluid with temperature, whereas

forced convection involves the mixing of hot and cold part of the fluid though some

external stirring, like a fan or pump (2mks)



‘ (c) (i) Copper is a good conductor of heat; hence water gets warmed faster

(ii) The glass cover does not allow the radiant heat form inside the panel to escape since this

heat as lower energy than that from the sun. This heat continues being trapped inside

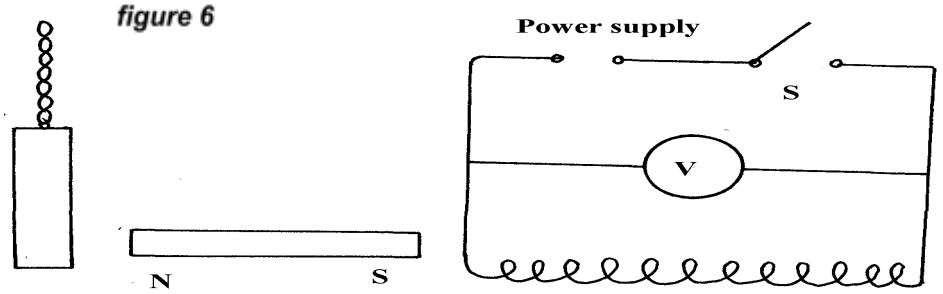
and the temperature increases, thus boosting the heating of the eater

Current II

1. A battery is rated 120 AH. How long will it work if it steadily supplies a current of 4A.
2. The current capacity of an accumulator is 40Ah. Find the amount of current flowing if the accumulator is used for 600 minutes

3. (a) A student hung a magnet next to a coil of wire to make a door chime as shown in ***figure 6:-***

figure 6



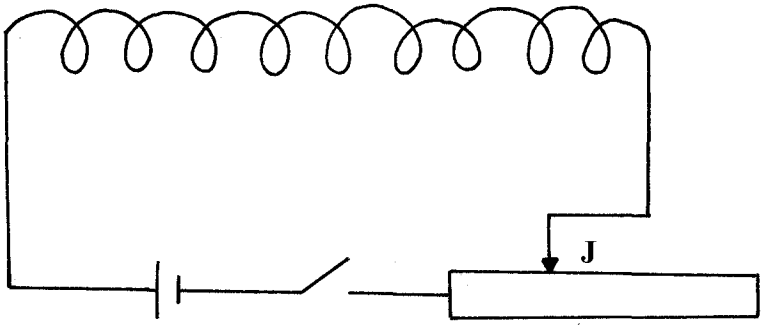
When the switch **S** was put on, the magnet hit the chime bar which made some noise.

(i) Explain how the current made the magnet move towards the chime bar

(ii) What should the student do to make the magnet hit the chime bar harder?

(iii) The student was asked to describe the energy changes inside the device. State the changes:

(b) A coil of wire is connected in series with a battery, a rheostat and a switch as shown in ***figure 7***:



(i) Draw on the diagram, the shape of the magnetic field inside and outside the coil when the

switch is closed

If the jockey **J** on the rheostat is moved towards **Q** what's the effect on:-

(ii)The resistance of the circuit

(iii) The current through the coil

(iv) The magnetic field in the coil

(i) Explain why a transformer will only transform alternating voltages and not direct current voltage

(ii) Explain why transformers are widely used throughout the national grid system

4. Determine the current passing through L_1 in the figure shown below, given that 0.8A passes through the battery, 0.28A through L_2 and 0.15A through L_3.

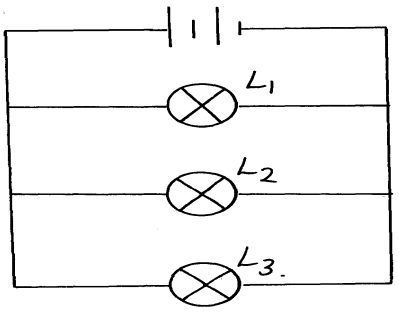


Figure 3

5. State **two** advantages of generating an alternating current (a.c) to direct current (d.c) in a power station.

Current II

1. $120 = 4t$

$t = \frac{120}{4}$ *1 mk*

$= 30$ *hrs 1 mk*

2. $I = \frac{Q}{t} = \frac{40}{\frac{600}{60}} = \frac{40}{10} = 4A$

3. (a) (i) - When the switch is closed current flows through the coil causing a magnetic field. This repels the magnet towards the chime bar. 1

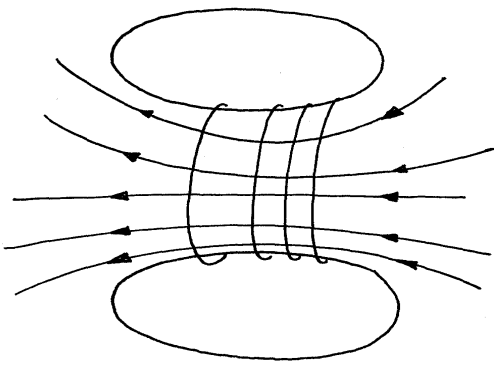
- The end of the coil adjacent to the sound pole of the bar magnet acquires a south pole.

(ii) – Increase he number of turns in the coil.

- *Increase d.c source.*
- *- Introduce a soft iron core in the coil.*

(b) (i) Electrical – magnetic - potential – sound energy

½ ½ ½ ½ 2mks



(ii) Resistance in the circuit increase. 1

(iii) Current reduces. 1

(iv) Become less stronger. 1

(c) (i) - In alternating current there is a change in the magnetic flux of the primary coil linked to the secondary soil. 1

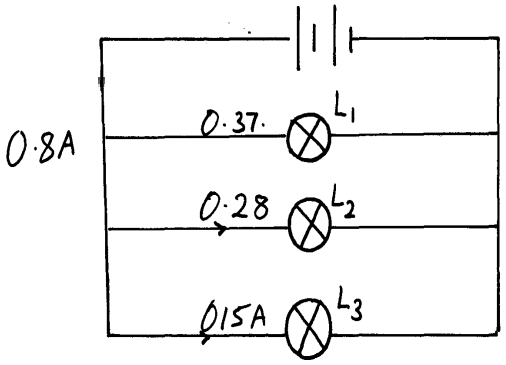
- In direct current there's no charge in the flux therefore no inducement of e.m.f in it.

(ii). - Transformers step up voltage to higher value for transmission which minimizes 1

power loss. 1

- They also step down higher voltage to the voltage required by the consumers.

4.



(a) Current tough L_1:

$0.8 = 0.15 + 0.28 + L_1$

$0.8 = 0.43 + L_1$

$L_1 = 0.37A$