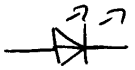
General Level.

1) A.
2). C
3) C
4). B
5). D
6). C
7). B
8). E

9). a) Input → Process → Output.

b) i 

ii) 

10 

11 a i). LDR.
ii). Thermistor.
iii). Loudspeaker.

b i) LED, LAMP 7 SEGMENT DISPLAY

b ii). Solenoid, Electric Motor; Relay.

12 a) i). $R = \frac{V}{I} = \frac{6}{0.005} = 1200\,\Omega$

ii). A) LDR ⇒ Resistance Decreases
B) Current will Increase.

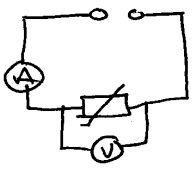
13 a): Input Output

b) i) Thermistor

ii) Loudspeaker

c).

14 a).



b) i) 18 mA

bii) $R = \frac{V}{I} = \frac{5}{0.018} = 278\,\Omega$

biii). R. decreases. (calc R @ 6V. $R = \frac{6}{0.025} = 240\,\Omega$)

15 a). Output Devices: Loudspeaker; LED; CD motor; 7-segment display.

b) Input Devices: On/OFF switch; Microphone;

c). electrical → light

Electronics — General.

16 LDR
Thermistor
Capacitor.

b i). Transistor

ii) Switch. — Electronic Switch.

c) Protect LED from too much current (or Voltage).

17 a i) IR detector.

a ii). LDR

b) I A) AND

B.

0	0	0
0	1	0
1	0	0
1	1	1

ii). AND.

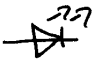
18. a) ~~Electrical~~ → ! Heat → Electrical

b). Analogue.

c) i) $I = \frac{V}{R} = \frac{0.8}{500} = 1.6 \times 10^{-3}$ A or 1.6 mA or 0.0016 A.

c ii). 7 Segment Display.

19 a). $\frac{\Gamma}{\_|}$ = 5.

b). 

c). Protect LED from too much current/voltage.

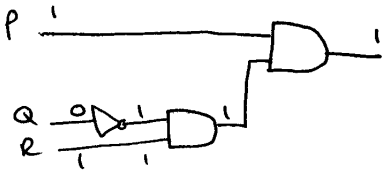
20. a). AND gate

bi) 

ii)

INPUT	OUTPUT
0	1
1	0

ci)



P = 1
Q = 0
R = 1

OR USE INFO TABLE!

cii). Motor

21 a) Microphone

b). Gain = $\frac{V_{out}}{V_{in}}$ how many times Vout is bigger than Vin.

c). 5000 Hz f does not change.

d). $P = \frac{E}{t}$ = energy in 1 second = 150 Joules in 1 second.

22.

a). Process

bi). Microphone.

bii). Loudspeaker

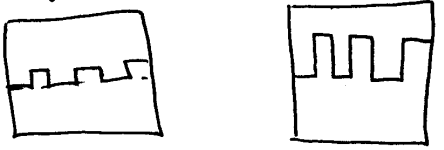
c). $Gain = \frac{V_{out}}{V_{in}} = \frac{0.45}{0.15} = \underline{\underline{3}}$

d). 

- Same frequency.
- Higher Amplitude.
- output V should be amplitude 5 x bigger than the input.

~~Bbj~~.

23a):



ii). digital.

b). Radio.

Electronics CREDIT.

24. a) loudspeaker

b). LED – does not have to produce much light
– does not use much energy.

c).i 

ii). $R = \frac{V_R}{I}$ $V_R = 9 - 2.4$

$V_R = 6.6\,V$

$R = \frac{6.6}{0.02}$

$R = 330\,\Omega$

---

25 a i) light → electrical

ii). $V_2 = \frac{R_2}{R_T} \cdot V_S$

$V_2 = \frac{2400}{3000} \times 1.5$

$V_2 = 1.2\,V$

b i) Transistor

ii). 20 Lux

iii). Protect LED from too high a current / voltage.

Electronics CREDIT.

Credit

26 a) i). NOT

ii)

	No Can	Can
LIGHT LDR	HIGH	LOW
R LDR	how	HIGH
VIN	HIGH	LOW
VOUT.	how	HIGH

LURD

b) i). BINARY

Decimal.

ii) AND.

0 0	0
0 1	0
1 0	0
1 1	1

iii) Capacator.

27 a) i

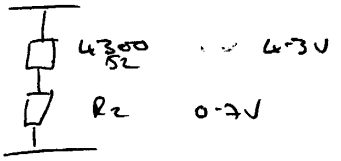
$$\frac{R_1}{R_2} = \frac{V_1}{V_2}$$

$$\frac{4300}{R_2} = \frac{4.3}{0.7}$$

$$\frac{4300}{R_2} = 6.143.$$

$$R_2 = \frac{4300}{6.143}$$

$R_2 = 700\,\Omega$



ii). A 80°C

B If R > 4300Ω

so R_{THERM} will have to ↑ to get 0.7V.

∴ Temp will decrease. [use curve!].

TOP.

TOP.

CREDIT.

27b

Credit

i) Transistor

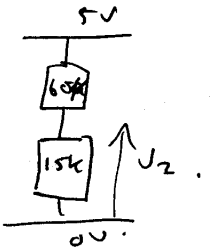
ii).
- As Temp ↓ so $R_{THERMISTOR}$ ↑
- V across Thermistor ↑ to 0.7 or above
- This voltage will switch on the transistor
- Current flows through transistor + relay to switch on the heater. (3).

---

28 a) a). $V_2 = \frac{R_2}{R_T} \cdot V_S$

$V_2 = \frac{15}{75} \times 5$

$V_2 = 0.1V$



b. X – AND Y – OR.

iii).

P	Q	R	S	T
0	0	0	0	0
0	1	0	0	0
1	0	0	0	0
1	1	1	0	1
0	0	0	1	1
0	1	0	1	1
1	0	0	1	1
1	1	1	1	1

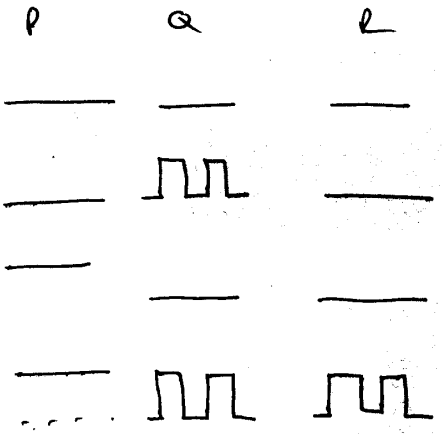
½ each correct row.

iv). emergency exit.

CREDIT Electronics.

29. a) AND

b).



c). (i) cap uncharged $V_x = 0$ —NOT→ V_y = HIGH

cap. charges X R x

cap charged x = HIGH —NOT→ V_y = LOW.

cap discharges X R y.

(ii) ↑ Resistance OR

↑ Capacitance.

CREDIT.

30

Credit

a) Variable Resistor

b). Transistor

c). COOL → $R_{THERMISTOR}$ ↓ →
$V_{THERMISTOR}$ ↓ (LESS 0.7V) →
Transistor switched off LED off.

31. a). X = NOT gate

b).

	P	Q	R
overfull	0	1	0
acceptable	1	0	0
underfull	1	0	1

1 each row.

c AND.

32 a i). W, X

ii). ↓ value Ω Resistor R + capacitor C.

b). $R_2 = \frac{V_R}{I} = \frac{(3-1.8)}{0.015} = 80\ \Omega$

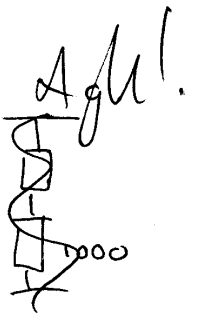
33 a)  need the arrow plus 2 connecting links

b). i) 0.7V

ii) $V_R = 5 - 0.7 = 4.3V$

iii).

$R = \frac{V}{I} = \frac{4.3}{0.01} = 430\ \Omega$



CREDIT Electronics

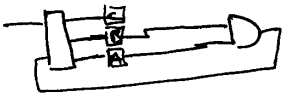
34 a). LDR.

b) i)

P	Q	R
0	0	0
0	1	0
1	0	0
1	1	1

ii) 5 eggs A = 1, C = 1.

iii).



A, B.

35. a). Transistor

b). loudspeaker

c). B Decreases

ii) ~~weak~~ Resistance ↑ R ↓ so V across R ↓

V across var-resistor ↑

When $V_{VAR} \geq 0.7$ transistor switched ON.

current flows through L'speaker.

36 a). i LDR

ii)

	1p	2p	5p
P	0	1	0
Q	1	1	0
R	1	1	1
S	1	1	1

1 for each column.

b i) A – NOT (B) AND

iii). T 1 U 1 V 1 W 1 X 1

iv). Solenoid.

37 a). Solar cell → Amplifier → Voltmeter. **Credit**

b). i) $Gain = \frac{V_{out}}{V_{in}} = \frac{40}{0.1} = 400$

ii) $V_1 = \frac{R_2}{R_T} \times V_S$ mixed up sign with R_1 R_2 V_1 !

$V_1 = \frac{180}{400} \times 0.4$ $V_S = 0.4$ mV (1)

$V_1 = 0.18$ mV

---

38. a i). $Power\ Gain = \frac{P_{out}}{P_{IN}} = \frac{64}{16 \times 10^{-3}} = 4000$

a ii). $P = \frac{V^2}{R}$

$V^2 = P.R$

$V^2 = 64 \times 9$

$V^2 = 576$

$V = 24$ V

b). $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2}$

$\frac{1}{R_P} = \frac{1}{9} + \frac{1}{9} = \frac{2}{9}$

$R_P = 4.5\ \Omega$

c). 258 Hz.

39. ai) Power Gain = $\frac{V_{out}}{V_{in}} = \frac{2}{5\times10^{-3}} = 400$

aii) $P = \frac{V^2}{R}$

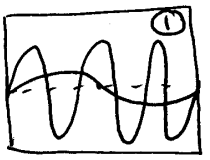
$R = \frac{V^2}{P} = \frac{4^2}{2} = 8\,\Omega$

b). Push switch → current thro coil. → magnetic field in coil attracts iron bar to open door.

40 a). $V_{out} = GAIN \cdot V_{in}$

$6 = 150 \cdot V_{in}$

$V_{in} = \frac{6}{150} = 0.06V$

b) i). 5  ①

style (3 ± freq) strings draw 3 waves with ① Greater amplitude [as louder] ①.

ii). 196.0 Hz