1 **(a) (i)** NOT B1

(ii) AND B1

(b) low / 0 / off B1
low / 0 / off B1

(ii) high / 1 / on B1
high / 1 / on B1

(c) B cannot provide enough power/voltage/current to light lamp (IGNORE strength) B1

(d) security lamp OR intruder alarm OR burglar alarm with explanation OR beach lighting OR air freezer at indoor ski slope OR fridge alarm i.e. something that switches on when hot and dark (in a practical situation) B1 [8]

2 **(a** **analogue** any reading possible/idea of continuous variation of value of quantity B1

digital idea of two states only B1

(b) if both inputs are 1/high, the output is 1/high B1
only added to previous line
OR if either or both inputs are 0/low, then output is 0/low B1
(accept both answers in form of a truth table)

[Total: 4]

3 **(a)** A NOT or inverter B1
B AND B1

(b) (accept 1 or ON for HIGH, and 0 or OFF or NOT HIGH for LOW throughout)

(i) A – HIGH and B – LOW (both) no e.c.f. B1

(ii) A – HIGH and B – HIGH (both) no e.c.f. B1

(iii) A – LOW and B – LOW (both) no e.c.f. B1

(c) B cannot provide enough power / current for lamp, or equiv.
OR allows remote lamp B1

(ii) the second one / dark and warm / HIGH, HIGH e.c.f. from **(b)** B1

(iii) warning if temperature in a closed / dark space (e.g. refrigerator, kiln) reaches too high a value
N.B. "to switch on a lamp when it is dark and warm" not accepted B1

[8]

4 **(a)** NOT or inverter B1

(b) thermistor NOT thermal resistor B1

(ii) resistance increases OR voltage across it increases B1

(c) LOW or 0 or off or NOT HIGH B1

(ii) (much) larger/ large / higher / high B1

(iii) low temperature e.c.f. from **(c) (ii)** B1

(d) to allow adjustment of the temp. at which relay will close / heater comes on B1

(e) automatic control or wtte of heating system / air-conditioning / automatic room heater
OR thermostat
OR any other sensible suggestion involving control of heating B1

[8]

5 **(a)** correct symbol, must show 3 connections, condone rounded "nose", ignore width of the shape, allow OR gate followed by NOT gate, correctly drawn B1

(b) if truth table is shown, mark the truth table and ignore the rest
either input 1, output 0 **AND** both inputs 1, output 0 B1
both inputs 0, output 1 accept high/low, on/off for both B1

(c) **(i)** one input is high/1 AND output is low/0 B1
IGNORE any reference to 2nd input

(ii) 1. on B1
2. o B1

[6]

6 **(a)** **(i)** LDR correctly identified B1

(ii) lamp correctly identified B1

(iii) transistor correctly identified B1

(b) (ignore anything that is in terms of currents)
resistance of LDR becomes high M1
LDR gets larger share of the voltage OR voltage across LDR gets bigger A1
transistor switches/turns lamp on A1 [6]