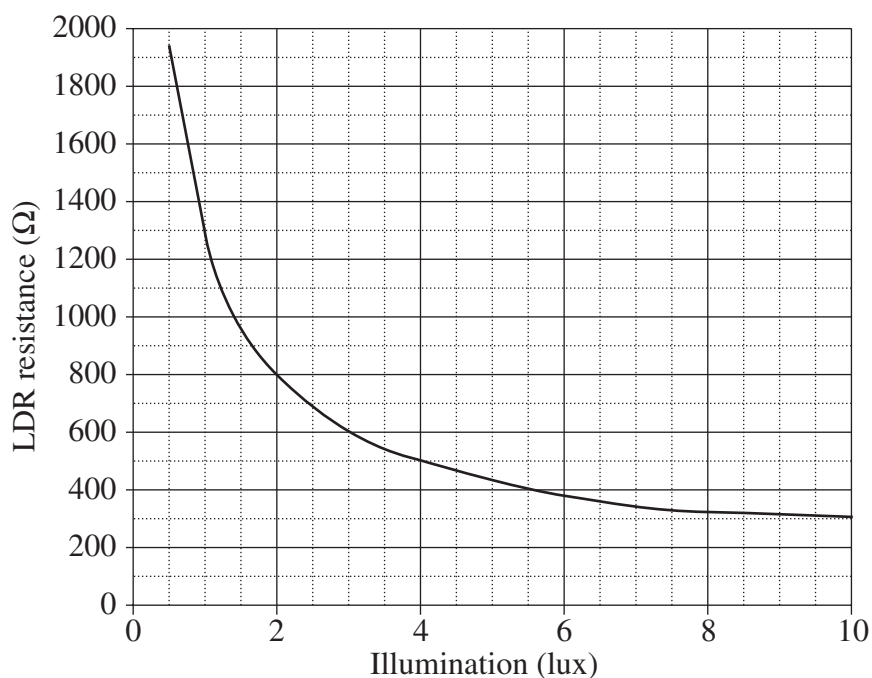


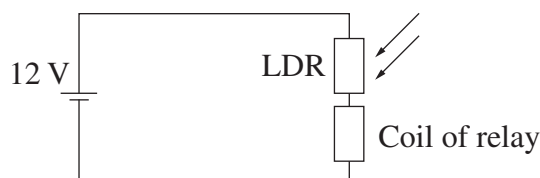
Question 32 — The Age of Silicon (25 marks)

- (a) (i) Describe the structure of an LED. 2
 (ii) Explain why, in some applications, it is preferable to use an LED rather than an ordinary light source. 4

- (b) (i) The diagram shows how the resistance of a light-dependent resistor (LDR) depends on the intensity of the light falling on it (illumination).



- (1) Describe qualitatively how the resistance of this LDR changes as the illumination increases. 1
 (2) What is the resistance of this LDR when the intensity of light falling on it is 4 lux? 1
- (ii) This LDR is connected in series with the coil of a relay to a 12 volt power supply as shown. 4



This relay switches on when the current through the coil reaches 4.8 mA. When connected in this circuit, the relay switches on when the illumination on the LDR is 2 lux.

Calculate the resistance of the coil of the relay.

Question 32 continues on page 37

Question 32 (continued)

- (c) The table gives the output voltage of an amplifier as a function of the input voltage.

<i>Input voltage</i> (microvolt)	<i>Output voltage</i> (volt)
-300	8.0
-250	8.0
-200	8.0
-150	6.0
-100	4.0
-50	2.0
0	0.0
50	-2.0
100	-4.0
150	-6.0
200	-8.0
250	-8.0
300	-8.0

- (i) Describe the properties of an ideal amplifier. **2**
- (ii) Calculate the gain of this amplifier. **2**
- (iii) Propose why this amplifier is not suitable for input signals that vary from -250 microvolt to $+250$ microvolt. **2**
- (d) Early computers used thermionic devices. Later computers used transistors and today computers use integrated circuits. Discuss the impact and limitations of these developments. **7**

End of paper