

# 2014 HSC Industrial Technology Electronics Technologies Marking Guidelines

## Section I

### Multiple-choice Answer Key

Question	Answer
1	D
2	D
3	A or B *
4	C
5	D
6	A
7	C
8	A
9	B
10	C

\* Both A and B were accepted as correct.

## Section II

### Question 11

Criteria	Marks
<ul style="list-style-type: none"> <li>Correctly identifies the value of the 4 band resistor. Tolerance not required</li> </ul>	1

**Sample answer:**

Band 1 = red = 2

Band 2 = red = 2

Band 3 = red = 100

Band 4 =  $\pm 20\%$

$\therefore$  the resistor value =  $2200\Omega$

2K2 ohms  $\pm 20\%$ , 2.2K ohms  $\pm 20\%$

**Answers could include:**

Values may be in ohms or converted to kilo ohms. Tolerance value need not be specified.

### Question 12

Criteria	Marks
<ul style="list-style-type: none"> <li>Correctly identifies a suitable/recognised method of PCB production</li> <li>Identifies the main features of the manufacturing process</li> </ul>	3
<ul style="list-style-type: none"> <li>Correctly identifies a suitable/recognised method of PCB production</li> <li>Identifies with partial accuracy some features of the manufacturing process</li> </ul>	2
<ul style="list-style-type: none"> <li>Lists a suitable manufacturing method</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>Lists a step in the manufacturing of a PCB</li> </ul>	1

**Sample answer:**

To produce a PCB using the press'n'peel technique the circuit can be drawn using a program such as circuit wizard. An appropriate size piece of copper board is then cut and cleaned with steel wool. The circuit is applied using the printed transfer and an iron. Ammonium persulphate etchant removes the unprotected copper. When all excess copper is removed, rinse and clean the board. Drill all component holes and seal with lacquer.

**Answers could include:**

- Hand or CAD based production techniques
- Methods could include Dalo pen/hand drawn, CAD developed and press'n'peel methods
- Removal of copper could be etchant or CNC
- Board protection via lacquer
- Use ferric chloride solution to etch away excessive copper

**Question 13**

<b>Criteria</b>	<b>Marks</b>
• Provides characteristics and features of the operation of relays, including an awareness of the cause and effect nature of their operation	3
• Sketches in general terms the operating properties of relays	2
• Lists a feature of a relay	1

***Sample answer:***

A relay is a simple electromechanical switch made up of an electromagnet and a set of contacts. Relays are simple devices, consisting of four parts; electromagnet, armature that can be attracted by the electromagnet, spring and a set of electrical contacts.

A relay consists of two circuits. The first is the electromagnet. When a small current is fed to the electromagnet it attracts the armature. The armature acts as a switch, completes the second circuit and allows a larger current to flow. When the electromagnet is not energised, the spring pulls the armature away and the circuit is not complete. In general, the point of a relay is to use a small amount of power in the electromagnet to move an armature that is able to switch a much larger amount of power.

***Answers could include:***

Diagrams or sketches to aid in the explanation.

Uses a small current to switch a much larger amount of power.

**Question 14**

Criteria	Marks
• Provides a correct answer (quantum and units) with a sequence of appropriate calculations	3
• Provides an incorrect answer with ONE or TWO minor errors in calculations	2
• Provides some evidence of which formulae to use	1

**Sample answer:**

Calculate the total resistance in a series circuit

$$R_T = R_1 + R_2 + R_3$$

$$R_T = 100 + 140 + 220$$

$$R_T = 460$$

$$V = IR$$

$$24 = I460$$

$$I = \frac{24}{460}$$

$$I = 0.052 \text{ amps}$$

Using  $V = IR$ , calculate the voltage at each resistor where current in the series circuit = 0.052 amps

$$V@R_1 = V = 0.052 \times 100$$

$$V = 5.22 \text{ v}$$

$$V@R_2 = V = 0.052 \times 140$$

$$V = 7.30 \text{ v}$$

$$V@R_3 = V = 0.052 \times 220$$

$$V = 11.48 \text{ v to 2 decimal places}$$

$$V@R_1 = 120/23\text{v}, V@R_2 = 168/23\text{v}, V@R_3 = 264/23\text{v}$$

**Question 15**

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides characteristics and features of integrated circuits that make them beneficial in the design and application of electronic circuits, clearly noting the cause and effect relationship of integrated circuits in devices</li> </ul>	5
<ul style="list-style-type: none"> <li>Sketches in general terms some features of integrated circuits that make them beneficial in the design or application of electronic circuits</li> </ul>	3–4
<ul style="list-style-type: none"> <li>Identifies or lists one or two advantages of integrated circuits</li> </ul>	1–2

***Sample answer:***

The advantages of integrated circuits with regard to both circuit design and function are many and varied. Primarily though, the advent of integrated circuits has significantly improved the speed and processing power within modern devices. Other benefits provided to the modern electronic product designer are the ability to reduce the size of items such as phones and laptops due to the chips having multiple circuits embedded in the silicon wafers contained in each chip. The small size of the chips now available also allows the weight of products such as laptops and gaming devices to be significantly lower than their predecessors, offering the consumer portable products with significant processing power and capacity. Lower power requirements also enable devices to run for longer aiding the portability of devices such as mobile phones. With regards to manufacture, ICs are cheaper and more efficient to produce than traditional soldered circuits due to the use of mass production techniques. The forming of ICs on silicon also provides better performance due to the absence of the traditional soldered joint, which is prone to issues such as dry joints or corrosion.

***Answers could include:***

The advantages of integrated circuits in the design and development of electronic devices are diverse and include:

- Small in size due to the reduced device dimension
- Low weight due to very small size
- Low power requirement due to lower dimension and lower threshold power requirement
- Low cost due to large-scale production
- High reliability due to the absence of a solder joint
- Facilitates integration of large number of devices
- Improves the device performance even at high-frequency region
- Greater processing power
- ICs are programmable
- Improves time management and circuit efficiency
- Small compact in size; large memory and bigger storage capacity
- ICs contain multiple circuits with multiple functions and less buttons to press

## Section III

### Question 16 (a)

Criteria	Marks
• Detailed understanding of the characteristics and features of how government legislation has impacted work practices	6
• Sound understanding of the characteristics and features of how government legislation has impacted work practices	4–5
• Basic understanding of features of government legislation and link to work practices	2–3
• Provides some relevant information	1

#### *Sample answer:*

Government legislation, such as the Equal Employment Opportunity Act, has had significant impacts on work practices. For example, when advertising, interviewing, and appointing someone to a position in an organisation care and diligence is required to ensure everybody has an opportunity to apply, get interviewed and appointed, regardless of gender, disability, race, beliefs etc. This may mean equal access now requires ramps, elevators, disabled toilets in all workplaces.

### Question 16 (b)

Criteria	Marks
• Provides a judgement based on detailed criteria of the effect of new and emerging technologies on work practices	9
• Provides a judgement based on criteria of the effect of new and emerging techniques on work practices	7–8
• Provides an understanding of the value and effect of new and emerging technologies on work practices	5–6
• Main features of the value or effect of new and emerging technologies on work practices	3–4
• Provides some relevant information	1–2

#### *Answers could include:*

The internet has now allowed people to do some of their work from home as they can access the company's software and data from home.

This is very positive for three main reasons:

1. Travel time is reduced. This means the worker can spend more time with his/her family which has positive effects for the happiness of the worker.
2. Fewer people travelling on roads to and from work means less traffic. Less traffic means faster travelling and less frustration before getting to work.
3. More work can be done as working alone at home means no distractions from other workers.

# Industrial Technology Electronics Technologies

## 2014 HSC Examination Mapping Grid

### Section I

Question	Marks	Content	Syllabus outcomes
1	1	Electricity principles	H1.2
2	1	Components circuitry – motors	H1.2, H4.3
3	1	Components circuitry – diodes	H1.2, H4.3
4	1	Components circuitry – thyristor	H1.2, H4.3
5	1	Electricity principles – logic gate	H1.2, H4.3
6	1	Circuitry – parallel	H1.2, H4.3
7	1	Components – switches	H1.2, H4.3
8	1	Processes	H3.2
9	1	Electricity principles – transformer	H1.2, H4.3
10	1	Processes	H3.2

### Section II

Question	Marks	Content	Syllabus outcomes
11	1	Circuitry – resistor colour codes	H1.2, H4.3
12	3	Circuitry/Electricity principles PCB construction	H1.2, H2.1, H4.3
13	3	Circuitry – relay operation	H1.2, H4.3
14	3	Circuit calculation	H3.2, H4.3
15	5	Electricity principles – IC application benefits	H4.3, H6.1

### Section III

Question	Marks	Content	Syllabus outcomes
16 (a)	6	Personnel issues	H1.1, H2.1
16 (b)	9	Technical considerations	H1.1, H2.1, H7.2