# 130 - TRADESPERSONS ELECTRICAL WORK CERTIFICATE MARKING SCHEDULE

Note: (1 mark) means that the preceding statement earns 1 mark.

This schedule sets out the expected answers to the examination questions. The marker can exercise their discretion and decide on the overall accuracy of any answer that is presented in the candidate's own words.

## Section 1 – All Candidates

### Question 1

(a) (i) Volts or Voltage.

(1 mark)

(ii) Amp or amperes.

(1 mark)

(b) (i) Watts.

(1 mark)

(ii) Any ONE of:
- Active.
- Line.
- Live.
- Alive.
- Hot.

(1 mark)

(c) $I = \frac{W}{V}$

$= \frac{1200}{230}$

(1 mark)

$= 5.21A$

(1 mark)

(d)
- A fusible link will isolate a circuit when the ambient temperature reaches an unsafe level.
- A fuse will isolate a circuit when excess current flows.

(2 marks)

(e) It is the maximum fault current that a fuse or circuit breaker can safely interrupt.

(2 marks)

**Question 2**

(a) No voltage can exist between either of the secondary terminals and earth.

(2 marks)

(b) Any TWO of:

- The appliance is fixed wired and connected through a continuous flexible cord to a supply of electricity from a source isolated from earth with a voltage between conductors not exceeding 250 volts:
- The appliance is supplied with electricity from a safety extra-low voltage source:
- The appliance is double-insulated and is supplied with electricity through a residual current device.
- The appliance is supplied with electricity from a monitored earth circuit where the supply to the appliance is automatically disconnected if the earth to the appliance is broken or disconnected:
- The appliance is supplied with electricity from a source connected to earth so that the voltage to earth will not be greater than 55 volts a.c.:
- The appliance is supplied with electricity through a residual current device:
- The appliance is supplied with electricity from a source isolated from earth with a voltage between conductors not exceeding 250 volts:
- The appliance is double insulated.

Ref: ER 77
(2 marks)

(c) Any ONE of:

- To avoid possible contact with a live terminal when removing or replacing the fuse carrier.
- To avoid flash burns from the fuse if it fails again because the initial fault has not been cleared.

(2 marks)

(d) Any TWO of:

- To ensure that the control switch, if single pole, is connected in the phase conductor.
- To ensure that the metal framework is connected to the earth conductor.
- Correct polarity on any Edison screw lampholder.
- Phase, neutral and earth connected correctly

(2 marks)

(e)
- By using a flexible cord with an increased cross sectional area.

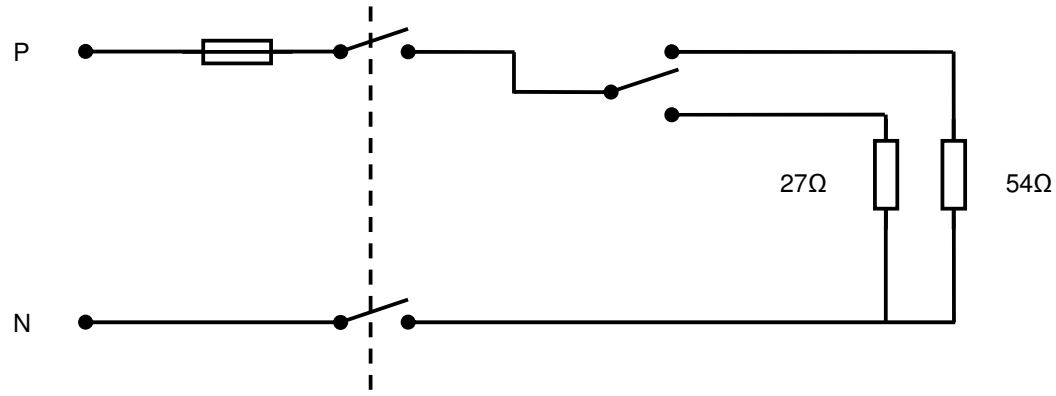
(1 mark)

- Reduce the length of the cord.

(1 mark)

**Question 3**

(a)




- Correct polarity

(1 mark)

- The fuse is in the phase and protects the resistors.

(1 mark)

- The double-pole switch switches phase and neutral simultaneously.

(1 mark)

- The two-position selector switch has two distinct positions.

(1 mark)

- The resistors are connected so two different load settings are achieved.

(1 mark)

(Total 5 marks)

(b) (i) $I = \frac{V}{R}$

$= \frac{230}{27}$

(1 mark)

$= 8.5A$

(1 mark)

(ii) 10A is the most suitable fuse

(1 mark)

(c) $W = V^2 \div R$

$= 230 \times 230 \div 54$

(1 mark)

$= 979.6$ watts

(1 mark)

**Question 4**

(a) (i) 1 ohm.

(1 mark)

(ii)
- The protective earthing conductor (earth continuity conductor) will ensure that if a phase to framework fault occurs, sufficient current will flow to ensure the rapid operation of the circuit protective device.
- Exposed metal remains at earth potential if there is insufficient current to operate the circuit protective device.

(2 marks)

(b)
- With a phase to frame fault, the exposed earthed metal provides a path for earth leakage current to return to the supply.

or

- If supply cord insulation breaks down, the user is exposed to risk of electric shock between the cord and earth or earthed metal.

or

- If the earth is broken or high resistance the exposed earthed metal provides a path for earth leakage current to return to the supply.

(2 marks)

**Question 5**

(a) (i)
- To protect the fixed wiring
- Against effects of heat
- Caused by excess current flow.

(3 marks)

(ii) To ensure that the point of circuit isolation is at a safe, accessible place.

(2 marks)

(b) Any **FIVE** of :

- It will safely interrupt short circuit currents of much higher values.
- It eliminates arcing because the fuse element is sealed.
- It is obtainable in a range of Utilisation category (fusing factors).
- It can provide "close" protection in P and Q1 Classes.
- It is not repairable – therefore wrong size of wire cannot be used.
- Current rating is clearly marked.
- Reliable operation within prescribed limits.
- Good discrimination.
- Constant fusing characteristics.
- Faster operation/acting.
- Doesn't deteriorate over time.

(5 marks)

**Question 6**

- Check the test instrument on a known live source. This proves that the meter is working correctly.

(2 marks)
- Test for isolation (between all conductors) on the circuit being isolated.

(1 mark)
- Re-check the test instrument on the known live source. This ensures that it is working correctly.

(2 marks)

**Question 7**

(a) Table 3.5 of AS/NZS 3000

| COLOURS OF CABLE CORES | | |
|---|---|---|
| **Function** | **Identifying colours** | |
| | **Recommended** | **Alternative** |
| | | |
| Earth/bonding | ***Green/yellow*** | ***Green*** |
| Neutral | ***Black*** | ***Light blue*** |
| Active | Red | ***Any colour except green/yellow, green, black, light blue*** |

Note: No marks if not completely correct.
A later amendment to AS/NZS 3000 permits the use of yellow as an active conductor in NZ.

**Question 8**

(a) It is the maximum current that a flexible cord is designed to carry safely without overheating.

(2 marks)

(b)
- Current flow in excess of the rating will produce excess heat.
- Excess heat may cause the insulation to deteriorate and breakdown and create a fire risk

(3 marks)

**Question 9**

(a)
- Normally the currents in the phase and neutral are equal.
- When an earth fault occurs, some current is diverted to earth.
- This causes an imbalance between the phase and neutral currents.
- The imbalance is detected by the sensing coil which trips and disconnects the supply to the load.

(4 marks)

(b) Any ONE of:
- To ensure the tripping mechanism has not become stuck or "frozen"
- To ensure it works correctly.

(1 mark)

**Question 10**

(a)
- Do not touch the live conductor or victim

(1 mark)

- Isolate the supply.

(1 mark)

(b) (Airway-Breathing-Circulation)
- Check for presence of breathing.
- Check for signs of life (pulse)

(1 mark)

(c) (i) 12 breaths per minute.

(1 mark)

(ii) 15:2.

(1 mark)

## Section 2 – Plumbers and Plumbers/Gasfitters Only

**Question 11**

(a) AS/NZS 3760

(1 mark)

(b) (i) (I) Low reading ohmmeter.

(1 mark)

(II) 1 ohm maximum

(1 mark)

(ii) (I) Insulation resistance tester.

(1 mark)

(II) 1 MΩ minimum

(1 mark)

**Question 12**

(a) It must be able to read low ohms.

(1 mark)

(b) • To check that the instrument is functional.

(1 mark)

• Either of:
- To zero the meter for accuracy.

OR
- Compensate for the resistance of the leads.

(1 mark)

(c) • It may show an apparent reading of zero.

(1 mark)

• It may be inaccurate when the protective earthing conductor (earth continuity conductor) resistance is high.

(1 mark)

**Question 13**

(a) ● To ensure that the resistance to earth from protectively earthed parts is low enough to permit adequate fault current to flow to earth.

Ref: AS/NZS3760: Foreword

or

● To ensure that the resistance of the protective earthing conductor is not greater than 1 ohm.

(1 mark)

(b) ● To ensure the integrity of the insulation between live mains parts and exposed or external metal parts.

Ref: AS/NZS3760: Foreword

or

● To ensure that the insulation resistance:
- between active and neutral and between neutral and earth
- between active and earth

(1 mark)

- is not less than 10,000 ohms.

(1 mark)

(c) ● Ensure phase, neutral and earth conductors are terminated at the correct terminals

(1 mark)

● Ensure switch and thermostat are in the phase conductor.

(1 mark)

**Question 14**

(a) **5** means protection against entry of dust in sufficient quantity to interfere with the operation.

(2 marks)

(b) **6** means protection against heavy seas or a strong jet of water from all directions.

(2 marks)

(c) **X** means unspecified protection.

(1 mark)

**Question 15**

- Use a 500V d.c. insulation tester.
  (1 mark)
- Check meter's operation.
  (1 mark)
- Bridge the phase and neutral.
  (1 mark)
- Test between the phase/neutral and accessible metal on the appliance.
  (1 mark)
- Minimum acceptable value - 10,000Ω.
  (1 mark)

**Question 16**

- Any ONE of:
  - They must be a holder of a tradespersons electrical work certificate issued by the Electrical Workers Registration Board.
  - The requirements of regulation 49(3)
  - The requirements of regulation 49(4)

  (1 mark)

- They must have satisfactorily completed, within the last 24 months, a refresher course in:-
  (a) Safe working practices.
  (b) Testing to ensure safety.
  (c) Basic first aid.
  (d) CPR.

  (4 marks)

## Section 3 – Gasfitters and Plumber/Gasfitters Only

**Question 17**

- Turn off the circuit isolator.
  (1 mark)
- Place an out-of-service tag on the isolator.
  (1 mark)
- Locate correct fuse at the switchboard and remove.
  (1 mark)
- Test for isolation using the prove-test-prove method.
  (1 mark)
- Secure isolation by placing danger tag at switchboard.
  (2 marks)
- Record the polarity of the conductors before disconnecting.
  (1 mark)

Ensure installation is safe by:

- Insulating conductor ends.
  (1 mark)
- Mechanically protecting conductors.
  (1 mark)
- Preventing access to conductors.
  (1 mark)

(Total -10 marks)

**Question 18**

(a) (i) **Direct contact**
means contact, by any person or animal, with live parts, including contact by any thing being carried or worn by that person or animal
ER 2
(1 mark)

(ii) **Isolated**
in relation to fittings or electrical appliances, means that the fittings or appliances are deliberately disconnected from any source of electricity
ER 2
(1 mark)

(iii) **Standard low voltage** means:

- In respect of electricity supplied by either a single-phase MEN system or a multiple-phase MEN system, a nominal voltage of 230 volts a.c. between phase and neutral r
- In respect of electricity supplied by any other system, a nominal voltage in relation to single-phase supplies, of 230 volts a.c. between conductors

- In respect of electricity supplied by any other system, a nominal voltage in relation to two-phase supplies, of 400 volts a.c. or 460 volts a.c. between conductors
- In respect of electricity supplied by any other system, a nominal voltage in relation to multiple-phase supplies, of 400 volts a.c. between conductors

ER 2
(3 marks)

(b)
- Replace fittings incorporated in gas-fired equipment that have an electrical rating of not more than 230 volts and 15 amperes
- Disconnect from and reconnect to fixed wiring, fittings incorporated in gas-fired equipment that have an electrical rating of not more than 230 volts and 15 amperes
- Remove and replace fusible links in relation to gasfitting work.

ER 49(7)
(3 marks)

(c) There is no significant risk of injury or death to any person or damage to any property as a result of the use of electricity.

ER 69(2)
(2 marks)

**Question 19**

- With all control switches on:

(1 mark)
- Join phase and neutral joined together to avoid damage to electronic components.

(2 marks)
- Test with a 500V insulation resistance tester from the appliance framework to phase and neutral

(1 mark)
- The result must not be less than 1 MΩ.

(1 mark)

Alternatively

- With all control switches on:

(1 mark)
- Test with a 250V insulation resistance tester from the appliance framework to phase and neutral

(3 marks)
- The result must not be less than 1 MΩ.

(1 mark)

**Question 20**

(a)
- To ensure that all exposed metal is at earth potential.
- Maintains zero volts between all services which reduces the risk of electric shock or fire.

(3 marks)

(b)
- The concrete and steel structure is in contact with the general earth mass.
- The concrete and steel structure is conductive.

(2 marks)