

TEWC 142 - TRADESPERSONS ELECTRICAL WORK CERTIFICATE MARKING SCHEDULE

- Notes:
- (1 mark) means that the preceding statement/answer earns 1 mark.
 - This schedule sets out the accepted answers to the examination questions. A marker can exercise their discretion and decide on the overall accuracy of any answer that is presented in the candidate's own words.
 - Symbols and terms - alternatives
Power W or P
Voltage V or E or U
Phase Active
 - Key to abbreviated terms:
EA Electricity Act 1992
ER Electricity Regulations 1997
AS/NZS Australia and New Zealand Joint Standard
NZS New Zealand Standard
AS Australian Standard
ECP New Zealand Electrical Code of Practice
GK General Knowledge
 - Those parts of an answer that are under-lined indicate the parts required to be covered by a candidate.

Section 1 – All Candidates

Question 1

- (a) It is the maximum fault current that a fuse or circuit breaker can safely interrupt. (2 marks)
- (b) Any TWO of:
- By use of the appropriate wording - double insulation.
 - By use of the international symbol for double insulated equipment.
 - By the wording **Class II** on the appliance. (2 marks)
- (c) In relation to fittings or electrical appliances, means that the fittings or appliances are deliberately disconnected from any source of electricity ER 2 (2 marks)
- (d) So that the transformer protects the extension leads as well as the portable appliance. (2 marks)
- (e) The cross sectional area of the flexible cord conductors. (2 marks)

(f) Any TWO of:

- Switch off the load on the particular fuse circuit where possible.
- Hold face well back and averted when withdrawing/replacing the carrier.
or
Wear safety glasses
- Withdraw, and replace, carrier with firm, fast action.

(2 marks)

- (g) • The test instrument functions correctly.
• That the circuit to be worked on has been correctly isolated and is safe to work on.

(2 marks)

(h) Any TWO of:

- Voltage applied.
- Current level .
- Contact duration.
- Skin dryness.
- Current path.

(2 marks)

- (i) Failure will be by heat build-up, leading to insulation deterioration and exposed conductors and/or dangerous leakage currents.

(2 marks)

(j) An isolating transformer

(2 marks)

Question 2

(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. (1 mark)
• Failure will be by heat build-up, leading to insulation deterioration and exposed conductors and/or dangerous leakage currents. (1 mark)

(c) Any FIVE of:

- Number of cores required
- Mechanical strength
- Operating environment
- Flexibility needed
- Application temperature at point of entry to appliance
- Colour coding
- Voltage rating
- Current rating
- Length
- Cross-sectional area

(5 marks)

(d) Any ONE of:

- Maximum terminal or connection contact.
- Minimise the risk of shock.
- Minimise the risk of short-circuit..

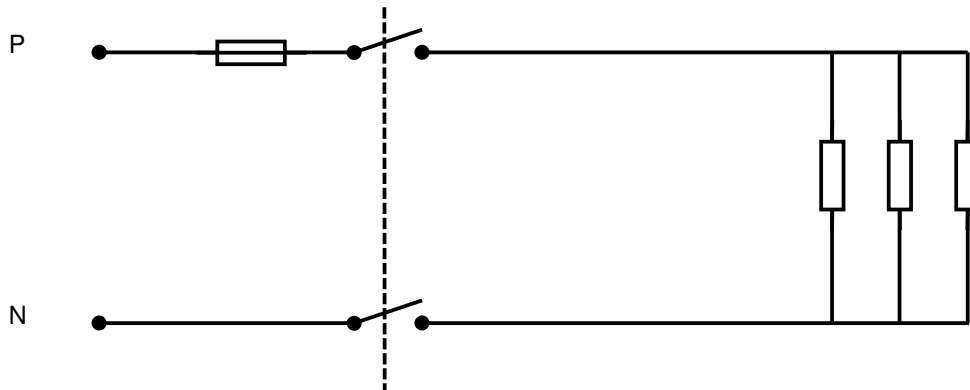
(1 mark)

Question 3

- (a) (i) Three (1 marks)
- (ii) • Brown, light blue (or blue) and green/yellow
or
• Red, black, green (3 marks)
- (iii) Two (1 marks)
- (iv) • Brown and light blue (or blue)
or
• Red and black (2 marks)
- (b) (i) If strain is applied to the flexible cord the protective earthing conductor (earth continuity conductor) will be the last to pull away from the terminals. (1 mark)
- (ii) If all conductors are the same length, the earth may pull away first leaving the appliance operational but unearthed. (2 marks)

Question 4

(a)



- Correct polarity (½ mark)
- Correctly connected fuse (½ mark)
- Correctly connected switch (½ mark)
- Correctly connected resistors. (½ mark)

(b) $R_T = R_1 + R_2 + R_3$ (½ mark)
 $= 100 + 50 + 25$ (½ mark)
 $= 175 \Omega$ (1 mark)

$I = \frac{V}{R}$ (½ mark)
 $= \frac{230}{175}$ (½ mark)
 $= 1.31A$ (1 mark)

(c) $R_T = R_1 + \frac{R_2 \times R_3}{R_2 + R_3}$ (½ mark)
 $= 100 + \frac{50 \times 25}{50 + 25}$ (½ mark)
 $= 116.66 \Omega$

(1 mark)

$$I = \frac{V}{R}$$

(½ mark)

$$= \frac{230}{116.66}$$

(½ mark)

$$= 1.97A$$

(1 mark)

Section 2 - Plumbers Only

Question 5

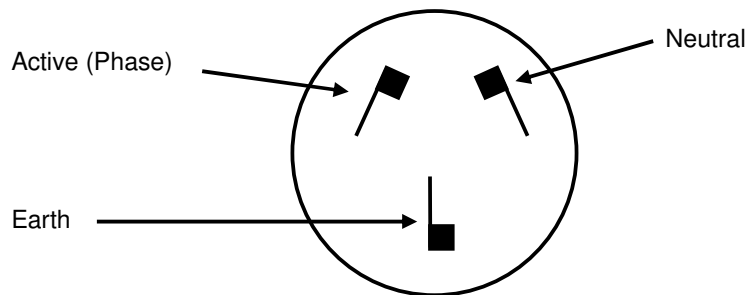
- (a) **Standard low voltage** means in respect of electricity supplied by either a single-phase MEN system or a multiple-phase MEN system, a nominal voltage of 230 volts a.c. between phase and neutral r

ER 2
(2 marks)

- (b) So that the earth pin:
- Is first to make contact when inserted,
 - And the last to break contact when the plug is withdrawn,

(2 marks)

(c)



(3 marks)

(d) Any TWO of:

- Building site under construction.
- Outdoor area.
- Factory with concrete floor and steel supports.
- Bathroom or any damp indoor situation.
- Contact with accessible metal which has a connection to earth

(2 marks)

(e) Any ONE of:

- It establishes low resistance path of no greater than 1 ohm.
- It ensures the appliance is effectively earthed.
- It ensures no potential difference can develop across the protective earthing conductor.
- It ensures that the appliance frame is held at 0 V and no shock hazard exists.
- It ensures that the protection will operate.

(1 mark)

Question 6

- (a) (i)
 - To protect the fixed wiring against excess current flow
 - or
 - Safely interrupt and disconnect a faulty circuit (2 marks)

- (ii) To provide personal protection to the user of an appliance that is connected to the circuit controlled by the RCD. (2 marks)

- (b)
 - 45A is the current rating.
 - 415V is the maximum nominal circuit voltage of the circuit.
 - AC 46 is the category of duty (i.e. 46,000A prospective short-circuit current). (3 marks)

- (c) Any TWO of:
- If correctly threaded, prevents fuse element from bulging out the side of the carrier and being accessible to touch.
or
If incorrectly threaded, contact could be made with the fuse element.
 - If correctly threaded, under overload conditions the heat produced in the element is confined to the tunnel area.
or
If incorrectly threaded, the arc or molten metal may escape under overload conditions.
 - If correctly threaded, under short-circuit conditions the arc and molten element is confined within the fuse carrier and base.
or
If incorrectly threaded, the arc or molten metal may escape under fault conditions.
- (2 marks)

- (d) To disconnect a large fault current safely. (1 mark)

Question 7

- (a) • Any FOUR of:
- Ensure conductor insulation is up to the terminals.
 - Apply cord clamp
 - Terminate conductors to correct terminals or correct colour coding.
 - Assemble plug ensuring there are no exposed conductors or basic insulation.
 - Protective earthing conductor is longer than the other conductors.

And

- Carry out appropriate tests - polarity, earth continuity, insulation resistance, visual).

Note: Failure to test the appliance after the fitting of the plug is considered dangerous and no marks are to be awarded for this part of question 5, if testing is not shown.

(5 marks)

- (b) Any **FIVE** of – from AS/NZS 3760:2001:

- Check for obvious damage or defects in the accessories or plugs.
- Check that flexible cords are effectively anchored to equipment and plugs.
- Check that the inner cores of flexible supply cords are not exposed or twisted;
- Check that the external sheaths are not cut, abraded, twisted, or damaged to such an extent that the insulation of the inner cores is visible
- Check that unprotected conductors or insulation tape are not in evidence.
- Check that any controls are in good working order i.e. they are secure, aligned and appropriately identified.
- Check that covers, guards and the like are secured in the manner intended by the manufacturer or supplier.
- Check that safety facilities and devices are in good working order.
- Check that ventilation inlets and exhausts are unobstructed.

AS/NZS 3760: 2.3.2

(5 marks)

Or

Any **FIVE** of – from AS/NZS 3760:2003:

- Check for obvious damage or defects in the accessories or plugs.
- Check for discolouration that may indicate exposure to heat, chemicals and moisture.
- Check that flexible cords are effectively anchored to equipment and plugs.
- Check that the inner cores of flexible supply cords are not exposed or twisted;
- Check that the external sheaths are not cut, abraded, twisted, or damaged to such an extent that the insulation of the inner cores is visible
- Check that unprotected conductors or banding insulation tape are not in evidence.
- Check that any operating controls are in good working order i.e. they are secure, aligned and appropriately identified.
- Check that covers, guards and the like are secured in the manner intended by the manufacturer or supplier.
- Check that ventilation inlets and exhausts are unobstructed.
- The pins of insulated pin plugs should be inspected for damage to the insulation of the pins.

AS/NZS 3760: 2.3.2
(5 marks)

Question 8

(a) The description has to cover:

1. An insulation resistance test showing:
 - the use of an insulation resistance tester (½ mark)
 - a 500V d.c. test voltage (½ mark)
 - testing between phase and earth and neutral and earth (½ mark)
 - an expected test result of 10,000 ohms or 0.01 Mohms (1 mark)
 - the test result being a minimum value (½ mark)

2. A protective earthing conductor test showing:
 - the use of a meter that can accurately read values of 1 ohm or less (½ mark)
 - a testing between the PEC conductor of the flexible cord and the case of the cylinder (½ mark)
 - an expected test result of 1 ohm (½ mark)
 - the test result being a maximum value (½ mark)

(b) The procedure has to cover:

- Identifying and removing the correct fuse on the switchboard. (1 mark)
- Attaching a Danger tag to the circuit. (1 mark)
- Removing the isolator cover and testing for voltage at the supply side of the isolator using the prove-test-prove method. (2 marks)

Question 9

(a) Any FIVE of:

- Replace storage water cylinder heater elements that have an electrical rating of not more than 230 volts and 15 amperes; and
- Replace storage water cylinder thermostats that have an electrical rating of not more than 230 volts and 15 amperes; and
- Disconnect from and reconnect to fixed wiring waste disposal units that have an electrical rating of not more than 230 volts and 15 amperes:
- Disconnect from and reconnect to fixed wiring dishwashing units that have an electrical rating of not more than 230 volts and 15 amperes:
- Disconnect from and reconnect to fixed wiring electronic water control units that have an electrical rating of not more than 230 volts and 15 amperes:
- Disconnect from and reconnect to fixed wiring water pressure devices that have an electrical rating of not more than 230 volts and 15 amperes:
- Disconnect from and reconnect to fixed wiring storage water heater cylinders that have an electrical rating of not more than 230 volts and 15 amperes:
- Remove and replace fusible links in relation to plumbing work.

(5 marks)
ER 49(6)

(b) Any THREE of:

- Safe Working Practices
- Testing
- CPR
- Basic first aid

(3 marks)
ER26(2)(b), (c), (d)

(c) Any TWO of:

- Prosecute the person.
- Disqualify or suspend the person for doing or assisting to do prescribed electrical work.
- Require a person to sit and pass any specified examination.
- Require a person to complete a period of training.
- Require a person to attend a specified course of instruction.
- Limit the work the person is permitted to do .

(2 marks)
EA 127

Section 3 – Gasfitters Only

Question 10

(a) Any TWO of:

- The wrong isolating switch has been operated.
- The wrong fuses or circuit breakers have been operated.
- The wiring is damaged or faulty.
- The isolating switch is faulty.
- The circuit is being fed from two different sources.
- The isolating switch is not in the Active conductor.
- A capacitor has not been discharged.

(2 marks)

(b) (i) Most of the internal wiring remain alive at 230V to earth

(1 mark)

(ii) Any TWO of:

- The phase and neutral can be transposed at the plug on the flexible cord.
- The phase and neutral can be transposed at the internal terminals in the appliance.
- The phase and neutral can be transposed in an extension cord supplying the appliance.

(2 marks)

(c) Any TWO of:

- There would be exposed live terminals in the fuse base.
- The circuit can be easily relivened by inserting a fuse carrier in the fuse.
- Don't need a tool to reliven.

(2 marks)

(d) Any THREE of:

- If covers are left off basic insulation will be exposed.
- If covers are left off live terminals will be exposed.
- If covers are left off moving parts will be exposed.
- If covers are unsecured access can be gained to live terminals.
- If covers are unsecured access can be gained to basic insulation.
- If covers are unsecured access can be gained to moving parts.

(3 marks)

Question 11

- (a) • 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.

(3 marks)

ER 49(6)

- (b) • Safe Working Practices
- Testing
- CPR
- Basic first aid

(4 marks)

ER26(2)(b), (c), (d)

- (c) Any THREE of:
- Prosecute the person.
- Disqualify or suspend the person for doing or assisting to do prescribed electrical work.
- Require a person to sit and pass any specified examination.
- Require a person to complete a period of training.
- Require a person to attend a specified course of instruction.
- Limit the work the person is permitted to do .

(3 marks)

EA 127

Question 12

- (a) **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

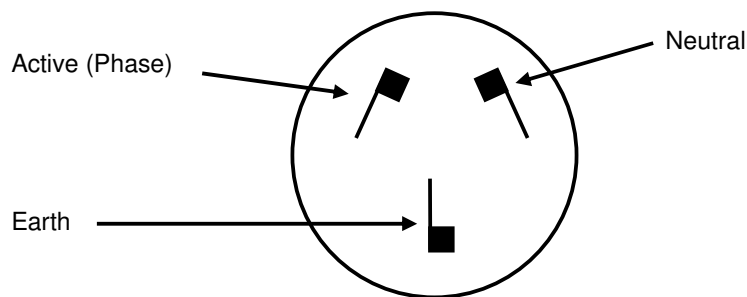
ER 2
(2 marks)

- (b) So that the earth pin:

- Is first to make contact when inserted,
- And the last to break contact when the plug is withdrawn,

(2 marks)

- (c)



(3 marks)

- (d) Any TWO of:

- Building site under construction.
- Outdoor area.
- Factory with concrete floor and steel supports.
- Bathroom or any damp indoor situation.
- Contact with accessible metal which has a connection to earth

(2 marks)

(2 marks)

- (e) Any ONE of:

- It establishes low resistance path of no greater than 1 ohm.
- It ensures the appliance is effectively earthed.
- It ensures no potential difference can develop across the protective earthing conductor.
- It ensures that the appliance frame is held at 0 V and no shock hazard exists.
- It ensures that the protection will operate.

(1 mark)

Question 13

- (a)
 - To protect the fixed wiring against excess current flowor
 - Safely interrupt and disconnect a faulty circuit(2 marks)
- (ii) To provide personal protection to the user of an appliance that is connected to the circuit controlled by the RCD.
(2 marks)
- (b)
 - 45A is the current rating.
 - 415V is the maximum nominal circuit voltage of the circuit.
 - AC 46 is the category of duty (i.e. 46,000A prospective short-circuit current).(3 marks)
- (c) Any TWO of:
- If correctly threaded, prevents fuse element from bulging out the side of the carrier and being accessible to touch.
OR
If incorrectly threaded, contact could be made with the fuse element.
 - If correctly threaded, under overload conditions the heat produced in the element is confined to the tunnel area.
OR
If incorrectly threaded, the arc or molten metal may escape under overload conditions.
 - If correctly threaded, under short-circuit conditions the arc and molten element is confined within the fuse carrier and base.
OR
If incorrectly threaded, the arc or molten metal may escape under fault conditions.
- (2 marks)
- (d) To disconnect a large fault current safely.
(1 mark)

Question 14

(a) The description has to cover:

1. An insulation resistance test showing:
 - the use of an insulation resistance tester (½ mark)
 - a 500V d.c. test voltage (½ mark)
 - testing between phase and earth and neutral and earth (½ mark)
 - an expected test result of 1 Mohm (1 mark)
 - the test result being a minimum value (½ mark)

2. A protective earthing conductor test showing: (½ mark)
 - the use of a meter that can accurately read values of 1 ohm or less (½ mark)
 - a testing between the PEC conductor of the flexible cord and the case of the cylinder (½ mark)
 - an expected test result of 1 ohm (½ mark)
 - the test result being a maximum value (½ mark)

(b) The procedure has to cover:

- Identifying and removing the correct fuse on the switchboard. (1 mark)
- Attaching a Danger tag to the circuit. (1 mark)
- Removing the isolator cover and testing for voltage at the supply side of the isolator using the prove-test-prove method. (2 marks)