

# TEWC 147 - TRADESPERSONS ELECTRICAL WORK CERTIFICATE MARKING SCHEDULE

- Notes: 1. (1 mark) means that the preceding statement/answer earns 1 mark.
2. 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.
3. Symbols and terms - alternatives  
Power W or P  
Voltage V or E or U  
Phase Active
4. 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

## 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) It is a continuous circuit that has a "break" in it. (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) A double insulated appliance. (2 marks)
- (e) An isolating transformer (2 marks)
- (f) 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  
ER 2  
(2 marks)

- (g) Any ONE of:
- Ensure that the flexible cord is securely anchored
  - Ensure that the cord grip is on the sheath of the flexible cord, not on the basic insulation.
  - Ensure that the basic insulation exposed for the purpose of termination is kept to a minimum
- (2 marks)
- (h) (i) Power or Watts (1 mark)
- (ii) Current or Amp or amperes. (1 mark)
- (i) Any TWO of:
- Damage to the circuit wiring.
  - Overheating or fire hazard.
  - Shock hazard
- (2 marks)
- (j) I =  $\frac{W}{V}$
- (1/2 mark)
- =  $\frac{2000}{230}$
- (1/2 mark)
- = 8.7 amps
- (1 mark)

## 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 insulation deterioration.

(1 mark)

(c) Any ONE of:

• Maximum terminal or connection contact.

• Minimise the risk of shock.

• Minimise the risk of short-circuit.

(1 mark)

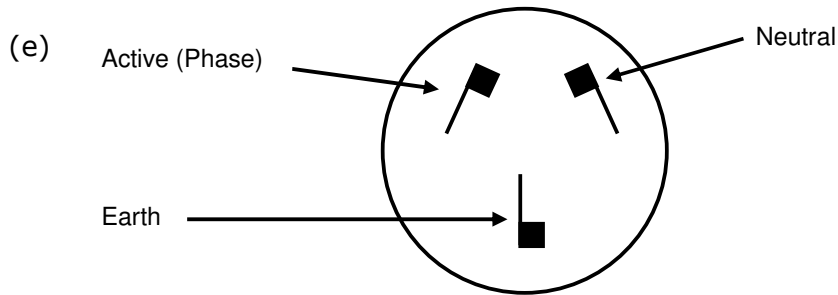
(d) So that the earth pin:

• Is first to make contact when inserted,

(1 mark)

• And the last to break contact when the plug is withdrawn,

(1 mark)



(3 marks)

### Question 3

(a) Value 1

$$R = \frac{V}{I} \quad (1/2 \text{ mark})$$

$$= \frac{230}{10} \quad (1/2 \text{ mark})$$

$$= 23 \text{ ohms} \quad (1 \text{ mark})$$

(b) Value 2

$$W = V \times I \quad (1/2 \text{ mark})$$

$$= 230 \times 10 \quad (1/2 \text{ mark})$$

$$= 2300 \text{ watts (or 2.3 kW)} \quad (1 \text{ mark})$$

(c) Value 3

$$I = \frac{W}{V} \quad (1/2 \text{ mark})$$

$$= \frac{1000}{200} \quad (1/2 \text{ mark})$$

$$= 5 \text{ amps} \quad (1 \text{ mark})$$

(d) Value 4

$$R = \frac{V}{I} \quad (1/2 \text{ mark})$$

$$= \frac{200}{5} \quad (1/2 \text{ mark})$$

$$= 40 \text{ ohms} \quad (1 \text{ mark})$$

(e) Value 5

$$V = IR \quad (1/2 \text{ mark})$$

$$= 5 \times 46$$

$$= 230 \text{ volts}$$

(½ mark)

(1 mark)

OR

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

$$= \frac{1150}{5}$$

(½ mark)

$$= 230 \text{ volts}$$

(½ mark)

(1 mark)

#### Question 4

(a) (i) (A) Three.

(1 mark)

(B)

Brown	Red	Phase
Blue/light blue	Black	Neutral
Green/Yellow	Green	Earth

(3 marks)

(ii) (A) Two.

(1 mark)

(B)

Brown	Red	Phase
Blue/light blue	Black	Neutral

(2 marks)

(b) • The supply would be short-circuited.

(2 marks)

- Meter protection would operate,  
or  
The circuit protection would operate.  
or  
A personal hazard – flash burns.  
or  
Meter and/or appliance components could be damaged.

(1 mark)

## Section 2 - Plumbers Only

### Question 5

(a) The method has to show:

- Identification of the fuse on the switchboard for the appliance. (1 mark)
- Switching off the main switch and removing fuse carrier.

or

Removing the load from circuit and removing fuse carrier (1 mark)

- Attaching a Danger tag. (1 mark)
- Testing for isolation at the supply side of the permanent connect unit using the prove-test-prove method. (2 marks)

- (b) • Go through the isolation procedure as in (a) above. (1 mark)
- Re-testing for isolation using the prove test prove method as per (b) above. (2 marks)

- (c) • Ensure the permanent connection unit cover is securely fixed in place to prevent access to live parts. (1 mark)
- Replace danger tag with an out of service tag. (1 mark)

## Question 6

(a) (i) Any ONE of:

- A coding system to indicate the degree of protection provided by the enclosure against access to live parts from solid objects, or the ingress of water or other liquids  
AS 1939 supplement 1 – 1990
- Degrees of enclosure protection for electrical equipment  
AS 60529
- A degree of protection in accordance with AS 1939.  
AS/NZS 3000:2000 1.4.58
- A degree of protection in accordance with AS 60529  
AS/NZS 3000:2007 1.4.61  
(2 marks)

(ii) Any ONE of:

- The degree of protection of persons against live or moving parts inside the enclosure  
And protection of the fitting against ingress of solid foreign bodies  
AS 1939 supplement 1 – 1990
- Protection against solid objects  
AS 60529
- The degree of protection against solid objects
- Protection of persons against access to hazardous parts.  
AS/NZS 3000:2000: 1.4.58
- Protection against ingress of solid objects  
AS/NZS 3000:2007: Figure G1a  
(2 marks)

(iii) Any ONE of:

- Protection of equipment against harmful ingress of water.  
AS 1939 supplement 1 – 1990
- Protection against liquids  
AS 60529
- A degree of protection against entry of water with harmful effects.  
AS/NZS 3000:2000 1.4.58
- Protection against harmful ingress of water  
AS/NZS 3000:2007: Figure G1b  
(2 marks)

(b) 3 Any ONE of:

- Protection of persons holding tools or wires (larger than 2.5 mm) and protection of equipment against objects larger than 2.5mm<sup>2</sup>.  
AS 1939 supplement 1
- Protected against solid objects over 2.5 mm (tools and small wires)  
AS 60529
- The access probe of 2.5 mm diameter shall not penetrate  
AS/NZS 3000:2007: Figure G1a

(1 mark)

4 Any ONE of:

- Protection against splashing and spraying water from all practicable directions.  
AS 1939 supplement 1
- Protection against water sprayed from all directions – limited egress permitted.  
AS 60529
- Protection against water splashed from all directions – limited egress permitted.

AS/NZS 3000:2007: Figure G1b  
(1 mark)

(c) Any ONE of:

- Electrical appliances that do not have personal electrical protection such as an RCD
- Electrical appliances that are not supplied by an individual isolating transformer.
- Electrical appliances that are not supplied at extra low voltage from an individual transformer.

ER 90(b)  
(2 marks)

### Question 7

- (a) • Some current is diverted to earth (1 mark)
- This causes an imbalance between phase and neutral currents (1 mark)
- Which is detected by the sensing coil (1 mark)
- Which trips and disconnects the supply to the load (1 mark)

(b) RCD

- To ensure the tripping mechanism has not become stuck or "frozen"
- or
- To ensure it works correctly

or

PRCD

- To ensure the tripping mechanism has not become stuck or "frozen"
- or
- To ensure PRCD does not remain in the "on" position after loss of supply. (1 mark)

- (c) • The RCD disconnects the supply before the leakage current reaches levels that could cause harm to humans. (2 marks)
- The RCD disconnects the supply very rapidly to minimise the exposure to electric shock (2 marks)

- (d) 30 mA (1 mark)

### Question 8

- (a) Utilisation category (fusing factor) is the ratio of minimum fusing current to the current rating of the fuse.

alternatively this may be expressed as:

$$\text{Utilisation category (fusing factor)} = \frac{\text{Minimum Fusing Current}}{\text{Current Rating}} \quad (2 \text{ marks})$$

(b)  $I = \frac{W}{V}$  (1/2 mark)

$= \frac{3000}{230}$  (1/2 mark)

$= 13A$  (1 mark)

16 amp fuse (15 amp fuse is also acceptable) would be purchased. (1 mark)

- (c) 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)

### Question 9

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

(2 marks)

(b) The insulation deteriorates and breaks down

(2 marks)

(c) Any FOUR 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

(4 marks)

(d) • Minimise the risk of shock.  
• Minimise the risk of short-circuit.

(2 marks)

## Section 3 – Gasfitters Only

### Question 10

(a) Any TWO of:

- The wrong isolating switch has been operated.
- The circuit is being fed from two different sources.
- The isolating switch is switching the neutral conductor.

(2 marks)

(b) (i) Most of the internal wiring remains 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) • To prevent access to basic insulation.  
• To prevent access to live terminals.  
• To prevent access to moving parts.

(3 marks)

### Question 11

(a) The method has to show:

- Identification of the fuse on the switchboard for the appliance. (1 mark)
- Switching off the main switch and removing fuse carrier.

or

Removing the load from circuit and removing fuse carrier (1 mark)

- Attaching a Danger tag. (1 mark)
- Testing for isolation at the supply side of the permanent connect unit using the prove-test-prove method. (2 marks)

(b) • Go through the isolation procedure as in (a) above. (1 mark)

- Re-testing for isolation using the prove test prove method as per (b) above.

(2 marks)

(c) • Ensure the permanent connection unit cover is securely fixed in place to prevent access to live parts. (1 mark)

- Replace danger tag with an out of service tag. (1 mark)

## Question 12

- (a) (i) To ensure the highest standard of safety for electrical workers and others. (2 marks)
- (ii)
- Each tradesperson applies own tag. (1 mark)
  - Only that tradesperson can remove their own tag. (1 mark)
  - A supervisor may remove a tag if special circumstances warrant it and it is safe to do so. (1 mark)
- (b) (i)
- To ensure that the test instrument is operating correctly. (1 mark)
  - To ensure that the correct circuit has been isolated before it is worked on. (1 mark)
- (ii)
- First - prove the meter is operating correctly on a known live circuit. (1 mark)
  - Then - test that the isolated circuit shows no voltage present. (1 mark)
  - Then - again prove the meter is operating correctly on a known live circuit. (1 mark)

### Question 13

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

(2 marks)

(b) The insulation deteriorates and breaks down

(2 marks)

(c) Any FOUR 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

(4 marks)

(d) • Minimise the risk of shock.  
• Minimise the risk of short-circuit.

(2 marks)

### Question 14

- (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