

TEWC 150A - 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

Question 1

(a) Any TWO of:

- Building site under construction.
- Outdoor area.
- Factory with concrete floor and steel supports.
- Bathroom or any damp indoor situation.

Note: The definition of "earthed situation" from AS/NZS 3000 is also acceptable.

(2 marks)

(b) Any TWO of:

- Insulation resistance test.
- Polarity test.
- Protective earthing conductor (earth continuity conductor) resistance.
- Circuit continuity test.

(2 marks)

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

(½ mark)

$$= \frac{1500}{230}$$

(½ mark)

$$= 6.52 \text{ A}$$

(1 mark)

(d) It is a continuous circuit that has a "break" in it. (2 marks)

(e) Any TWO of:

- Safe Working Practices that are appropriate to the type of work being undertaken.
- Testing to ensure safety before, during and after the completion of work.
- CPR
- Basic first aid

ER 26
(2 marks)

(f) 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.
- Censure
- Make no order

EA 127
(2 marks)

(g) Any TWO of:

- Damage to the circuit wiring.
- Overheating or fire hazard.
- Shock hazard

(2 marks)

(h) (i) 250V d.c.

(1 mark)

(ii) 500V d.c.

(1 mark)

(i) 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

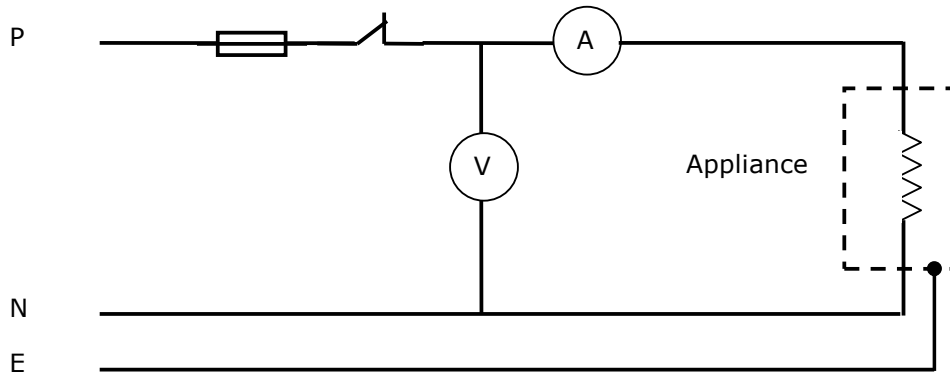
(2 marks)

(j) 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:
Ref: ER 77(3)(a)
- The appliance is supplied with electricity from a safety extra-low voltage source.
Ref: ER 77(3)(b)
- The appliance is double insulated and is supplied with electricity through a RCD
Ref: ER 77(3)(c)
- The appliance is supplied with electricity from a monitored earth circuit where the supply to the appliance is automatically disconnected in the event of the earth to the appliance being broken or disconnected:
Ref: ER 77(4)(b)
- The appliance is supplied with electricity from a source connected to earth in such a way that the voltage to earth will not exceed 55 volts a.c:
Ref: ER 77(4)(c)
- The appliance is supplied with electricity through a RCD
Ref: ER 77(4)(d)
- The appliance is supplied with electricity from a source isolated from earth with a voltage between conductors not exceeding 250 volts
Ref: ER 77(4)(e)
- The appliance is double insulated:
Ref: ER 77(4)(f)
(2 marks)

Question 2

(a)



- Correct polarity (1½ marks)
- The fuse protects the whole circuit. (½ mark)
- The single-pole switch controls the whole circuit. (½ mark)
- The voltmeter is in parallel with the appliance on the load side of the switch. (½ mark)
- The ammeter is in series with the appliance and in the phase on the load side of the switch. (½ mark)
- The appliance is earthed (½ mark)
- Working circuit (2 marks)

(b) $R = \frac{V^2}{W}$ (½ mark)

$= \frac{230 \times 230}{1500}$ (½ mark)

$= 35.27 \text{ ohms}$ (1 mark)

(c) $I = \frac{W}{V}$ (½ mark)

$= \frac{1500}{230}$ (½ mark)

$= 6.52A$ (1 mark)

Question 3

- (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 protected by the RCD. (2 marks)
- (b) 45A Is the maximum current the fuse can continuously carry (1/2 mark)
without deterioration. (1/2 mark)
- 415V is the maximum voltage the fuse can withstand (1/2 mark)
without flashover. (1/2 mark)
- AC46 40,000AC is the maximum prospective short circuit current (1/2 mark)
the fuse can safely interrupt (1/2 mark)
- (c) Any TWO of:
- It prevents the fuse element from bulging out the side of the carrier and being accessible to touch.
 - Under overload conditions the heat produced in the element is confined to the tunnel area.
 - Under short-circuit conditions the arc and molten element is confined within the fuse carrier and base.
- (2 marks)
- (d) To disconnect a large fault current safely. (1 mark)

Question 4

(a) Any TWO of:

- There might 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)

(b) Any THREE of:

- To prevent basic insulation being exposed
- To prevent live terminals being exposed
- To prevent access to moving parts
- To prevent ingress of foreign matter or liquids

(3 marks)

(c) (i) Any THREE of:

- The flexible conduit has become detached exposing basic insulation.
- Broken isolating switch cover.
- There is no cover on the appliance terminals.
- Poor termination of cables

(3 marks)

(ii) Any TWO of:

- To prevent basic insulation from being exposed.
- To prevent the connections pulling away in the event of strain on the flexible conduit.
- To prevent damage to cables.
- Double insulation is maintained

(2 marks)

Question 5

(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
- A degree of protection of an item of enclosed equipment is expressed as an IP (International Protection) rating in accordance with AS 60529.
AS/NZS 3000:2007: G1
(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 of against ingress of solid objects.
AS/NZS 3000:2007: Table G1(a)
(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 of against harmful ingress of water.
AS/NZS 3000:2007: Table G1(b)
(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 2.5mm².
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: Table G1(a)
(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 ingress permitted.
AS 60529
- Protection against water splashed from all directions. Limited ingress permitted.
AS/NZS 3000:2007: Table G1(b)
(1 mark)

(c) A situation in which moisture is either permanently present, or intermittently present to such an extent as would be likely to impair the effectiveness or safety of an electrical installation which complies with this Standard for ordinary situations.

AS/NZS 3000:2000 1.4.37
AS/NZS 3000:2007 1.4.40
(2 marks)

Question 6

(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 7

- (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:

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

$$\begin{aligned} \text{(b) } I &= \frac{W}{V} && (1/2 \text{ mark}) \\ &= \frac{3000}{230} && (1/2 \text{ mark}) \\ &= 13A && (1 \text{ mark}) \end{aligned}$$

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 8

- (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 9

(a) (i) The method has to show:

- Identification of the fuse on the switchboard for the boiler. (1 mark)
- Removing the load from circuit and removing fuse carrier (1 mark)
- Testing for isolation at the supply side of the permanent connect unit using the prove-test-prove method. (2 marks)

(ii) The method has to show:

- Identification of the correct fuse on the switchboard by a process of elimination. (1 mark)
- Re-testing for isolation at the supply side of the permanent connect unit using the prove-test-prove method. (2 marks)
- Attaching a danger tag to the fuses. (1 mark)

(b) • Ensure the permanent connection unit cover is securely fixed in place to prevent access to live parts. (2 marks)