



Candidate Code No.	
For Board Use Only	
Result	Result
Date	Date
Int	Int

TRADESPERSON ELECTRICAL WORK CERTIFICATE EXAMINATION

28 November 2009

PLUMBERS OR GASFITTERS

QUESTION AND ANSWER BOOKLET

Time Allowed two hours and 30 minutes

INSTRUCTIONS – READ CAREFULLY

You have 10 minutes to read this paper but do not start writing until you are told to do so by the supervisor.

Write your Candidate Code Number in the box provided above. Your name must NOT appear anywhere on this paper

The pass mark for this examination is 60 marks.

Plumbers must attempt all questions in Sections 1 and 2.

Gasfitters must attempt all questions in Sections 1 and 3.

Use a pen for written answers. **Do not** use a pencil or a red pen.

Drawing instruments and pencils may be used when diagrams are required. Marks are allocated on the basis of correctness.

Do not use correcting fluid or correcting tape.

Non-programmable calculators may be used.

It is recommended that the reference source for your answers be included in the space provided if a question can be answered from the Act, Regulations, Standard or Code. However, just stating a reference only will earn no marks.

For calculation questions all workings, including formulae, must be shown to gain full marks.

Warning – You could get 0 marks for any question, or part of a question, if you show anything hazardous or dangerous in your answer.

You will need to use some of the following documents in this examination:

- The Electricity Act 1992 reprinted at 19 August 2005.
- The Electricity Regulations 1997 reprinted at 5 September 2005.
- AS 60529 or AS 1939 supplement 1 – 1990; AS/NZS 3000:2000 (including amendments 1, 2, A and 3) **or** AS/NZS 3000:2007; NZS 3019:2004 **or** AS/NZS 3019:2007; AS/NZS 3760:2003 and Amendment 1.

**PLEASE HAND THIS PAPER TO THE SUPERVISOR BEFORE LEAVING THE ROOM
(turn over)**

SECTION 1 – ALL CANDIDATES

Question 1

(a) In a circuit where a 30Ω element and a 20Ω element are connected in parallel:

(i) Which element will have the highest heating effect?

(1 mark)

(ii) Which element will have the lowest current flow?

(1 mark)

(b) State **TWO** reasons why it is important to thread the fuse wire from terminal to terminal through the **tortuous path** in the fuse carrier when reloading a rewirable fuse.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 1 continued

(c) Refer to the Electricity Regulations and briefly state what is meant by each of the following terms:

(i) Isolated

(1 mark)

(ii) Live

(1 mark)

Ref:

(d) You are using a double insulated appliance supplied by extension leads in an outdoor situation. State the **main advantage** of using an isolating transformer to supply the extension leads and appliance.

(2 marks)

(e) A single phase electrical appliance is **not** connected to the supply. Explain how to find the current drawn by the appliance if only the power rating and voltage are stated on the appliance name plate.

(2 marks)

(turn over)

Question 1 continued

- (f) A fuse has blown on a switchboard circuit supplying a single phase plug-in electrical appliance. The appliance has been taken away to be tested for faults. The main switch is turned off and the fuse repaired. When the switch is turned on (the appliance is still disconnected) the fuse blows again.

State the likely cause of the fault and the action that should be taken to rectify it.

(2 marks)

- (g) A handheld electrical appliance used on a building or structure under construction must be used in conjunction with an appropriate safeguard. Refer to the Electricity Regulations 1997 and state **TWO** such safeguards.

(2 marks)

(1) _____

(2) _____

Ref:

- (h) State **TWO** characteristics an insulating material must possess to be suitable for use as insulation in a flexible cord.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 1 continued

- (i) List **TWO** tests using instruments that should be carried out on a Class I electrical appliance after it has been repaired.

(2 marks)

(1) _____

(2) _____

- (j) State **TWO** factors that determine the severity of electric shock upon the human body.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 2

- (a) An HRC fuse on a switchboard has blown because of an overload. You need to replace a fuse cartridge but it is not practical to turn off the main switch. State **TWO** precautions that should be taken when replacing the fuse cartridge.

(2 marks)

(1) _____

(2) _____

- (b) When using a suitable test instrument to check for isolation of a circuit, the **prove-test-prove** procedure is recommended.

Describe the **TWO** principal conditions that the procedure is intended to verify?

(2 marks)

(1) _____

(2) _____

- (c) The **prove-test-prove** method is recommended for checking that isolation has been achieved. Explain how this test is carried out.

(3 marks)

(turn over)

Question 2 continued

- (d) (i) Explain the **main purpose** of using a Danger Tag system. (1 mark)

- (ii) Describe the **main information** that should be on a danger tag (2 marks)

(turn over)

Question 3

The Electricity Regulations requires that a plug-in electrical appliance that has been repaired is checked and tested in accordance with AS/NZS 3760 before being returned to service.

- (a) Refer to AS/NZS 3760 and state **FOUR** visual checks (inspections) that must be carried out.

Note: **The visual checks (inspections) must relate to a Class I plug-in electrical appliance.**

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

(turn over)

Question 3 continued

(b) Refer to AS/NZS 3760 and complete the following in relation to the tests using test instruments:

- Note:**
1. A PAT tester is not to be used
 2. An earth leakage tester is not to be used
 2. The appliance does not contain MOV or EMI components

Test No.1

(1) Type of test (1 mark)

(2) Instrument used (1 mark)

(3) Acceptable test result (1 mark)

Ref:

Test No.2

(1) Type of test (1 mark)

(2) Instrument used (1 mark)

(3) Acceptable test result (1 mark)

Ref:

(turn over)

Question 4

(a) The figure below represents the metal frame of a 230V, Class I, heater.

- Within the frame, draw and label the following components:
 - * A fuse that protects the whole circuit.
 - * A single-pole switch that controls the circuit.
 - * Two elements, one of 15 ohms and the other of 60 ohms.
 - * A two-position selector switch to connect the supply to either of the elements.
 - Draw and label the supply to the heater.
- (5 marks)



(b) For the heater in (a), calculate the **maximum current drawn**.
(2 marks)

(turn over)

Question 4 continued

(c) For the heater in (a), calculate the **maximum power consumed**.
(2 marks)

(d) For the heater in (a), state the most suitable rating for the fuse.
(1 mark)

(turn over)

Question 6

(a) An isolating switch supplying a 230V a.c. single phase motor in a dishwasher is to be replaced.

(i) What would be the result if the **phase and neutral** were accidentally transposed at the terminals of the isolating switch, when the switch was replaced?

(2 marks)

(ii) What would be the result if the **neutral and earth** were accidentally transposed at the terminals of the isolating switch, when the switch was replaced?

(1 mark)

(iii) What would be the result if the **phase and earth** were accidentally transposed at the terminals of the isolating switch, when the switch was replaced?

(3 marks)

(turn over)

Question 6 continued

- (iv) State **TWO** tests that would detect the interchange of the phase and earth conductors?

(1 mark)

(1) _____

(2) _____

- (b) An adjacent isolating switch for a single phase, fixed wired appliance has been switched off. It is found, when testing for isolation, that some terminals on the appliance are still alive. State **THREE** reasons why the terminals may still be live.

(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 7 continued

- (ii) After completing the prove-test-prove test in (a)(i) above you find that the water heater is still live. Describe the procedure you would follow to prove that the water heater is isolated.

(4 marks)

- (b) Describe what you would do to leave the site safe.

(2 marks)

(turn over)

Question 8

- (a) A Residual Current Device (RCD) - either a portable type or permanently connected type - is live even if no load is connected to the circuit in which it is installed.

State the **main reason** why the Residual Current Device (RCD) does not trip, even though it is live.

(1 mark)

- (b) Briefly explain how a Residual Current Device (RCD) detects an earth fault and disconnects the supply from a faulty Class I electrical appliance.

(4 marks)

- (c) Why should an RCD be operationally tested?

(1 mark)

(turn over)

Question 8 continued

(d) Refer to NZS 3019 and state:

- (i) The maximum time in which an RCD used for personal protection must operate at its rated residual current.

(1 mark)

Ref:

- (ii) The maximum time in which an RCD used for personal protection must operate at five times its rated residual current.

(1 mark)

Ref:

- (e) Briefly explain why a Portable Residual Current Device (PRCD) is "voltage dependent". That is, if the electricity supply to the device fails, the device trips.

(2 marks)

(turn over)

Question 9

- (a) Electrical equipment designed for use in damp situations has an **IP rating** – an International Protection rating or Ingress protection rating. An **IP rating** consists of the initials IP followed by two numbers.

Refer to AS1939; AS 60529 or AS/NZS 3000 and answer the following:

- (i) What is an IP rating?

(2 marks)

Ref:

- (ii) Explain what the first number after the letters IP indicates.

(2 marks)

Ref:

- (iii) Explain what the second number after the letters IP indicates.

(2 marks)

Ref:

(turn over)

Question 9 continued

(b) Refer to AS1939, AS 60529 or AS/NZS 3000 and describe the level of protection offered by fittings rated at **IP34**.

(2 marks)

3 _____

4 _____

Ref:

(c) Refer to AS/NZS 3000 and state what is meant by the term "damp situation".

(2 marks)

Ref:

Section 3 – Gasfitters Only

Question 10

- (a) State the **FIVE** electrical tests or checks you would normally carry out on a gas fired boiler before it is returned to service after a repair.

(5 marks)

- (1) _____
(2) _____
(3) _____
(4) _____
(5) _____

- (b) A correct circuit connections (polarity) test must be carried out on a 230V, Class I, plug-in electrical appliance that has a single-pole control switch, after reconnection. State **FOUR** main conditions that this test will confirm.

(4 marks)

- (1) _____

(2) _____

(3) _____

(4) _____

- (c) State **ONE** reason why an insulation resistance tester must be used to test the insulation of a portable electrical appliance rather than an ohmmeter

(1 mark)

- _____

(turn over)

Question 11

(a) An isolating switch supplying a 230V a.c. single phase motor in a gas boiler is to be replaced.

(i) What would be the result if the **phase and neutral** were accidentally transposed at the terminals of the isolating switch, when the switch was replaced?

(2 marks)

(ii) What would be the result if the **neutral and earth** were accidentally transposed at the terminals of the isolating switch, when the switch was replaced?

(1 mark)

(iii) What would be the result if the **phase and earth** were accidentally transposed at the terminals of the isolating switch, when the switch was replaced?

(3 marks)

(turn over)

Question 11 continued

(iv) State **TWO** tests that would detect the interchange of the phase and earth conductors?

(1 mark)

(1) _____

(2) _____

(b) An adjacent isolating switch for a single phase, fixed wired appliance has been switched off. It is found, when testing for isolation, that some terminals on the appliance are still alive. State **THREE** reasons why the terminals may still be live.

(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 12 continued

- (ii) After completing the prove-test-prove test in (a)(i) above you find that the boiler is still live. Describe the procedure you would follow to prove that the boiler is isolated.

(4 marks)

- (b) Describe what you would do to leave the site safe.

(2 marks)

(turn over)

Question 13

- (a) A Residual Current Device (RCD) - either a portable type or permanently connected type - is live even if no load is connected to the circuit in which it is installed.

State the **main reason** why the Residual Current Device (RCD) does not trip, even though it is live.

(1 mark)

- (b) Briefly explain how a Residual Current Device (RCD) detects an earth fault and disconnects the supply from a faulty Class I electrical appliance.

(4 marks)

- (c) Why should an RCD be operationally tested?

(1 mark)

(turn over)

Question 13 continued

(d) Refer to NZS 3019 and state:

- (i) The maximum time in which an RCD used for personal protection must operate at its rated residual current.

(1 mark)

Ref:

- (ii) The maximum time in which an RCD used for personal protection must operate at five times its rated residual current.

(1 mark)

Ref:

- (e) Briefly explain why a Portable Residual Current Device (PRCD) is "voltage dependent". That is, if the electricity supply to the device fails, the device trips.

(2 marks)

(turn over)

Question 14

- (a) List **THREE** possible causes of exposed basic insulation or live terminals on a gas fired boiler supplied by a TPS cable, a surface mounted switch, starter unit and flexible conduit enclosing PVC conduit wire.

(3 marks)

(1) _____

(2) _____

(3) _____

- (b) Give **TWO** reasons why the flexible conduit used to supply a 230V gas heater must be securely clamped.

(2 marks)

(1) _____

(2) _____

- (c) State **TWO** reasons why you should not complete a permanent isolation of a circuit **by only removing the carrier of a fuse.**

(2 marks)

(1) _____

(2) _____

(turn over)

Question 14 continued

- (d) State **THREE** reasons why covers must be in place and secured before returning a repaired plug-in electrical appliance to service.

(3 marks)

(1) _____

(2) _____

(3) _____

For Candidate's Use

In the box, write the number of **EXTRA** sheets you have used. Write **NIL** if you have not used any

For Examiner's Use Only		
Questions Answered	Marks	
<u>Section 1</u>		
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OR		
TOTAL SECTIONS 1 & 3		