



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

**ELECTRICAL WORKERS REGISTRATION BOARD
TRADESPERSON ELECTRICAL WORK CERTIFICATE
EXAMINATION**

20 March 2004

WRITTEN PAPER

Time Allowed

Plumbers: Two hours and 30 minutes

Gasfitters: Two hours and 30 minutes

Plumbers/Gasfitter: Three hours

INSTRUCTIONS – READ CAREFULLY

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

Write your Candidate Code Number in the space provided above. Your name must NOT appear.

Plumbers must attempt all questions in **Sections 1 and 2**. To pass this examination you must obtain a minimum of 40 marks in Section 1 and a minimum of 20 marks in Section 2.

Gasfitters must attempt all questions in **Sections 1 and 3**. To pass this examination you must obtain a minimum of 40 marks in Section 1 and a minimum of 20 marks in Section 3.

**Plumber/
Gasfitters** must attempt all questions in **Sections 1, 2 and 3**. To pass this examination you must obtain a minimum of 40 marks in Section 1; a minimum of 20 marks in Section 2; and a minimum of 20 marks in Section 3

Use a pen for writing your answer. You may use a pencil for diagrams. Do not use correcting fluid or correcting tape.

Drawing instruments may be used when diagrams are required. Marks are allocated on the basis of correctness. Approved calculators may be used. However, for calculation questions all workings 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.

Candidates are permitted to use the following documents in this examination:

Electricity Regulations 1997 and the 1999 and 2003 Amendments or the Electricity Regulations Compilation 2003

AS 1939 supplement 1:1990; AS/NZS 3000:2000; NZS 3019:2002; AS/NZS 3760:2001.

Note: 1. The terms “protective earth conductor” and “earth continuity conductor” have the same meaning.

2. The terms “active” and “live” have the same meaning.

THIS PAPER MUST BE HANDED TO THE SUPERVISOR BEFORE LEAVING THE ROOM.

(turn over)

SECTION 1 – ALL CANDIDATES

Question 1

(a) State the term used for:

(i) The force or pressure of electricity.

(1 mark)

(ii) The flow of electricity.

(1 mark)

(b) State:

(i) The unit of power used by an electrical appliance.

(1 mark)

(ii) Another common term used to describe the **phase** conductor.

(1 mark)

(c) Calculate the current that will be drawn by a water heater element rated at 1.2kW, 230V.

(2 marks)

(d) Briefly describe the difference between the protection provided by a fusible link and the protection provided by a fuse.

(2 marks)

(e) State the meaning of the term breaking capacity for fuses or circuit breakers.

(2 marks)

(turn over)

Question 2

- (a) Briefly explain how an isolating transformer protects the user of a Class I electrical appliance from receiving an electric shock.

(2 marks)

- (b) Refer to the Electricity Regulations and list **TWO** electrical safeguards for use with handheld appliances in indoors and normally damp situations.

(2 marks)

(1) _____

(2) _____

- (c) A new fuse needs to be inserted into a fuse carrier to replace a blown fuse on a switchboard. State **ONE** of the main safety reasons why the main switch should be turned off before removing the fuse carrier from, or replacing it into, the fuse base.

(2 marks)

(turn over)

Question 2 continued

(d) A polarity test should be carried out on a fixed wired electrical appliance after reconnection. Give **TWO** reasons why polarity tests should be made.

(2 marks)

(1) _____

(2) _____

(e) State **TWO** ways in which the effect of overheating of a flexible cord can be reduced.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 3

(a) In the space below, sketch a circuit diagram using all of the following electrical components connected to a 230V a.c. supply. The polarity must be shown.

- Two load resistors, one of 27 ohms and the other of 54 ohms.
- A two-position selector switch to connect the supply to either of the load resistors.
- A fuse that protects the whole circuit.
- A double pole switch that controls the circuit.

(5 marks)

(b) (i) Show by calculation the maximum current drawn by the above circuit.

(2 marks)

(ii) State the most suitable rating for the fuse in the above circuit.

(1 mark)

(turn over)

Question 3 continued

- (c) Calculate the power dissipated when the selector switch operates the 54Ω resistor.

(2 marks)

(turn over)

Question 4

(a) It is necessary to have a reliable protective earthing conductor (earth continuity conductor) on a Class I portable electrical appliance.

(i) State the maximum resistance value for this conductor as required by AS/NZS 3760.

(1 mark)

(ii) Describe the **TWO** ways that this conductor contributes to the electrical safety of the appliance.

(2 marks)

(1) _____

(2) _____

(b) A Class I electrical appliance is used in an **earthed situation**. Briefly describe how the operator of the appliance is at risk of an electrical shock if the electrical appliance is used without an isolating transformer or RCD.

(2 marks)

(turn over)

Question 5

Rewirable fuses and HRC fuses may be found on switchboards.

- (a) (i) What are the main functions of a fuse? (3 marks)

- (ii) Why are fuses located on switchboards? (2 marks)

- (b) State **FIVE** technical advantages which HRC fuses have over rewirable fuses. (5 marks)

(1)

(2)

(3)

(4)

(5)

(turn over)

Question 6

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

(5 marks)

Question 7

A new flexible cord is to be fitted to a Class I single-phase electrical appliance and the cord conductors are identified by colour. Refer to clause 3 of AS/NZS 3000 and complete the following table.

(5 marks)

Function	Identifying colours	
	Recommended	Alternative
Earth/bonding		
Neutral		
Active	<i>Red</i>	

(turn over)

Question 8

All flexible cords are given a **current rating**.

- (a) Explain the meaning of the term **current rating**.

(2 marks)

- (b) What could happen if the flexible cord was used to supply an electrical appliance that draws a current in excess of the cord's rating?

(3 marks)

Question 9

- (a) Briefly explain how a Residual Current Device (RCD) disconnects the supply from an electrical appliance when an earth leakage fault occurs.

(4 marks)

- (b) Why should an RCD be operationally tested before each use?

(1 mark)

(turn over)

Question 10

You are present when a workmate receives a severe electric shock.

- (a) Before administering first aid, what precautions are necessary to ensure your own safety and the safety of the workmate?

(2 marks)

- (b) How do you find out if the person requires CPR?

(1 mark)

- (c) When carrying out CPR on an adult victim:

- (i) At what **rate** should the breaths be given?

(1 mark)

- (ii) At what **ratio** are the compressions-to-breaths given?

(1 mark)

(turn over)

Section 2 – Plumbers and Plumbers/Gasfitters Only

Question 11

- (a) Which Standard contains the tests for electrical appliances after they have been repaired? (1 mark)
-

- (b) The Standard required in (a) above, details earth continuity tests and insulation resistance tests. Refer to that Standard and state:

- (i) For the earth continuity test:

- (I) The type of instrument required. (1 mark)
-

- (II) The minimum or maximum value of the test result. (1 mark)
-

- (ii) For the insulation resistance test:

- (I) The type of instrument required. (1 mark)
-

- (II) The minimum or maximum value of the test result. (1 mark)
-

(turn over)

Question 12

An earth continuity resistance test is being carried out on the exposed metal parts of an electrical appliance with a multimeter.

State:

- (a) Why it is necessary to select the appropriate ohms range? (1 mark)

- (b) Why it is necessary to first touch the meter probes together? (2 marks)

- (c) What may occur if the incorrect range is selected on the multimeter? (2 marks)

(turn over)

Question 13

When testing a 230V storage water heater to see whether it is safe to use, the following electrical tests are carried out:

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

Briefly explain the reason for carrying out each test:

- (a) Protective earthing conductor (earth continuity conductor) test (1 mark)

- (b) Insulation resistance test. (2 marks)

- (c) Polarity test. (2 marks)

(turn over)

Question 14

The Ingress Protection Code establishes degrees of protection against the ingress of moisture and solid objects such as sand. On a fitting labelled **IP56**:

- (a) What level of protection is specified by the number 5? (2 marks)

- (b) What level of protection is specified by the number 6? (2 marks)

- (c) If an **X** appears in place of one of the numbers, what does this mean? (1 mark)

Question 15

Explain how an insulation resistance test should be carried out on a 230V under-sink water heater. The answer must include the type of meter used and the maximum or minimum acceptable values.

(5 marks)

(turn over)

Question 16

State the **TWO** requirements under the Electricity Regulations that must be met by a registered plumber or gasfitter before they undertake the prescribed electrical work detailed in Regulation 49 (6) and (7).

(5 marks)

(turn over)

Question 18

Refer to the Electricity Regulations and:

(a) State what is meant by the following terms:

(i) **Direct contact.**

(1 mark)

(ii) **Isolated.**

(1 mark)

(iii) **Standard Low Voltage** for an MEN system.

(3 marks)

(turn over)

Question 18 continued

(b) State the **THREE** categories of prescribed electrical work that can be carried out by a gasfitter who has been issued with a Tradespersons Electrical Work Certificate by the Electrical Workers Registration Board.

(3 marks)

(1) _____

(2) _____

(3) _____

(c) Briefly explain what the term **electrically safe** means.

(2 marks)

(turn over)

Question 20

- (a) Metallic gas reticulation pipes are required to be bonded (joined) electrically to other metallic pipe services such as water pipes.

Explain why this bonding is necessary.

(3 marks)

- (b) A gas appliance is being installed in a factory that has a concrete floor and a structure of steel supports and cross beams. Refer to section 1 of AS/NZS 3000 and state **TWO** reasons why this environment is considered to be an **earthed situation**.

(2 marks)

(1) _____

(2) _____

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>		
1		
2		
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Total Section 1		
<u>Section 2</u>		
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20		
Total section 3		
TOTAL SECTIONS 1 & 2		
TOTAL SECTIONS 1 & 3		
TOTAL SECTIONS 1, 2 & 3		