



<b>Candidate Code No.</b>	
<b>For Board Use Only</b>	
Result	Result
Date	Date
Int	Int

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

**057**

**27 November 2004**

### **QUESTION AND ANSWER BOOKLET**

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 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**

**Plumbers must attempt all questions in Sections 1 and 2 only.** 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 only.** 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 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 the following documents in this examination:**

- The Electricity Regulations 1997 and the Electricity Amendment Regulations 1999, Electricity Amendment Regulations 2002 and the Electricity Amendment Regulations 2003; or  
The Electricity Regulations Compilation 2003 and the Electricity Amendment Regulations 2003; or  
The Integrated Electricity Regulations 1997
- AS 1939 supplement 1 – 1990; AS/NZS 3000:2000 (including amendments 1, 2, 3 and A); NZS 3019 (Int):2002; AS/NZS 3760:2001 or; AS/NZS 3760:2003

**PLEASE HAND THIS PAPER TO THE SUPERVISOR BEFORE LEAVING THE ROOM**

**(turn over)**

## SECTION 1 – ALL CANDIDATES

### Question 1

- (a) State **TWO** factors which affect the severity of electric shock upon the human body.

(2 marks)

(1) \_\_\_\_\_

(2) \_\_\_\_\_

- (b) Work is being carried out on a 230V plug-in electrical appliance. The only instrument available is an ohmmeter which gives a reading of 23 ohms when connected to the appliance's flexible cord plug. Calculate the power (in watts) the appliance will use when it is supplied at 240V.

(2 marks)

\_\_\_\_\_

\_\_\_\_\_

- (c) Briefly describe what is meant by the term non-earthed situation.

(2 marks)

\_\_\_\_\_

\_\_\_\_\_

- (d) Give **TWO** examples of a non-earthed situation.

(2 marks)

(1) \_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

\_\_\_\_\_

(turn over)

**Question 1 continued**

- (e) State the **TWO** primary characteristics that determines the maximum current a flexible cord can conduct safely without overheating.

(2 marks)

(1) \_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

\_\_\_\_\_

**(turn over)**

## Question 2

- (a) Calculate the current that will be drawn by an electrical appliance rated at 1,000W, 230V.

(2 marks)

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- (b) State the colour coding for the cores of a flexible cord supplying a double insulated electrical appliance:

(2 marks)

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- (c) 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 **TWO** reasons why the terminals may still be live.

(2 marks)

(1) \_\_\_\_\_

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(2) \_\_\_\_\_

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- (d) 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)

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(turn over)

**Question 2 continued**

- (e) The cores of a flexible cord are being terminated in an electrical appliance. State **TWO** reasons why it is important to remove only sufficient basic insulation to allow the cores to be terminated.

(1 mark)

(1) \_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

\_\_\_\_\_

**(turn over)**

### Question 3

- (a) In the space below, sketch the circuit diagram of a 230V, single phase circuit, controlled by a double pole switch and protected by a fuse, that supplies three resistors connected in parallel.

Include an ammeter to measure the total circuit current and a voltmeter to measure the voltage across the resistors. The correct polarity must be shown.  
(6 marks)

- (b) The combined resistance of the parallel resistances is 50 ohms. What will be the reading on the ammeter?

(2 marks)

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- (c) Calculate the total power used by the resistors.

(2 marks)

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### Question 4

Instruments used to test **THREE** separate resistive circuits indicate the values listed in the table below. Using this information, calculate the missing values and enter them into the appropriate spaces in the table. Show all calculations.

(10 marks)

Circuit	Supply Volts	Total Ohms resistance	Current	Watts
One	230		10	
Two	200			1000
Three		46	5	1150

One

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Two

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Three

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(turn over)

**Question 5**

(a) When selecting a replacement cartridge for an open circuit HRC fuse, it is necessary to consider its **Utilisation category (fusing factor)**.

(i) State what is meant by **Utilisation category (fusing factor)**. (3 marks)

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(ii) How does the Utilisation category (fusing factor) influence the fuse operation? (2 marks)

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(b) A circuit supplies a fixed wired electrical appliance rated at 3000W, 230V. The HRC fuse protecting the circuit has blown. Show by calculation, the rating of the HRC fuse cartridge that would be purchased to replace the blown one. (3 marks)

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**Question 5 continued**

- (c) State why is it important when selecting a fuse link to ensure that the correct category of duty is chosen.

(2 marks)

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**(turn over)**

## Question 6

- (a) Electrical equipment designed for use in damp situations has an IP rating. An **IP rating** consists of the initials IP followed by two numbers. Refer to AS1939 or AS/NZS 3000 and answer the following:

- (i) What is an IP rating?

(2 marks)

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Ref: .....

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

(2 marks)

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Ref: .....

- (iii) What does the second number after the letters indicates.

(2 marks)

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Ref: .....

- (b) If an electrical appliance or fitting is labelled "**IP 23**".

- (i) What level of protection is specified by the number 2?

(1 mark)

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(turn over)

**Question 6 continued**

(ii) What level of protection is specified by the number 3?

(1 mark)

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Ref: .....

(c) In accordance with AS/NZS 3000 what is a **damp situation**?

(2 marks)

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Ref: .....

**(turn over)**

**Question 7**

- (a) A multimeter has been connected in parallel with an electric heating element to measure the single phase supply voltage. The multimeter has accidentally been left on the 10A a.c. range. Describe what will happen, and why, when the power is switched on.

(3 marks)

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- (b) State **TWO** reasons why an ohmmeter or a multimeter is unsuitable to carry out an insulation resistance test on a 230V gas heater.

(2 marks)

(1) \_\_\_\_\_

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(2) \_\_\_\_\_

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**(turn over)**

## Question 8

Answer (a) or (b). **DO NOT** answer both.

(a) Analogue ohmmeters

Briefly explain the procedure for:

- (i) Zero calibrating the ohmmeter

(3 marks)

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- (ii) Why is it necessary to zero an analogue ohmmeter before making a measurement of resistance?

(2 marks)

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(b) Digital ohmmeters

Briefly explain the procedure for:

- (i) Calibrating or zeroing a digital ohmmeter.

(3 marks)

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- (ii) Why is it necessary to calibrate a digital ohmmeter before making a measurement of resistance?

(2 marks)

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**(turn over)**

**Section 2 – Plumbers and Plumbers/Gasfitters Only**

**Question 9**

- (a) Determine, by calculation, if the permanent connection unit has an adequate current rating to supply the 3000 watt element.

(2 marks)

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- (b) What other considerations are necessary before the plumber undertakes to install the new 3000 watt element?

(3 marks)

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**Question 10**

- (a) A domestic storage water heater is supplied via a TPS cable, surface mounted isolating switch and PVC conduit wire enclosed in flexible steel conduit.

Describe **THREE** different situations where either live terminals or basic insulation could be exposed to touch.

(3 marks)

- (1) \_\_\_\_\_  
\_\_\_\_\_
- (2) \_\_\_\_\_  
\_\_\_\_\_
- (3) \_\_\_\_\_  
\_\_\_\_\_

- (b) Give **TWO** reasons why the flexible cord used to supply a domestic storage water heater must be securely clamped.

(2 marks)

- (1) \_\_\_\_\_  
\_\_\_\_\_
- (2) \_\_\_\_\_  
\_\_\_\_\_

**(turn over)**

### Question 11

- (a) An electrical appliance has been repaired. The repair included the replacement of the flexible cord to the appliance. When the appliance is operated, the cord overheats. State **THREE** reasons why this could occur.

(3 marks)

(1) \_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

\_\_\_\_\_

(3) \_\_\_\_\_

\_\_\_\_\_

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

(2 marks)

(1) \_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

\_\_\_\_\_

(turn over)

## Question 12

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

(1 mark)

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- (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)

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

(1 mark)

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- (ii) For the insulation resistance test:

- (I) The type of instrument required.

(1 mark)

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

(1 mark)

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**(turn over)**

### Question 13

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)

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## Question 14

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)

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(b) Insulation resistance test.

(2 marks)

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(c) Polarity test.

(2 marks)

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**Question 16**

- (a) 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) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- (b) Name **ONE** of the actions that may be taken by the Electrical Workers Registration Board if the holder of a Tradespersons Electrical Work Certificate fails to satisfactorily complete the safety refresher courses as specified.

(1 mark)

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\_\_\_\_\_

Ref: .....

**(turn over)**

### Question 17

An isolating switch supplying a 230V a.c. single phase induction motor is to be replaced. What would be the result in terms of safety to the user and the motor's operation, if during reconnection the following conductors were accidentally interchanged at the supply side of the isolating switch: -

(a) The phase and neutral

(4 marks)

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(b) The neutral and earth

(2 marks)

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(c) The phase and earth

(3 marks)

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(d) State **ONE** test that would detect the interchange of the phase and earth conductors?

(1 mark)

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**(turn over)**

### Question 18

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)

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

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

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**(turn over)**

### Question 19

When using a multimeter to check the isolation of a circuit, the **prove-test-prove** safety rule should be observed.

- (a) List **TWO** checks that are done by this method.

(2 marks)

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- (b) How is the rule applied?

(3 marks)

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**For Candidate's Use**

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

<b>For Examiner's Use Only</b>		
<b>Questions Answered</b>	<b>Marks</b>	
<b><u>Section 1</u></b>		
1		
2		
3		
4		
5		
6		
7		
8		
<b><u>Total Section 1</u></b>		
<b><u>Section 2</u></b>		
9		
10		
11		
12		
13		
14		
<b><u>Total section 2</u></b>		
<b><u>Section 3</u></b>		
15		
16		
17		
18		
19		
<b><u>Total section 3</u></b>		
<b>TOTAL SECTIONS 1 &amp; 2</b>		
<b>TOTAL SECTIONS 1 &amp; 3</b>		