



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

ELECTRICAL WORKERS REGISTRATION BOARD TRADESPERSON ELECTRICAL WORK CERTIFICATE EXAMINATION

17 September 2005

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 may 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 and the Electricity Amendment Regulations 2003.
- AS 1939 supplement 1 – 1990; AS/NZS 3000:2000 (including amendments 1, 2, 3 and A); NZS 3019 (Int):2002 or NZS 3019:2004; 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) Refer to the Electricity Regulations and briefly explain what the term **electrically safe** means.

(2 marks)

- (b) State **TWO** types of **electrical safeguards** which could be used with a Class I electrical appliance to provide personal safety when operating outdoors.

(2 marks)

(1) _____

(2) _____

- (c) You are using test instruments to measure the voltage and current values of 230V electrical appliances. Briefly describe **TWO** important precautions which will promote personal safety when doing the testing.

(2 marks)

(1) _____

(2) _____

- (d) State **ONE** reason why an insulation resistance tester, rather than a standard multimeter, must be used to test the insulation of a portable electrical appliance.

(2 marks)

(turn over)

Question 1 continued

- (e) Refer to the Electricity Regulations and briefly explain what the term **insulated** means. (2 marks)

Ref:

- (f) State **ONE** reason why two electrical appliances should not be used from the same isolating transformer at the same time. (2 marks)

- (g) State **ONE** reason why a 500V insulation tester, set on M Ω scale, must not be used to carry out a protective earthing conductor continuity test. (2 marks)

- (h) 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) _____

- (i) Electricity Regulation 25(2) requires plumbers and gasfitters who have a Tradespersons Electrical Work Certificate to be competent to do any electrical work that they undertake. What does this mean for a plumber or gasfitter? (2 marks)

(turn over)

Question 1 continued

(j) State the term used for:

(i) The force or pressure of electricity.

(1 mark)

(ii) The flow of electricity.

(1 mark)

(turn over)

Question 2

- (a) Rewirable fuses and HRC fuses may be found on switchboards. State **TWO** main functions of a fuse.

(2 marks)

(1) _____

(2) _____

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

(5 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

- (c) State the meaning of the term **breaking capacity** for fuses or circuit breakers.

(2 marks)

- (d) State **ONE** reason why an HRC fuse is used to protect a circuit.

(1 mark)

(turn over)

Question 3

(a) In the space below, sketch and label 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 15 ohms and the other of 60 ohms.
- A two-position selector switch to connect the supply to either of the load resistors.
- A fuse that protects the whole circuit.
- A single-pole switch that controls the circuit.

(5 marks)

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

(2 marks)

(turn over)

Question 3 continued

- (ii) Show by calculation the maximum current drawn by the above circuit. (2 marks)

- (iii) State the most suitable rating for the fuse in the above circuit. (1 mark)

(turn over)

Question 4

- (a) (i) You are testing an electrical appliance. Give **THREE** reasons why you would not connect a voltmeter in series with the electrical appliance.

(4 marks)

(1) _____

(2) _____

(3) _____

- (ii) When using the multi-meter to measure an unknown voltage in an appliance, which meter range should be selected first?

(1 mark)

(turn over)

Question 4 continued

- (b) You are testing an electrical appliance. State **THREE** reasons why you would not connect an ammeter in parallel with the electrical appliance.

(3 marks)

(1) _____

(2) _____

(3) _____

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

(2 marks)

(1) _____

(2) _____

(turn over)

SECTION 2 - PLUMBERS ONLY

Question 5

A replacement 2kW, 230V element is to be fitted in a domestic water heater. The heater is supplied via a surface mounted 10A switch and conduit wire enclosed in flexible steel conduit.

- (a) Determine, by calculation, if the 10A switch is of adequate capacity to switch the 2kW element. (3 marks)

- (b) State the **THREE** tests detailed in AS/NZS 3760 that must be carried out before the supply is reconnected to the water heater. (3 marks)

(1) _____

(2) _____

(3) _____

Ref:

(turn over)

Question 5 continued

- (c) Before returning the water heater to service, visual checks must be undertaken. List **FOUR** items that should be checked.

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(turn over)

Question 6

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

(4 marks)

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

(1 mark)

- (c) 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)

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

(2 marks)

(turn over)

Question 7

(a) A replacement flexible cord is being fitted to a single phase Class I electrical appliance.

(i) How many cores must there be in the flexible cord? (1 mark)

(ii) What colour coding is required for the cores of the flexible cord? (3 marks)

(b) In a double insulated electrical appliance:

(i) How many cores does the flexible cord need to have? (1 mark)

(ii) State the polarity and colour coding for the conductor cores. (4 marks)

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

(1 mark)

(turn over)

Question 8

- (a) You are required to disconnect a 230 volt fixed wired appliance supplied from a permanent connection unit. The appliance is to be removed for major servicing work. The appliance is supplied by a circuit protected by an MCB.

Briefly explain the sequence of actions you will take to ensure your own safety while doing the work and the safety of others after you have disconnected the appliance.
(5 marks)

(1) _____

(2) _____

(3) _____

(4) _____

- (b) State **TWO** reasons why it is not permitted to complete a permanent isolation of a circuit by only removing the carrier of a fuse.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 8 continued

- (c) State **THREE** reasons why covers must be in place and secured before returning the repaired appliance to service.

(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 9

Instruments used to test **THREE** separate resistive circuits indicate the values listed in the table below. Using this information, calculate the missing values 1 to 5.

Circuit	Supply (Volts)	Total resistance (Ohms)	Current (Amps)	Power (Watts)
One	230	<i>Value 1</i>	10	<i>Value 2</i>
Two	200	<i>Value 3</i>	<i>Value 4</i>	1000
Three	<i>Value 5</i>	46		1150

(a) Value 1 (2 marks)

(b) Value 2 (2 marks)

(c) Value 3 (2 marks)

(d) Value 4 (2 marks)

(turn over)

Question 9 continued

(e) Value 5

(2 marks)

Question 10 continued

- (ii) Detail **THREE** other types of electrical test or inspection that should be carried out to ensure that the gasheating appliance in (a) above, is electrically safe. (3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 11

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

(4 marks)

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

(1 mark)

- (c) 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)

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

(2 marks)

(turn over)

Question 12

- (a) You are required to disconnect a 230 volt fixed wired appliance supplied from a permanent connection unit. The appliance is to be removed for major servicing work. The appliance is supplied by a circuit protected by an MCB.

Briefly explain the sequence of actions you will take to ensure your own safety while doing the work and the safety of others after you have disconnected the appliance.

(5 marks)

(1) _____

(2) _____

(3) _____

(4) _____

- (b) State **TWO** reasons why it is not permitted to complete a permanent isolation of a circuit by only removing the carrier of a fuse.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 12 continued

- (c) State **THREE** reasons why covers must be in place and secured before returning the repaired appliance to service.

(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 13

(a) A replacement flexible cord is being fitted to a single phase Class I electrical appliance.

(i) How many cores must there be in the flexible cord? (1 mark)

(ii) What colour coding is required for the cores of the flexible cord? (3 marks)

(b) In a double insulated electrical appliance:

(i) How many cores does the flexible cord need to have? (1 mark)

(ii) State the polarity and colour coding for the conductor cores. (4 marks)

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

(1 mark)

(turn over)

Question 14

Instruments used to test **THREE** separate resistive circuits indicate the values listed in the table below. Using this information, calculate the missing values 1 to 5.

Circuit	Supply (Volts)	Total resistance (Ohms)	Current (Amps)	Power (Watts)
One	230	<i>Value 1</i>	10	<i>Value 2</i>
Two	200	<i>Value 3</i>	<i>Value 4</i>	1000
Three	<i>Value 5</i>	46		1150

(a) Value 1

(2 marks)

(b) Value 2

(2 marks)

(c) Value 3

(2 marks)

(d) Value 4

(2 marks)

(turn over)

Question 14 continued

(e) Value 5

(2 marks)

For Candidate's Use

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

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For Examiner's Use Only

Questions Answered	Marks	
<u>Section 1</u>		
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TOTAL SECTIONS 1 & 2		
OR		
TOTAL SECTIONS 1 & 3		