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

ELECTRICAL WORKERS REGISTRATION BOARD

TRADESPERSON ELECTRICAL WORK CERTIFICATE EXAMINATION

25 September 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:

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

AS 1939 supplement 1: 1990; AS/NZS 3000:2000 (including amendments 1 and 2); AS/NZS 3001:2001; 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) Explain what is meant by the term **open circuit**.

(2 marks)

_____

_____

(b) Calculate the resistance of an electrical appliance with a rating of 2300 watts when it is supplied at 230V.

(2 marks)

_____

_____

(c) State **TWO** reasons why, when reloading a rewirable fuse, it is important to thread the fuse wire from terminal to terminal through the **tortuous path** in the fuse carrier in the manner intended by the fuse manufacturer.

(2 marks)

(1) _____

_____

(2) _____

_____

(d) Briefly state **TWO** reasons why it is not permitted to bridge the terminals of HRC fuse carriers with fuse wire of the same current rating as the blown cartridge.

(2 marks)

(1) _____

_____

(2) _____

_____

(turn over)

Question 1 continued

(e) State a typical application for each of the following electrical control devices:

(i) A solenoid valve.

(1 mark)

_____

(ii) A pressure switch.

(1 mark)

_____

(turn over)

Question 2

(a) Briefly explain the operation principles of a thermostat.

(2 marks)

_____

_____

(b) A replacement flexible cord is being fitted to a single phase double insulated electrical appliance. List **TWO** technical factors that must be considered when selecting the flexible cord.

(2 marks)

(1) _____

(2) _____

(c) 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) _____

(d) It is necessary to have a reliable protective earthing conductor (earth continuity conductor) on a Class I portable electrical appliance describe the **TWO** ways that this conductor contributes to the electrical safety of the appliance.

(2 marks)

(1) _____

_____

(2) _____

_____

(turn over)

Question 2 continued

(e) (i) State the primary purpose of using an HRC fuse to protect a circuit.

(1 mark)

_____

_____

(ii) If a Class I portable electrical 230V appliance with a phase to framework fault and broken protective earthing conductor (earth continuity conductor) is being used outdoors, what type of protection device will prevent the passage of an electric current through the operator's body?

(1 mark)

_____

(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)

_____

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

(2 marks)

_____

_____

_____

(turn over)

Question 4

(a) Explain why the earth pin of a standard New Zealand 3 pin 10 amp plug is longer than the phase and neutral pins.

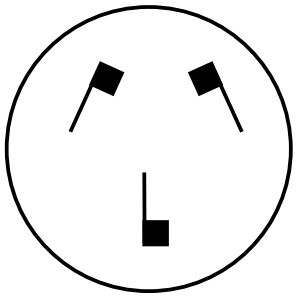
(2 marks)

_____

_____

(b) The figure below represents the **rear** of an appliance plug after the cover has been removed. Indicate on the figure the active (phase), neutral and earth terminals.

(3 marks)



(turn over)

Question 5

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 AS/NZS 3000 and complete the following table.

(5 marks)

Function	Identifying colours	
	Recommended	**Alternative**
Earth/bonding		
Neutral		
Active	***Red***	

(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)

(turn over)

Question 7

A 230 volt fixed wired appliance supplied from a permanent connection unit is to be disconnected from the supply and removed for major servicing work.

(a) Explain the precautions that must be taken to prevent the possibility of an electric shock while carrying out the work.

(6 marks)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(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 7 continued

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

(2 marks)

(1) _____

_____

(2) _____

_____

(turn over)

Question 8

(a) Before a Class I electrical appliance is returned to service after being repaired, AS/NZS 3760 requires that it must be inspected and also tested in two ways. Refer to AS/NZS 3760 and:

(i) State the type of inspection required.

(2 marks)

_____

_____

Ref: …….

(ii) Complete the following:

Name of test: _____

(½ mark)

Type of instrument: _____

(½ mark)

Acceptable test result: _____

(1 mark)

Ref: …….

Name of test: _____

(½ mark)

Type of instrument: _____

(½ mark)

Acceptable test result: _____

(1 mark)

Ref: …….

(turn over)

Question 8 continued

(b) State **TWO** actions that must be taken if one of the tests stated in (a)(ii) above does not comply with AS/NZS 3760.

(2 marks)

(1) _____

_____

(2) _____

_____

Ref: ……..

(c) State a reason why a 500V insulation tester, set on MΩ scale, must not be used to carry out an earth continuity test.

(2 marks)

_____

_____

_____

_____

(turn over)

Question 9

(a) Refer to AS1939 or AS/NZS 3000 and answer the following:

On a fitting labelled **IP56:**

(i) What does the term “IP” mean?

(1 mark)

_____

_____

_____

_____

Ref: ……

(ii) What level of protection is specified by the number 5?

(1 mark)

_____

_____

_____

_____

Ref: ……

(iii) What level of protection is specified by the number 6?

(1 mark)

_____

_____

_____

_____

Ref: ……

(turn over)

Question 9 continued

(b) In accordance with AS/NZS 3000 state what is meant by the term **damp situation?**

(2 marks)

_____

_____

_____

_____

_____

_____

_____

_____

Ref: ……

(turn over)

Section 2 – Plumbers and Plumbers/Gasfitters Only

Question 10

A replacement 2kW, 230V element has been fitted in a domestic water heater. The heater is supplied via a surface mounted 10A switch and conduit wires 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 10 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) _____

_____

Ref: ……

(turn over)

Question 11

(a) Refer to AS/NZS 3000 and:

(i) Briefly describe what is meant by the term **earthed situation.**

(3 marks)

_____

_____

_____

_____

_____

_____

_____

Ref: …….

(ii) Give **ONE** example of an **earthed situation**.

(2 marks)

_____

_____

_____

_____

_____

_____

Ref: …….

(turn over)

Question 11 continued

(b) A length of leaking galvanised iron water mains is to be replaced with new polybutylene pipe.

(i) State the safety precaution that should be taken before cutting the leaking pipe.

(1 mark)

_____

_____

(ii) State the reason why the precaution in (i) is necessary?

(1 mark)

_____

_____

(c) A green earthing lead is clamped, with a brass clamp, to the galvanised iron pipe on the house side of your repaired section. On the earthing lead is a tag reading "Earthing lead, do NOT disconnect". What action should be taken?

(3 marks)

_____

_____

_____

_____

_____

_____

(turn over)

Question 12

A single-phase electric hot water cylinder in a small factory is to be replaced with a new cylinder by a plumber. The wiring between the cylinder and isolating switch is also to be replaced. The cylinder is supplied from a fuse on a three-phase switchboard and the isolating switch is located adjacent to the cylinder.

You have been requested by the Supervisor to:

- Disconnect the element and control thermostat and wiring between the isolator and cylinder.
- Ensure that an electrician can safely connect the new cylinder wiring.

You do not need to contact the Supervisor before starting the work.

Warning: If any part of your answer is dangerous or hazardous, you will get no marks for this question.

(a) Describe how you would safely isolate the hot water cylinder.

(3 marks)

_____

_____

_____

_____

_____

_____

_____

_____

(b) Describe how you would ensure that the isolator and cylinder is safely isolated.

(2 marks)

_____

_____

_____

_____

(turn over)

Question 12 continued

(c) Describe the work the Supervisor requested you to do.

(2 marks)

_____

_____

_____

_____

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

(3 marks)

_____

_____

_____

_____

(turn over)

Section 3 – Gasfitters and Plumber/Gasfitters Only

Question 13

A 230V, single phase, ac mains operated gasheating appliance, has recently been serviced in a workshop. Some sections of its electronic control circuitry have been repaired and/or replaced, and are not accessible for disconnection.

Before returning the appliance to the factory for reinstallation, an insulation test is to be carried out between the frame and the internal wiring.

Describe the procedure that should be followed to carry out this test, the test instrument used and any minimum or maximum values that may apply.

(5 marks)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(turn over)

Question 14

A 230V fixed wired appliance is connected via a flexible cord to a permanent connection unit and is supplied from a fuse on a three-phase switchboard.

You have been requested by the Supervisor to disconnect the appliance from the supply and removed it for major servicing work. The flexible cord is to remain with the appliance.

You do not need to contact the Supervisor before starting the work or after finishing.

Warning: If any part of your answer is dangerous or hazardous, you will get no marks for this question.

(a) Describe how you would safely isolate the appliance.

(3 marks)

_____

_____

_____

_____

_____

_____

_____

_____

(b) Describe how you would ensure that the appliance is safely isolated.

(2 marks)

_____

_____

_____

_____

(turn over)

Question 14 continued

(c) Describe the work the Supervisor requested you to do.

(1 mark)

_____

_____

_____

_____

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

(2 marks)

_____

_____

_____

_____

(e) Describe the action you would take if you find that, when testing to ensure the appliance is safely isolated, the circuit is still live.

(2 marks)

_____

_____

_____

_____

(turn over)

Question 15

(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 AS/NZS 3000 and state **TWO** reasons why this environment is considered to be an **earthed situation.**

(2 marks)

(1) _____

_____

_____

(2) _____

_____

_____

Ref: ……..

(turn over)

Question 16

Refer to the Electricity Regulations and:

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

(i) **Direct contact.**

(1 mark)

_____

_____

_____

Ref: ……..

(ii) **Isolated**.

(1 mark)

_____

_____

_____

Ref: ……..

(iii) **An MEN system**.

(3 marks)

_____

_____

_____

_____

_____

_____

_____

Ref: ……..

(turn over)

Question 16 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) _____

_____

_____

Ref: ……..

(2) _____

_____

_____

Ref: ……..

(3) _____

_____

_____

Ref: ……..

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

(2 marks)

_____

_____

_____

_____

_____

_____

_____

_____

Ref: ……..

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**	
Section 1		
1		
2		
3		
4		
5		
6		
7		
8		
9		
Total Section 1		
Section 2		
10		
11		
12		
Total section 2		
Section 3		
13		
14		
15		
16		
Total section 3		
TOTAL SECTIONS 1 & 2		
TOTAL SECTIONS 1 & 3		