



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

## TRADESPERSON ELECTRICAL WORK CERTIFICATE EXAMINATION

**22 November 2008**

**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 of Practice. 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 (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) List **TWO** examples of an "earthed situation".

(2 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

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

(2 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

(c) Repairs have been carried out on a fixed wired electrical appliance rated at 1500W, 230V. Calculate the current drawn by the appliance.

(2 marks)

(d) Explain what is meant by the term "open circuit".

(2 marks)

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**(turn over)**

**Question 1 continued**

(e) Refer to the Electricity Regulations and state **TWO** subjects that must be covered in refresher courses for the holders of a Tradespersons Electrical Work Certificate.

(2 marks)

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

\_\_\_\_\_

\_\_\_\_\_

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

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Ref: .....

(f) Refer to the Electricity Act and state **TWO** actions that may be taken by the Electrical Workers Registration Board against the holder of a Tradespersons Electrical Work Certificate who is found guilty of a disciplinary offence.

(2 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

Ref: .....

(g) An HRC fuse, that protects a circuit, blows every time the correct fuse link is inserted. State **TWO** undesirable effects that may occur if the fuse link is replaced with one of a higher current rating.

(2 marks)

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

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

**(turn over)**

## Question 1 continued

(h) What is the minimum output voltage required from an insulation resistance tester when testing the insulation resistance of a Class I, 230V electrical appliance:

(i) That has an MOV connected?

(1 mark)

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(ii) That does not have an MOV connected?

(1 mark)

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(i) State **ONE** method of minimising the possibility of exposing basic insulation when connecting a flexible cord to an appliance.

(2 marks)

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(j) 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) 

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(2) 

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Ref: .....

**(turn over)**

## Question 2

(a) Draw and label a circuit diagram for a circuit supplying a Class 1, single phase electrical appliance rated at 1500W, 230V that includes the following:

- A fuse
- A single pole switch that controls the whole circuit.
- An ammeter that measures the current drawn by the appliance.
- A voltmeter that measures the voltage.
- Polarity of the supply.

(6 marks)

**(turn over)**

## **Question 2 continued**

(b) Calculate the resistance of the appliance.

(2 marks)

(c) Calculate the current drawn by the appliance.

(2 marks)

**(turn over)**

### Question 3

(a) Fuses and RCDS are found on switchboards.

(i) What is the main purpose of a fuse on a switchboard? (2 marks)

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(ii) What is the main purpose of an RCD on a switchboard? (2 marks)

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(b) Each HRC cartridge fuse carries a label bearing information about its manufacture and operating characteristics. A new fuse carries the following information:

- 45 Amps.
- 415 Volt.
- AC 46.

Briefly describe the meaning of each of these items of information. (3 marks)

45 amps \_\_\_\_\_

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415 volts \_\_\_\_\_

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AC46 \_\_\_\_\_

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**(turn over)**

### Question 3 continued

- (c) 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) \_\_\_\_\_

\_\_\_\_\_

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

(1 mark)

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**(turn over)**

## Question 4

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

\_\_\_\_\_

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

(3 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

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

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**(turn over)**

## Question 4 continued

(c) A fixed wired Class I electrical appliance is supplied from a surface mounted isolating switch via PVC conduit wire enclosed in PVC flexible conduit.

(i) State **THREE** possible causes of exposed basic insulation in this situation.

(3 marks)

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

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\_\_\_\_\_

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

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

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(ii) State **TWO** reasons why the PVC flexible conduit must be securely clamped.

(2 marks)

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

**(turn over)**

## SECTION 2 - PLUMBERS ONLY

### Question 5

- (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)

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Ref: .....

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

(2 marks)

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Ref: .....

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

(2 marks)

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Ref: .....

**(turn over)**

**Question 5 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** \_\_\_\_\_  
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**4** \_\_\_\_\_  
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\_\_\_\_\_  
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Ref: .....

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

(2 marks)

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Ref: .....

**(turn over)**

## Question 6

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

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

(2 marks)

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- (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?

(2 marks)

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- (c) A flexible cord is to be fitted to a single phase electrical appliance. List **FOUR** considerations which may influence the selection of the cord.

(4 marks)

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

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

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

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(4) \_\_\_\_\_

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**(turn over)**

## Question 6 continued

- (d) The cores of a flexible cord are being terminated in an electrical appliance. Explain why it is important to remove the minimum amount of basic insulation from the cores?

(2 marks)

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**(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)

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

(2 marks)

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**(turn over)**

## Question 8

A Class I, 230V, single phase, electrical appliance that has two control switches, 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. There are no MOV or EMI components fitted to the appliance

- (a) Before returning the appliance to service, an insulation resistance test is required to be carried out. Describe the procedure that should be followed to carry this test, the test instrument used and any minimum or maximum values that may apply.

(5 marks)

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- (b) Briefly explain the reason for carrying out an insulation resistance test.

(2 marks)

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**(turn over)**

## Question 8 continued

- (c) State **THREE** other checks or electrical tests that should be carried out to ensure that the electrical appliance in (a) above, is electrically safe.  
(3 marks)

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

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

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

**(turn over)**

## Question 9

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

(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)

**(turn over)**

**Question 9 continued**

(c) Refer to the Electricity Regulations and state **FIVE** categories of prescribed electrical work that can be carried out by a plumber who holds a Tradespersons Electrical Work Certificate issued by the Electrical Workers Registration Board.

(5 marks)

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

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

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

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(4) \_\_\_\_\_

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(5) \_\_\_\_\_

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Ref: .....

## Section 3 – Gasfitters Only

### Question 10

(a) Replacement flexible cords are to be fitted to some electrical appliances:  
(7 marks)

(i) What is the minimum number of cores required for a flexible cord for a Class I electrical appliance?

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(ii) What is the colour coding required for the cores of a flexible cord for a Class I electrical appliance?

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(iii) What is the minimum number of cores required for a flexible cord for a Class II electrical appliance?

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(iv) What is the colour coding required for the cores of a flexible cord for a Class II electrical appliance?

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**(turn over)**

## Question 10 continued

(b) When a three core flexible cord is fitted to an appliance, it is recommended that the protective earthing conductor should be left longer than the phase and neutral conductors.

(i) State **ONE** reason why this is recommended.

(1 mark)

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(ii) Explain what could happen if the protective earthing conductor was shorter than the phase and neutral conductors.

(2 marks)

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**(turn over)**

## Question 11

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

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

(2 marks)

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- (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?

(2 marks)

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- (c) A flexible cord is to be fitted to a single phase electrical appliance. List **FOUR** considerations which may influence the selection of the cord.

(4 marks)

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

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

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

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(4) \_\_\_\_\_

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### **Question 11 continued**

- (d) The cores of a flexible cord are being terminated in an electrical appliance. Explain why it is important to remove the minimum amount of basic insulation from the cores?

(2 marks)

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**(turn over)**



**Question 12 continued**

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

(4 marks)

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

(2 marks)

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**(turn over)**

### Question 13

A Class I, 230V, single phase, electrical appliance that has two control switches, 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. There are no MOV or EMI components fitted to the appliance

- (a) Before returning the appliance to service, an insulation resistance test is required to be carried out. Describe the procedure that should be followed to carry this test, the test instrument used and any minimum or maximum values that may apply.

(5 marks)

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- (b) Briefly explain the reason for carrying out an insulation resistance test.

(2 marks)

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**(turn over)**

### Question 13 continued

- (c) State **THREE** other checks or electrical tests that should be carried out to ensure that the electrical appliance in (a) above, is electrically safe. (3 marks)

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

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

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

**(turn over)**

## Question 14

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

(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)

- (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 14 continued**

(d) Refer to the Electricity Regulations and state the **THREE** categories of prescribed electrical work that can be carried out by a gasfitter who holds a Tradespersons Electrical Work Certificate issued by the Electrical Workers Registration Board.

(3 marks)

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

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

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

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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	
<b><u>Section 1</u></b>		
<b>1</b>		
<b>2</b>		
<b>3</b>		
<b>4</b>		
<b><u>Total Section 1</u></b>		
<b><u>Section 2</u></b>		
<b>5</b>		
<b>6</b>		
<b>7</b>		
<b>8</b>		
<b>9</b>		
<b><u>Total section 2</u></b>		
<b><u>Section 3</u></b>		
<b>10</b>		
<b>11</b>		
<b>12</b>		
<b>13</b>		
<b>14</b>		
<b><u>Total section 3</u></b>		
<b>TOTAL SECTIONS 1 &amp; 2</b>		
<b>OR</b>		
<b>TOTAL SECTIONS 1 &amp; 3</b>		