



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

## TRADESPERSON ELECTRICAL WORK CERTIFICATE EXAMINATION

**20 September 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. 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) Refer to the Electricity Regulations and briefly state what is meant by each of the following terms:

(i) Isolated

(1 mark)

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(ii) Live

(1 mark)

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Ref: .....

(b) 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) \_\_\_\_\_

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

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Ref: .....

**(turn over)**

**Question 1 continued**

- (c) Refer to the Electricity Regulations and state **TWO** safeguards either of which can be used with portable electrical appliances when the user is wholly or partly immersed in a conductive substance (2 marks)

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

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

Ref: .....

- (d) Describe how to measure voltage at the supply terminals of a fixed-wired single phase appliance. (2 marks)

\_\_\_\_\_  
\_\_\_\_\_

- (e) Calculate the resistance of an electrical appliance with a rating of 2300 watts when it is supplied at 230V. (2 marks)

**(turn over)**

## Question 1 continued

- (f) 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) \_\_\_\_\_

\_\_\_\_\_

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

(2 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

- (h) State **TWO** factors that determine the severity of electric shock upon the human body.

(2 marks)

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

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

**(turn over)**

## Question 1 continued

- (i) 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) \_\_\_\_\_

\_\_\_\_\_

- (j) 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?

(2 marks)

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**(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/240V 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 supply voltage.
- Polarity of the supply.

(4 marks)

(b) Calculate the resistance of the appliance.

(2 marks)

**(turn over)**

## **Question 2 continued**

(c) Calculate the current drawn by the appliance.

(2 marks)

(d) Calculate the power used by the appliance when the voltage is 240V.

(2 marks)

**(turn over)**



**Question 3 continued**

(b) Refer to AS/NZS 3760 and state the insulation resistance permitted between the live supply conductors and earthed exposed metal parts of a Class I portable isolating transformer. State a reference to support your answer.

(1 mark)

\_\_\_\_\_

Ref: .....

(c) A polarity test should be carried out on a plug-in Class I electrical appliance after a replacement flexible cord has been fitted. The appliance is controlled by a single-pole switch. What FOUR important points will this polarity test confirm?

(4 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

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

\_\_\_\_\_

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

\_\_\_\_\_

**(turn over)**



## Question 4 continued

- (a) (ii) After completing the prove-test-prove test in (a)(i) above you find that the circuit is still live. Describe the procedure you would follow to prove that the appliance 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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## 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** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**4** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Ref: .....

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

(2 marks)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Ref: .....

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## Question 6

(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 6 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 7

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

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

(1 mark)

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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) \_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

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

\_\_\_\_\_

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

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**(turn over)**

## Question 7 continued

(d) In a **double insulated** electrical appliance:

- (i) What is the minimum number of cores required in the flexible cord.  
(1 mark)

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- (ii) What is the polarity and colour of the cores.  
(2 marks)

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**(turn over)**

## Question 8

- (a) You have tested a Class I, 230V storage water heater to ensure it is safe to connect. The tests you carried out were; protective earthing conductor test; an insulation resistance test; and a correct circuit connections (polarity) test

Briefly explain the reason for carrying out each test:

- (i) Protective earthing conductor test

(1 mark)

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- (ii) Insulation resistance test.

(2 marks)

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- (iii) Correct circuit connections (polarity) test.

(4 marks)

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**(turn over)**

## Question 8 continued

- (b) 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 the **main safety issues** that arise when this situation occurs.

(3 marks)

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**(turn over)**

## Question 9

(a) The prove-test-prove method of testing is used for checking that isolation has been achieved.

(i) What are the **TWO** conditions that the prove-test-prove method is intended to verify?

(2 marks)

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

(ii) Explain how prove-test-prove method of testing is carried out.

(3 marks)

\_\_\_\_\_

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(b) (i) Explain the **main** purpose of using a Danger Tag system.

(1 mark)

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**(turn over)**

## Question 9 continued

- (ii) Describe the **main** information that should be on a danger tag  
(2 marks)

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- (iii) Where would you use a danger tag?  
(2 marks)

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## Section 3 – Gasfitters Only

### Question 10

- (a) List **THREE** possible causes of exposed basic insulation or live terminals on a gas fired boiler supplied by a TPS cable, a surface mounted switch, starter unit and flexible conduit enclosing PVC conduit wire.

(3 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

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

\_\_\_\_\_

- (b) Give **TWO** reasons why the flexible conduit used to supply a 230V gas heater must be securely clamped.

(2 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

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

\_\_\_\_\_

**(turn over)**

### Question 10 continued

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

(3 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

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

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**(turn over)**

## Question 11

(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 11 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 12

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

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

(1 mark)

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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 12 continued

(d) In a **double insulated** electrical appliance:

- (i) What is the minimum number of cores required in the flexible cord.  
(1 mark)

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- (ii) What is the polarity and colour of the cores.  
(2 marks)

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**(turn over)**

### Question 13

- (a) You have tested a Class I, 230V gas heater to ensure it is safe to connect. The heater contains its own control switch. The tests you carried out were; protective earthing conductor test; an insulation resistance test; and a correct circuit connections (polarity) test

Briefly explain the reason for carrying out each test:

- (i) Protective earthing conductor test (1 mark)

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

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- (iii) Correct circuit connections (polarity) test. (4 marks)

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**(turn over)**

### Question 13 continued

- (b) 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 the **main safety issues** that arise when this situation occurs.

(3 marks)

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**(turn over)**

## Question 14

(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 14 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 the same length as the phase and neutral conductors.

(2 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>		
<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>		