



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

TRADESPERSON ELECTRICAL WORK CERTIFICATE EXAMINATION

25 November 2006

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. Show all working to TWO decimal places

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 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); 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) State:

(i) The unit used to measure the power of an electrical appliance.
(1 mark)

(ii) State another common term used to describe the **phase** conductor.
(1 mark)

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

(c) A 25 metre three core flexible extension cord has been wound on a drum to provide ease of storage and mechanical protection. If the cord is used while still wound on the drum, how might the cord fail if precautions are not taken?
(2 marks)

(d) 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) _____

(turn over)

Question 1 continued

- (e) Explain how to minimise the possibility of exposing basic insulation when connecting a flexible cord to an appliance. (2 marks)

- (f) Calculate the current that will be drawn by a water heater element rated at 1.2kW, 230V. (2 marks)

- (g) Refer to AS/NZS 3000 and state the minimum output voltage required from an insulation resistance tester for use on 230V electric appliances that:

- (i) **Do not contain** semi-conductor devices (such as an MOV) (1 mark)

Ref:

- (ii) **Contain** semi-conductor devices (such as an MOV) (1 mark)

Ref:

(turn over)

Question 1 continued

(h) State the colour coding for the cores of a flexible cord supplying a double insulated electrical appliance:
(2 marks)

(i) State **TWO** factors which affect the severity of electric shock upon the human body.
(2 marks)

(1) _____

(2) _____

(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) _____

Ref:

(2) _____

Ref:

(turn over)

Question 2

- (a) In the space below, draw and label 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.

$$R_1 = 100\Omega$$

$$R_2 = 50$$

$$R_3 = 25\Omega$$

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.

(3 marks)

- (b) Calculate the reading on the ammeter.

(4 marks)

(turn over)

Question 2 continued

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

(2 marks)

(d) If the resistors were connected in series would the current drawn be more or less than that drawn when connected in parallel?

(1 mark)

(turn over)

Question 3

- (a) Rewirable fuses and HRC fuses may be found on switchboards. What is the main function of a fuse?

(2 marks)

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

(3 marks)

(1) _____

(2) _____

(3) _____

- (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) _____

(turn over)

Question 3 continued

- (d) When an HRC cartridge fuse is replaced, the replacement cartridge must have similar characteristics to the original. State **THREE** electrical characteristics to be checked for similarity.

(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 4

- (a) 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 3760 and complete the following table.

(6 marks)

Function	International	Superseded
Earth		
Neutral		
Active		

Ref:

- (b) The cores of a flexible cord are being terminated in an electrical appliance:

- (i) How much of basic insulation should be removed from the cores?
(1 mark)

- (ii) Explain why this is important.
(3 marks)

(turn over)

Question 5 continued

- (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) _____

- (c) State **TWO** reasons why covers must be in place and secured before returning a repaired appliance to service. (2 marks)

(1) _____

(2) _____

(turn over)

Question 6

Before a Class I dishwasher is returned to service after being repaired, AS/NZS 3760 requires that it must be inspected and two tests carried out using test instruments. Refer to AS/NZS 3760 and:

(a) State **FOUR** visual checks that must be carried out.

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

(b) Complete the following in relation to the tests using test instruments:

Test No.1

(1) Type of test

(1 mark)

(2) Instrument used

(1 mark)

(3) Acceptable test result

(1 mark)

Ref:

(turn over)

Question 6 continued

Test No.2

(1) Type of test (1 mark)

(2) Instrument used (1 mark)

(3) Acceptable test result (1 mark)

Ref:

(turn over)

Question 7

(a) 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 test.
- Insulation resistance test
- Polarity test

Briefly explain the reason for carrying out each test:

(i) Protective earthing conductor test

(1 mark)

(ii) Insulation resistance test.

(2 marks)

(iii) Polarity test.

(2 marks)

(turn over)

Question 9

A replacement 3kW, 230V element has been fitted in a domestic water heater. The heater is supplied by flexible cord and 3-pin plug. The socket outlet used to supply the cylinder is controlled by a surface mounted 10A switch.

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

Ref:

(2) _____

Ref:

(3) _____

Ref:

(turn over)

Question 9 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) _____

Section 3 – Gasfitters Only

Question 10

Before a Class I gas appliance is returned to service after being repaired, AS/NZS 3760 requires that it must be inspected and two tests carried out using test instruments. Refer to AS/NZS 3760 and:

- (a) State **FOUR** visual checks that must be carried out. (4 marks)

- (1) _____

- (2) _____

- (3) _____

- (4) _____

Ref:

- (b) Complete the following in relation to the tests using test instruments:

Test No.1

- (1) Type of test (1 mark)

- (2) Instrument used (1 mark)

- (3) Acceptable test result (1 mark)

Ref:

(turn over)

Question 10 continued

Test No.2

(1) Type of test (1 mark)

(2) Instrument used (1 mark)

(3) Acceptable test result (1 mark)

Ref:

(turn over)

Question 11

(a) When testing a 230V gas heater to see whether it is safe to use, the following electrical tests are carried out:

- Protective earthing conductor test.
- Insulation resistance test
- Polarity test

Briefly explain the reason for carrying out each test:

(i) Protective earthing conductor test

(1 mark)

(ii) Insulation resistance test.

(2 marks)

(iii) Polarity test.

(2 marks)

(turn over)

Question 12

- (a) The **prove-test-prove** method is recommended for checking that isolation has been achieved. Explain how this test is carried out. (5 marks)

- (b) (i) Explain the purpose of the Safety Tag system. (1 mark)

(turn over)

Question 13

- (a) Refer to the Electricity Regulations and state the 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) _____

(2) _____

(3) _____

Ref:

- (b) Refer to the Electricity Regulations and briefly state what is meant by each of the following terms:

- (i) Electrically safe

(2 marks)

Ref:

(turn over)

Question 13 continued

(ii) Direct contact

(1 mark)

Ref:

(iii) Isolated

(1 mark)

Ref:

(iv) Live

(1 mark)

Ref:

(c) Refer to the Electricity Act and state **TWO** 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.

(2 marks)

(1) _____

(2) _____

Ref:

(turn over)

Question 14

The circuit supplying a 230V a.c. single phase induction motor in a gas boiler has both RCCB and MCB protection. The motor isolator has been replaced.

What would be the effect if:

- (a) The phase and neutral were accidentally interchanged at the supply side of the isolating switch.

(3 marks)

- (b) The neutral and earth were accidentally interchanged at the supply side of the isolating switch.

(1 mark)

- (c) The phase and earth were accidentally interchanged at the supply side of the isolating switch and the RCCB failed to operate.

(4 marks)

(turn over)

Question 14 continued

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

(2 marks)

(1) _____

(2) _____

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	
<u>Section 1</u>		
1		
2		
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4		
<u>Total Section 1</u>		
<u>Section 2</u>		
5		
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<u>Total section 2</u>		
<u>Section 3</u>		
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14		
<u>Total section 3</u>		
TOTAL SECTIONS 1 & 2		
OR		
TOTAL SECTIONS 1 & 3		