BOSTES BOARD OF STUDIES TEACHING & EDUCATIONAL STANDARDS NSW

2014 HIGHER SCHOOL CERTIFICATE EXAMINATION

Electrotechnology

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Write using black or blue pen
  Black pen is preferred
- Board-approved calculators may be used
- Write your Centre Number and Student Number at the top of pages 9, 13 and 15

Total marks – 80

Section I Pages 2–5

15 marks

- Attempt Questions 1–15
- Allow about 20 minutes for this section

Section II Pages 9–17

35 marks

- Attempt Questions 16–21
- Allow about 50 minutes for this section

Section III Page 19

15 marks

- Attempt Question 22
- Allow about 25 minutes for this section

Section IV Page 20

15 marks

- Attempt Question 23
- Allow about 25 minutes for this section

Section I

15 marks
Attempt Questions 1–15
Allow about 20 minutes for this section

Use the multiple-choice answer sheet for Questions 1–15.

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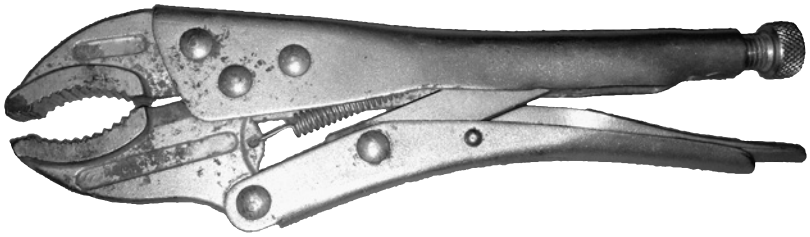
1 What is the tool shown?



(A) Pliers

(B) Vice grip

(C) Adjustable grip

(D) Linesman's pliers

2 Following the identification of a hazard, what is the next action in risk control?

(A) Control the risk

(B) Eliminate the risk

(C) Have correct PPE

(D) Minimise the danger

3 Which of the following identifies two forms of sustainable energy?

(A) Wind and fossil fuels

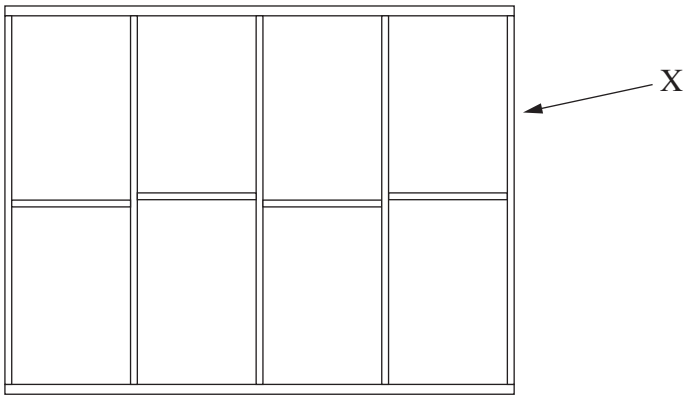
(B) Nuclear and geothermal

(C) Solar photovoltaic and tidal

(D) Natural gas and large-scale hydroelectric

4 A timber wall frame is shown.

What is the member X?



(A) Bearer

(B) Nogging

(C) Plate

(D) Stud

5 How should an ammeter be connected in a circuit to measure current?

(A) In series with the load

(B) In shunt with the load

(C) In parallel with the load

(D) In series parallel with the load

6 Which of the following is a hazard that would prohibit working in a confined space?

(A) Difficulty in using tools

(B) Inability to stand upright

(C) Presence of flammable contaminants

(D) Area restricted to a single worker

7 What is the primary purpose of effective verbal communication in the workplace?

(A) Increased productivity

(B) Good workplace morale

(C) Efficient selection of materials

(D) A more environmentally friendly worksite

8 What does the acronym SOP represent?

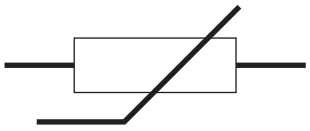
(A) Standard operating procedure

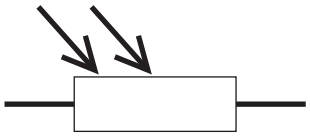
(B) Sequential operating procedure

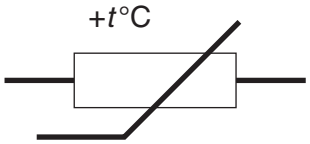
(C) Standard organisational procedure

(D) Sequential organisational procedure

9 Which of the symbols below represents a light-dependent resistor?

(A) 

(B) 

(C) 

(D) 

10 The output power of an electrical machine measures electrical input power

(A) plus losses.

(B) minus losses.

(C) divided by losses.

(D) multiplied by losses.

11 Who must sign off a Certificate of Compliance for electrical work?

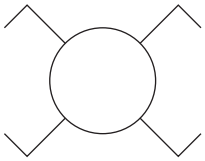
(A) The consumer

(B) The electrical inspector

(C) The licensed installing electrician

(D) The licensed electrician who carries out the testing

12 What does the symbol shown below represent?



(A) An intermediate switch

(B) A pull switch, single pole

(C) A 2-way switch, single pole

(D) An electrical switch, general symbol

13 In what electrical state are circuit diagrams conventionally drawn?

(A) On state

(B) Live state

(C) Energised state

(D) De-energised state

14 What condition will cause a residual current device (RCD) to de-energise a circuit?

(A) A predetermined increase in neutral current only

(B) A predetermined imbalance in neutral current only

(C) A predetermined increase in both active and neutral current

(D) A predetermined imbalance in both active and neutral current

15 What is the charge stored in a 470 μF capacitor connected to a 250 V DC supply?

(A) 1.175×10^{-3} C

(B) 11.75×10^{-3} C

(C) 117.5×10^{-3} C

(D) 1175×10^{-3} C

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Electrotechnology

Centre Number

Student Number

Section II

35 marks
Attempt Questions 16–21
Allow about 50 minutes for this section

Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.

Question 16 (3 marks)

Describe strategies for minimising waste when working as a tradesperson in the energy sector. **3**

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Question 17 (3 marks)

What information is provided in a schedule of work? **3**

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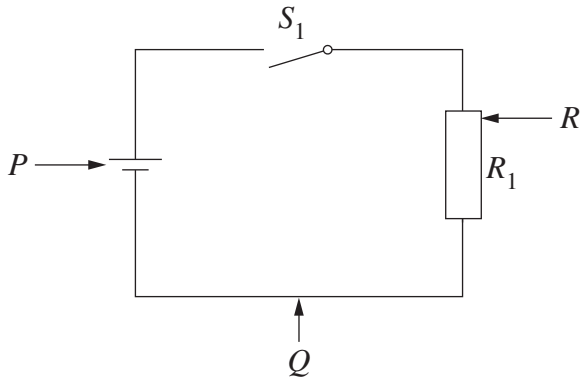
Question 18 (8 marks)

Use the circuit diagram to answer parts (a) and (b).



(a) Identify the components indicated in the circuit diagram. **2**

P .....

Q .....

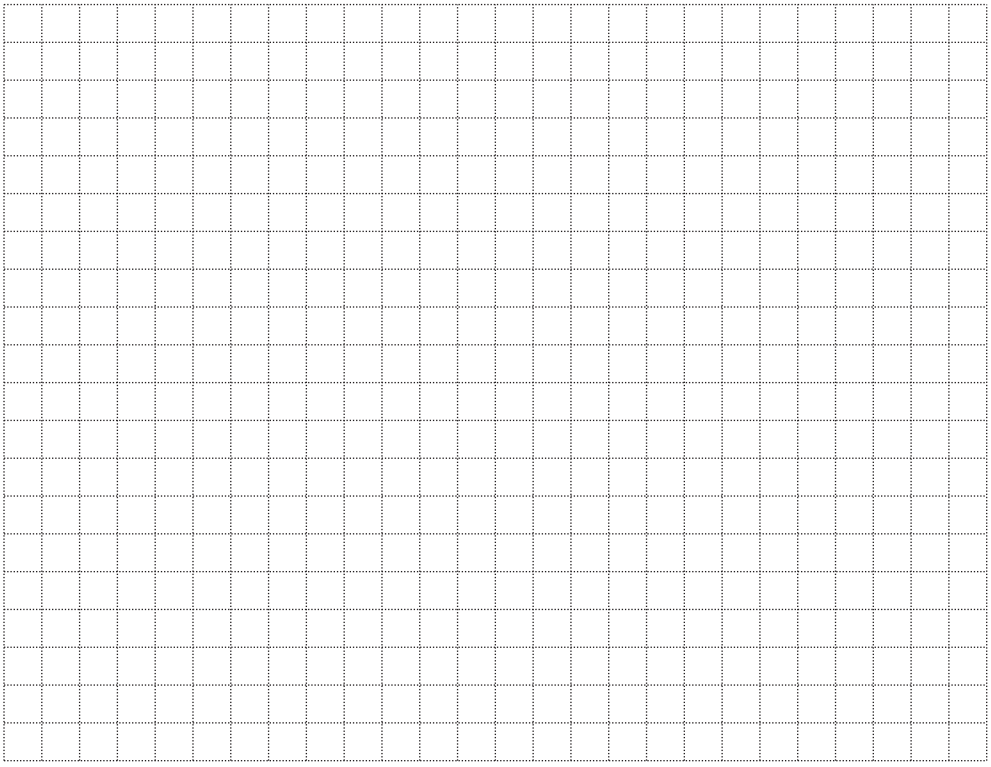
R .....

Question 18 continues on page 11

Question 18 (continued)

(b) Re-draw the circuit diagram shown on page 10 in the space provided to include the components listed below. Show correct symbols and placement. **6**

- Resistor 2 (R_2) and resistor 3 (R_3):
  - in series
  - in parallel with R_1
- Switch 2 (S_2) to control R_2 and R_3
- Ammeter to measure current flow through R_1
- Voltmeter to measure voltage drop across R_3



End of Question 18

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Centre Number

Student Number

Section II (continued)

Question 19 (9 marks)

Please turn over

Question 19 (9 marks)

One single phase 20 A weatherproof socket outlet is to be installed on an external cavity brick wall of a domestic dwelling.

(a) Select and justify an appropriate method for fixing the weatherproof socket outlet to the wall. **3**

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(b) Outline the electrical requirements for installing the weatherproof socket outlet to an external cavity brick wall. **6**

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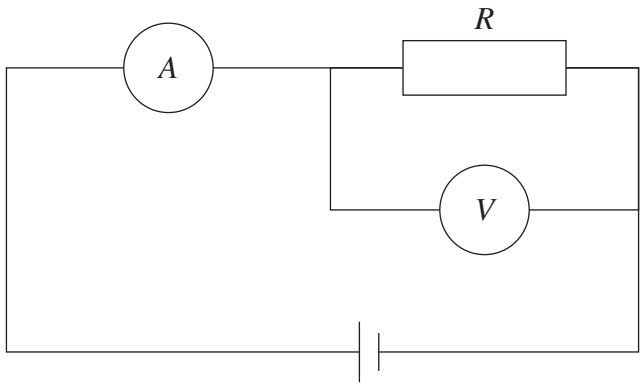
Question 20 (3 marks)

In the circuit diagram shown the ammeter reads 20 mA, the voltmeter reads 9.8 V and has a resistance of 200 kΩ.



(a) Calculate the resistance of *R* using the voltmeter and ammeter readings. Show all working. **1**

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(b) Calculate the true value of the resistor. Show all working. **2**

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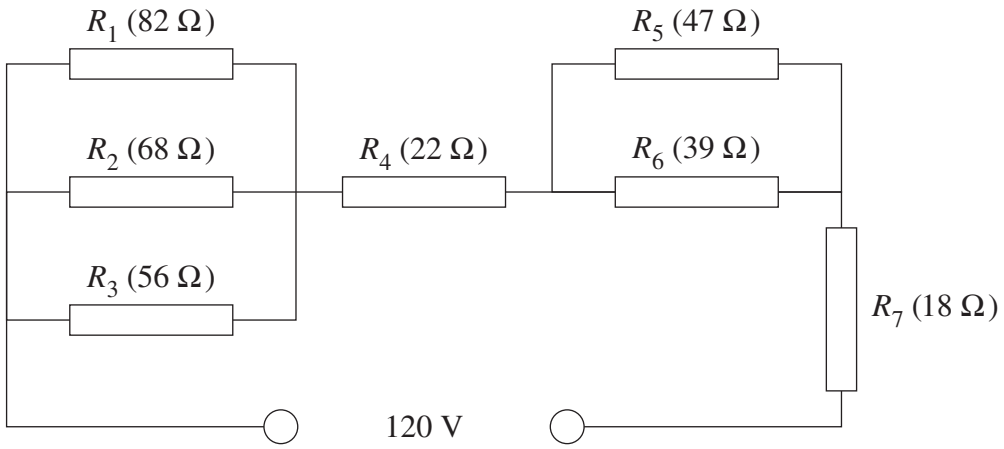
Question 21 (9 marks)

Use the circuit diagram to answer parts (a)–(d). Show all working.



(a) Calculate the total circuit resistance. **3**

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(b) Calculate the current through the resistor R_4. **2**

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Question 21 continues on page 17

Question 21 (continued)

(c) Calculate the voltage across the resistor R_5. **2**

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(d) Calculate the power consumed by the resistor R_6. **2**

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End of Question 21

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Electrotechnology

Section III

15 marks
Attempt Question 22
Allow about 25 minutes for this section

Answer the question in a writing booklet. Extra writing booklets are available.

In your answer you will be assessed on how well you:

- demonstrate knowledge and understanding relevant to the question
- communicate ideas and information using relevant workplace examples and industry terminology
- present a logical and cohesive response

Question 22 (15 marks)

An electrician entering a building site finds an apprentice has fallen from an extension ladder and is unconscious. The apprentice had been repairing an overhead light.

Explain the immediate response and long-term actions that should occur as a result of this incident.

Please turn over

Section IV

15 marks
Attempt Question 23
Allow about 25 minutes for this section

Answer the question in a SEPARATE writing booklet. Extra writing booklets are available.

Question 23 (15 marks)

An existing school hall is being refurbished to move towards a carbon neutral footprint. Many of the electrical fittings and appliances are more than 10 years old.

(a) Select and justify the fittings and appliances that would make this hall more energy efficient. **5**

(b) Describe the procedure, hazards and controls which would be included in a Safe Work Method Statement (SWMS) for replacing the high bay lighting in the hall. **10**

End of paper