

**Level 2    Technical Certificate in  
Electrical Installation**

**8202-20**

**Version Sample September 2016**

**Question Paper Pack**

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# 1 Assessment

1. Which non-statutory regulation would be used for guidance when designing an electrical installation?
  - a. The IET Wiring Regulations.
  - b. The Hazardous Waste Regulations.
  - c. The Electricity at Work Regulations.
  - d. Control of Asbestos at Work Regulations.
  
2. What is the correct colour of a plug for a power tool used with a 230 V socket-outlet on a construction site?
  - a. Yellow.
  - b. Blue.
  - c. Red.
  - d. Black.

3. What type of sign is shown in the image below?

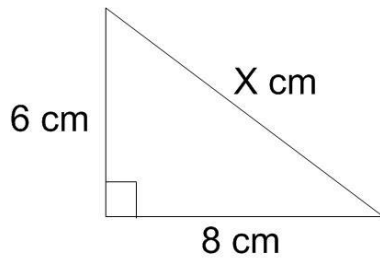


- a. Warning.
  - b. Mandatory.
  - c. Prohibition.
  - d. Information.
- 
4. Which job role would work closely with the client at the initial design stage of a project?
    - a. Structural Engineer
    - b. Clerk of Works.
    - c. Site Manager
    - d. Architect.
  
  5. Which numeric sequence is in the correct ascending order?
    - a. Nano, Pico, Micro, Milli
    - b. Milli, Micro, Kilo, Mega
    - c. Tera, Giga, Mega, Kilo
    - d. Kilo, Mega, Tera, Giga

6. What variation of the formula,  $V = I \times R$ , is used to determine current?

- a.  $I = R \div V$
- b.  $I = V \div R$
- c.  $I = V \times R$
- d.  $I = R \times V$

7. What is the value of the side marked X, in the image shown?



- a. 16 cm
- b. 12 cm
- c. 10 cm
- d. 14 cm

8. What is the volume of a room that measures 2 m wide, 3 m in length and has a ceiling which is 4 m high?

- a.  $7 \text{ m}^3$
- b.  $12 \text{ m}^3$
- c.  $20 \text{ m}^3$
- d.  $24 \text{ m}^3$

9. Which atomic element is measured in coulombs?

- a. Proton.
- b. Neutron.
- c. Electron.
- d. Centron

10. Which material is a conductor?

- a. PVC.
- b. Glass.
- c. Mica.
- d. Carbon.

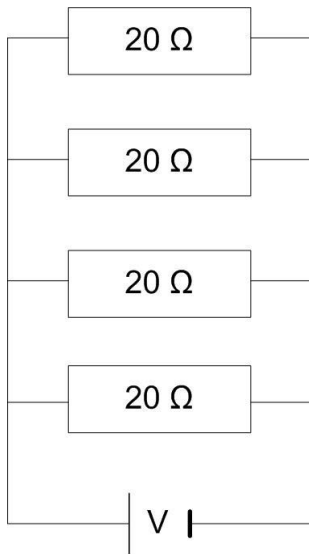
11. Which of the statements below identifies the protection intended if the equipment was found to be satisfactory?
- a. The cpc to the drill provides fault protection and the insulation on the live conductors provides basic protection.
  - b. The cpc to the drill provides basic protection and the insulation on the live conductors provides fault protection.
  - c. The cable insulation provides basic protection, the class of equipment provides fault protection and the RCD provides additional protection.
  - d. The cable insulation provides fault protection, the circuit breaker provides basic protection and the RCD provides additional protection

***Applied knowledge and understanding***

Learners must have a high level of understanding of protective measures against electric shock and how class II protection acts as a technical protective measure. It also requires learners to evaluate basic protection and risks associated with the hazard present.

12. Why is copper commonly used in the construction of cables?
- a. It has a low resistivity value which makes it a good insulator.
  - b. It has a high resistivity value which makes it a good conductor.
  - c. It has a high resistivity value which makes it a good insulator.
  - d. It has a low resistivity value which makes it a good conductor.
13. What is the total resistance, if three resistors are connected in series and each resistor had a value of 10  $\Omega$ ?
- a. 3.3  $\Omega$
  - b. 10  $\Omega$
  - c. 30  $\Omega$
  - d. 100  $\Omega$

14. What is the total resistance of the circuit shown in the image?

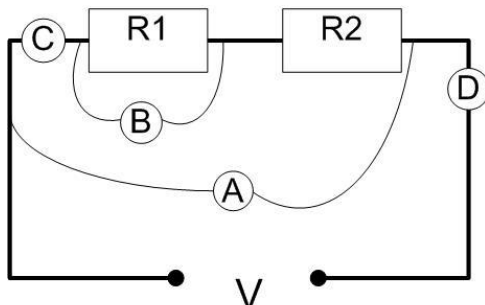


- a. 5 Ω
- b. 10 Ω
- c. 20 Ω
- d. 80 Ω

15. What instrument and connection method is used to measure the current in a d.c. circuit?

- a. A voltmeter connected in parallel with the load.
- b. An ammeter connected in parallel with the load.
- c. A voltmeter connected in series with the load.
- d. An ammeter connected in series with the load.

16. Which instrument would be used to measure voltage drop across R1 in the circuit shown?



- a. A
- b. B
- c. C
- d. D

17. Which device uses magnetic force in its operation?

- a. Fuse.
- b. Relay.
- c. Resistor
- d. Capacitor.

18. What force is produced by a 4 m conductor carrying 10 A, when placed in a magnetic field of 1.5 T?

- a. 6 N
- b. 15 N
- c. 40 N
- d. 60 N

19. Which sine wave value represents 0.707 of the peak value?

- a. rms.
- b. Period.
- c. Average.
- d. Frequency.

20. What value of EMF is induced from a simple alternator having a 20 cm conductor rotating at a velocity of 10 m/s within a magnetic field having a flux density of 4 Tesla?

- a. 0.8 V.
- b. 8.0 V.
- c. 80 V.
- d. 800 V.

21. What is the output voltage of a transformer with a turn's ratio of 10:1, and a primary voltage of 110 V?

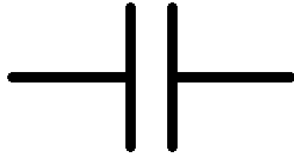
- a. 9 V.
- b. 11 V.
- c. 460 V.
- d. 1150 V.



22. Which term defines the principle operation of a double-wound transformer?

- a. Step-up.
- b. Step-down.
- c. Mutual induction.
- d. Mutual impedance.

23. Which electronic component is shown in the image below?



- a. Diac.
- b. Triac.
- c. Cell.
- d. Capacitor.

24. What is the **most** appropriate tool to ensure a series of brackets are vertically aligned, over a distance of 10 m, on an external wall?

- a. Rule.
- b. Square.
- c. Chalk-line.
- d. Spirit Level

25. What is the **maximum** number of 4 mm<sup>2</sup> thermosetting PVC cables that could be installed in a 75 mm<sup>2</sup> x 25 mm<sup>2</sup> trunking to comply with the IET On-Site Guide?

- a. 20
- b. 30
- c. 40
- d. 50

26. What type of conduit box is shown in the image below?



- a. Stop-end box.
- b. Through box.
- c. Angle Box.
- d. Tangent Angle Box.

27. What type of fixing is used to secure conduits to wooden shuttering before concrete is poured?

- a. Cleat
- b. Saddle
- c. Toggle
- d. Crampet

28. What type of cable would be the **most** appropriate for installation when clipped directly to a wall in a room with a high ambient temperature?

- a. Thermoplastic non-sheathed.
- b. Thermosetting multi-core.
- c. Multi-core PVC flexible.
- d. PVC/PVC flat profile.

29. Why are the terminations of mineral insulated metal sheathed cable sealed?

- a. The conductors are close together.
- b. The cable insulation is absorbent.
- c. The conductors are absorbent
- d. The insulation is a mineral oil.

30. What type of cable support is shown in the image below?



- a. Tie.
- b. Clip.
- c. Cleat.
- d. Bracket.

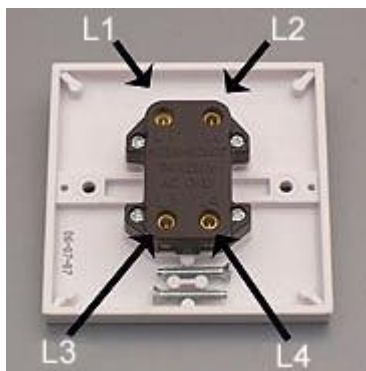
31. What type of switch is used to control a one-way lighting circuit?

- a. Isolator.
- b. Intermediate.
- c. Single-pole.
- d. Double-pole.

32. Why is a SELV socket-outlet permitted in zone 1 of a bathroom?

- a. Because the separated voltage is reduced to safe levels.
- b. This type of socket-outlet is the only type having an IP44 rating.
- c. Because the socket-outlet provides double-pole switching.
- d. This type of socket-outlet provides dual 230/120 V for shavers.

33. What type of switch is shown in the image below?



- a. Intermediate.
- b. Two-way.
- c. One-way.
- d. Double-pole.

34. Why is hydro-electricity defined as renewable?

- a. The energy source can be utilised for other products after use.
- b. The energy source is self-seeding causing constant re-growth.
- c. The energy source is produced naturally by fossilization of plants.
- d. The energy source is from a naturally reoccurring process.

35. Which item is part of the consumer's installation for an incoming electrical supply to a domestic property?

- a. Meter tails.
- b. Electricity meter.
- c. Service cut-out.
- d. Service fuse.

36. What level of protection should the horizontal top surface of a consumer unit provide?

- a. IP1X
- b. IP2X
- c. IP3X
- d. IP4X

37. What is the **maximum** typical value of external earth loop impedance ( $Z_e$ ), quoted by the DNO, for a TN-S earthing arrangement?

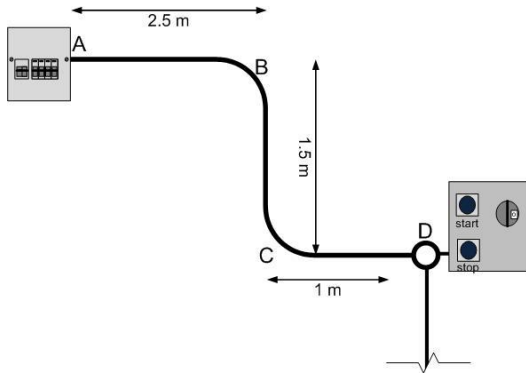
- a. 0.35  $\Omega$
- b. 0.8  $\Omega$
- c. 12  $\Omega$
- d. 21  $\Omega$

38. Which earthing arrangement would typically be supplied to a new domestic property in a town?

- a. TT
- b. TN-C
- c. TN-S
- d. TN-C-S

**The below scenario is for questions 39-46**

An electrical installation forms part of a single-phase TN-C-S earthing arrangement. The metal conduit is to be installed on an external wall brick wall to supply a single-phase 4.5 kW motor using single-core 70°C thermosetting non-sheathed cable with copper conductors wired as a radial circuit. The length of circuit and run for the conduit is 5 m and incorporates two bends as shown in the image. The conduit contains six existing 2.5 mm<sup>2</sup> single core cables. The circuit is to be protected by an RCBO.



39. What type of conduit is unsuitable for this type of installation?

- a. Black PVC.
- b. Black enamel.
- c. Stainless Steel.
- d. Galvanised Steel.

40. Which containment system is **most** suitable to support a number of large SWA cables?

- a. Tray
- b. Ladder
- c. Basket
- d. Trunking

41. What is the **most** appropriate type of RCBO for this installation?

- a. Type A
- b. Type B
- c. Type C
- d. Type D

42. What type of protection does the RCBO provide?

- a. Additional Protection.
- b. Undervoltage Protection.
- c. Main Protective Bonding
- d. Supplementary Protective Bonding.

43. What provides the earth return path external to this installation?

- a. General mass of earth.
- b. Incoming cable sheath.
- c. Supply PEN conductor.
- d. Source earth electrode

44. What is the **minimum** size of live conductors acceptable?

- a. 1.0 mm<sup>2</sup>
- b. 1.5 mm<sup>2</sup>
- c. 2.5 mm<sup>2</sup>
- d. 4.0 mm<sup>2</sup>

**Applied knowledge and understanding**

This item requires learners to evaluate and select a great deal of information. Once the key information is selected, learners must apply decisive applications across several learning outcomes such as selection of nominal rating of protective device, based on a determined design current calculated from a power rating. Once the device rating is selected, learners must research permitted materials for the correct table applicable. This item tests knowledge, understanding and evaluation across several learning outcomes.

45. What is the **minimum** acceptable diameter of conduit to be used if all cables contained are stranded?

- a. 16 mm
- b. 20 mm
- c. 25 mm
- d. 32 mm

**Applied knowledge and understanding**

Learners will need to pull in information across several topics and analyse information within the scenario. Learners will then need to research permitted material to obtain factors from several key tables. Once this information is gathered and analysed, they need to calculate an overall factor and select a suitable diameter.

46. What would be the **maximum** acceptable distance between supports for the conduit between points A-B

- a. 0.75 m
- b. 1.75 m
- c. 2.25 m
- d. 2.50 m

*Applied knowledge and understanding*

This is a challenging item as learners need to determine the suitable type of conduit to be used (rigid PVC or metallic), and from this, research the information in the scenario as well as permitted material to come to a conclusion.

47. What item is intended to provide Basic Protection?

- a. RCD
- b. Insulation
- c. Circuit breaker
- d. CPC

48. Which item would require connection to a CPC?

- a. Metallic gas pipe.
- b. Metallic water pipe.
- c. Metal-clad socket outlet.
- d. Metal casing of a Class II appliance.

49. What is the purpose of protective equipotential bonding?

- a. To reduce the voltages between exposed and extraneous conductive parts in the event of a fault.
- b. To increase the voltages between exposed and extraneous conductive parts in the event of a fault.
- c. To reduce the disconnection times of protective devices in the event of a fault.
- d. To increase the disconnection times of protective devices in the event of a fault.

50. What is the value of voltage drop, in milli volts per ampere per metre, for a 2.5 mm<sup>2</sup> 70 °C thermoplastic insulated and sheathed flat cable, intended to supply a single-phase circuit?

- a. 11 mV/A/m.
- b. 18 mV/A/m.
- c. 29 mV/A/m.
- d. 44 mV/A/m.

51. What type of diagram is most suitable for showing the sequence of control for a distribution system in a large office block?

- a. Block diagram.
- b. Wiring diagram.
- c. Circuit diagram.
- d. Connection diagram.

52. What is the scale where an actual distance of 1 m measures 2 cm on a drawing?

- a. 1:50
- b. 1:100
- c. 50:1
- d. 100:1

53. Which statement describes the reasons for the voltages used to transmit electricity?

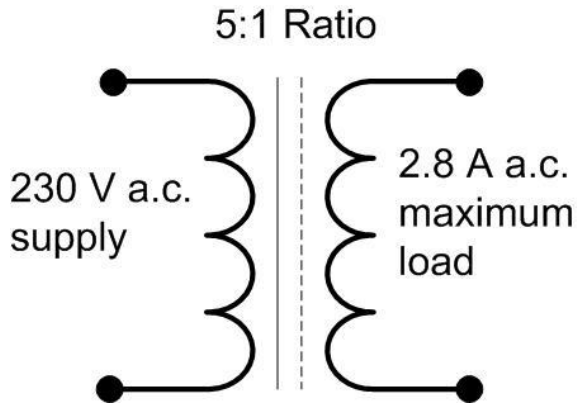
- a. High voltages leads to low current allowing smaller csa cables
- b. Low voltages leads to high current for supplying greater demands
- c. High voltages lead to high current for supplying greater demands
- d. Low voltages leads to low current allowing smaller csa cables

*Applied knowledge and understanding*

It is expected that learners have previous knowledge and understanding of transmission voltages and must understand electrical transformer principles. Learners need to demonstrate these principles through reasoning and the application of ohms law and transformer theory.



54. Which statement would be true, if the transformer shown in the image was used under maximum loaded conditions?

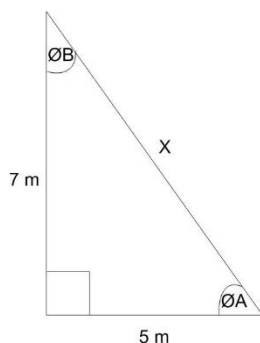


- The output voltage would be suitable for a SELV circuit and the input current would be greater than the output current
- The output current would not be suitable for a SELV circuit and the output voltage would be greater than the input voltage
- The output voltage would not be suitable for a SELV circuit and the input current would be greater than 1A
- The output voltage would be suitable for a SELV circuit and the input current would be less than 1A

**Applied knowledge and understanding**

This requires learners to apply understanding and evaluation from several topics and LOs. They need to use the limited information provided and apply several calculations (as well as an inverse calculation) to determine values. Once values are determined, they need to evaluate the possible answers by applying technical understanding of terms used in other units.

55. Which statement defines the missing values shown in the image?



- Value X is 12 and angle B is  $35^\circ$
- Value X is 8.6 and angle A is  $54.5^\circ$
- Value X is 12 and angle A is  $45^\circ$
- Value X is 8.6 and angle B is  $45.5^\circ$

**Applied knowledge and understanding**

This item requires learners to review the information available and from this apply either Pythagoras' theorem to determine the hypotenuse or one of the variations of trigonometry. In order to determine the angles, they must analyse the available information and select a suitable variant of trigonometry to determine the correct answer.

56. A 230 V Class II drill is to be used via an RCD protected socket outlet that is supplied via a 16 A BS EN 60898 circuit breaker. Before using the drill, the user checks the lead and notices that insulation has become damaged and the line and neutral conductors are visible.

Which of the statements identifies the risk that could occur including the outcome of that risk?

- a. There could be a short circuit between live conductors and the RCD would operate within 40 mS.
- b. The line conductor could touch the earthed metal casing of the drill and RCD would operate within 40 mS.
- c. The line conductor could touch the earthed metal casing of the drill and the magnetic part of the circuit breaker would disconnect rapidly.
- d. There could be a short circuit between live conductors and the magnetic part of the circuit breaker would disconnect rapidly.

**Applied knowledge and understanding**

This item requires learners to have an understanding across several topics and units. They must evaluate the situation from the scenario and apply a high level of understanding of types of overcurrent as well as component operation. This also requires an ability to determine risks from hazards.

57. A ladder is to be used to gain access to a flat roof which is 7 m high. What is the **minimum** length of a ladder that could provide safe access?

- a. 7.25 m
- b. 8 m
- c. 8.25 m
- d. 9 m

**Applied knowledge and understanding**

This item requires learners to have a good, detailed understanding of health and safety requirements as well as application of mathematics. Learners need to understand particular safe erection ratio's, safe extending points (beyond wall heights) and apply the ratio mathematically to determine the hypotenuse length.

58. A homeowner requires a price for installing a new socket outlet in their house. The amount of cable required may be up to 50 m the exact amount will not be known until work commences. Materials required including the charge for installing, will cost the following excluding VAT at 20%.

Cable at £2 per metre

Socket at £20 each

Mounting box at £4.50 each

Circuit breaker at £20 each

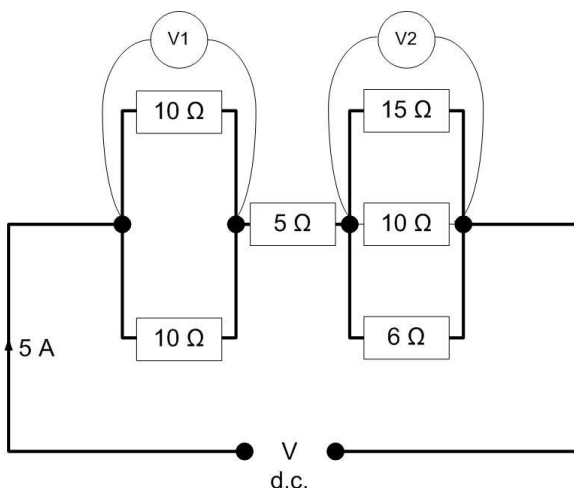
What statement is the **most** appropriate way for the client to receive this information?

- Provide an estimate of £173.40 inc VAT
- Provide a quotation of £115.60 less VAT
- Provide an estimate of £55.80 inc VAT
- Provide a quotation of £94.50 less VAT

**Applied knowledge and understanding**

This item requires learners to have a detailed understanding of financial documentation. An understanding of VAT and be able to apply understanding to use calculations to derive appropriate outcomes.

59. Which of the statements is correct from the values indicated in the image shown?



- The total resistance of the circuit is 56 Ω
- The instrument V1 would read 100 V.
- The Instrument V2 would read 155 V.
- The total voltage for the circuit is 65 V.

***Applied knowledge and Understanding***

This item requires learners to pull together an understanding across several topics and then apply each topic in unison in order to understand this circuit. Once they have evaluated the circuit, they must then prove the answer through a series of calculations. Several calculations must also be undertaken to disprove the distractors.

60. A d.c.circuit contains three loads identified as A, B and C. The potential difference across loads A and B are equal but the potential difference across load C is higher. The current through loads A, B and C is equal.

Which statement identifies this circuit?

- a. The loads are arranged in parallel and load C has a higher resistance than loads A and B.
- b. The loads are arranged in series and load C has a lower resistance than loads A and B.
- c. The loads are arranged in parallel and load C has a lower resistance than loads A and B.
- d. The loads are arranged in series and load C has a higher resistance than loads A and B.

***Applied knowledge and understanding***

This is a good item that makes learners consider information across several topics. As the statements and stem are descriptive, learners need to identify, understand and evaluate several feeds of information.

## 2 Mark scheme

### 2.1 Multiple choice

<b>Question</b>	<b>Key</b>
1	A
2	B
3	A
4	D
5	A
6	B
7	C
8	D
9	C
10	D
11	C
12	A
13	C
14	A
15	D
16	B
17	B
18	D
19	A
20	B
21	B
22	C
23	D
24	C
25	C
26	C
27	D
28	B
29	B
30	C
31	C
32	A
33	A
34	D
35	A

36	D
37	B
38	D
39	B
40	B
41	C
42	A
43	C
44	C
45	C
46	B
47	B
48	C
49	A
50	B
51	A
52	A
53	A
54	D
55	B
56	D
57	C
58	A
59	D
60	D

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