



**8202-520 APRIL 2018**  
**Level 2 Technical Certificate in Electrical Installation**  
Level 2 Electrical – Theory exam

**Thursday 26 April 2018**  
**09:30 – 11:30**

**You should have the following for this examination**

- a multiple-choice answer sheet
- a pen with blue or black ink
- non-programmable calculator

**Permitted reference material:**

BS 7671  
IET On-site Guide

---

**This question paper is the property of the City and Guilds of London Institute and is to be returned after the examination.**

**Read the following notes before you answer any questions**

- You **must** use a pen with black or blue ink to complete **all** parts of the answer sheet.
- Check that you have the correct answer sheet for the examination.
- Check that your name and candidate details are printed correctly at the top of your answer sheet.
- Inform the invigilator if your name or examination details are not correct.
- Each question shows **four** possible answers (lettered 'a', 'b', 'c' and 'd'); only **one** is correct.
- Decide which **one** is correct and mark your answer on the **answer sheet** with your pen.

For example if you decide 'a' is correct, mark your answer like this

101	<input checked="" type="radio"/>	<input type="radio"/> b	<input type="radio"/> c	<input type="radio"/> d
	Cancel	Cancel	Cancel	Cancel

If you want to change your answer, cancel your first choice by filling in the 'cancel' box below the circle like this

101	<input checked="" type="radio"/>	<input type="radio"/> b	<input type="radio"/> c	<input type="radio"/> d
	Cancel	Cancel	Cancel	

Then mark the answer which you have now decided is correct. For example if you now decide 'c' is correct, mark your answer like this

101	<input checked="" type="radio"/>	<input type="radio"/> b	<input checked="" type="radio"/>	<input type="radio"/> d
	Cancel	Cancel	Cancel	

Any other marks on the form may invalidate some of your answers.

- Any calculations or rough working can be done on the question paper.
- Attempt all questions. If you find a question difficult, leave it and return to it later.

**This paper contains 60 questions. Answer them using the 'boxes' numbered 1 to 60 on the answer sheet.**

- 1 Why is a risk assessment carried out?
- a To make sure work is completed quickly.
  - b To make sure work is carried out safely.
  - c To make sure all PPE is always worn.
  - d To make sure BS 7671 is followed when working.

2 What is the **most** appropriate procedure for dealing with a request to clean a light fitting that is attached to a suspected asbestos insulating board?

- a Refuse, unless specific training has been given.
- b Use a damp, lint-free cleaning cloth to contain the dust.
- c Use an appropriate vacuum cleaner to remove any dust.
- d Refuse, unless planning permission has been granted.

3 What asbestos survey type **must** take place before an office block, constructed in the 1960s, is totally refurbished?

- a Type 1.
- b Type 2.
- c Type 3.
- d Type 4.

4 What is the correct colour of a 230 V extension lead used on a construction site?

- a Red.
- b Yellow.
- c Blue
- d Violet.

5 What is the role of an architect?

- a To meet the needs of the quantity surveyor.
- b To meet the needs of the clerk of works.
- c To meet the needs of the site manager.
- d To meet the needs of the customer.

6 Which industry organisation represents the interests of consumer?

- a Electrical Safety First.
- b Joint Industries Board.
- c JT Ltd.
- d UNITE.

7 What defines Current?

- a The flow of electrons in a given time.
- b The energy consumed by a resistance.
- c The force opposing the flow of electricity.
- d The force pushing the flow of electricity.

8 The current in a circuit is 16.5 mA. What is this value in amperes?

- a 1.65 A
- b 0.165 A
- c 0.0165 A
- d 0.00165 A

9 What is the unit of measurement for Energy?

- a Joule.
- b Amp.
- c Volt.
- d Hertz.

10 What is the correct transposition of the formula shown below to make V the subject?

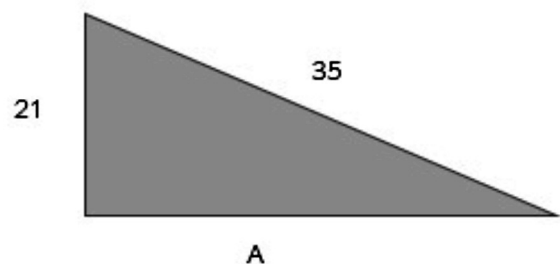
$$P = \frac{V^2}{R}$$

a  $V = \sqrt{\frac{R^2}{P}}$

b  $V = \sqrt{P \times R}$

c  $V = \frac{P}{R}$

d  $V = P^2 R$



**Figure 1**

11 What is the value of side A in Figure 1.

- a 14
- b 28
- c 30
- d 56

12 What is the unit of measurement for resistance?

- a Amp.
- b Volt.
- c Watt.
- d Ohm.

13 Which law states that voltage and current are directly proportional to each other?

- a Kirchoff's Law.
- b Ohms Law.
- c Watts Law.
- d Tesla's Law.

14 What is the csa of a copper conductor, having a resistivity of  $0.0172 \mu\Omega/\text{m}$ , a measured resistance of  $0.55 \Omega$  and a length of 80 m?

- a  $1.0 \text{ mm}^2$ .
- b  $1.5 \text{ mm}^2$ .
- c  $2.5 \text{ mm}^2$ .
- d  $4.0 \text{ mm}^2$ .

15 What is the resistance of 150 m of a single copper conductor, having a csa of  $10 \text{ mm}^2$ ? The resistivity of copper is  $1.72 \times 10^{-8} \Omega/\text{m}$ .

- a  $2.58 \Omega$
- b  $0.258 \Omega$
- c  $0.0258 \Omega$
- d  $0.00258 \Omega$

16 What instrument would be used to measure Current?

- a Voltmeter.
- b Ammeter.
- c Ohmmeter.
- d Wattmeter.

17 What value of resistance would draw a current of 2.5 A when connected across a 200 V DC supply?

- a  $60 \Omega$
- b  $80 \Omega$
- c  $100 \Omega$
- d  $500 \Omega$

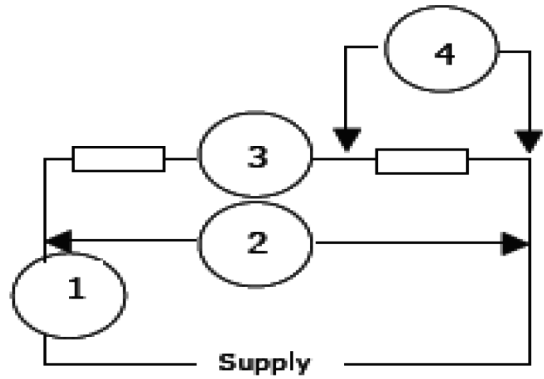


Figure 2

18 Which **two** meter connections, shown in Figure 2, could be used to calculate the total circuit power?

- a 4 and 2.
- b 4 and 3.
- c 1 and 3.
- d 1 and 2.

19 A circuit contains three resistors of  $1.5 \Omega$ ,  $4 \Omega$  and  $12 \Omega$ , connected in parallel across a 10 V supply. What is the total current flowing in the circuit?

- a 0.83 A
- b 2.5 A
- c 6.67 A
- d 10 A

20 What is the actual direction of electron flow?

- a Negative to positive.
- b Left to right.
- c Positive to Negative.
- d Right to left.

21 What is the unit of measure for magnetic Flux?

- a Weber.
- b Tesla.
- c Kelvin.
- d Hertz.

22 What is the induced EMF in a conductor, with a length of 0.25 m, moving at a velocity of 5 m/s through a magnetic field having a flux density of 1.6 Tesla?

- a 6.85 V
- b 3.15 V
- c 2 V
- d 0 V

23 What is the **minimum** number of windings used by a single generator supplying a three-line, four-wire system?

- a 1
- b 2
- c 3
- d 4

24 What is the peak voltage of a sine wave having an RMS value of 11 kV?

- a 19.1 kV
- b 15.5 kV
- c 7.7 kV
- d 3.6 kV

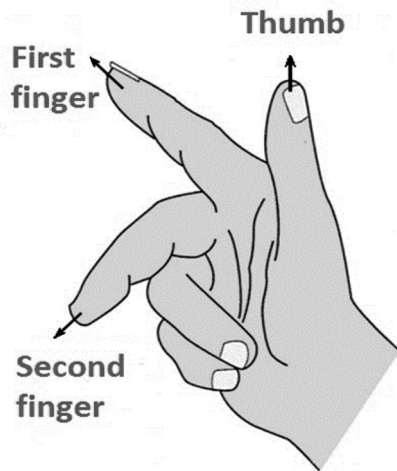


Figure 3

25 What is represented by the first finger, in Figure 3, when applying Fleming's right hand rule?

- a Field.
- b Motion.
- c Current.
- d Velocity.

26 What is the operating principle for a single-loop, AC generator?

- a Electromagnetic reduction.
- b Electromagnetic radiation.
- c Electromagnetic interference.
- d Electromagnetic induction.

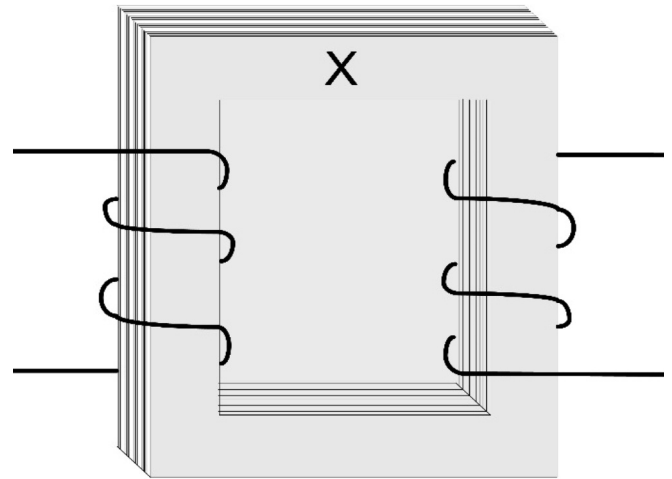


Figure 4

27 What is represented by the area marked X in Figure 4?

- a Primary Winding.
- b Secondary Winding.
- c Laminated Iron Core.
- d Laminated Cable Core.

28 What is the full load, secondary current of a 60 kVA transformer having a ratio of 8.25:1 and a primary voltage of 3.3 kV?

- a 18.1 A
- b 150 A
- c 181.1 A
- d 272 A



Figure 5

29 What is the electronic component shown in Figure 5?

- a LDR.
- b DIAC.
- c TRIAC.
- d LED.

- 30 What does the VDE standard on a screwdriver apply to?
- Torque value.
  - Voltage rating.
  - Current setting.
  - Weight ratio.
- 31 What component **must** be used to secure metallic conduit to a normally damp wall?
- Cleat.
  - Crampet.
  - Distance saddle.
  - Spacer bar saddle.
- 32 What is the **most** important reason for selecting a particular wiring system in a riser?
- Ease of installation.
  - Longevity.
  - External Influences.
  - Aesthetics.
- 33 What is the **first** task when terminating a PVC/SWA cable into a consumer unit?
- Remove the steel wire.
  - Tighten the brass gland.
  - Remove the outer sheath.
  - Strip back the inner sheath.
- 34 What is the correct method for securing cables onto a horizontal cable tray?
- Ties.
  - Saddles.
  - Brackets.
  - Crampets.
- 35 What is the space factor for a trunking system?
- 60%
  - 55%
  - 50%
  - 45%
- 36 What is the purpose of intermediate switching?
- To control a luminaire from a single point.
  - To control a luminaire from a minimum of 3 points.
  - To control multiple luminaires from a single point.
  - To control multiple luminaires from a maximum of 2 points.
- 37 What is the purpose of Grommet strip?
- To support cables inside trunking.
  - To make trunking air tight.
  - To protect the cable insulation.
  - To provide earth continuity.
- 38 What cable is used for data transmission systems?
- SY.
  - SWA.
  - MIMS.
  - Cat 5.
- 39 What type of termination requires a ratchet type tool?
- Crimp.
  - Solder.
  - Brazed.
  - Welded.
- 40 What termination method is used in a standard socket-outlet?
- Brazed.
  - Crimped.
  - Screwed.
  - Soldered.
- 41 What is a general category of external influences as given in BS 7671?
- Environment.
  - Method of supply.
  - Earthing arrangements.
  - Method of installation.
- 42 What is the **most** suitable position for a wind turbine in order to maximise power output?
- A town centre.
  - A wooded site with tall trees.
  - Close to the coast on high ground.
  - Close to the coast below cliff level.
- 43 What voltage is supplied to heavy industry?
- 230 V
  - 400 V
  - 33 kV
  - 400 kV

- 44 How is the number and type of live conductors for a supply to a new building determined?
- Consultation with the local distributor.
  - Enquiry to the local council offices.
  - Reference to BS 7671.
  - Reference to ESQCR.
- 45 What **must** all consumer control units need to be within, in a dwelling?
- A plastic enclosure.
  - A see-through enclosure.
  - A metallic enclosure.
  - A compartmentalised enclosure.
- 46 What is the  $U_0$  when three-phase is supplied by a DNO in the UK?
- 55 V
  - 110 V
  - 230 V
  - 400 V
- 47 What is the purpose of a switch for mechanical maintenance?
- For electrical isolation purposes.
  - For overload and fault protection.
  - To enable normal user operation of the equipment.
  - To stop the unwanted functioning of the equipment.
- 48 Why is bonding installed?
- To connect together conduit and trunking.
  - To provide a link between extraneous parts.
  - To provide a path for fault current to flow.
  - To connect together all exposed conductive parts.
- 49 Why **must** a cpc be correctly designed?
- For sufficient earth fault current to flow to allow a short disconnection time.
  - For sufficient overload current to prevent nuisance tripping of an RCD.
  - For sufficient short-circuit current to flow to allow for discrimination.
  - For sufficient nominal current for the loading of the equipment.
- 50 What is an example of an exposed conductive part?
- Centrally heated towel rail.
  - Plastic casing of a light switch.
  - Metal casing of a heating pump.
  - Suspended ceiling T-bars.
- 51 What is used to determine total earth-fault loop impedance?
- $Z_S = Z_e - (R_1 + R_2)$
  - $Z_S = Z_e + (R_1 + R_2)$
  - $Z_e = Z_S + (R_1 + R_2)$
  - $Z_S = Z_e + (R_1 - R_2)$
- 52 How is basic protection provided within a dwelling?
- Insulation of live parts.
  - 100 mA RCD protection.
  - Supplementary bonding.
  - Placing out of reach.
- 53 What are rating factors applied to during cable selection?
- $I_n$
  - $I_b$
  - $I_a$
  - $I_z$
- 54 What would be the actual length of a wall measuring 40 mm on 1:50 scaled drawing?
- 6 m
  - 4 m
  - 2 m
  - 1 m
- 55 What information **must** be included in a manufacturer's handbook for an electric cooker?
- Rating of grouping factors for the wiring arrangement.
  - Instructions on how the user operates the appliance.
  - Specifications of the supply earthing arrangement.
  - Detail of the wiring route to supply the appliance.

Questions 56 to 60 refer to the following scenario.

A new single-phase electrical installation within a small workshop is to be wired using single-core non-sheathed 70 °C thermoplastic (PVC) cables having stranded copper conductors.

The cables are to be installed in a mixture of surface, metallic conduit and trunking. Part of the schedule for the final-circuits is shown below.

No.	Designation	Live mm <sup>2</sup>	cpc mm <sup>2</sup>
1	9 kW steel cutting machine	10	6
2	6 kW drill	4	2.5
3	3 kW space heater	2.5	1.5
4	Ring final circuit	2.5	1.5
5	3 kW water heater	2.5	1.5
6	6x 100 W fluorescent luminaires	1.5	1.5

**Table 1**

56 A short, straight conduit run of 0.5 m is required to carry **all** the final circuit cables between the CCU and the trunking below.

What is the **minimum** conduit size required?

- a 20 mm
- b 32 mm
- c 38 mm
- d 50 mm

57 Who is responsible for maintaining the meter tails which link the meter to the consumers' control unit?

- a DNO.
- b ECA.
- c Installer.
- d Consumer.

58 What type of circuit-breaker would be selected for protecting the lighting circuit?

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

59 What is the correct coordination for the water heater final-circuit?

- a  $I_b = 20 \text{ A}, I_n = 25 \text{ A}, I_z = 18 \text{ A}$
- b  $I_b = 18 \text{ A}, I_n = 15 \text{ A}, I_z = 13 \text{ A}$
- c  $I_b = 13 \text{ A}, I_n = 16 \text{ A}, I_z = 20 \text{ A}$
- d  $I_b = 25 \text{ A}, I_n = 16 \text{ A}, I_z = 13 \text{ A}$

60 The space heater circuit has a length of 14 m installed as method B. What is the voltage drop for this circuit at full load current?

- a 3.26 V
- b 4.32 V
- c 5.94 V
- d 6.89 V

### NOW GO BACK AND CHECK YOUR WORK

- IMPORTANT -

Are the details at the top of the answer sheet correct?

Have you filled in your answers in INK in the appropriate boxes on the answer sheet?