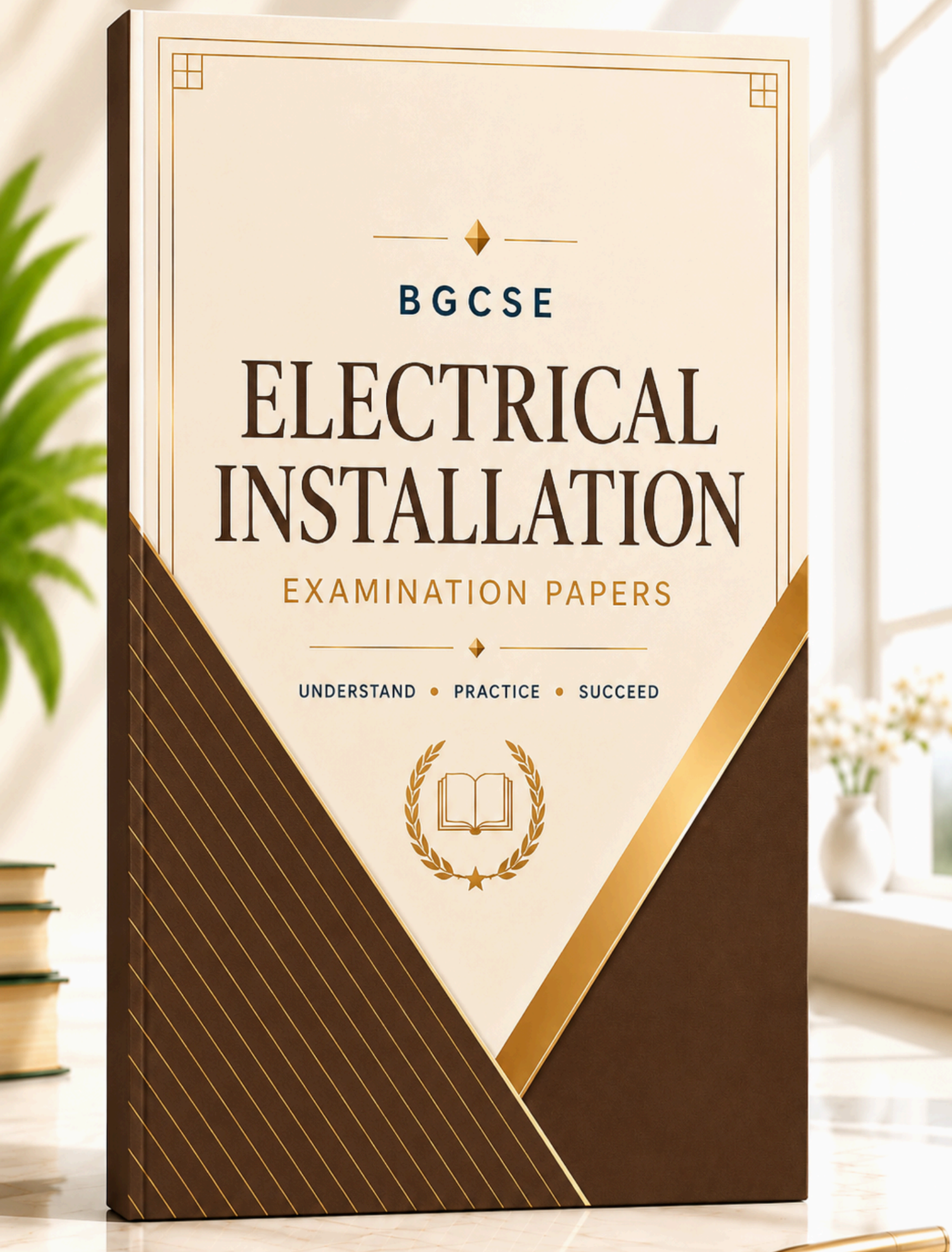
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4130/1 **BGCSE**

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ELECTRICAL INSTALLATION

PAPER 1 4130/1

Wednesday 14 MAY 2025 9:00 A.M.–10:00 A.M.

Additional materials:
Coloured pencils

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NATIONAL EXAMINATIONS

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Attempt **ALL** the questions. Write your answers in the spaces provided below each question.

INFORMATION FOR CANDIDATES

The number of marks available is shown in brackets [ ] at the end of each question or part question.

Electronic calculators are allowed.

This question paper consists of 10 printed pages and 2 blank pages.

Answer **ALL** questions. Write your answers in the spaces provided.

1. The current that lights your house changes direction many times per second. State the name of the current used.

_____ [1]

2. State the modern unit of frequency and how is it abbreviated.

unit _____ [1]

abbreviation _____ [1]

3. Which instrument is used to measure the following quantities?

(i) voltage _____ [1]

(ii) resistance _____ [1]

(iii) current _____ [1]

(iv) power _____ [1]

4. List **FOUR** different parts of an electric circuit.

(i) _____ [1]

(ii) _____ [1]

(iii) _____ [1]

(iv) _____ [1]

5. State the **TWO** best metal conductors used in electrical wiring other than silver.

(i) _____ [1]

(ii) _____ [1]

6. Which colour wires are commonly used as neutral conductors?

_____ and _____ [2]

7. What is the normal length of conduits and what is the minimum size of the diameter?

length _____ [1]

diameter _____ [1]

8. State the **TWO** main types of EMT fittings.

(i) _____ [1]

(ii) _____ [1]

9. State the purpose of a switch in a circuit.

_____

_____ [1]

10. Describe the difference between a series and a parallel circuit.

_____

_____ [2]

11. Calculate the amount of current used to illuminate a 100-watt light bulb rated at 125 V.

Answer: _____ [1]

12. There are many ways to produce electromotive force or voltage. Some ways are listed below. Match these six most common methods with their description by writing the letter of the description next to the Common Method.

Common Methods		Description	
_____	(i) Friction	(a)	Voltage produced by heating the junction where two unlike metals are joined
_____	(ii) Pressure	(b)	Voltage produced in a conductor that is moved across a magnetic field
_____	(iii) Heat	(c)	Voltage produced by squeezing certain crystals
_____	(iv) Light	(d)	Voltage produced by putting two charged objects near each other
_____	(v) Chemistry	(e)	Voltage produced by use of certain photosensitive
_____	(vi) Magnetism	(f)	Voltage produced in a battery cell
		(g)	Voltage produced by rubbing two materials together

[6]

13. Using **Fig. 13.1**, answer questions (a) to (f).

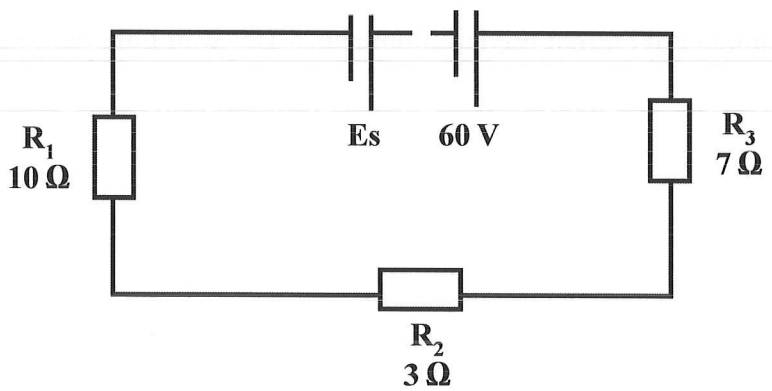


Fig. 13.1

(a) Identify the direction of the current flow.

_____ [1]

(b) Calculate the total resistance. Show all working.

Answer: _____ [3]

(c) Calculate the total current. Show all working.

Answer: _____ [3]

(d) Calculate the voltage drop across R_1. Show all working.

Answer: _____ [3]

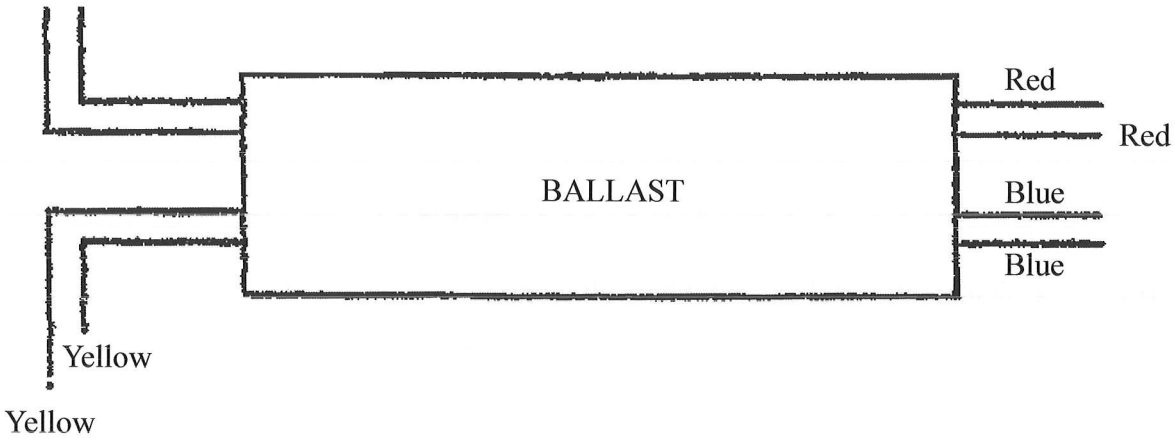
(e) How much power is absorbed by R_2? Show all working.

Answer: _____ [3]

(f) Calculate the total power dissipated in the circuit. Show all working.

Answer: _____ [3]

14. **Fig. 14.1** represents a fluorescent lamp circuit. Use coloured pencils and draw lines to show how you would connect the ballast to the two tubes in order for them to light.



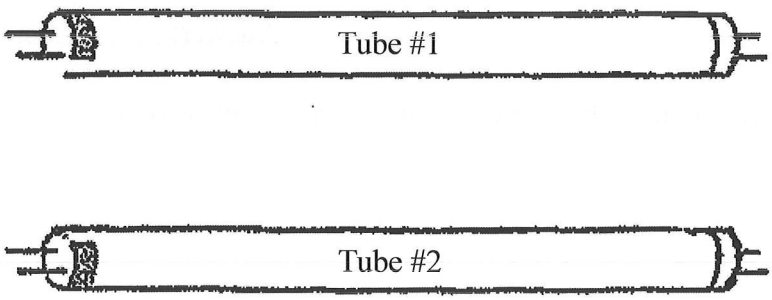


Fig 14.1

[5]

15. Write the following abbreviations out in full.

(a) EMT _____ [1]

(b) PVC _____ [1]

(c) kW _____ [1]

(d) AC _____ [1]

(e) EMF _____ [1]

(f) hP _____ [1]

16. **Fig. 16.1** shows two types of electric circuits. Study them carefully and answer the questions that follow.

Diagram A

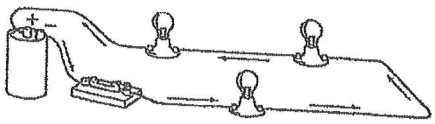


Diagram B

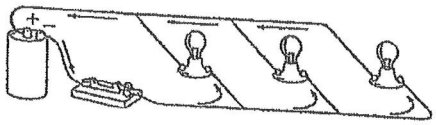


Fig. 16.1

Identify the type of circuit in

(i) Diagram **A** _____ [1]

(ii) Diagram **B** _____ [1]

If you unscrew one light bulb in Diagram **B**,

(iii) what would happen to the other bulbs?

_____

_____ [1]

State a reason why

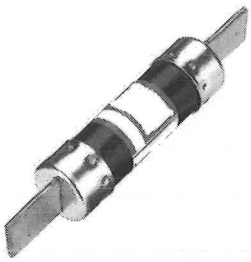
(iv) copper is commonly used as the wire for electrical circuits.

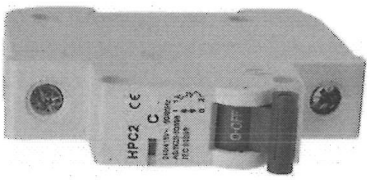
_____ [1]

(v) electrical wires are covered with a layer of plastic.

_____ [1]

17. Name the following over current protection devices.

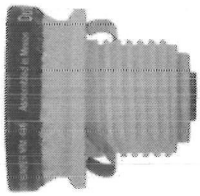
(a)  _____ [1]

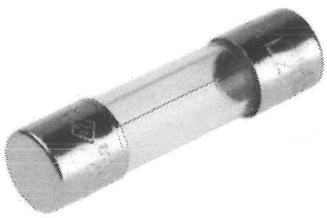
(b) 

_____ [1]

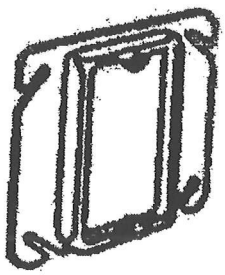
(c) 

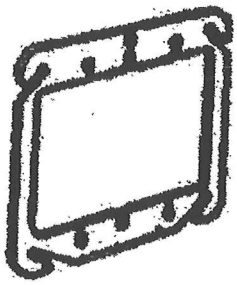
_____ [1]

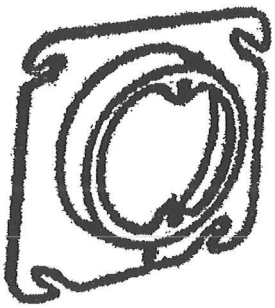
(d)  _____ [1]

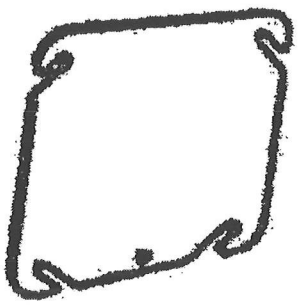
(e)  _____ [1]

18. The devices below fit the 4″ square box. Label them.

(a)  _____ [1]

(b)  _____ [1]

(c)  _____ [1]

(d)  _____ [1]

19. Use Ohm's law equations to calculate the missing values in the following chart.

	DEVICES	VOLTS	AMPS	OHMS
(a)	automobile headlamp	12		1.4
(b)	bench grinder	120	8	
(c)	circular saw		12.5	10
(d)	soldering iron	117		57
(e)	fluorescent lamp	125	0.9	
(f)	automobile battery	12	75.0	
(g)	6-cell flashlight bulb	9		20.7
(h)	electric tea kettle	115	10.5	

[8]

End]

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4130/2 **BGCSE**

School Number	Candidate Number
Surname and Initials	

ELECTRICAL INSTALLATION

PAPER 2 4130/2

Wednesday 14 MAY 2025 10:15A.M.–11:45A.M.

Additional materials:
Coloured pencils
Calculators

MINISTRY OF EDUCATION
NATIONAL EXAMINATIONS

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The number of marks available is shown in brackets [ ] at the end of each question or part question.

Electronic calculators are allowed.

This question paper consists of 8 printed pages.

1. **Fig. 1** shows the plan of a residential dwelling consisting of the usual rooms and facilities. It also shows the position of each outlet and control device. Refer to the plan to answer questions 1(a) – 1(c).

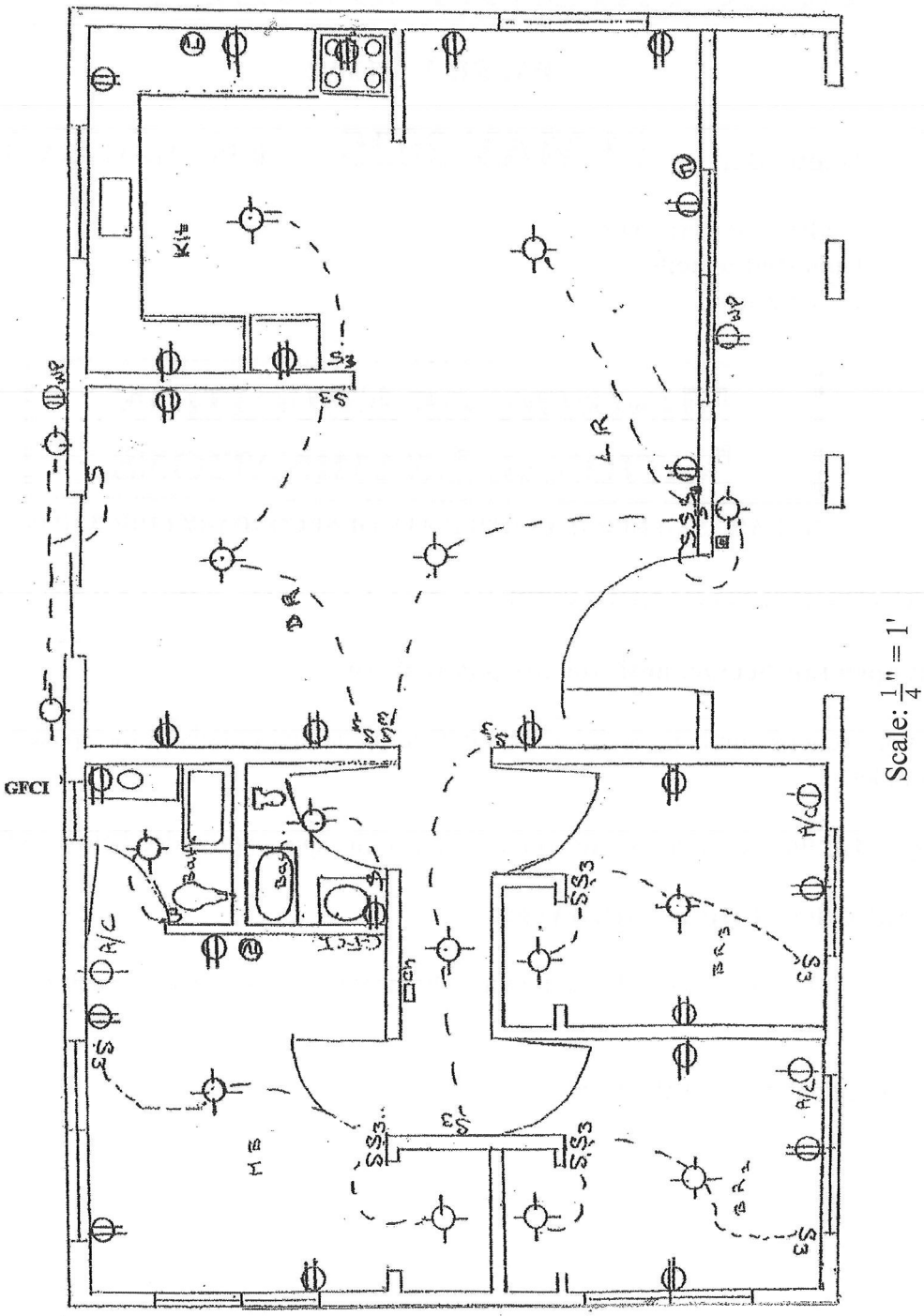


Fig. 1

(a) List the number of:

(i) ceiling lights; _____ [1]

(ii) wall mounted lights; _____ [1]

(iii) three-way switches; _____ [1]

(iv) single pole switches; _____ [1]

(v) duplex receptacles; _____ [1]

(vi) air condition outlets; _____ [1]

(vii) weather proof outlets; _____ [1]

(viii) TV outlets; _____ [1]

(ix) push button switches; _____ [1]

(x) 250V outlets. _____ [1]

(b) State the location of the:

(i) push button switches; _____ [1]

(ii) 250V outlets. _____ [1]

(c) The scale of the plan was $\frac{1}{4}$" = 1'. Show all working and calculate the actual:

(i) length of the building; _____ [1]

(ii) width of the building; _____ [1]

(iii) floor area.

Answer: _____ [2]

(d) Calculate the floor power (wattage).

Answer: _____ [2]

2. The power transformer in **Fig. 2** has 14,560 volts applied to the primary coil. The secondary voltage is 208 volts and the load is drawing 210 amperes.

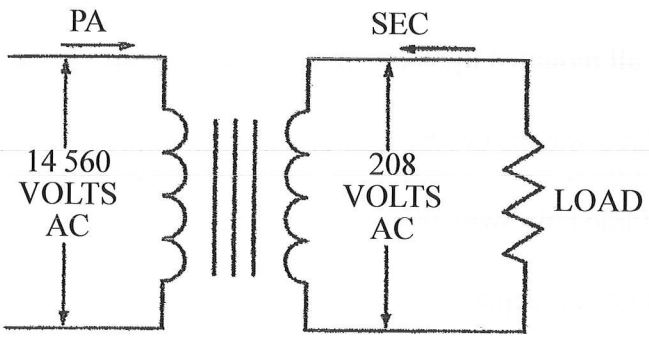


Fig. 2

Show all working and calculate:

(a) the primary current;

Answer: _____ [5]

(b) the resistance of the load;

Answer: _____ [3]

(c) the power the load dissipates in kW;

Answer: _____ [4]

(d) the turns ratio of the transformer.

Answer: _____ [4]

3. State the name and function of the following parts in **Fig. 3**.

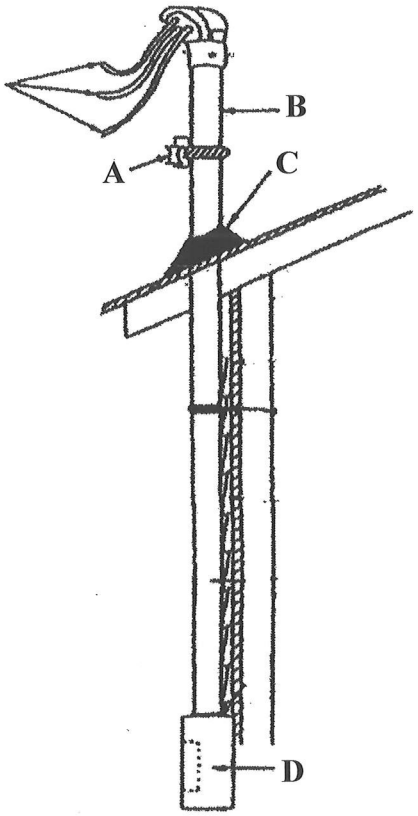


Fig. 3

(i) **A**

Name: _____ [1]

Function: _____

_____

_____ [2]

(ii) **B**

Name: _____ [1]

Function: _____

_____

_____ [2]

(iii) **C**

Name: _____ [1]

Function: _____

_____

_____ [2]

(iv) **D**

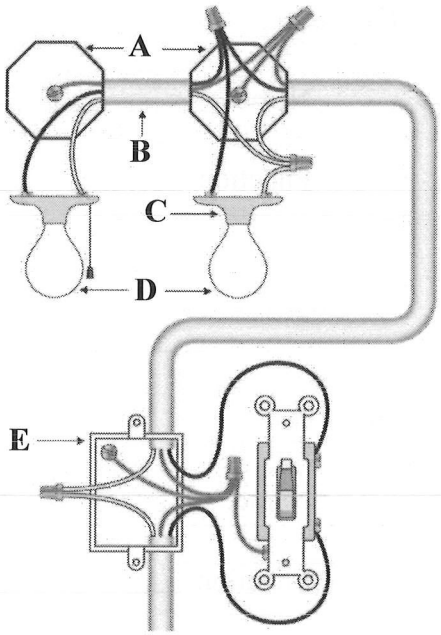
Name: _____ [1]

Function: _____

_____

_____ [2]

4. **Fig. 4** shows two lights controlled by different switches.



adapted from HowToWireALightSwitch.com

Fig. 4

(a) State the electrical trade names of the two switches.

(i) _____ [1]

(ii) _____ [1]

(b) State the electrical trade name for the twist on wire connectors shown.

_____ [1]

(c) State the shape of the outlet boxes:

(i) at **A**; _____ [1]

(ii) at **E**. _____ [1]

(d) State the electrical trade name for the light holder at **C**.

_____ [1]

(e) State the colour and electrical trade name of the wires shown:

(i) Colour _____ trade name _____ [2]

(ii) Colour _____ trade name _____ [2]

5. **Fig. 5** below is a pictorial of a four-pole alternator, where one revolution of armature produces two complete cycles of voltage.

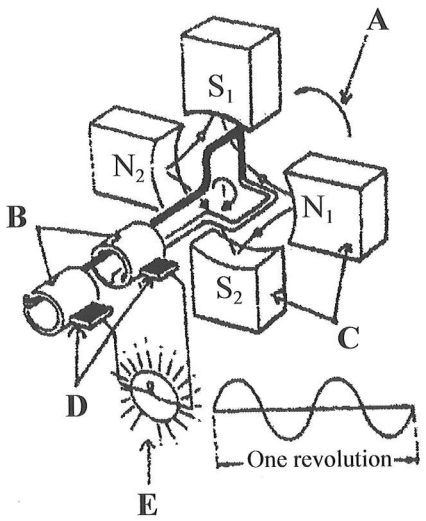


Fig. 5

Identify the parts labelled:

A _____ [1] D _____ [1]

B _____ [1] E _____ [1]

C _____ [1] N _____ [1]

6. (a) On Fig. **6.1**, using coloured pencils or pens, draw the proper connections for a front door bell and a rear door buzzer in a single family dwelling. [5]

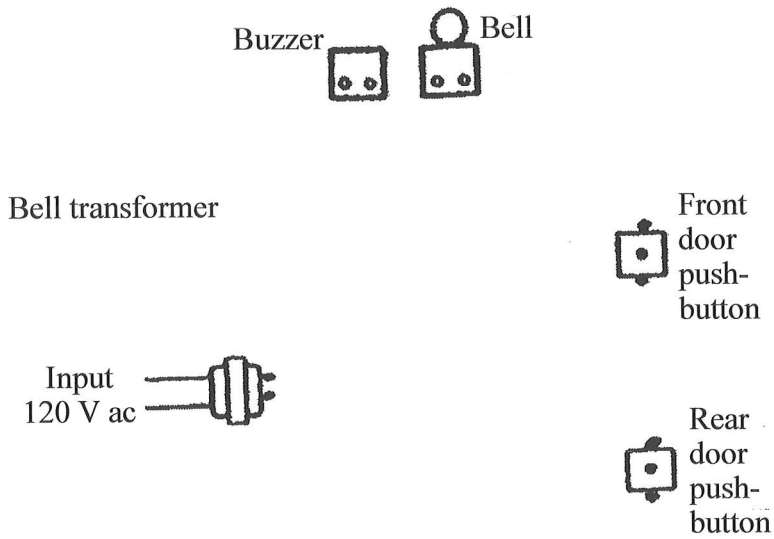


Fig. 6.1

(b) Use coloured pencils or pens to complete **Fig. 6.2**, so that the lamp is controlled from the two 3-way switches. The supply is at the lamp. The conduit is E.M.T. [5]

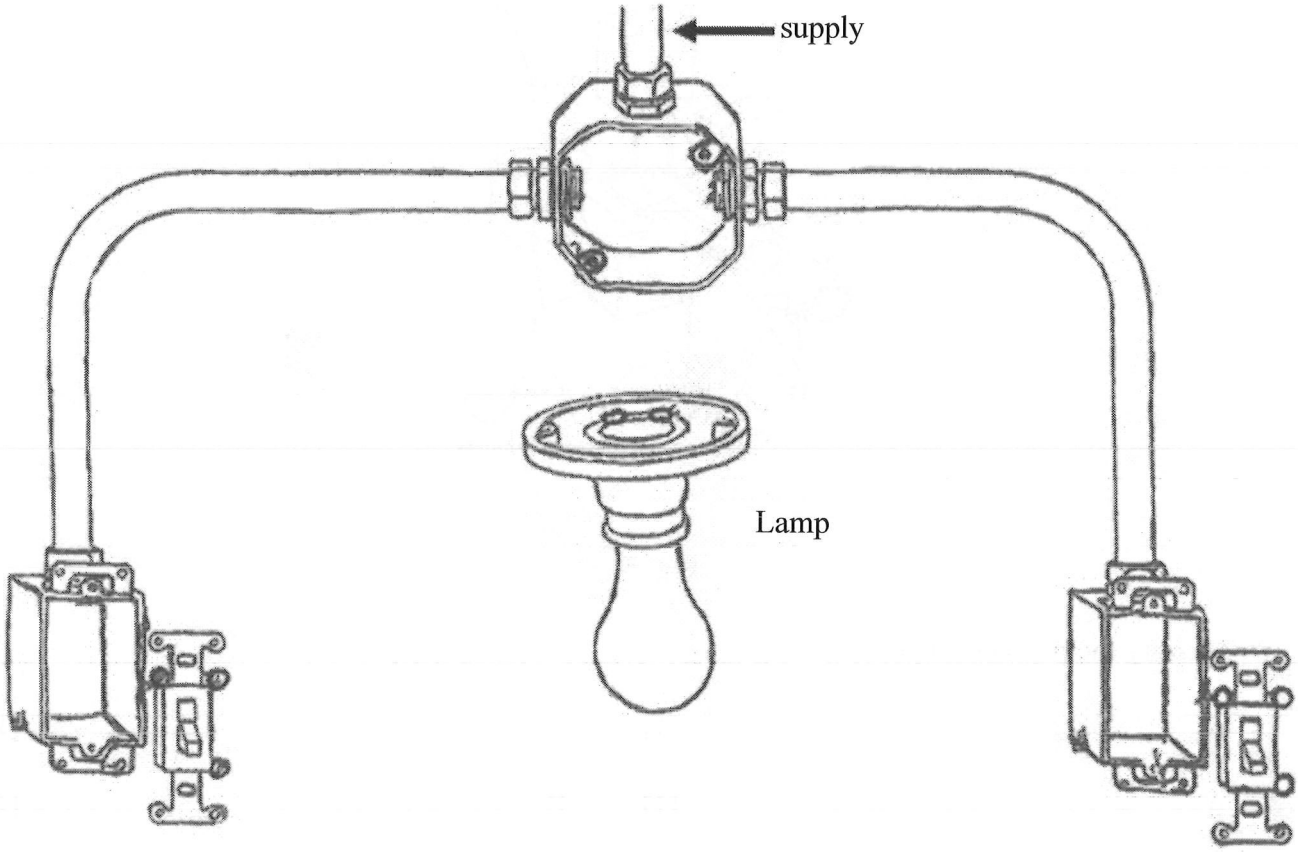


Fig. 6.2

End]

School Number	Candidate Number
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ELECTRICAL INSTALLATION

PAPER 3 PRACTICAL EXAMINATION 4130/PRA/3a
ASSIGNMENT 1

31 MARCH – 8 MAY 2025

Additional materials: **1 hour plus**
Electrical tools/supplies **30 minutes for preparation**

MINISTRY OF EDUCATION
NATIONAL EXAMINATIONS

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Answer the questions as they relate to your circuits.

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Measuring instruments and electronic calculators are allowed.

This question paper consists of _4_ printed pages.

Table of Allowable Excerpt NEC 2011

Ampacities of Insulated Conductors with Not More Than Three Current-Carrying Conductors in Raceway, Cable or Earth (Directly Buried)

Size AWG or kcmil	Temperature Rating of Conductor						Size AWG or kcmil
	60° C (140° F)	75° C (167° F)	90° C (194° F)	60° C (140° F)	75° C (167° F)	90° C (194° F)	
	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, USE, ZW	Types TBS, SA, SIS, FEP, FEPB, MI, PFA, RHH, RHW-2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW, XHHW-2, XHWN, XHWN-2, XHHN, Z, ZW-2	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, XHWN, USE	Types TBS, SA, SIS, THHN, THHW, THW-2, THWN-2, RHH, RHW-2, USE-2, XHH, XHHW, XHHW-2, XHWN, XHWN-2, XHHN	
	COPPER			ALUMINIUM OR COPPER-CLAD ALUMINIUM			
18*	—	—	14	—	—	—	—
16*	—	—	18	—	—	—	—
14*	15	20	25	—	—	—	—
12*	20	25	30	15	20	25	12*
10*	30	35	40	25	30	35	10*
8	40	50	55	35	40	45	8
6	55	65	75	40	50	55	6
4	70	85	95	55	65	75	4
3	85	100	115	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	145	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	195	230	260	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400

Adapted from Goodheart-Willcox Co, Inc.

For all circuits assume 75° C temperature, please refer to table above where applicable.

Grounding

- A six inch grounding wire should be affixed and allowed to hang on all devices or control units that should be grounded.
- Install a grounding wire in the appropriate place in the main switch.
- It is not necessary to run the grounding wire throughout the installation if the conduit run is EMT.

ASSIGNMENT 1

On your wiring boards you are required to wire:

A. a 60A, 125/250V 3-wire single phase overhead service for a residential installation with **TWO** circuits in the installation. [8]

B. **Circuit I:** **ONE** 30A, 125/250V receptacle suitable for an electric dryer. [5]

C. **Circuit II:** **TWO** 60W, 125V lamps controlled from **TWO** locations. [5]

QUESTIONS

1. What size and type are the main service copper conductors?

   Size _____ [1]

   Type _____ [1]

2. What is the size and type of circuit breaker used in the main disconnect switch?

   Size _____ [1]

   Type _____ [1]

In Circuit I:

3. State the voltage that is applied across to the dryer receptacle.

   _____ [1]

4. State the size and type of circuit breaker that is required to protect this circuit.

   Size _____ [1]

   Type _____ [1]

In Circuit II:

5. Calculate the total power used when both lamps are lit. [3]

Show all working.

6. Calculate the total current drawn when both lamps are lit. [3]

Show all working.

End]