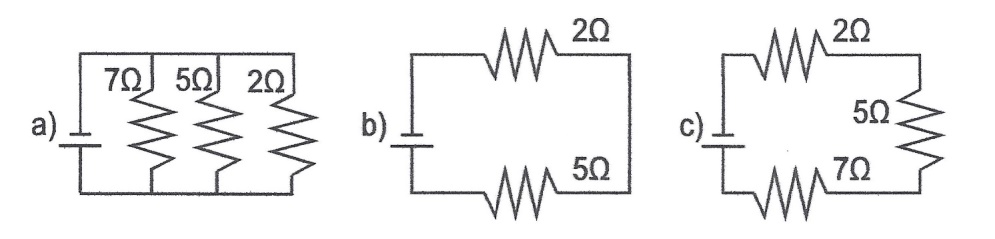
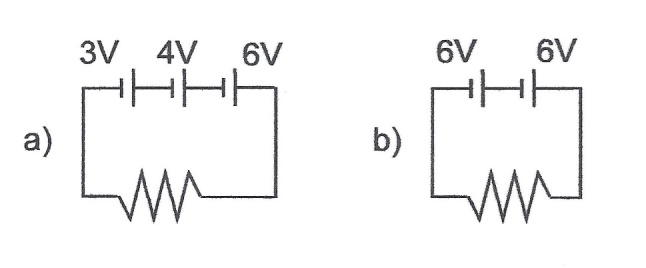
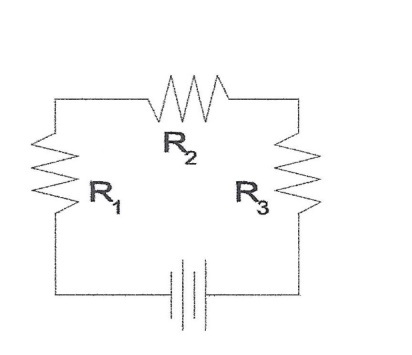
**Final control questions in electrical engineering**

1. Determine the equivalent (total) resistance for each of the following circuits below.



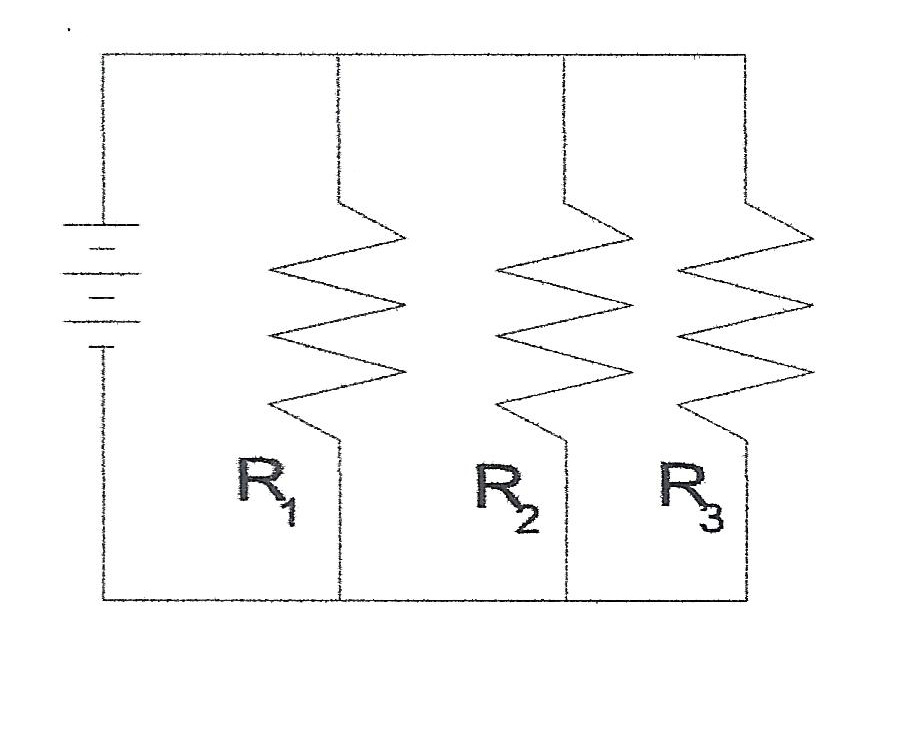
2. Determine the total voltage (electric potential) for each of the following circuits below.



3. Fill out the table for the circuit diagramed at the right.

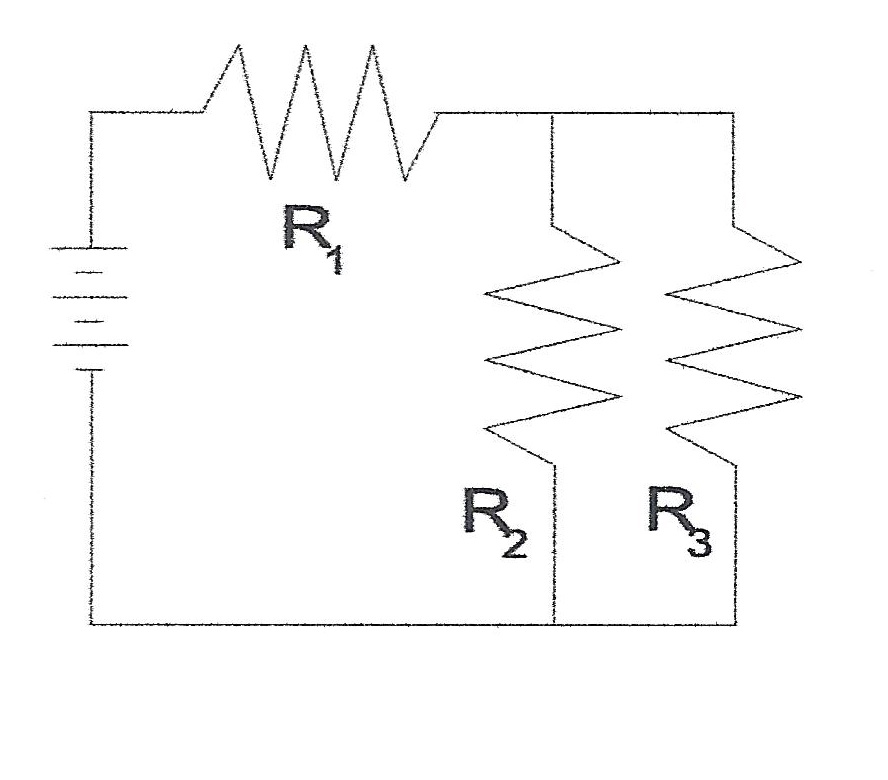
|  |  |  |  |
| --- | --- | --- | --- |
| Circuit Position | Voltage (V) | Current (A) | Resistance (Ω) |
| 1 |  |  | 10.0 |
| 2 |  |  | 20.0 |
| 3 |  |  | 30.0 |
| Total | 6.00 |  |  |

4. Fill out the table for the circuit diagramed at the right.



|  |  |  |  |
| --- | --- | --- | --- |
| Circuit Position | Voltage (V) | Current (A) | Resistance (Ω) |
| 1 |  |  | 10.0 |
| 2 |  |  | 20.0 |
| 3 |  |  | 30.0 |
| Total | 6.00 |  |  |

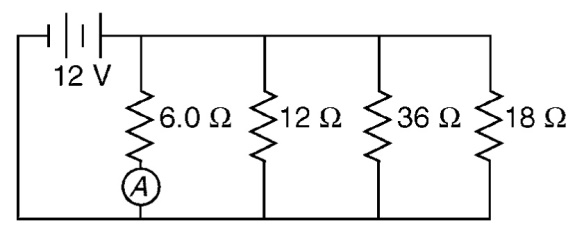
5. Fill out the table for the circuit diagramed at the right.



|  |  |  |  |
| --- | --- | --- | --- |
| Circuit Position | Voltage (V) | Current (A) | Resistance (Ω) |
| 1 |  |  | 10.0 |
| 2 |  |  | 20.0 |
| 3 |  |  | 30.0 |
| Total | 6.00 |  |  |

Questions 6 and 7 refer to the following:

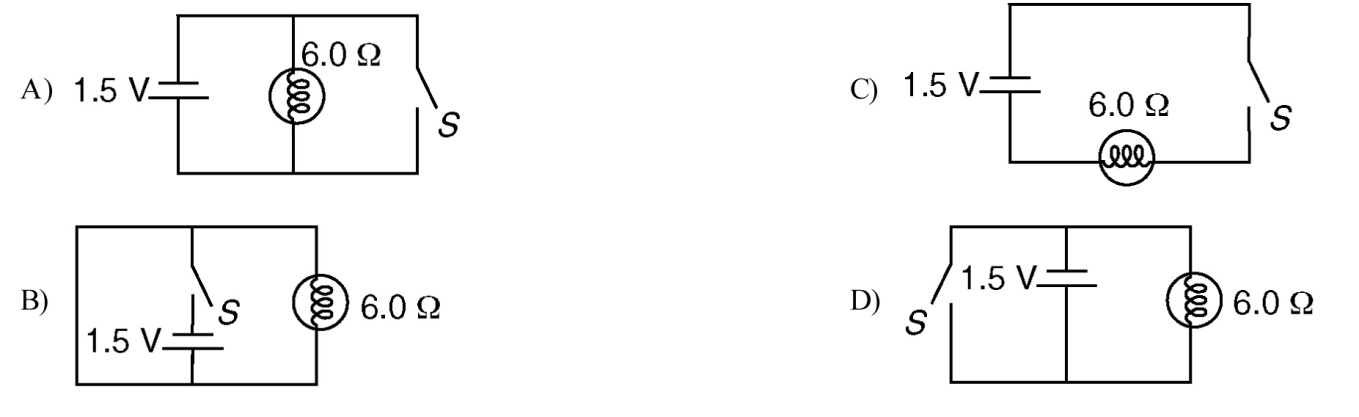
The diagram to the right represents an electric circuit consisting of four resistors and a 12-volt battery.



6) What is the equivalent resistance of the circuit shown?

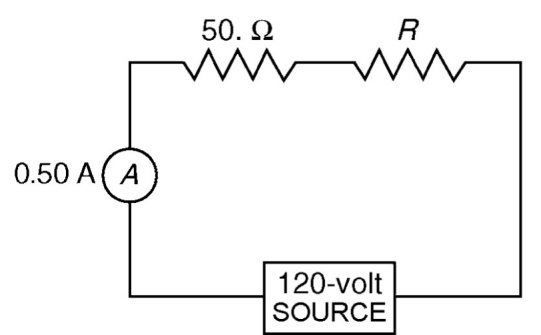
7) What is the current measured by ammeter *A* shown in the diagram?

8) A 6.0-ohm lamp requires 0.25 ampere of current to operate. In which circuit below would the lamp operate correctly when switch *S* is closed?



Questions 9 and 10 refer to the following:

A 50.-ohm resistor, an unknown resistor *R*, a 120-volt source, and an ammeter are connected in a complete circuit. The ammeter reads 0.50 ampere.

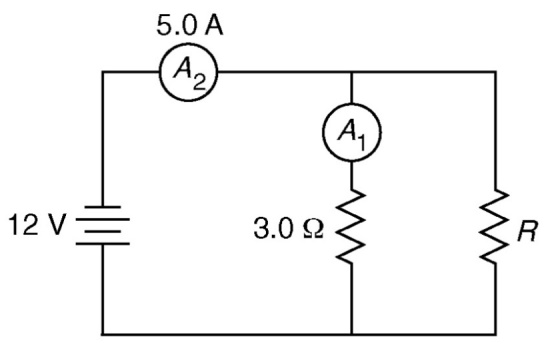


9) Calculate the equivalent resistance of the circuit shown.

10) Determine the resistance of resistor *R* shown in the diagram.

Questions 11 through 13 refer to the following:

A 3.0-ohm resistor, an unknown resistor, *R*, and two ammeters, *A*1 and *A*2, are connected as shown below with a 12-volt source. Ammeter *A*2 reads a current of 5.0 amperes.



11) Determine the equivalent resistance of the circuit shown.

12) Calculate the current measured by ammeter *A*1 in the diagram shown.

13) Calculate the resistance of the unknown resistor, *R* in the diagram shown.

14. The load across a 50.0-V battery consists of a series combination of two lamps with resistances of 125 Ωand 225 Ω.

a. Find the total resistance of the circuit.

b. Find the current in the circuit.

c. Find the potential difference across the 125-Ωlamp.

15. The load across a 12-V battery consists of a series combination of three resistances are 15 Ω, 21 Ω, and 24 Ω, respectively.

a. Draw the circuit diagram.

b. What is the total resistance of the load?

c. What is the magnitude of the circuit current?

16. The load across a 40-V battery consists of a series combination of three resistances R1, R2, and R3. R1 is 240 Ωand R3 is 120 Ω. The potential difference across R1 is 24 V.

a. Find the current in the circuit.

b. Find the equivalent resistance of the circuit.

c. Find the resistance of R2.

17. The load across a 12-V battery consists of a series combination of three resistances R1, R2, and R3. R1 is 210 Ω, R2 is 350 Ω, and R3 is 120 Ω.

a. Find the equivalent resistance of the circuit.

b. Find the current in the circuit.

c. Find the potential difference across R3.

18. Two resistances, one 12 Ωand the other 18 Ω, are connected in parallel. What is the equivalent resistance of the parallel combination?

19. Three resistances of 12 Ω each are connected in parallel. What is the equivalent resistance?

20. Two resistances, one 62 Ωand the other 88 Ω, are connected in parallel. The resistors are then connected to a 12-V battery.

a. What is the equivalent resistance of the parallel combination?

b. What is the current through each resistor?

21. A 110-V household circuit that contains an 1800-W microwave, a 1000-W toaster, and an 800-W coffeemaker is connected to a 20-A fuse. Determine the current. Will the fuse melt if the microwave and the coffeemaker are both on?

22. A 35-Ω, 55-Ω, and 85-Ωresistor are connected in parallel. The resistors are then connected to a 35-V battery.

a. What is the equivalent resistance of the parallel combination?

b. What is the current through each resistor?

23. Resistors R1, R2, and R3 have resistances of 15.0 Ω, 9.0 Ω, and 8.0 Ωrespectively. R1 and R2 are connected in series, and their combination is in parallel with R3 to form a load across a 6.0-V battery.

a. Draw the circuit diagram.

b. What is the total resistance of the load?

c. What is the current in R3?

d. What is the potential difference across R2?

24. A 15.0-Ωresistor is connected in series to a 120-V generator and two 10.0-Ω resistors that are connected in parallel to each other.

a. Draw the circuit diagram.

b. What is the total resistance of the load?

c. What is the magnitude of the circuit current?

d. What is the current in one of the 10.0-Ωresistors?

e. What is the potential difference across the 15.0-Ωresistor?

WORKSHEET SERIES AND PARALLEL

Power

Supply

A

B

C

*For questions 1 – 3 consider this circuit*

1. How many pathways are there for electricity to flow through?
2. Is this a series or parallel circuit?
3. If light bulb A was removed would light bulb B still work? Light bulb C?

Power

Supply

A

B

C

*For questions 4 through 7 consider this circuit*

1. How many pathways are there for electricity to flow through?
2. Is this a series or parallel circuit?
3. If a light bulb A was removed would light bulb B still work? Light bulb C?
4. Would the removal of any light bulb affect the other two?

B

A

Power

Supply

C

*For questions 8 through 11 consider this circuit*

1. How many pathways are there for electricity to flow through?
2. Is this a series or parallel circuit?
3. If a light bulb A was removed would light bulb B still work? Light bulb C?
4. What would happen if light bulb B. was removed?

*Trace the path electricity could take in the following circuits and identify the series and parallel parts*

E

C

B

B

*In the*

F

D

D

E

C

A

A

Power

Supply

Power

Supply

Series and Parallel Circuits Worksheet

Use the chart to answer each of the following questions. Be sure to place a box around the calculated values requested.

1. A 20 Ohm lamp and a 5 Ohm lamp are connected in series and placed across a potential difference of 50 V. What is the equivalent resistance of the circuit? What is the voltage drop across each lamp? What is the power dissipated in each lamp?
2. Three identical lamps are connected in series to a 6 V battery. What is the voltage drop across each lamp?
3. The load across a battery consists of two resistors, with values of 15 Ohm and 45 Ohm connected in series. What is the total resistance of the load? What is the voltage of the battery if the current in the circuit is 0.1 A?
4. A lamp having a resistance of 10 Ohm is connected across a 15 V battery. What is the current through the lamp? What resistance must be connected in series with the lamp to reduce the current to 0.5A?
5. A 75 W bulb is connected to a 120 V source. What is the current through the bulb? What is the resistance of the bulb? A lamp dimmer puts a resistance in series with the bulb. What resistance would be needed to reduce the current to 0.3 A?
6. Three identical lamps are connected in parallel to each other and then connected to a 6 V battery. What is the voltage drop across each lamp?
7. A 16 Ohm and a 20 Ohm resistor are connected in parallel. A difference of potential of 40 V is applied to the combination. Compute the equivalent resistance of the parallel circuit. What is the current in the circuit? How large is the current through the 16 Ohm resistor?
8. A circuit contains a 10 Ohm heater and six 240 Ohm lamps, each containing a 60 Watt bulb, all connected in series. The voltage across the circuit is 120 V. What is the current in the circuit when only 4 lamps are turned on? What is the current in the circuit when all the lamps are turned on? What is the current in the circuit when all six lamps and the heater are turned on? If the circuit has a fuse which will melt if the current exceeds 12 A, will the fuse melt?
9. Three 15 Ohm resistors are connected in parallel and placed across a 30 V potential difference. What is the equivalent resistance of the parallel circuit? What is the current through the entire circuit? What is the current though each branch of the parallel circuit?
10. A 12 Ohm resistor and a 15 Ohm resistor are connected in parallel and placed across the terminals of a 15 V battery. What is the equivalent resistance of the parallel circuit? What is the current through the entire circuit? What is the current though each branch of the parallel circuit?
11. The current out of the source in the figure below is 5 mA. How much current does each milliammeter in the circuit indicate?

VS

A

A

A

R1

R2

R3

1. The following resistors (one each) are connected in a series circuit. 1, 2, 5, 12 and 22 Ω. Determine the total resistance.
2. If the total resistance in the figure below is 18 kΩ, what is the value of R - 5?

R1

5 kΩ

R2

1 kΩ

R3

2 kΩ

R4

4 kΩ

R5

?

1. What is the current in the circuit to the right?

2.5 MΩ

R2

16 V

1 MΩ

500 kΩ

R3

R1

1. Four equal - value resistors are in series with a 5 V battery and 2.5 mA are measured. What is the value of each resistor?
2. Five resistors are in series with a 20 V source. The voltage drops across four of the resistors are 1.5 V, 5.5 V, 3 V, and 6 V. How much voltage is dropped across the fifth resistor?
3. In the circuit below, determine the resistance of R4.

10 V

50 Ω

5 V

25 Ω

5 Ω

R4

1 V

4 V

1. If there are 10 V across R1 in the figure below, what is the voltage across each of the other resistors?
2. Five series resistors each handle 50 mW. What is the total power?
3. How much voltage would you read in AB, AC, CD, EC?

R4

E

D

R3

R2

R1

5 V

A

B

C

1. The following resistors are in parallel: 1000, 800, 500, 200, and 100 Ω. What is the total resistance?
2. Suppose that you need a total resistance of 100 Ω. The only resistors that are immediately available are.
3. Three 600 Ω resistors are connected in parallel, and 5 V are applied across the parallel circuit. How much current is there out of the source?
4. Six resistors of
5. Each branch in a five branch parallel
6. Determine the unknown resistances in the circuit in the figure below.

I2 = 0.5 A

5 A

R3

R1 = 10 Ω

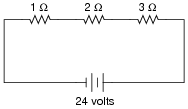
I3

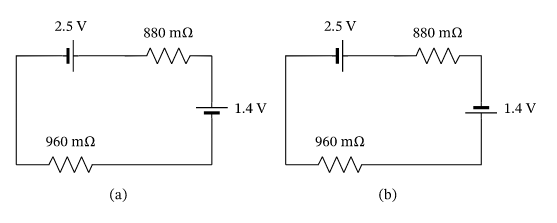
I1 = 1 A

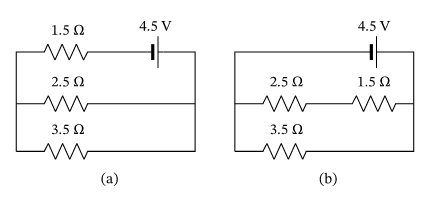
VS

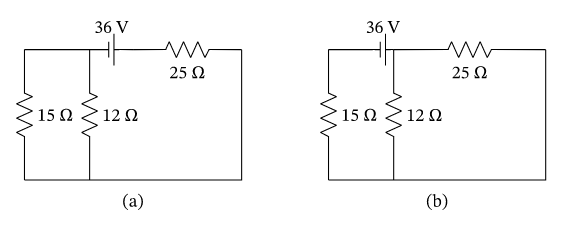
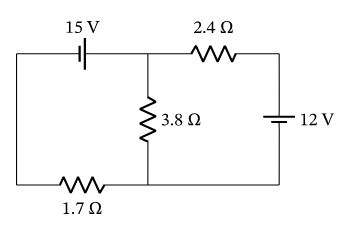
R2

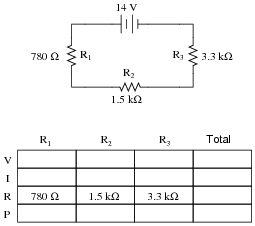
1. What resistance value in parallel with 100 Ω produces a total resistance of 40 Ω?
2. In a kitchen, three 75 W bulbs are connected in parallel across 120 V. All three bulbs are on. At 6:00 am, a 360 W coffeepot also in parallel is turned on. Calculate the total current drawn.
3. Find the resistance that must be put in series with a resistor of 400 Ω such that, when 120 V is applied across the combination, the current in the circuit will be 0.010 A.
4. A 10 Ω resistor, a 11 Ω resistor and a 39 Ω resistor are connected in series across a potential difference of 120 V. Calculate the voltage drop across the 10 Ω resistor.
5. Three resistors, whose values are 35 Ω, 45 Ω, and 85 Ω, are connected in parallel across a 35 V battery. What is the current through the 35 Ω resistor?
6. In this circuit, three resistors receive the same amount of current (4 amps) from a single source. Calculate the amount of voltage “dropped” by each resistor, as well as the amount of power dissipated by each resistor:



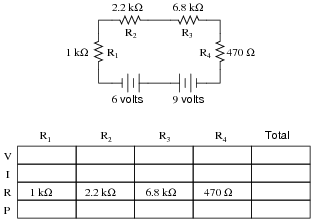
1. Q3: The circuits (a) and (b) appear very similar but are slightly different from each other. What is the difference in the total current between the circuit shown in diagram (a) and the circuit shown in diagram (b)? Give your answer to one decimal place.
2. Q4: What is the ratio of the total current produced by the circuit shown in diagram (a) to the total current produced by the circuit shown in diagram (b)? Give your answer to two decimal places.



1. Q5: What is the ratio of the total current produced by the circuit shown in diagram (a) to the total current produced by the circuit shown in diagram (b)? Give your answer to two decimal places.
2. Q6: The diagram shows a circuit containing two cells.
3. What is the current at the negative terminal of the 15-volt battery? Give your answer to one decimal place.
4. What is the current at the negative terminal of the 12-volt battery? Give your answer to one decimal place.
5. What is the current through the 3.8 Ω resistor? Give your answer to one decimal place.
6. Complete the table of values for this circuit:



1. Complete the table of values for this circuit:



1. In a series circuit, certain general rules may be stated with regard to quantities of voltage, current, resistance, and power. Express these rules, using your own words:

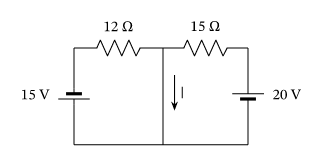
“In a series circuit, voltage . . .”

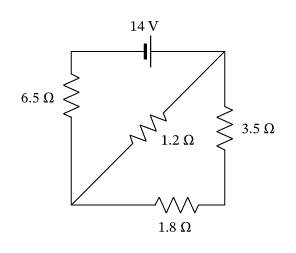
“In a series circuit, current . . .”

“In a series circuit, resistance . . .”

“In a series circuit, power . . .”

For each of these rules, explain *why* it is true.

Q1: Find the total current in the circuit shown. Give your answer to one decimal place.

Q2: What is the current 𝐼 in the circuit shown? Give your answer to two decimal places.

Calculate single phase circuits

1. The frequency of the alternating current used in aircraft is 400 Gts. Determine the period.
2. The angular frequency of the alternating current is shown in Figs. Determine the frequency and period of that current
3. If the frequency of the alternating current is f = 400 gts; 25 kgts; 2 kgts; 40 kgts; If it is 1250 kgts, find the signal cycle
4. T = 0.2 s; 1 s; 40 ms; 50; 250; Determine the frequency f of a variable sinusoidal signal with cycles of 0.8mks
5. Periods T = 2.5 • 10-4; 10-3; 20 • 10-2; 5 • 10-5; 8 • 10-4; 4 • Find the angular frequency of a sinusoidal current of 10-6 sec
6. The angular frequency of an alternating current
7. ω= 3140; 942; 12560; 5024; 94200; If 10048 • 1 / sec, find the frequency and period of the signal.
8. The alternating current generator has a rotational frequency of 2800 rpm. If the pole pair of the generator is equal to 6, find the angular frequency, period and frequency of the electric current
9. An electric hob with power R = 600 W is connected to the AC mains with voltage U = 220 V. Determine the current, resistance, and amount of energy consumed by the hob during operation t = 3 hours.
10. The rotation speed of the alternator generating alternating current is rpm, the current cycle is T = 0.005 sec. How many pairs of poles should a generator have?
11. A coil with an inductance of 0.01 g is connected to a network with a voltage of 127 V and a frequency of 50 gts. Determine the reactive resistance of the circuit, the current in it and the reactive power: Determine the reactive resistance and current at a frequency of 500 gts.
12. A coil with an inductance of 51 mJ and an active resistance of 12 Ohms is connected to a network with a voltage of 250 V and a frequency of 50 gts. Determine the following quantities: Xl, Z, I, Ua, UL, Cosh, and R.
13. Two parallel mains circuits are connected to a 230 V mains supply. One of the parallel networks is connected to a coil with active resistance r1 = 1 Ohm and reactive resistance  Ohm, and the other is connected to a coil with resistances r2 = 3 Ohm and Ohm, respectively. Find the currents in these networks and the total current in the circuit.
14. Find XC, I, and WMs connected to a mains with a capacitor voltage of 380 V and a frequency of 50 gts with a capacitance of 80 μf.
15. A 14 kW, Cosph = 0.6 motor is connected to the mains with a voltage of 380 V and a frequency of 50 gts.

A capacitor must be connected to increase the Cosh of the device to 0.9. Find the capacitance of the capacitor

1. An ac circuit consists of a pure resistance of 10Ω and is connected to an ac supply of 230 V, 50 Hz. Calculate the (i) current (ii) power consumed and (iii) equations for voltage and current.
2. A pure inductive coil allows a current of 10A to flow from a 230V, 50 Hz supply. Find (i) inductance of the coil (ii) power absorbed and (iii) equations for voltage and current.
3. A 318µF capacitor is connected across a 230V, 50 Hz system. Find (i) the capacitive reactance (ii) rms value of current and (iii) equations for voltage and current.
4. A coil having a resistance of 7Ω and an inductance of 31.8mH is connected to 230V, 50Hz supply. Calculate (i) the circuit current (ii) phase angle (iii) power factor (iv) power consumed
5. A 200 V, 50 Hz, inductive circuit takes a current of 10A, lagging 30 degree. Find (i) the resistance (ii) reactance (iii) inductance of the coil
6. A Capacitor of capacitance 79.5µF is connected in series with a non-inductive resistance of 30Ω across a 100V, 50Hz supply. Find (i) impedance (ii) current (iii) phase angle (iv) Equation for the instantaneous value of current
7. A 230 V, 50 Hz ac supply is applied to a coil of 0.06 H inductance and 2.5 Ω resistance connected in series with a 6.8 µF capacitor. Calculate (i) Impedance (ii) Current (iii) Phase angle between current and voltage (iv) power factor (v) power consumed
8. A resistance R, an inductance L=0.01 H and a capacitance C are connected in series. When an alternating voltage v=400sin (3000t-20º)is applied to the series combination, the current flowing is 10 sin(3000t-65º). Find the values of R and C.
9. A coil of pf 0.6 is in series with a 100µF capacitor. When connected to a 50Hz supply, the potential difference across the coil is equal to the potential difference across the capacitor. Find the resistance and inductance of the coil.
10. The main conditional symbols in electric circuits and the main types of electric circuit schemes
11. Direct current electric circuits and methods of their calculation
12. Single-phase alternating current electric circuits
13. Three-phase alternating current electric circuits
14. Transformers
15. DC machines
16. Asynchronous machines
17. Synchronous machines
18. What are the elements of circui?
19. Three resistors, whose values are 35 Ω, 45 Ω, and 85 Ω, are connected in parallel across a 35 V battery. What is the current through the 35 Ω resistor?
20. What is Circuit?
21. What are the types of electrical circuits?
22. A 10 Ω resistor, a 11 Ω resistor and a 39 Ω resistor are connected in series across a potential difference of 120 V. Calculate the voltage drop across the 10 Ω resistor.
23. Give information about the symbols of the circuits used in electrical circuits
24. Find the resistance that must be put in series with a resistor of 400 Ω such that, when 120 V is applied across the combination, the current in the circuit will be 0.010 A.
25. Where does an ammeter go in a circuit? (How does an ammeter connect to measure current?)
26. Complete the table of values for this circuit:
27. State Om's law and write the formula
28. Fill out the table for the circuit diagramed at the right.
29. State Krichoff's law of current and write the formula
30. In a kitchen, three 75 W bulbs are connected in parallel across 120 V. All three bulbs are on. At 6:00 am, a 360 W coffeepot also in parallel is turned on. Calculate the total current drawn.
31. State Krichoff's law of voltage and write the formula
32. Define: Node (OR) Junction, Loop & branch
33. An Electric iron is rated 1000W, 240V. Find the current drawn & resistance of the heating element
34. Write down the expression of equivalent resistance for ‘n’ – number of resistors in series and parallel connection
35. What is an Energy Source?
36. A 15 Ω resistor, a 12 Ω resistor and a 35 Ω resistor are connected in series across a potential difference of 120 V. Calculate the voltage drop across the 15 Ω resistor.
37. What is Conductor? What makes a good conductor?
38. What are called closed circuits?
39. Three resistors, whose values are 30 Ω, 45 Ω, and 90 Ω, are connected in parallel across a 35 V battery. What is the current through the 36 Ω resistor?
40. What are called open circuits?
41. What are called short circuits?
42. What are called parallel circuits?
43. In a series circuit, certain general rules may be stated with regard to quantities of voltage, current, resistance, and power. Express these rules, using your own words:

“In a series circuit, voltage . . .”

“In a series circuit, current . . .”

1. What are the advantages of 3 phase circuits over single phase circuits?
2. What is Mutual Inductance?
3. Give information about the symbols of the circuits used in electrical circuits
4. Where does an ammeter go in a circuit? (How does an ammeter connect to measure current?)
5. What are some advantages and disadvantages of three-phase current as compared to single-phase current?
6. State the principle of operation of a transformer
7. State the relationship between line voltage & phase voltage and line current & phase current of a 3 phase delta connected system
8. Write the expression for the instantaneous values of emfs in a 3 phase circuit
9. What are the advantages of 3Φ system?
10. Basic working principle of transformer
11. Describe the construction details of single phase transformer
12. What is the direct current?
13. Draw the circuit for various types of d.c motor
14. Tell us about Om’s law for part and all of the chain
15. Give some application of D.C motor.
16. Mention the application of DC generator?
17. State the principle of operation of a transformer.
18. Write down the EMF equation of a single phase transformer
19. Explain the different types of dc motor with neat sketch.
20. Write shorts notes on the types of dc machines
21. What is a Resonant frequency?
22. What is the series resonance?
23. What is a parallel resonance?
24. Determine the power factor of a RLC series circuit with R=5ohm, XL=8ohm and XC=12ohm.
25. Define Reactive power.
26. Define Apparent power and Power factor.
27. What are the materials used for wiring?
28. Draw the circuit for various types of d.c motor.
29. Give some application of D.C motor.
30. Write the principle of DC Motor?
31. Separately excited DC generator
32. Self Excited DC Generator
33. Describe the construction details of single phase transformer
34. Basic working principle of transformer
35. Split Phase Induction Motor
36. Working principle of a DC generator: