
DC ELECTRICAL FUNDAMENTALS TRIAL MID-SEMESTER TEST

- This test is **closed** book, calculator permitted.
- Answer questions in the spaces provided.
- Clearly label all currents, resistors and voltage drops in the circuits and state any assumptions in order to obtain a full mark
- When calculating values, show clearly all steps, starting with the formula, then substituting with numbers and finally show the measuring units of the obtained result. Otherwise **NO MARKS** are given
- Time permitted 1½ hours.
- **60 MARKS TOTAL (70% pass)**

Q1) What does the ohmmeter measure? [1 mark]

Q2) What does the voltmeter measure? [1 mark]

Q3) What does the ammeter measure? [1 mark]

Q4) Define the term 'resistor'. [1 mark]

Q5) Define the term 'battery'. [1 mark]

Q6) How a voltmeter always should be connected? (circle the correct answer) [1 marks]
a. in parallel
b. in series
c. doesn't matter

Q7) How an ammeter always should be connected? (circle the correct answer) [1 mark]
a. in parallel
b. in series
c. doesn't matter

Q8) How can twenty million Ohms be expressed in MΩ? [1 mark]

Q9) How many μA is 0.0000123 A? [1 mark]

Q10) What is 'electrical current'? [1 mark]

Q11) What is 'voltage'? [2 marks]

Q12) What does the abbreviation 'e.m.f.' mean? What is the difference between 'e.m.f.' and 'voltage'?

Q13) Define the process of 'measurement'. [1 mark]

Q14) What does 'a base unit of measurement' mean? [1 mark]

Q15) List the base units in the system SI. [3 marks]

Q16) What does a 'derivative unit of measurement' mean? [1 mark]

Q17) What are the main advantages of the system SI? **[2 marks]**

Q18) What does 'scientific notation' mean? **[1 mark]**

Q19) What does 'engineering notation' mean? **[1 mark]**

Q20) Why are scientific and engineering notations being used? **[1 mark]**

Q21) Which of the two notations is more useful in electro technology? **[1 mark]**

Q22) Express these numbers in a scientific notation **[4 marks]**

200
5000
0.000063
0.00000015

Q23) Express these numbers in an engineering notation **[4 marks]**

300
7000
0.000047
0.00000058

Q24) Perform the following operations, using powers of ten **[4 marks]**

$$(2 \times 10^2) + (5 \times 10^3) =$$

$$(10 \times 10^{-2}) - (3 \times 10^{-3}) =$$

$$(5 \times 10^5) \times (4 \times 10^7) =$$

$$(25 \times 10^4) \div (5 \times 10^{-3}) =$$

Q25) Express each quantity using a metric prefix **[4 marks]**

$$50\,000\text{ V} =$$

$$25\,000\,000\,\Omega =$$

$$0.000036\text{ A} =$$

$$0.000000000047\text{ F} =$$

Q26) Add these quantities **[4 marks]**

$$200\,\Omega + 2\text{ k}\Omega =$$

$$50\text{ kV} + 5\text{ MV} =$$

$$630\,\mu\text{A} + 10\text{ mA} =$$

$$1500\text{ pF} + 120\text{ nF} =$$

Q27) What is an atom? **[1 mark]**

Q28) Draw a diagram of an atom according to the Bohr model. Clearly identify all the particles **[2 marks]**

Q29) What does the term ‘atomic number’ mean? **[1 mark]**

Q30) What is an ‘electron shell’? **[1 mark]**

Q31) Is it true that electrons at the L shell possess more energy than the ones in the K shell? **[1 mark]**

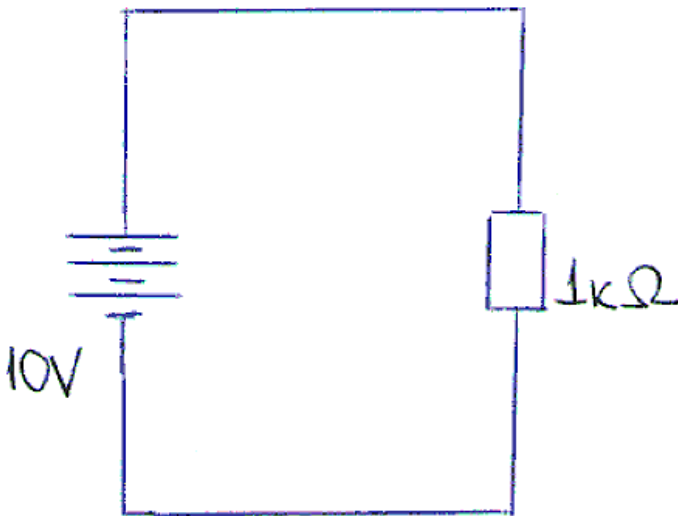
Q32) What are ‘valence electrons’? **[1 mark]**

- Q33)** Define 'conductors'. **[1 marks]**
- Q34)** Define 'insulators'. **[1 marks]**
- Q35)** Define 'semiconductors'. **[1 marks]**
- Q36)** How many Coulombs does the number 123.1×10^{17} represent? **[2 marks]**
- Q37)** The voltage in a circuit is 10 V. The el. charge is 500 mC. What is the energy? **[2 marks]**
- Q38)** What two *general* types of batteries do you know? **[1 marks]**
- Q39)** What types of primary cells do you know? **[1 marks]**
- Q40)** What types of secondary cells do you know? **[1 marks]**
- Q41)** What are the advantages of the lead-acid batteries? **[1 marks]**

- Q42)** What are the advantages of the lithium-ion batteries? **[1 marks]**
- Q43)** How long time it takes to transfer 2 C of el. charge with an el. current of 200 μA ? **[2 marks]**
- Q44)** What is 'memory effect'? **[1 marks]**
- Q45)** What is the difference between a potentiometer and a rheostat? **[1 marks]**
- Q46)** What is the resistance value and the tolerance of a resistor marked with red, violet, orange, gold? **[1 marks]**
- Q47)** Calculate the upper and the lower limit for the resistor value given above **[3 marks]**
- Q48)** What are the main advantages of electronic switches as opposed to mechanical? **[1 marks]**
- Q49)** What is the difference between a fuse and a circuit breaker? **[1 marks]**

Q50) Find the resistance of a 100 m copper wire, with a cross-sectional area of 1 mm^2 . The resistivity of copper is $\rho (\text{Cu}) = 1.75 \times 10^{-8} \Omega\text{m}$. **[3 marks]**

Q51) In the circuit below calculate the value of the current. **[3 marks]**

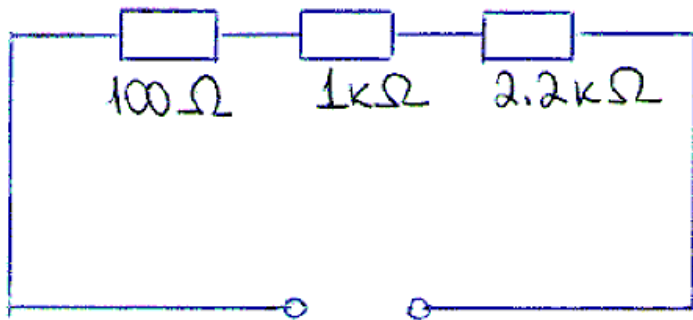


Q52) For the circuit in the previous question Q12 what resistor power values you would use? **[3 marks]**

Q53) What is the cost of the consumed electrical energy, if a heater with a power rating of 2500 W is switched on for 10 hours? Use the domestic supply tariff for Western Australia, which in July 2012 was 24.8866 cents/kWh. Disregard the daily supply charges.

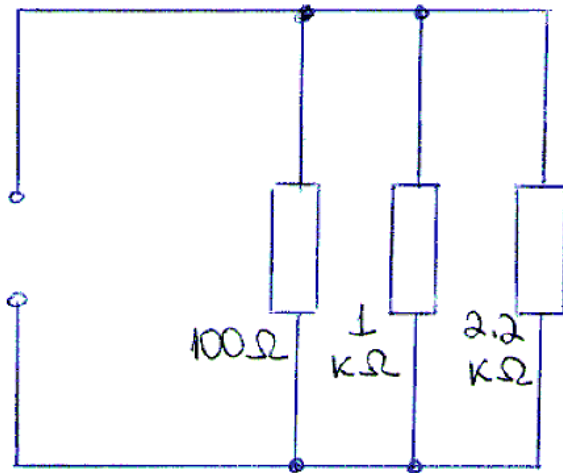
Q54) Given the following circuit calculate the total resistance.

[3 marks]



Q55) Given the following circuit calculate the total resistance.

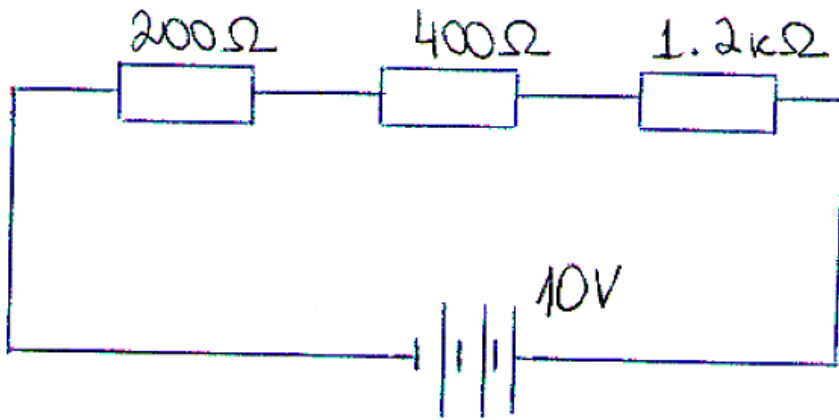
[3 marks]



Q56) Calculate the power rating of the resistors from Q55 above assuming a power supply of 10V.

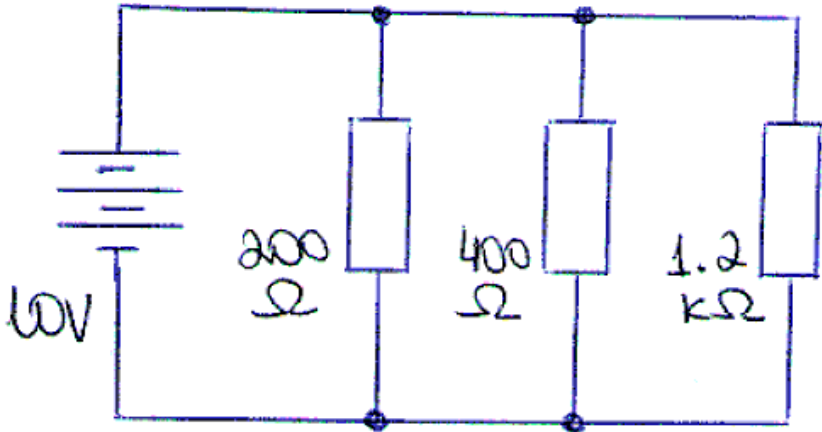
[3 marks]

Q57) Calculate the following circuit using three different methods of calculation. By achieving the same result three times you can be certain in its correctness. Also, in such a way you demonstrate that you can correct your mistakes independently, without the need of a tutor. **[6 marks]**



Q58) The input power of a machine is 150 W. The efficiency of the machine is 75 %. What is the output power? **[2 marks]**

Q59) Calculate the following circuit using three different methods of calculation. By achieving the same result three times you can be certain in its correctness. Also in such a way you demonstrate that you can correct your mistakes independently, without the need of a tutor. **[6 marks]**



END OF TEST
(Check your work!)