

## Grade 10 Science: Electric circuits revision (2014)

### Multiple choice

1.1 Which ONE of the following is the unit of measurement for the rate of flow of charge?  
A Ohm  
B Volt  
C Ampere  
D Coulomb

1.2 The equivalent **units** for the ampere and the volt respectively are:

- A.  $C \cdot s^{-1}$  and  $J \cdot C^{-1}$
- B.  $Q \cdot t$  and  $W \cdot t$
- C.  $C \cdot t^{-1}$  and  $J \cdot Q^{-1}$
- D.  $V \cdot R$  and  $W \cdot Q$

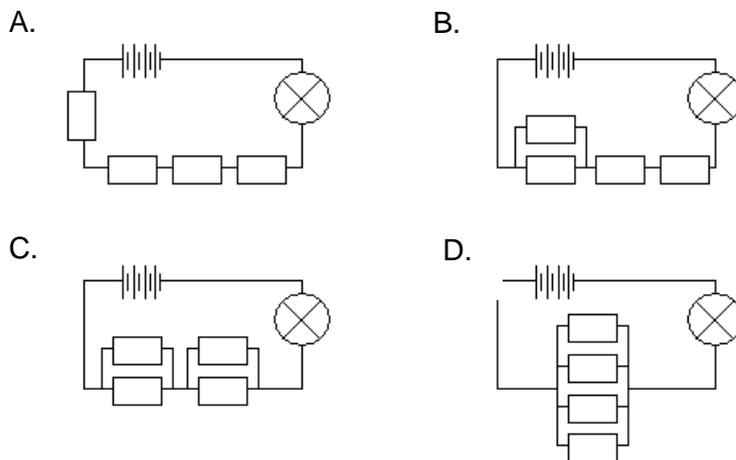
1.3 2. Complete the following 2 sentences:

- I Resistors in series are \_\_\_\_\_ dividers
- II Resistors in parallel are \_\_\_\_\_ dividers

Select the correct combination of answers that will make I and II true.

- B I voltage                      II voltage
- A I current                      II current
- C I current                      II voltage
- D I voltage                      II current

1.4 If all the resistors in the circuit below are identical, in which of the following circuits will the bulb shine the dimmest?



1.5 The equivalent unit of the **volt** is:

- A.  $J \cdot C^{-1}$
- B.  $A \cdot \Omega^{-1}$
- C.  $A \cdot s^{-1}$
- D.  $\Omega \cdot A^{-1}$

1.6 A simple circuit is made up of a 24V battery, conducting wires and a bulb. If a current of 0.5A flows through the bulb, how long will it take for the bulb to give off 48J of energy?

A. 1 second

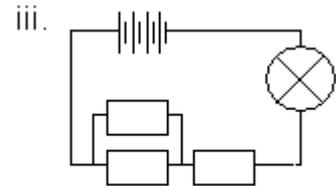
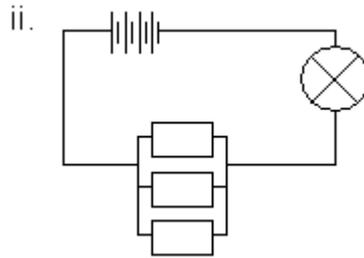
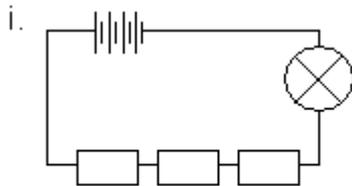
B. 4 seconds

C. 0.25 seconds

D. 576 seconds

(2)

1.7 Rank the bulbs in the following circuits from brightest to most dim...



A. i, ii and iii

B. i, iii and ii

C. ii, iii and i

D. iii, ii and i

1.8 The dimensions of four pieces of copper wire are given below. Which of the four wires will provide the **most** resistance to the flow of charge?

A. 5cm in length, 10cm in diameter at 10°C

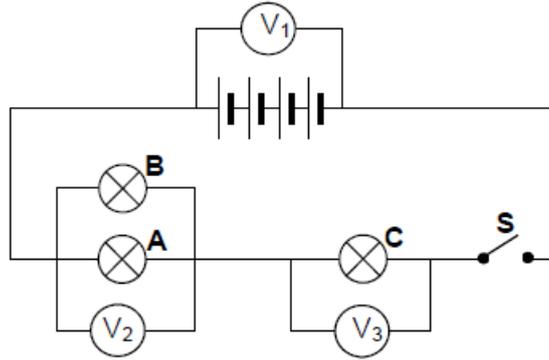
B. 50cm in length, 10cm in diameter at 100°C

C. 5cm in length, 10cm in diameter at 100°C.

D. 50cm in length, 10cm in diameter at 10°C

## Long questions

2. Learners set up a circuit as shown in the diagram below. The emf of each cell is 1,5 V. Each of bulbs **A** and **B** has a resistance of  $2\ \Omega$  and bulb **C** has a resistance of  $3\ \Omega$ .



- 2.1 Calculate the effective resistance of bulbs A and B. (3)  
Switch S is now closed for a short time.
- 2.2 Determine the reading on:
- 2.2.1 Voltmeter V1 (1)
- 2.2.2 Voltmeter V3 (2)
- 2.3 Calculate the energy transferred in bulb C in 3 seconds if the current in the circuit is 2 A. (5)
- 2.4 ALL the bulbs are now connected in parallel. How will the total current in the circuit be affected? Write down only INCREASES, DECREASES or REMAINS THE SAME. (1)

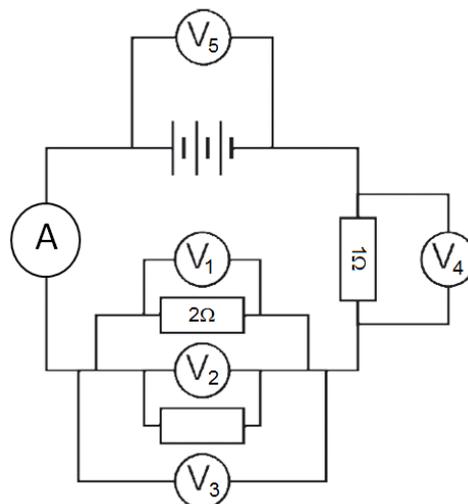
### QUESTION 3

- 3.1 Answer the following questions by just writing down the answer (1 word):
- 3.1.1 A perspex ruler is rubbed with a silk cloth, what charge will the ruler obtain?
- 3.1.2 Resistors in series are \_\_\_\_\_ dividers
- 3.1.3 An object that opposes the flow of current
- 3.1.4 A voltmeter measures the amount of \_\_\_\_\_ per charge (4)
- 3.2 Define the following terms
- 3.2.1 Resistance (1)
- 3.2.3 Series circuit (2)
- [7]

### QUESTION 4

Three 1,5 V cells are connected as shown in the diagram below. A  $2\ \Omega$  resistor (under  $V_1$ ) is in parallel with an unknown resistor. The combined parallel resistance is  $1,5\ \Omega$ . The reading on  $V_4$  is 3 V and the resistance of the resistor under  $V_4$  is  $1\ \Omega$ .

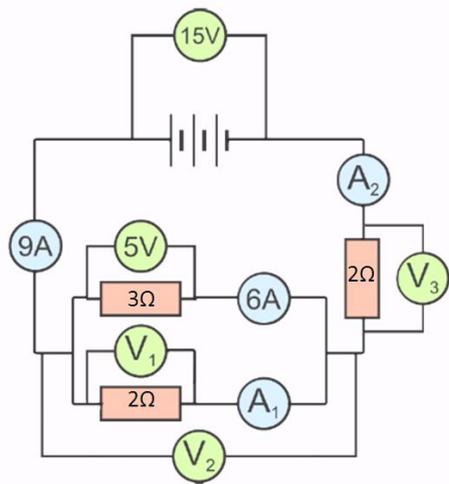
Answer the questions that follow:



- 4.1 What is the reading on voltmeter  $V_5$ ? (1)
- 4.2 What is the reading on  $V_1$ ? (2)
- 4.3 Calculate the reading on A. (3)
- 4.4 Calculate the resistance of the unknown resistor. (4)
- 4.5 Calculate the amount of charge that flows through the ammeter in 2 seconds. (3)
- 4.6 The resistor under  $V_4$  becomes hot. This is due to energy transferred in the resistor. Calculate the amount of energy transferred in the resistor. (3)

### QUESTION 5

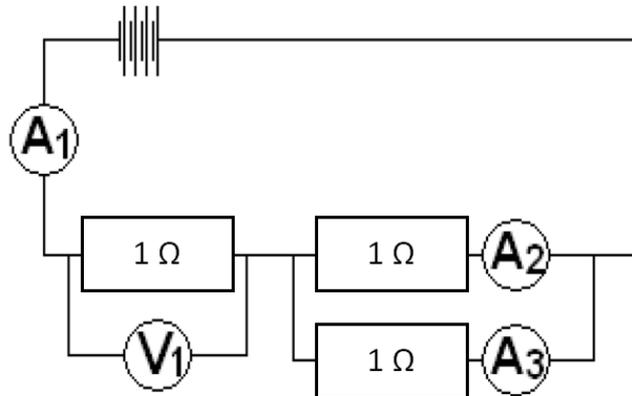
5. Answer the following questions with data from the circuit diagram below:



- 5.1 Give the reading on  $V_2$ . (1)
- 5.2 Calculate the reading on  $A_1$ . (2)
- 5.3 Calculate the reading on  $V_3$ . (2)
- 5.4 If the  $3\ \Omega$  resistor transfers 6 J of energy, calculate the amount of charge that flowed through it. (4)
- 5.5 How long (in minutes) does it take 60 C of charge to flow through the  $3\ \Omega$  resistor? (3)

### QUESTION 6

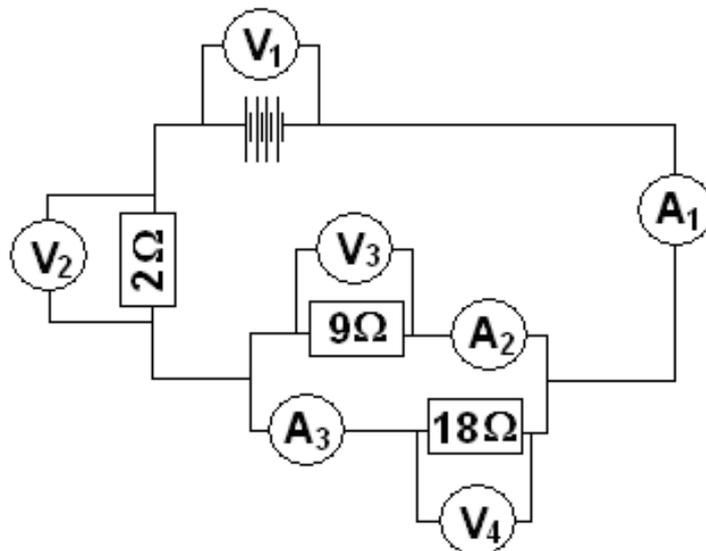
6.1 The following circuit consists of 3 identical resistors of  $1\Omega$  each, a voltmeter and 3 ammeters as shown in the sketch. Four 10V cells are connected in series to create a 40V battery.



- 6.1.1 Give the total resistance of the circuit (you may only give an answer). (1)
- 6.1.2 Calculate the total current in the circuit (i.e. The reading on  $A_1$ ) (3)
- 6.1.3 Give the readings on  $A_2$  and  $A_3$ . (1)
- 6.1.4 Calculate the reading on  $V_1$ . (2)
- [11]

### QUESTION 7

Consider the circuit below...

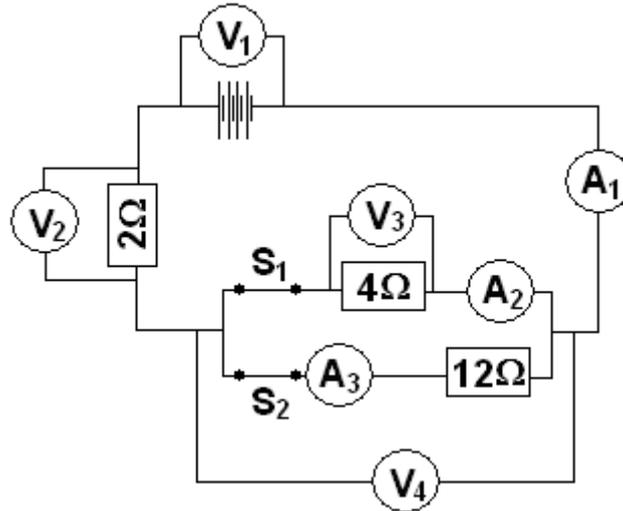


If the reading on voltmeter  $V_4$  is 36V, calculate...

- 7.1 The reading on ammeter  $A_3$  (3)
- 7.2 The reading on ammeter  $A_2$  (3)
- 7.3 The reading on ammeter  $A_1$  (1)
- 7.4 The total resistance of the circuit. (3)
- 7.5 The reading on voltmeter  $V_1$  (2)

### QUESTION 8

Consider the circuit below...

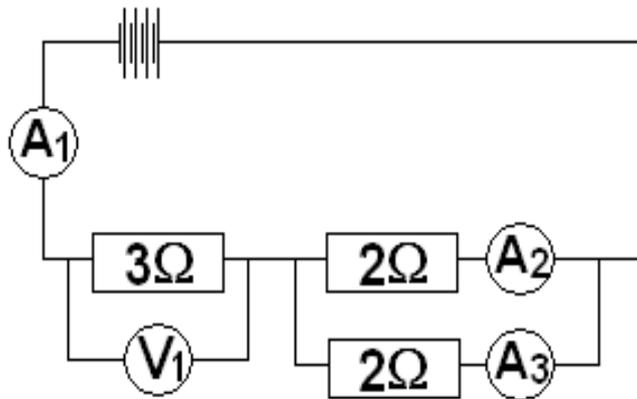


If each cell in the battery has a potential difference of 2.5V, calculate...

- 8.1.1 The total resistance of the circuit. (3)
- 8.1.2 The reading on voltmeter  $V_1$  (1)
- 8.1.3 The reading on ammeter  $A_1$  (3)
- 8.1.4 The reading on voltmeter  $V_2$  (3)
- 8.1.5 The reading on voltmeter  $V_4$  (2)
- 8.1.6 The reading on voltmeter  $V_3$  (1)
- 8.1.7 The reading on ammeter  $A_2$  (3)
- 8.1.8 Would the reading on ammeter  $A_3$  INCREASE, DECREASE or STAY THE SAME if switch  $S_1$  is opened? (1)
- 8.1.9 Would the reading on ammeter  $A_1$  INCREASE, DECREASE or STAY THE SAME if switch  $S_1$  is opened? (1)
- 8.2 Calculate the amount of charge that moves through a light bulb in a circuit when 150J of heat and light energy is transferred between a potential difference of 5V. (2)
- 8.3 Calculate the amount of charge moving through a resistor in 25minutes, in a circuit in which the current strength is 20A. (2)

### QUESTION 9

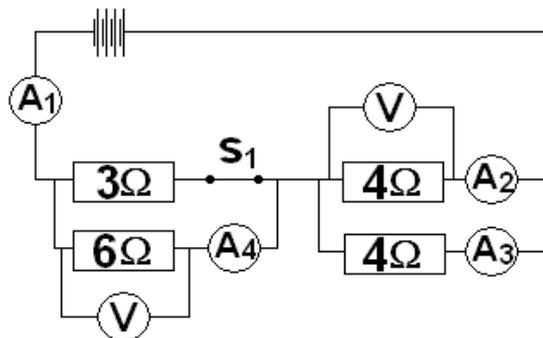
In the diagram below, four 10V cells are connected in series to create a 40V battery.



- 9.1 Calculate the total resistance of the circuit. (3)
- 9.2 Calculate the total current in the circuit. (3)
- 9.3 Calculate the reading on ammeter  $A_2$ . (1)
- 9.4.1 Calculate the reading on voltmeter  $V_1$ . (3)
- 9.5 Calculate the energy transferred to the  $3\Omega$  resistor in one minute. (4)
- 9.6 If a third  $2\Omega$  resistor is added in parallel with the initial two, would the total current in the circuit: **INCREASE, DECREASE** or **STAY THE SAME?** (1)

### QUESTION 10

In the diagram below, four 6V cells are connected in series to create a 24V battery.



If switch  $S_1$  is closed...

- 10.1 Calculate the total resistance of the circuit. (4)
- 10.2 Calculate the total current in the circuit. (3)
- 10.3 Determine the reading on ammeter  $A_2$ . (1)
- 10.4 Calculate the reading on the voltmeter connected across the  $4\Omega$  resistor. (3)
- 10.5 Determine the reading on ammeter  $A_4$ . (3)
- 10.6 Calculate the energy transferred to the  $6\Omega$  resistor in 10 minutes if the current through the resistor is 2A and the reading on the voltmeter is 12V. (4)
- 10.7 If switch  $S_1$  is opened, will the reading on ammeter  $A_1$ :  
**INCREASE, DECREASE** or **STAY THE SAME?** (1)