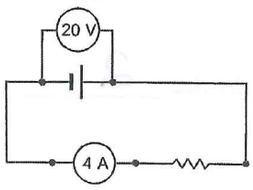
AST Circuit Calculations **Assignment #2** **Name:** _____

Due Monday, September 23rd, 2018

Show all you work, indicate the units and box your final answer please. **/36**

1. Taking into account the information given on the circuit below, calculate the resistance of the resistor. (2)



$V = RI$

$R = \frac{V}{I} = \frac{20}{4} = \boxed{5\,\Omega}$

2. What charge through a circuit in 30 minutes if the current intensity is 10A? (2)

$I = \frac{q}{\Delta t}$

$\Delta t = 30 \times 60 = 1800\,s$

$q = I \times \Delta t = 10 \times 1800\,s = \boxed{18000\,C}$

3. How much <u>energy</u> is provided by 9V battery if 200 C of charge flow through a radio in 15 minutes? (2)

$V = \frac{E}{q}$ $E = V \cdot q$ $= 9 \times 200$ $E = 1800\,J$

or

$I = \frac{q}{\Delta t} = \frac{200}{900} = 0.\bar{2}A$ $15 \times 60 = 900\,s$

$P = VI = 9 \times 0.\bar{2} = 2W$

$E = P\Delta t = 2 \times 900 = 1800\,J$

4. It takes a student 15 minutes to dry her hair. If the hair dryer is rated to use 110 V and 1685 W, how much electrical energy did they use? (2)

$\Delta t = 15 \times 60 = 900s$

$E = P\Delta t$ $= 1685 \times 900$

$\boxed{E = 1\,516\,500\,J}$

$P = VI$ $I = \frac{P}{V} = \frac{1685}{110} = 15.3\bar{1}8A$

or

$I = \frac{q}{\Delta t}$ $q = I\Delta t = 15.3\bar{1}8 \times 900 = 13786C$

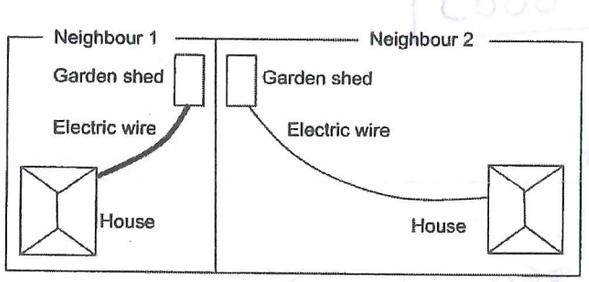
$V = \frac{E}{q}$ $E = Vq = 110 \times 13786 = 1516500J$

5. Calculate the power of an electric motor with a resistance of 8 Ω and that operates at a voltage of 120 V. (2)

$V = IR$

$I = \frac{V}{R} = \frac{120}{8} = 15A$ $P = VI = 120 \times 15 = \boxed{1800\,W}$

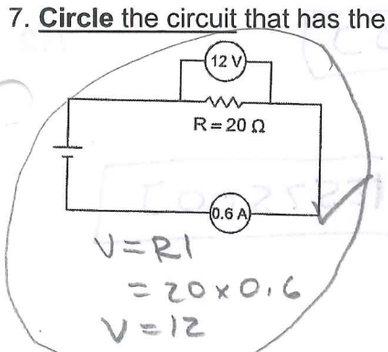
6. Two neighbours installed a back-up generator in their garden sheds. The two generators are identical, and each is connected to the house using a wire. Which neighbour has the optimal set-up? Why? (2)

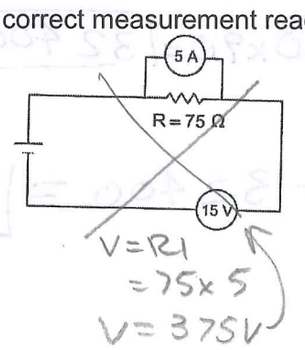


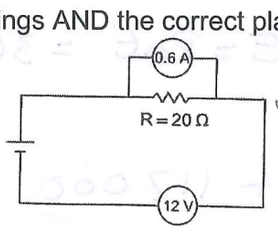
Neighbour 1 because:

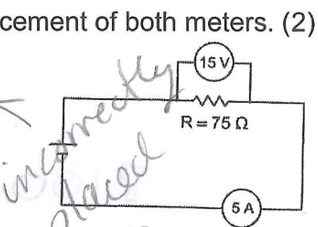
1. shorter
2. thicker

7. **Circle** the circuit that has the correct measurement readings AND the correct placement of both meters. (2)









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8. Consider the four electrical devices described in the table bellow. Which is most energy efficient, if they are all used for the same amount of time? (4)

DEVICE	CHARACTERISTICS	
1	120 V	15 A
2	120 V	1 500 W
3	240 V	20 Ω
4	240 V	1.85 kW

$P = VI = 120 \times 15 = 1800\,W$

$\rightarrow 1500\,W$ * lowest.

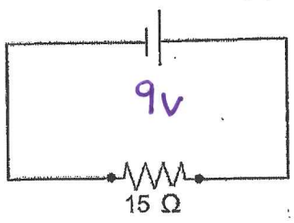
$V = RI \quad I = \frac{V}{R} = \frac{240}{20} = 12A$

$P = VI = 240 \times 12 = 2880\,W$

$\rightarrow 1.85\,kW \times 1000 = 1850\,W$

Device 2

9. Consider this circuit. (2)



What would happen to the current intensity if the 15 Ω resistor were replaced by a 10 Ω resistor? (circle one)

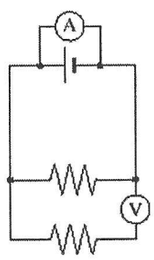
(Increase) Decrease

What would happen to the current intensity if the battery were replaced with a 3V battery? (circle one)

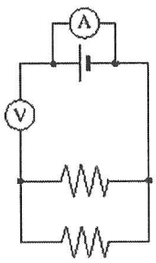
Increase (Decrease)

10. Circle the circuit that has the ammeter and voltmeter connected properly. (2)

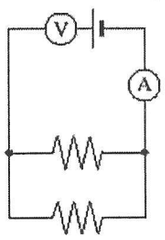
A.



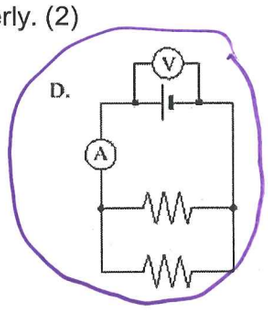
B.



C.



D.



12. Using the information given in the table below calculate the total energy used to operate all three items. (4)

Item #1	9 V	0.5 A	30 min
Item #2	120 V	1300 W	1.5 min
Item #3	120 V	40 Ω	90 sec

$\times 60 = 1800s$

$\times 60 = 90s$

① $P = VI = 9 \times 0.5 = 4.5W$

$E = Pot = 4.5 \times 1800 = \boxed{8100J}$

② $E = Pot = 1300 \times 90 = \boxed{117\,000J}$

③ $V = IR \quad I = \frac{V}{R} = \frac{120}{40} = 3A$

$P = VI = 120 \times 3 = 360$

$E = Pot = 360 \times 90 = \boxed{32\,400J}$

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$8100 + 117\,000 + 32\,400 = \boxed{157\,500J}$