SEKHUKHUNE DISTRICT

GRADE 10 PRE- EXAM JUNE PHYSICAL SCIENCE PAPER 1 2016

MARKS : 130   **TIME : 2 HOURS**

INSTRUCTIONS
1. ANSWER ALL QUESTIONS IN THE ANSWER SHEET
2. YOU MAY USE NON-PROGRAMMABLE CALCULATOR
3. YOU MAY USE APPROPRIATE MATHEMATICAL INSTRUMENTS
4. NUMBER THE QUESTIONS CORRECTLY ACCORDING TO THE NUMBERING SYSTEM USED IN THIS QUESTION PAPER.
5. GIVE BRIEF MOTIVATION, DISCUSSIONS ET CETERA WHERE REQUIRED
6. SHOW FORMULA BEFORE CALCULATIONS ALL THE TIME
7. ROUND OFF YOUR NUMERICAL ANSWERS TO TWO DECIMAL PLACES.

QUESTION 1 (Multiple Choice)

Four possible answers are provided, as indicated by A,B,C and D for each question. Each question has only ONE correct answer. Write **ONLY** the letter (A-D) next to the question number (1.1-1.10) in the ANSWER BOOK.

1.1 An object which is charged positively has
   A. Gained electrons
   B. Lost electrons
   C. Gained protons
   D. Lost protons

1.2 The distance between two successive points that are in phase is …….
   A. Wave
   B. Amplitude
   C. Period
   D. Wavelength

1.3 Which of the following is true for metals?

	Thermal conductivity	Electrical conductivity
A	Good	Good
B	Good	Poor
C	Poor	Good
D	Poor	Poor

1.4 All electromagnetic waves travelling in a vacuum have the same …
   A. Frequency
   B. Speed
   C. Wavelength
   D. Intensity

1.5 A permanent magnet is placed close to a bar of soft iron

Permanent magnet

| S | N |

Soft iron bar

| P | Q |

After some time, what happens to the soft iron bar?

  A. The pole of the magnet are reversed
  B. PQ does not become magnetic
 C. P becomes the North pole
  D. P becomes the South pole

1.6 The diagram below shows the magnetic field around a bar magnet. Small magnetic compasses are placed in the magnetic field around the bar magnet.
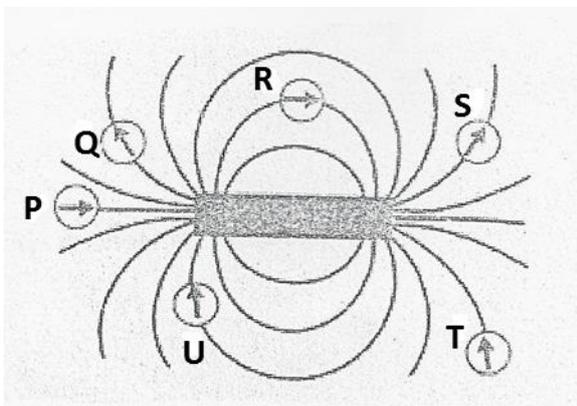
Which one of the combinations of compasses all point the correct direction in the magnetic field?

  A. Q,R and T
  B. U, R and S
  C. P, U and S
  D. T, S and R

1.7 Two insulated, graphite-coated polystyrene spheres are suspended from threads. The spheres are held a small distance apart. The charges on the spheres are -6×10^{-3} C and -2×10^{-3} C.

-6×10^{-3} C -2×10^{-3} C
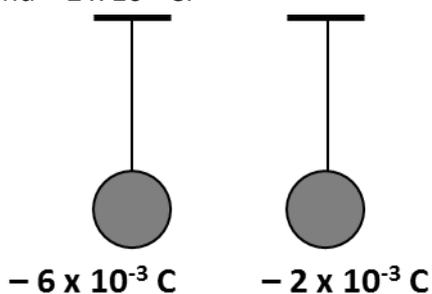
Which of the following is likely to happen?

    A. The spheres move towards each other and cling to one another.

    B. The spheres will repel each other.

    C. The spheres will swing towards each other, touch each other and move apart again.

    D. The spheres will move towards each other, touch each other and become neutral.

1.8 When resistors are connected in series, they are…

    A. current dividers

    B. voltage dividers

    C. all having the same resistance

    D. all passing different currents through them

1.9 In the circuit below, each of the voltmeter indicates the potential difference across one of the four resistors connected in series.
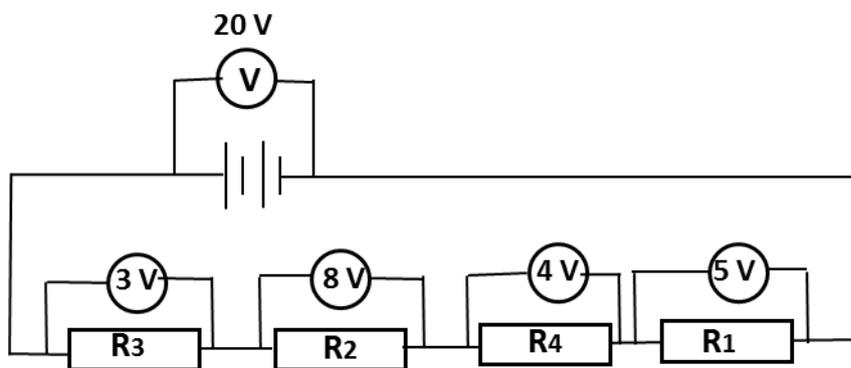
Which resistor has the highest resistance?

    A. R_1

    B. R_2

    C. R_3

    D. R_4

1.10 A house mother is ironing a bulk of clean clothes using an electric iron. What is the main energy conversion that takes place while she continues with the ironing?

    A. Mechanical to heat

    B. Mechanical to electrical

    C. Kinetic to potential

    D. Electrical to heat

[10 x 2 = 20]

QUESTION 2

2.1   The diagram below shows two pulses, Pulse A and Pulse B, which moves in two opposite directions in a rope. The mass of the rope can be ignored. Each block on the diagram represents a 0.5 cm by 0.5 cm block.
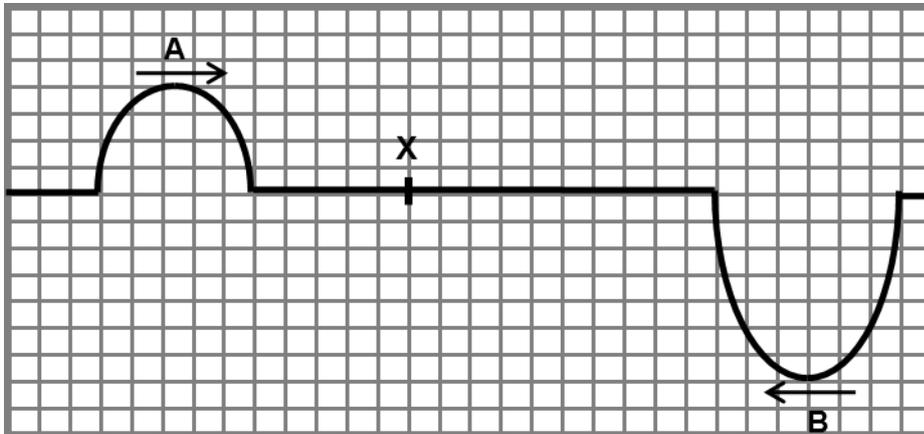
2.1.1   Define the term 'amplitude'.   (2)

2.1.2   Calculate the amplitude of both Pulse A and B.   (2)

2.1.3   Determine the speed of both pulses (in cm.s^{-1}) if Pulse A covers a distance of 6 blocks in 3 seconds and Pulse B covers a distance of 9 blocks in the same time.   (4)

2.1.4   The pulses meet each other after 4 seconds at point **X**. Draw a sketch which shows the resulting pulse that forms when Pulse A and B meet each other at point X. Show the value of the amplitude of the resulting pulse on your sketch.   (2)

2.1.5   What is the phenomenon observed in Question 2.1.4 above called?   (1)

2.2   The graph below represents a sound wave that is formed. The y-axis of the graph represents the amplitude of the wave and the x-axis of the wave represents the time elapsed. Two areas have been identified on the graph.
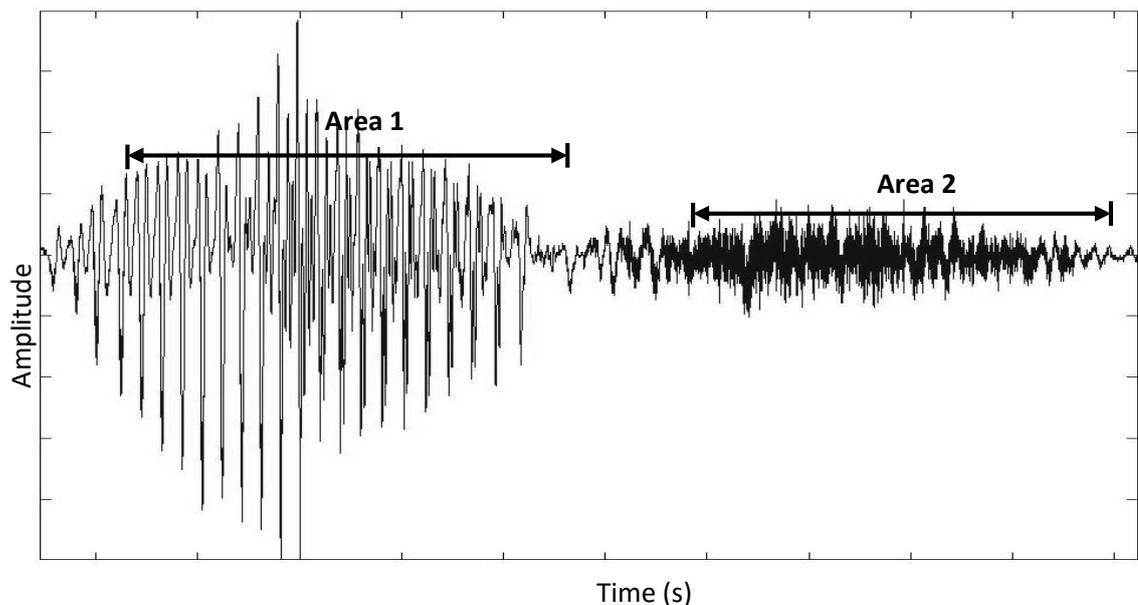
2.2.1   Which area on the graph, Area 1 or Area 2, indicates where the sound wave was the loudest? (1)

2.2.2   Which area on the graph, Area 1 or Area 2, indicates where the sound wave had the highest pitch? Give a reason for your answer. (2)

2.3   Cell phones make use of electromagnetic radiation to communicate with the network.

2.3.1   A certain cell phone frequency radiates a frequency of 900 MHz. Calculate the energy of a photon with such a frequency. (4)

(Hint: M = mega = 10^6)

There is great concern that the exposure to electromagnetic radiation from cell phones in the long run can be harmful to people. Many people are of the opinion that long term *exposure* to electromagnetic radiation can lead to cancer. Research in this area has however, shown that this allegation may not be correct. Some researchers propose that the radiation from cell phones occurs at too low frequencies and that they therefore would have no effect on people. .

2.3.2   Use your knowledge of the penetration ability of electromagnetic radiation to explain the researchers' proposal. (3)

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QUESTION 3

3.1 Two learners, Maggy and Meah, investigate the speed of sound in metal using an iron palisade fence. Maggy taps again an iron pole in the fence while Meah holds her ears against another pole iron pole 200 meters further along the fence.

3.1.1 Meah hears the sound through the iron 0.08 s after Maggy tapped the first iron pole. Calculate the speed of the sound through the iron. (3)

3.1.2 How much later does Meah hear the sound through the air? (Assume that the speed of the sound through air is 340 m·s⁻¹) (4)

3.1.3 Will the sound that has travelled through the iron have a longer or shorter wavelength than the sound that travelled through the air? (1)

3.2 The sketch below is a representation of a sound wave produced by a trumpet. The distance travelled by the wave from source is given in cm. The speed of sound in the air is 343 m·s⁻¹.
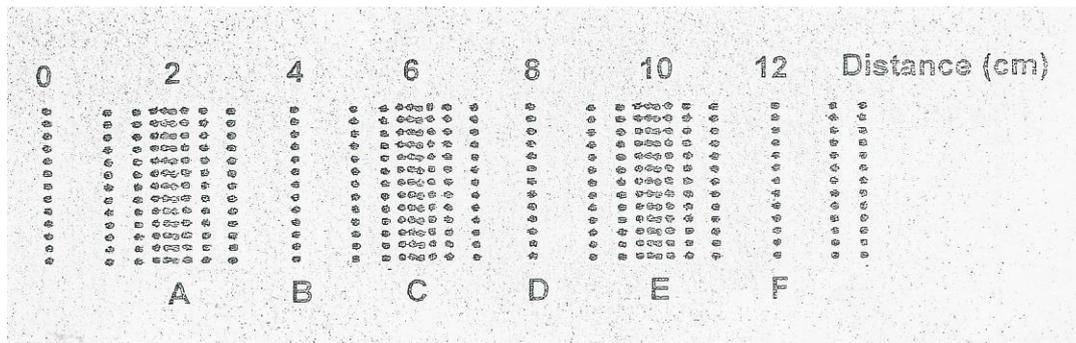
3.2.1 Is sound a transverse or longitudinal wave? (2)

3.2.2 Write the letter of any point representing a compression. (2)

3.2.3 Identify the term used to describe points **B or D** (2)

3.2.4 Give letters of any TWO consecutive points on the wave that are in phase. (2)

3.2.5 Determine the wavelength of the wave. (2)

3.2.6 Calculate the frequency of the wave (3)

3.3 The diagram below represents the electromagnetic spectrum.

Radio waves	Micro waves	Infrared	Visible light	Utra-violet	x-rays	Gamma rays

3.3.1 Briefly describe how electromagnetic waves generated. (2)

3.3.2 Name the type of electromagnetic radiation that:
   a) Has the shortest wavelength (1)
   b) Is used for satellite communication (1)

3.3.3 State ONE difference between electromagnetic waves and sound waves (2)

[27]

QUESTION 4

4.1 Light is an example of a transverse wave. Below are two simplified illustrations of red and blue light respectively. The red light has a frequency of 400 THz (4×10^{12} Hz). Study the diagrams and answer the questions that follow:
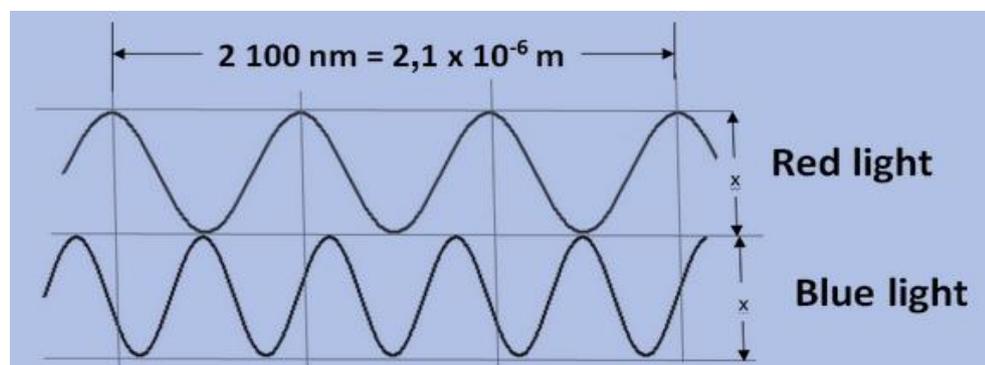
4.1.1   Give the definition of a transverse wave.   (2)

4.1.2   Except for the fact that both of these waves are transverse waves, give
         one other wave property that these two waves have in common.   (1)

4.1.3   Name one aspect in which these waves differ.   (2)

4.1.4   Calculate the period of the red light wave.   (3)

4.1.5   Calculate the speed of the red light wave.   (4)

4.2 Ultrasound is used to convert sound waves into pictures as shown below.

4.2.1 Briefly explain how images are created by ultrasound.   (2)

4.2.2 Name two benefits of the use of ultrasound in the medical profession.   (2)

[16]

QUESTION 5

X and Y are two identical spheres. Sphere X is on an insulated stand while Y has an insulated handle attached. The charge in sphere X is $+6.4 \times 10^{-19}$C and Y is neutral. Y is now brought nearer and touches X, after which they are separated again.
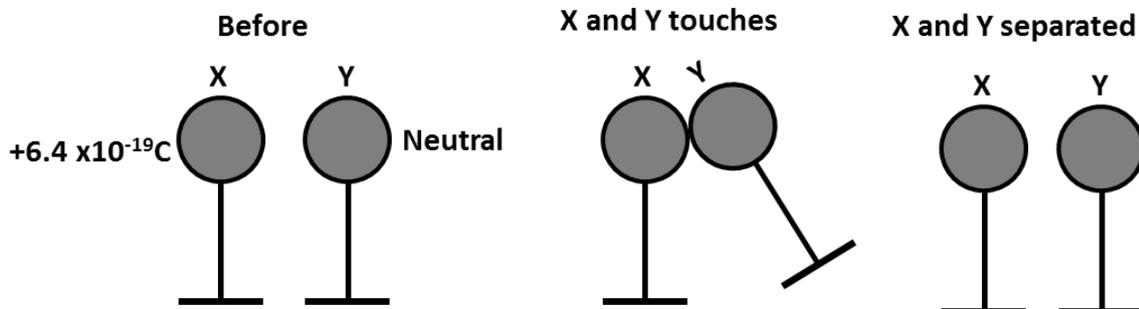
5.1 State the Law of Conservation of charge in words (2)

5.2 Does sphere X has excess or deficiency of electrons before touching? (2)

5.3 Y was neutral before. Explain what this means: (2)

5.4 Are electrons transferred from X to Y or from Y to X when they touch? (1)

5.5 Calculate the new charge on Y after touching and separation. (4)

5.6 State the principle of charge quantization. (2)

5.7 Calculate the number of electrons transferred from one sphere to the other when X and Y touch. (3)

[16]

QUESTION 6

6.1 The magnetic field that surrounds the Earth protects us against solar winds as shown below:
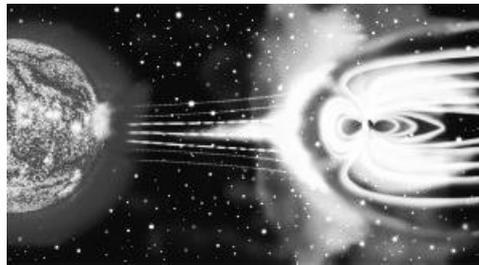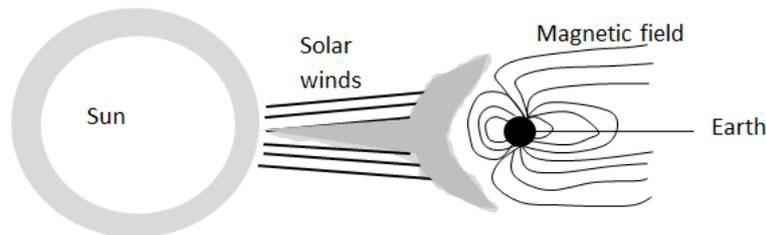
Photograph:

Diagram:


6.1.1 Explain what is meant by a magnetic field. (2)

6.1.2 Name one property that magnetic forces, gravitational forces and electrical forces have in common. (2)

6.1.3 Explain how a compass is used to indicate direction on Earth. (3)

6.1.4 Give the name of the phenomenon that occurs due to the protection of the Earth's magnetic field against solar winds. (2)

6.1.5   Explain what you would observe during the phenomenon described in   (2)
          QUESTION 3.1.4. and where this phenomenon would most likely occur.

6.1.6   Explain the difference between the geographical North pole and the   (2)
          magnetic North pole of the Earth.

6.1 Two bar magnets are placed close to one another as shown the diagram below.

| S   N | | N   S |
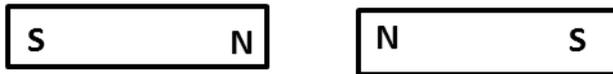
6.1.1 Draw the resultant magnetic field pattern between the two magnets.   (3)

6.1.2 How will the field lines drawn in 6.1.1 change if the magnets are move further apart?

Write down only: REMAIN THE SAME, move CLOSER or move FURTHER APART.   (2)

6.1.3 Name the instrument used to determine the direction of the magnetic field.   (2)

[20]

Question 7

7.1 The following table gives a range of electric circuit components and their symbols. Study the table and answer the questions that follow:

Component	Example	Symbol
Cell and battery		
Electric Switch (open en closed)		
Light Bulb		

Component	Example	Symbol
Resistor		
Potentiometer/ Rheostat		
Ammeter		A
Voltmeter		V
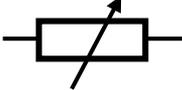
7.1.1 Which ONE of the above components cannot be connected in series with other components? (2)

7.1.2 An ammeter measures the electrical current of an electric circuit. Define the term 'electrical current'. (2)

7.1.3 A conductor that resists the flow of electrical current is called a 'resistor'. Name two factors which influences the resistance of a conductor. (4)

7.2
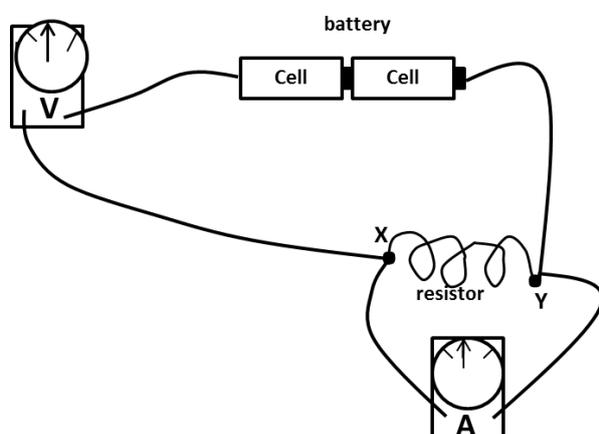
A group of learners were doing some investigation. They wanted to measure the voltmeter reading across a battery of 2 cells, when this battery is connected to a resistor. They also wanted to measure the current flowing through the circuit. They connected the components as shown in the diagram.

Their teacher saw the connections and said that there are two major mistakes in the connection. Their teacher drew a correct circuit diagram for the learners so that they can do the investigation.

7.2.1   Mention the two major mistakes in the connection made by learners.   (2)

7.2.2   Draw the **correct circuit** diagram that the teacher drew for the learners, where there   (4)
are no major mistakes. Include a switch in the circuit diagram.

[14]

QUESTION 8

A 3Ω resistor is connected in series to two parallel resistors, 4Ω and 12Ω, shown in the circuit below. The potential difference across the cell is 12V. The resistance of the ammeter, connecting wires and cell is negligible.
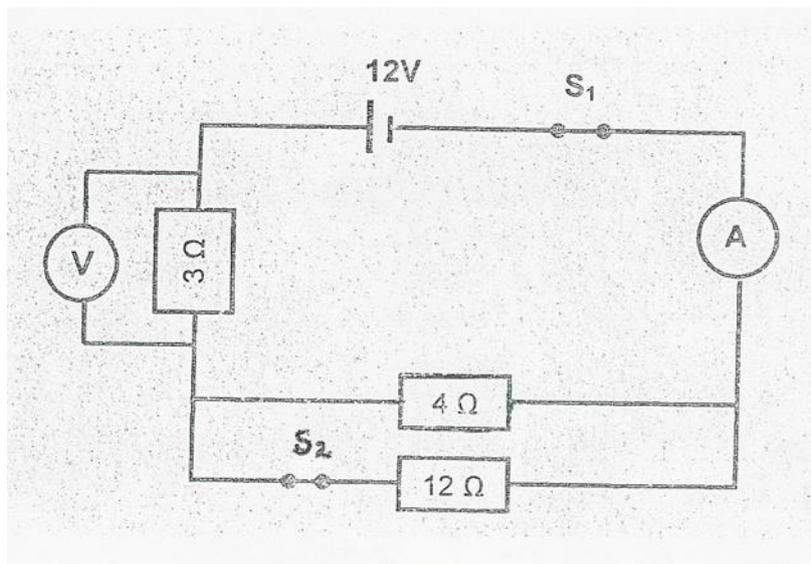
8.1 Calculate the effective resistance of the parallel combination.   (4)

8.2 When one of the switches opened, the ammeter reading decreases to zero. Which one of the switches S_1 and s_2 was opened? Provide reason for your answer.   (3)

8.3 Which one of the meters, voltmeter or ammeter is connected in series in the circuit?   (2)

8.4 Will the reading on voltmeter be greater than, equal to or smaller than 12V? Provide a reason for your answer.   (2)

8.5 With both switches closed, the reading on the ammeter is 2A. Calculate charge passing through the 3Ω resistor in 10 seconds.   (3)

8.6 Switch s_2 is now opened. What happens to the ammeter reading? Write down only, increase decrease or remains the same.   (2)

[16]

TOTAL = 150