



LIMPOPO

PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES: PHYSICS (P1)
MID-YEAR EXAMINATION 2014

MARKS: 150

TIME: 2 hrs

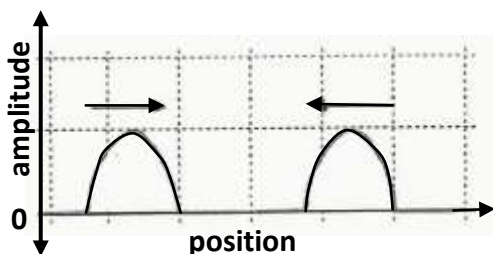
INSTRUCTIONS AND INFORMATION

1. Write your NAME and GRADE on the answer book.
2. Answer ALL questions in the ANSWER BOOK
3. Non-programmable calculators may be used.
4. Number the questions correctly according to the number system used in this question paper.
5. Round off your answers to a MINIMUM of TWO decimal places, where applicable.
6. Wherever motivations, discussions, et cetera are required be brief.

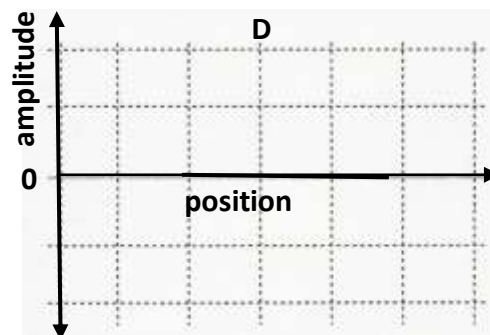
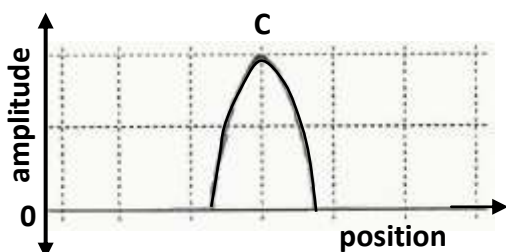
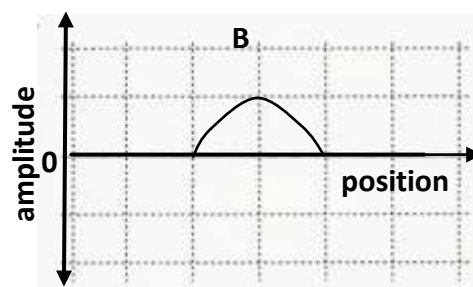
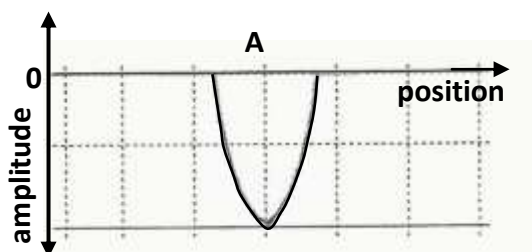
QUESTIONS 1: MULTIPLE CHOICE QUESTIONS

Four possible options are provided as answers to the following questions. Each question has only ONE correct answer. Write only the correct letter (A – D) next to the question number (1.1 – 1.10).

- 1.1 Two pulses of the same amplitude are travelling towards one another as shown in the sketch.

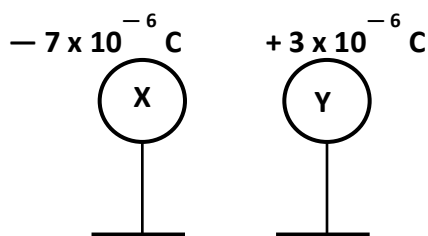


Which one of the following diagrams correctly represent the resultant of the pulses when they meet?



(2)

- 1.2 The distance between two consecutive points that are in phase is called.....
 A. the amplitude
 B. the wavelength
 C. the mean position
 D. the node (2)
- 1.3 If the velocity a wave remains constant, which of the following **increases** as the **wavelength decreases**?
 A. Amplitude
 B. Period
 C. Speed
 D. Frequency (2)
- 1.4 Two identical metallic spheres, X with a charge of $-7 \times 10^{-6} \text{ C}$ and Y with a charge of $+3 \times 10^{-6} \text{ C}$ are attached to wooden stands.



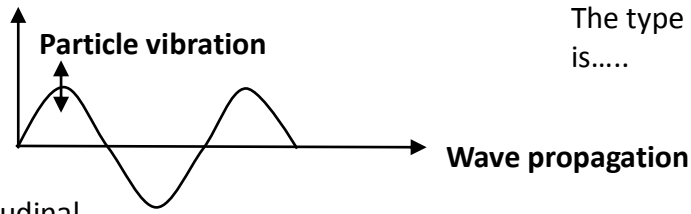
(2)

Spheres X and Y are allowed to touch and then separated. Charges on X and Y after they are separated will be:

	CHARGE ON X	CHARGE ON Y
A	$-2 \times 10^{-6} \text{ C}$	$+2 \times 10^{-6} \text{ C}$
B	$-5 \times 10^{-6} \text{ C}$	$-5 \times 10^{-6} \text{ C}$
C	$-2 \times 10^{-6} \text{ C}$	$-2 \times 10^{-6} \text{ C}$
D	$+2 \times 10^{-6} \text{ C}$	$-2 \times 10^{-6} \text{ C}$

- 1.5 A neutral plastic rod is rubbed with a dry cloth. It is observed that the rod's charge after rubbing is $-3.2 \times 10^{-9} \text{ C}$. This charge is obtained by.....
 A. gaining 2.0×10^{10} electrons by the rod.
 B. losing 2.0×10^{10} electrons from the rod.
 C. losing 2.0×10^{10} protons from the rod.
 D. gaining 5.0×10^{11} electrons by the rod (2)
- 1.6 1 ohm (Ω) is.....
 A. one volt per coulomb
 B. one volt per joule
 C. one volt per ampere
 D. one volt per meter (2)

1.7



The type of wave shown in the diagram is.....

- A. longitudinal
- B. transverse
- C. spherical
- D. infrasonic

(2)

1.8 Doctors use certain equipment to check on the health of unborn babies. This equipment uses the following wave...

- A. X-ray
- B. Infrared light
- C. Ultra sound
- D. Ultra violet light

(2)

1.9 Which ONE of the following materials listed below **will NOT** experience a force in a magnetic field?

- A. Nickel
- B. Gold
- C. Iron
- D. Cobalt

(2)

1.10 Which one of the following statements about the resistance of a wire **is correct**?

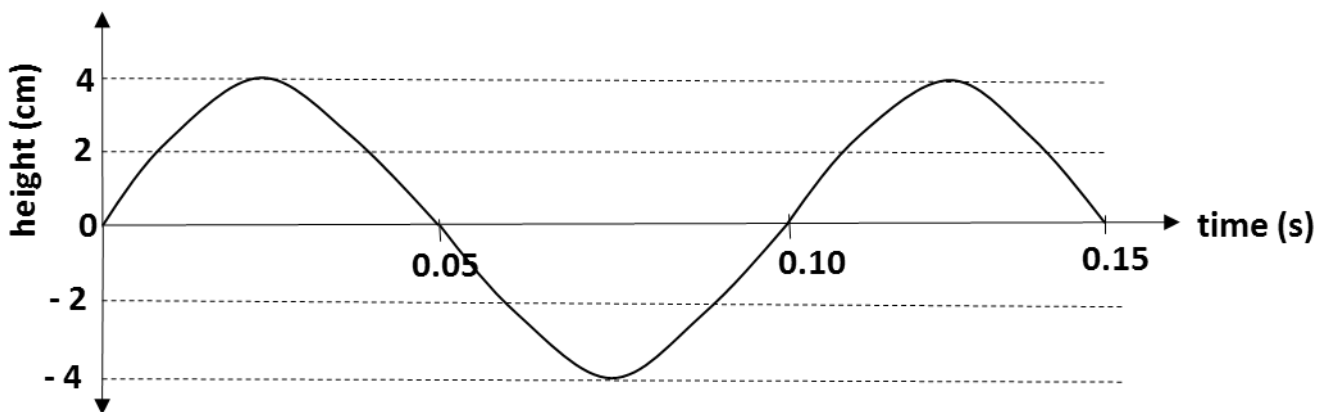
- A. The resistance decreases when the length of the wire increases.
- B. The resistance increases when the temperature decreases.
- C. Iron wire has less resistance than a copper wire if both wires have the same dimensions.
- D. Resistance decreases when the radius of the wire increases.

(2)

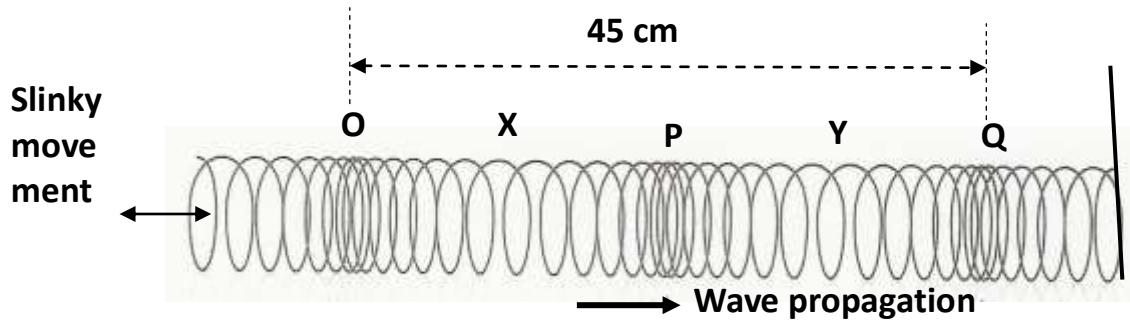
[20]

QUESTION 2

2.1 The following sketch graph is for a wave and the height is drawn against time. The graph is not according to scale



- 2.1.1 Determine the amplitude of the wave (2)
- 2.1.2 Determine the period of the wave (2)
- 2.1.3 Calculate the frequency of the wave (3)
- 2.2 Calculate the wavelength if the speed of the wave is $20 \text{ m}\cdot\text{s}^{-1}$. (4)
- 2.3 Two learners used a slinky and produced a wave pattern as shown in the sketch.



- 2.3.1 Name the type of wave produced on the slinky. Your naming must be based on the movement of the slinky and the direction of propagation of the wave. (2)
- 2.3.2 Points X and Y represent regions where the coils are spread apart, thus maximizing the distance between coils. What is the name given to such points? (2)
- 2.3.3 Points O, P and Q represent regions where the coils are pressed together in a small amount of space. What is the name given to such points? (2)
- 2.3.4 Determine the wavelength of the wave in meters from the sketch. (2)
- 2.3.5 Calculate the period of this wave if the velocity of the wave is $9.0 \text{ m}\cdot\text{s}^{-1}$. (4)
- 2.4 Thabo and Thabiso are a very much interested in Science. They once read in a book that the velocity of sound in air can be determined by echo method. In order to determine the velocity of sound in air, they perform an experiment. Thabo and Thabiso stood 500 m away from a mountain and Thabo fired a toy gun. Thabiso simultaneously started a stop watch. Their aim was to listen to the echo produced. They repeated the experiment three times and recorded the readings.

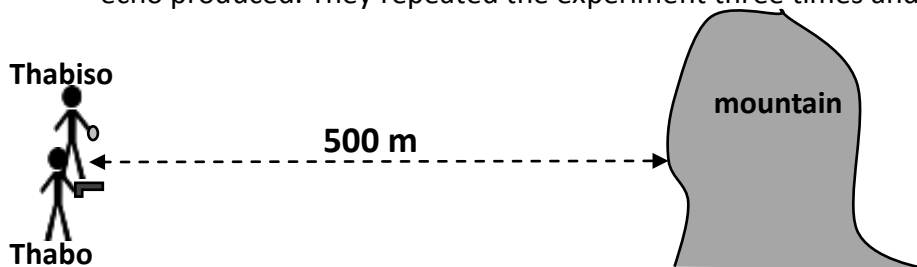


Table of readings:

Experiment number	Time taken (s)
1	3.01
2	2.95
3	3.04

- 2.4.1 Describe how echo is formed. (2)
- 2.4.2 Determine the average time from the above table of readings and calculate velocity of sound. (5)
- 2.5 Loudness of sound produced by a vuvuzela depends on two things. Name them. (2)

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QUESTION 3

Electromagnetic waves are the waves that are propagated by simultaneous periodic variations of electric and magnetic field intensity and that include X-rays ,radio waves, gamma rays , visible light, ultraviolet, and infrared light.

Normally when we use the term "light," we are referring to a type of electromagnetic wave that stimulates the retina of our eyes. In this sense, we are referring to visible light, a small spectrum from the enormous range of frequencies of electromagnetic radiation. This visible light region consists of a spectrum of wavelengths that range from approximately 700 nanometers (abbreviated nm) to approximately 400 nm. Expressed in more familiar units, the range of wavelengths extends from 7×10^{-7} meter to 4×10^{-7} meter.

- 3.1 Describe the source of electromagnetic waves. (2)
- 3.2 Explain wave-particle duality of light. (2)
- 3.3 A learner arranged the following electromagnetic waves according to the increasing order of wavelength. This learner is wrong. Arrange these electromagnetic waves correctly according to their wavelength(shorter wavelength first and longer wavelength last): (5)

wavelength increases →

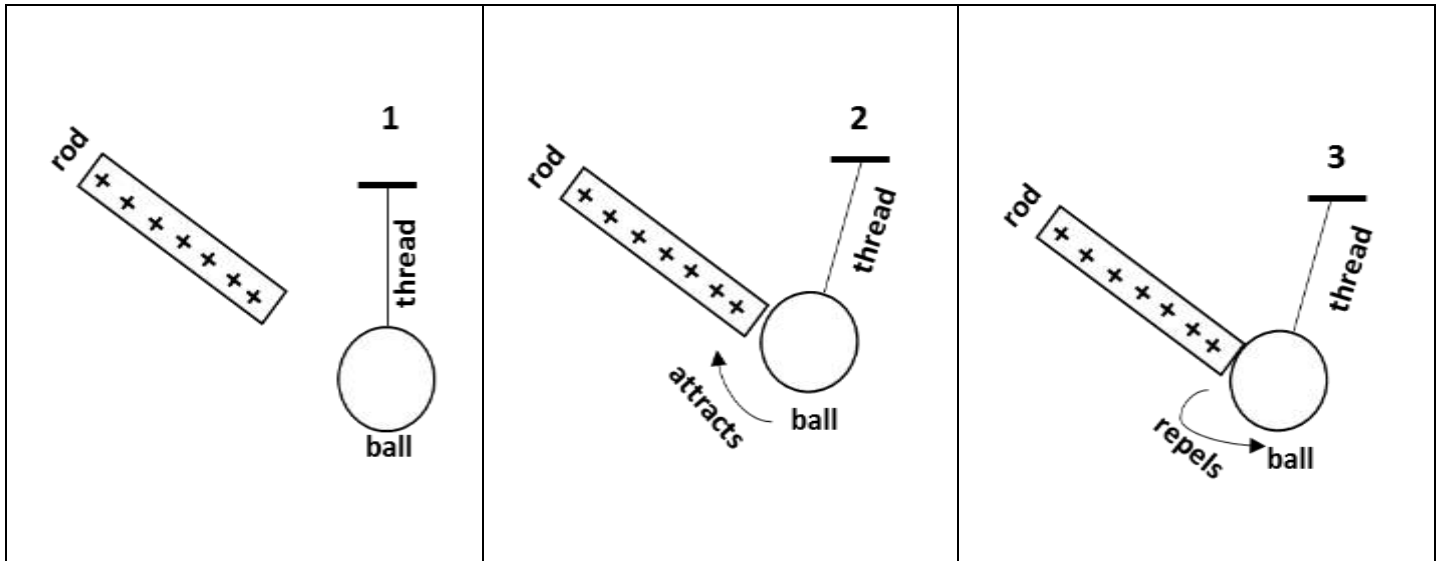
Infrared rays	visible light	microwaves	Gamma rays	X-rays
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- 3.4 Which one of the waves listed in question 3.3 has the highest penetrating ability? Give a reason why this wave has the highest penetrating ability. (3)
- 3.5 Define a photon. (2)
- 3.6 The wavelength of X-rays produced by an X-ray machine is 0.015 nm. Calculate the energy of these X-ray photons. ($1 \text{ nm} = 10^{-9} \text{ m}$). (5)
- 3.7 NAME two important uses of X-rays. (2)

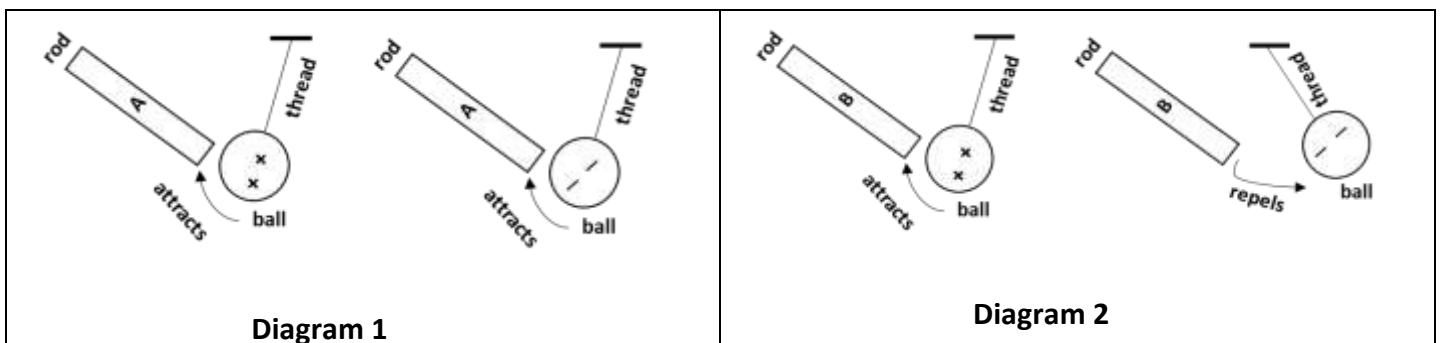
[21]

QUESTION 4

- 4.1 A positively charged Perspex rod is brought near a polystyrene ball which is hanging as shown in the diagram 1. The ball is not charged initially. The ball is attracted by the rod (diagram 2) and it touches the rod. Immediately after the ball touches the rod, the ball moves away from the rod.



- 4.1.1 State the principle of conservation of charges. (2)
- 4.1.2 Make **use of sketch number two. Sketch the charge distribution** on the ball as well as the rod if any and explain how the neutral ball is attracted by the charged rod. (9)
- 4.1.3 Explain why the ball is repelled as it touches the rod, as shown in sketch number 3. (Do not draw any diagram) (4)
- 4.2 A test was conducted to check the nature of charge on rods A and B. It is noticed that rod A could attract both negatively and positively charged balls as shown in diagram 1. Rod B attracted a positively charged ball but repelled a negatively charged ball as shown in diagram 2.



- 4.2.1 Using the description in diagram 1, determine whether rod A is positive/negative OR neutral. (2)
- 4.3.2 Identify the charge on rod B? (2)

[19]

QUESTION 5

5.1 The following diagram shows a bar magnet **AB**. The North pole of this magnet is at **A**.



5.1.1 What will be the polarity at C? (1)

5.1.2 What will be the polarity at D? (1)

5.1.3 What will be the polarity at B? (1)

5.2 Two bar magnets are kept with their north poles facing each other, as shown in the diagram.



Sketch the magnetic field in between the two magnets. (4)

5.3 An **aurora** is a natural light display in the sky. Latin word *aurora* means "sunrise" or the Roman goddess of dawn. Aurora is common in Arctic and Antarctic regions.

Explain how auroras are formed. (4)

5.4 **The following passage is about the Hermanus Magnetic Observatory (HMO)**

HMO is a research facility that carries out fundamental and applied research in the field of geomagnetism as well as ionospheric and magnetospheric physics.

This observatory is situated in Hermanus, a coastal town in southern Cape. This Magnetic Observatory had to be moved from Cape Town due to magnetic interference from the electric urban railway system. Hermanus was chosen as the new home for this Magnetic Observatory because it has a magnetically clean environment. There are no railway lines in Hermanus.

5.4.1 Explain why Hermanus is considered to be 'magnetically clean' while cities like Cape Town are not magnetically clean. (4)

5.4.2 Name the element that is present in railway lines and this element causes magnetic interference (2)

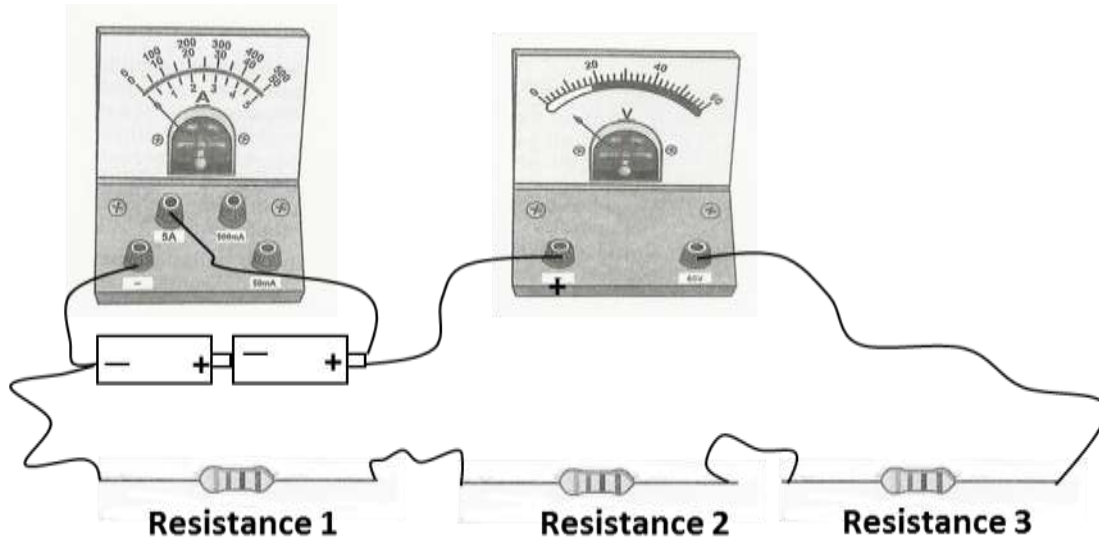
5.4.3 What is meant by the term 'geomagnetism'? (2)

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QUESTION 6

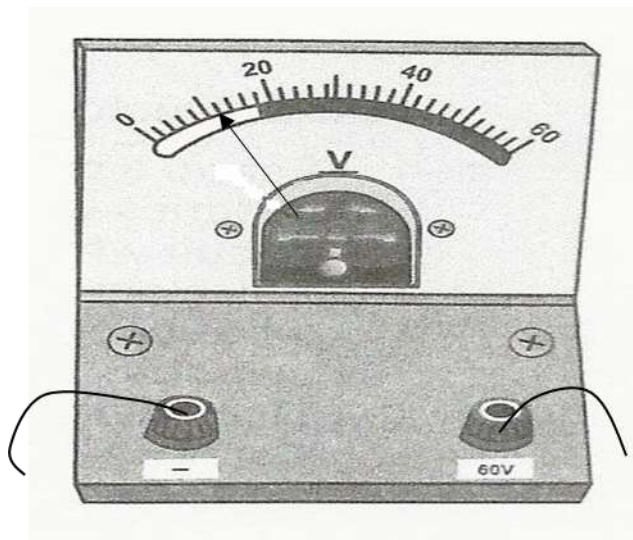
- 6.1 Define current. (2)
- 6.2 Two learners were asked by their teacher to connect three resistors in series and to connect a voltmeter to measure the potential difference across the combination of resistor 1 and resistor 2. They were also asked to connect an ammeter to measure the current in the circuit. The learners could not draw a circuit diagram for the connection but they drew a sketch that is given below. Study their sketch and answer the questions given below.

Learner's sketch



- 6.2.1 There are two very serious mistakes that they made in their connection. Study the learner's diagram and describe the two mistakes that the learners made. (4)
- 6.2.2 Draw the **correct circuit diagram** based on the instructions given by the teacher. Also include a switch in the circuit diagram. (6)

- 6.3 The diagram of a voltmeter connected in a circuit is shown below. What is the reading on the voltmeter? (2)



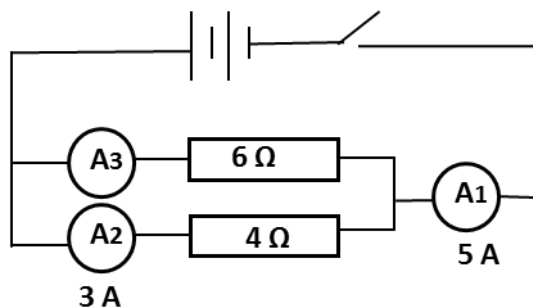
- 6.4 A potential difference of 24 V is applied across a resistor to drive a certain charge through it. The work done in driving this charge through the resistor is 3J. Calculate the charge. (4)

[18]

QUESTION 7

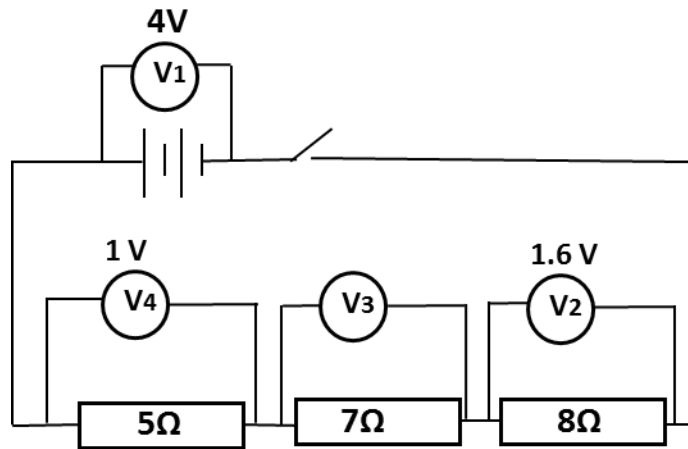
Batteries are part and parcel of our personal and professional life. Our cell phones, calculators, watches, cars etc use batteries. We also use many small devices in our everyday life and each small device needs power.

- 7.1 Define the emf of a battery. (2)
- 7.2 Consider the circuit below. When the switch is closed, Ammeter A_1 reads 5A and ammeter A_2 reads 3 A.



- 7.2.1 Calculate the effective resistance of the combination of the two resistors. (5)
- 7.2.2 What will be the reading on ammeter A_3 when the switch is closed? (2)

- 7.3 Consider the following circuit. When the switch is closed, voltmeter V_1 reads 4V, V_2 reads 1.6 V and voltmeter V_4 reads 1.0 V.



- 7.3.1 Find the effective resistance of the combination of the three resistors. (3)
- 7.3.2 Find the voltmeter reading on V_3 when the switch is closed. (3)
- 7.3.3 If the current passing through the 8Ω resistor is 0.2 A, what will be the current through 5Ω resistor? (2)
- 7.4 A charge of 48 C of charge flows through a circuit in 2 minutes. Calculate the current flowing. (4)

[21]

TOTAL = 150