

# SENIOR SECONDARY SUBJECTS

KENNY'S



## FOR GRADE 10-12

## MATTHEWS REVISION

### QUOTE

A THOUSAND MILES JOURNEY STARTS WITH A SINGLE  
STEP. START THE JOURNEY TODAY AND YOU WILL NOT  
REGRET AT THE END.

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## CHEMISTRY REVISION QUESTIONS AND ANSWERS

- 1 What is matter?
  - Any substance that occupies space and has weight.
- 2 Name the three states of matter?
  - Solids
  - Liquids
  - Gases
- 3 What are the two properties of solids?
  - They have a definite shape
  - They have a definite volume
- 4 What are the two properties of liquids?
  - They have a fixed volume
  - They have no fixed shape. They take the shape of the container.
- 5 What are the three basic units of matter?
  - Atoms
  - Ions
  - Molecules
- 6 What is an atom?
  - This is the smallest particle of an element that can take part in a chemical reaction.
- 7 Name the three sub atomic particles?
  - Protons
  - Neutrons
  - Electrons
- 8 What is the mass of a neutron?

- 1

- 9 The total number of protons and neutrons present in the nucleus of an atom is called.....
- Mass number/nucleon number
- 10 What is the atomic number?
- This is the total number of protons and neutrons present in the nucleus of an atom.
- 11 What is the other name for atomic number?
- Proton number
- 12 Why are atoms said to be electrically neutral?
- They contain same number of protons and neutrons.
- 13 What is the chemical formula for potassium fluoride?
- KF
- 14 What is the chemical formula for lithium chloride?
- LiCl
- 15 What is the chemical formula for lithium fluoride?
- LiF
- 16 What is the chemical formula for magnesium fluoride?
- $\text{MgF}_2$
- 17 What is the chemical formula for calcium oxide?
- CaO
- 18 What is the chemical formula for calcium chloride?
- $\text{CaCl}_2$

19 What is the chemical formula for potassium nitride?

- $K_3N$

20 What is the chemical formula for magnesium nitride?

- $Mg_3N_3$

21 What is the chemical formula for iron (II) nitrate?

- $Fe(NO_3)_2$

22 What is the chemical formula for lithium phosphate?

- $Li_3PO_4$

23 Convert the following word equation into a chemical equation.

Magnesium+water  $\longrightarrow$  magnesium hydroxide+hydrogen gas

- $Mg + H_2O \longrightarrow Mg(OH)_2 + H_2$

24 What is the chemical formula for carbon monoxide?

- $CO$

25 What is the chemical formula for carbon dioxide?

- $CO_2$

26 What is the chemical formula for sulphur dioxide?

- $SO_2$

27 What is the chemical formula for ammonia?

- $NH_3$

28 What is the chemical formula for silicon dioxide?

- $SiO_2$

29 A certain organic compound is given by the formula  $\text{CH}_4$ . What is the name of this compound?

- Methane

30 What is the chemical formula for ozone?

- $\text{O}_3$

31 .....are written down in an equation to identify the physical state of the reactants and products.

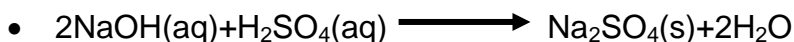
- State symbols

32 Written down the four state symbols that are present?

- Solid(s)
- Liquid(l)
- Gas(g)
- Aqueous(aq)

33 Write a balanced chemical equation for the word equation below.

Sodium hydroxide + sulphuric acid  $\longrightarrow$  sodium sulphate + water



34 How many atoms of different elements are present in the formula of the compound nitric acid ( $\text{HNO}_3$ )?

- 1 hydrogen atom 1 nitrogen atom and 3 oxygen atoms making the number of atoms altogether to be 5 atoms.

35 How many atoms of different elements are present in the formula of the compound methane ( $\text{CH}_4$ )?

- 1 carbon atom and 4 hydrogen atoms making the number to be 5 atoms altogether.

- 36 How many atoms of different elements are present in the formula of the compound copper nitrate,  $\text{Cu}(\text{NO}_3)_2$ ?
- 1 copper atom ,2 nitrogen atoms and 6 oxygen atoms making the number to 9 atoms altogether.
- 37 How many atoms of different elements are present in the formula of the compound ethanoic acid  $\text{CH}_3\text{COOH}$ ?
- 8 atoms
- 38 Write down the chemical formula for ammonium sulphate?
- $(\text{NH}_4)_2\text{SO}_4$
- 39 Balance the following equations
- (a)  $\text{Zn}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{ZnO}(\text{s})$
  - (b)  $\text{Fe}(\text{s}) + \text{Cl}_2(\text{g}) \rightarrow \text{FeCl}_3(\text{s})$
  - (c)  $\text{Li}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{Li}_2\text{O}(\text{s})$
  - (d)  $\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{g})$
  - (e)  $\text{Mg}(\text{s}) + \text{CO}_2(\text{g}) \rightarrow \text{MgO}(\text{s}) + \text{C}(\text{s})$
- 40
- 41 What is an acid?
- Any substance that produces hydrogen ions as the only positive ions when dissolved in water.
- 42 Give any four examples of acids?
- Hydrochloric acid
  - Nitric acid
  - Ethanoic acid
  - Sulphuric acid
- 43 What are the three physical properties of acids?
- They have a sour taste

- They change the colour of indicators
- They have a PH less than 7

44 What is the chemical formula for hydrochloric acid?

- $\text{HCl(aq)}$

45 What is the chemical formula for sulphuric acid?

- $\text{H}_2\text{SO}_4$

46 What is the chemical formula for nitric acid?

- $\text{HNO}_3$

47 Write down the ions present in hydrochloric acid?

- $\text{H}^+ \text{Cl}^-$

48 Write down the ions present in sulphuric acid.

- $\text{H}^+ \text{SO}_4^{2-}$

49 Write down the ions present in nitric acid?

- $\text{H}^+ \text{NO}_3^-$

50 Write down the ions present in ethanoic acid.

- $\text{H}^+ \text{CH}_3\text{COO}^-$

51 What is the identity test for hydrogen gas?

- It puts off a flame with a pop sound.

52 What are the products when metals above hydrogen in the reactivity series react with an acid?

- Salts and hydrogen gas

53 Write a balanced chemical equation including state symbols for the reaction of magnesium with hydrochloric acid.

- $2\text{HCl(aq)} + \text{Mg(s)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$

- 54 What is a base?
- A base is any substance that reacts with an acid to give a salt and water only.
- 55 Bases that dissolve in water are called.....
- Alkalis
- 56 Define an alkali.
- Any substance that produces hydroxide ions when dissolved in water.
- 57 Give any two examples of alkalis?
- Sodium hydroxide
  - Calcium hydroxide
  - Ammonium hydroxide
- 58 Give any three physical properties of alkalis.
- They feel slippery
  - Edible alkalis have a bitter taste
  - They change the colour of indicators
  - They have a PH of above 7
- 59 Bases are classified as soluble and insoluble bases. Give any three examples of insoluble bases?
- Magnesium oxide
  - Lead(II) oxide
  - Copper(II) oxide
- 60 Give any three examples of soluble bases.
- Sodium hydroxide
  - Calcium hydroxide
  - Ammonium hydroxide



61 The PH ranges from.....

- 0-14

62 What does a PH value of 7 indicate?

- A substance is neutral

63 What does a PH value of less than 7 indicate?

- A substance is an acid.

64 Below is a list of some organic compounds represented by the letters **A** to **E**.

**A**  $\text{CH}_4$

**B**  $\text{C}_4\text{H}_{10}$

**C**  $\text{C}_4\text{H}_9\text{OH}$

**D**  $\text{C}_4\text{H}_8$

**E**  $\text{CH}_3\text{COOH}$

(a) Give the name of compound **A**.

- Methane

(b) Identify the two compounds ,from the list ,that belong to the same homologous series.

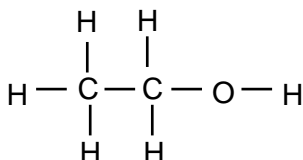
- Compound A(methane ) and compound B (butane)

(c) (i) State the compound which has the same functional group as ethanol.

- $\text{C}_4\text{H}_9\text{OH}$  (butanol)

(ii) Draw the displayed molecular structure of ethanol.

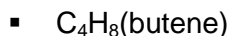
- The structure of ethanol is shown below.



(iii) Construct a chemical equation for the hydration of ethene to ethanol.



(d) (i) Give one compound that is unsaturated hydrocarbon, from the list above.



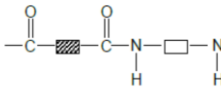
(ii) Describe a chemical test for an unsaturated hydrocarbon.

(e) Compound **E** is acidic.


(i) State the name of compound **E**.

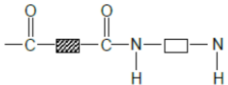
(ii) describe a test to show that compound **E** is acidic.

65 Plastics are organic polymers. The table below describes two types of plastics. Complete the table. Part of the table has been completed for you as an example.

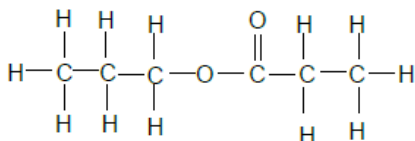
Name	Repeating unit	Use	Type of polymerisation used in manufacture
Pol(ethene)		Making plastic bags	
			Condensation polymer

• The completed diagram is shown below.

Name	Repeating unit	Use	Type of polymerisation used in manufacture
Pol(ethene)		Making plastic bags	Addition polymer

<b>Nylon</b>			Condensation polymer

- 66 Organic acids are a homologous series of compounds having the carboxylic group-COOH joined to an alkyl radical.
- What is the general formula for organic acids?
  - Draw the structure of butanoic acid.
  - A reaction between an alcohol and an organic acid is described as esterification and this is similar to neutralisation.
    - Ethylethanoate is an ester. Name two reagents used to prepare it.
    - State two ways in which esterification is different from neutralisation.
    - Write a balanced chemical equation for the esterification of ethylethanoate.
  - Calculate the mass of ethylethanoate formed from 15g of organic acid.
- 67 Below is a structure of an ester made in a reversible reaction between a carboxylic acid and an alcohol.



(a) (i) Draw the structure of the carboxylic acid used in this reaction.

(ii) state one condition necessary for the formation of the ester above.

(b) A student carried out an experiment to compare the relative strengths of dilute methanoic acid and dilute sulphuric acid.

(i) Describe a test to distinguish between the two acids.

.....  
.....  
.....  
.....

(ii) Name a metal that will react with both acids. Describe what you would see during the reaction.

Metal.....

Observation.....

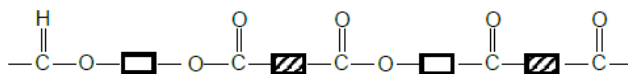
68 A carbohydrate is formed from the reaction of the small molecules, one of which is represented by the diagram below.



(a) (i) what is the general name of the small molecules which combine to form very large molecules.

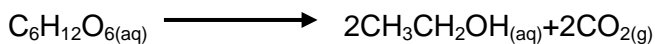
(ii) Show how two of the small molecules like the one drawn above would join to form a bond.

- (b) Starch is hydrolysed to glucose by the enzymes in yeast and the glucose is then converted to an alcohol by a second process. Name:
- The second process
  - The alcohol produced.
- (c) State two uses of alcohol named in **(b)(ii)** above.



- (d) Terylene is an ester.
- State one use of terylene.
  - The structure of terylene is represented in the diagram below.
  - Draw a box around a repeating unit in this structure.
  - Why does terylene cause pollution.

69 The chemical equation below is a reaction in which glucose is changed to ethanol.



- What term is used to describe this type of reaction?
- What is the purpose of the yeast?
- Draw the structural formula of ethanol?
- To which homologous series does ethanol belong to?

- (e) When ethanol is exposed to air, it becomes 'sour'. Explain what happens?
- (f) Draw the structural formula of the compound formed when ethanol is dehydrated.

70 Organic compounds form homologous series.

- (a) Give two characteristics of members of any homologous series.
- (b) Draw the structure of an alkene with two carbon atoms in the molecule.
- (c) Calculate the percentage by mass of hydrogen in this alkane.

71 (a) (i) What is meant by the term unsaturated hydrocarbon?

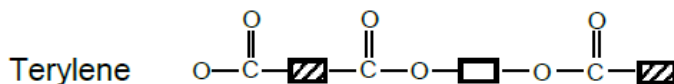
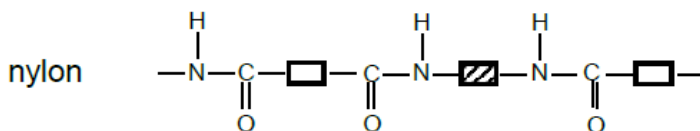
- (ii) Name one unsaturated hydrocarbon and draw its structural formula.
- (iii) Name or write the chemical of the product formed when bromine and the named unsaturated hydrocarbon combine.
- (iv) Name one saturated hydrocarbon.

(b) (i) Which of the two named hydrocarbons in (a)(ii) or (iv) can be converted to a polymer?

(ii) Name the polymer and draw its structure.

(iii) State one environmental disadvantage of the polymer named in (b)(ii).

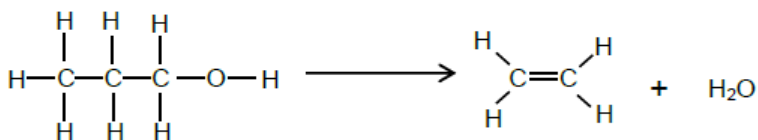
72 The diagrams below show sections of the polymer chain of two condensation polymers.



- (a)
  - (i) Draw a circle around an amide linkage in the diagram. Label this amide linkage.
  - (ii) Draw a circle around an ester linkage in the diagram. Label this ester linkage.
- (b) Name a type of naturally occurring polymer that has the same linkage to nylon.
- (c) Why are nylon and terylene known as condensation polymers?
- (d) Fishing nets used to be made of natural fibres but many nets are now made from nylon. Suggest one advantage other than the strength and one disadvantage of using nylon in place of natural fibres to make fishing nets.

73 A student set up an experiment to produce ethanol from glucose, she dissolved glucose in warm water, added yeast and left the mixture in a warm place for about 7 days in the apparatus shown below.

- (a) Write a word equation for the formation of glucose.
- (b) What is the scientific name for this reaction.
- (c) Suggest a suitable temperature at which the process occurs.
- (d) The airlock prevents air from going into the flask but allows carbon dioxide to go out.
  - (i) Why must not air not be allowed into the flask?
  - (ii) Describe the change which will be seen in the airlock.
- (e) Ethanol can be oxidised to ethanoic acid by boiling ethanol with acidified potassium dichromate(VI). Give two reasons why the conversion of ethanol to ethanoic acid is an oxidation process.
- (f) When concentrated sulphuric acid is added to ethanol, the following reaction occurs.



- (i) What type of reaction is this?
- (ii) What can be done to show ethene is formed?

74 The table below shows the structural formulae of various organic compounds and the polymers that can be made from them.

Monomer	$  \begin{array}{c} \text{H} & \text{H} \\   &   \\ \text{C} & = \text{C} \\   &   \\ \text{H} & \text{H} \end{array}  $	$  \begin{array}{c} \text{F} & \text{F} \\   &   \\ \text{C} & = \text{C} \\   &   \\ \text{F} & \text{F} \end{array}  $	$  \begin{array}{c} \text{CH} & \text{F} \\   &   \\ \text{C} & = \text{C} \\   &   \\ \text{F} & \text{F} \end{array}  $
	ethene	tetrafluoroethene	<b>W</b>
Polymer	$  \left( \begin{array}{c} \text{H} & \text{H} \\   &   \\ -\text{C} & - \text{C}- \\   &   \\ \text{H} & \text{H} \end{array} \right)_n  $	$  \left( \begin{array}{c} \text{F} & \text{F} \\   &   \\ -\text{C} & - \text{C}- \\   &   \\ \text{F} & \text{F} \end{array} \right)_n  $	

**Y**



		n	
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- (a) Identify the monomers which are hydrocarbons.
- (b) Name the monomer W.
- (c) Draw the displayed structure for polymer Y
- (d) (i) Identify the common feature among the monomers in the table above.
- (ii) Give the name of the compounds with this feature.
- (e) Decane  $C_{10}H_{22}$ , can be cracked to produce hexane,  $C_6H_{14}$  and butene,  $C_4H_8$ . Explain the meaning of the word cracking.

75

76

## **PHYSICS REVISION**

- 1 What is a physical quantity?
  - A physical quantity is anything that can be measured and contains a numerical magnitude.
- 2 Give any four examples of physical quantities.
  - Length
  - Speed
  - Acceleration
  - Weight
  - Distance
  - Temperature
- 3 What do we call the system of measurement that we use in physics?
  - International System of Units (SI Units)
- 4 What is the SI unit for mass?
  - kilogram(kg)
- 5 What is the SI unit for time?

- Second(s)
- 6 What is the SI unit for temperature?
- Kelvin (K)
- 7 Mention any four instruments used in the measurement of length.
- Micrometer screw gauge
  - Metre rule
  - Vernier caliper
  - Measuring tape
- 8 What is the accuracy of a ruler?
- 0.1cm
- 9 What is the accuracy of a micrometer screw gauge?
- 0.01mm
- 10 What is the SI unit for current?
- Ampere
- 11 What is an alloy?
- This is a metal that is mixed with other metals.
- 12 What is a mole?
- Amount of a substance
- 13 What is the SI unit for a mole?
- Mole
- 14 What is the SI unit for light intensity?
- Candela
- 15 The number 420000 written in standard form is.....

- $4.2 \times 10^5$

16 Write the number 0.0000037 in standard form.

- $3.7 \times 10^{-6}$

17 A plumber needs to measure the internal diameter of a water pipe as accurately as possible. The instrument he should use is the.....

- Vernier calipers

18 What physical quantity is measured by a micrometer screw gauge?

- Length

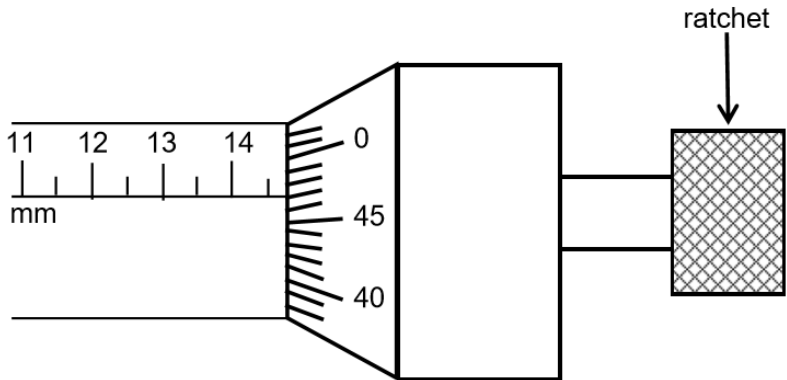
19 Mention any two precautions that must be taken when using a micrometer screw gauge?

- The anvil and the spindle must be cleaned thoroughly
- The zero accuracy must be corrected.

20 Mention two examples of things that can be measured by a micrometer screw gauge.

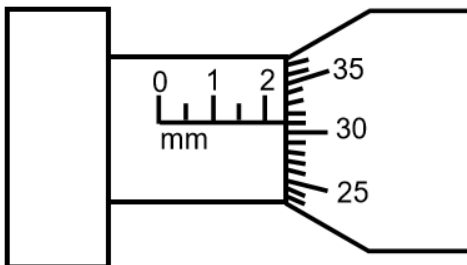
- Diameter of a wire
- \*-Thickness of a paper

21 The diagram below shows a micrometer screw gauge.



- (a) What is the correct reading of the micrometer screw gauge?
- *Main scale reading* = 14.5
  - *Rotating scale reading* =  $47 \times 0.01 = 0.47$
  - Therefore the correct reading =  $14.5 + 0.47 = 14.97\text{mm}$
- (b) What is the main function of the ratchet?
- To adjust the micrometer.
- (c) Apart from the ratchet mention any one part of the micrometer screw gauge.
- Spindle and anvil

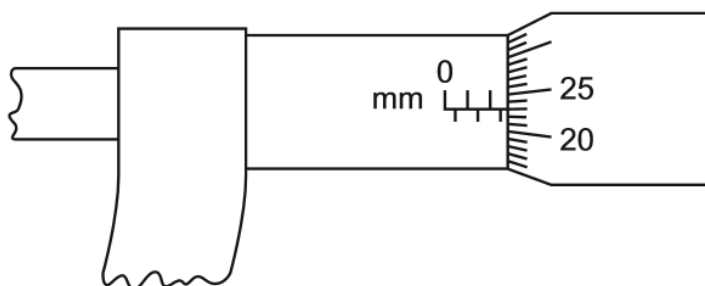
22 The diagram below shows a micrometer screw gauge.



What is the reading shown on the micrometer screw gauge?

- *Main scale reading* = 2.0
- *Rotating scale reading* =  $31 \times 0.01 = 0.31$
- Therefore the actual reading is  $2.0 + 0.31 = 2.31\text{mm}$

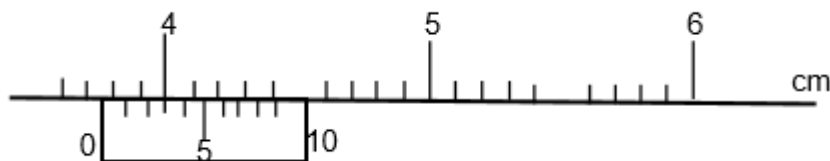
23 The diagram below shows a micrometer.



What is the reading shown?

- *Main scale reading* = 2.5mm
- *Rotating scale reading* =  $23 \times 0.01 = 0.23$
- Therefore the *reading* =  $2.5 + 0.23 = 2.73\text{mm}$

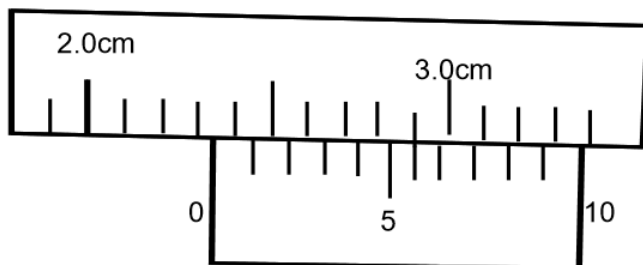
24 The figure below shows part of a vernier caliper used to measure a physical quantity.



What is the correct reading shown above on the vernier caliper?

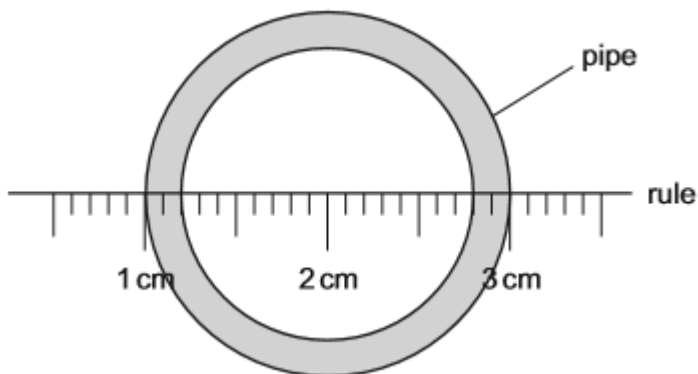
- *Main scale reading* = 3.7cm
- *Vernier scale reading* =  $3 \times 0.01 = 0.03$
- The *total reading* =  $3.7 + 0.03 = 3.73\text{cm}$

- 25 The diagram below shows part of a vernier caliper used to measure the width of a rectangular glass block.



What is the correct reading of the caliper?

- *Main scale reading* = 2.3 cm
  - *Vernier scale reading* =  $6 \times 0.01 = 0.06 \text{ cm}$
  - *The total reading* =  $2.3 + 0.06 = 2.36 \text{ cm}$
- 26 Which instrument can be used to give an accurate reading of the internal diameter of a test tube?
- Vernier caliper
- 27 A ruler is used to measure the internal diameter of a pipe as shown below.



What is the internal diameter of the pipe?

- $Reading = 2.8cm - 1.2cm = 1.6cm$

28 The SI unit for time is second. Mention any other units that may be used in the measurement of time other than second.

- Minute
- Hour

29 Mention any three instruments used in the measurement of time?

- Pendulum clock
- Stop watch
- Clock

30 Who invented the pendulum clock?

- Christian Huggens

31 The swinging of a pendulum from one side to the other, and back again is called .....

- An oscillation

32 Define the period of a pendulum?

- This is the time taken for the pendulum bob to make one oscillation.

33 Mention any two factors that affect the period of the pendulum?

- Length of a pendulum
- Gravitational force

34 What is the formula used to calculate the Period of the pendulum?

- $T = \frac{t}{n}$

35 Define the frequency of a pendulum?



- This is the number of oscillations made in one second.

36 What is the formula used to calculate frequency of a pendulum?

- $F = \frac{1}{T}$

37 In which units is the frequency of a pendulum measured into?

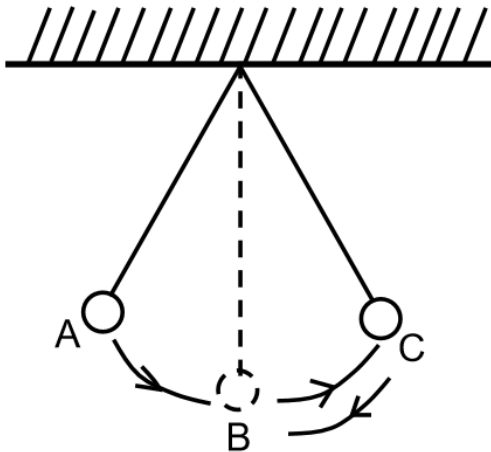
- *Hertz(Hz)*

38 The pendulum bob takes 10 seconds to make 20 complete oscillations. What is the period of the pendulum?

- $T = \frac{t}{n}$

$$= \frac{10s}{20} = 0.5s$$

39 The diagram below shows a simple pendulum that oscillates between position A and C. It takes 2.05 seconds to go from A to C and back to the midpoint B.



(ii) What is the period of the pendulum?

- $T = \frac{t}{n}$

Notice the pendulum bob moves from A to C and back to B. therefore  $n = \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4} = 0.75$

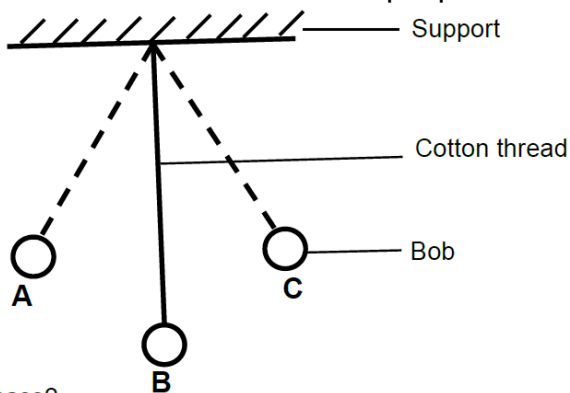
$$T = \frac{2.05}{0.75} = 2.73s$$

(iii) Calculate the frequency of the pendulum.

- $F = \frac{1}{T}$  since  $T=2.73$  hence

$$F = \frac{1}{2.73} = 0.37Hz$$

40 The figure below shows an experiment which was carried out to measure the time interval of a simple pendulum.



The bob was oscillating between A and C.

(a) State the meaning of the term 'oscillation'.

- An oscillation is the movement of the bob from A to C and back to A.

(b) If the pendulum bob took 0.20s to swing from A to C, calculate the period.

- $Period\ T = \frac{t}{n}$
- $number\ of\ oscillations = \frac{1}{4} + \frac{1}{4} = \frac{1}{2} = 0.5$
- $Period\ T = \frac{0.2}{0.5} = 0.4s$

(c) Using your answer to (b), determine the frequency of the bob.

- Frequency  $F = \frac{1}{T}$
- Frequency  $F = \frac{1}{0.4} = 2.5\text{Hz}$

41 What is mass?

- Mass is the amount of matter contained in a substance

42 A lion of mass 200kg is transferred from the moon to the Earth. Acceleration of free fall on the moon is  $1.67\text{m/s}^2$  while that on Earth is  $10\text{m/s}^2$ .

(a) State

- (i) An instrument commonly used in the laboratory for measuring the amount of material in a body.
  - Beam balance or electronic balance.
- (ii) The mass of the 200kg lion on Earth.
  - The mass does not change hence mass is 200kg

(b) Calculate the weight of the lion on earth.

- Weight  $W = mg$
- $W = 200 \times 10 = 2000\text{N}$

43 Name two instruments used in the measurement of mass.

- Beam balance
- Electronic balance

44 What is density?

- This is the mass per unit volume.

45 What is the SI unit for density?

- Kilogram per cubic metres  $\text{kg/m}^3$

46 What is the formula for density?

- $Density = \frac{mass}{volume}$

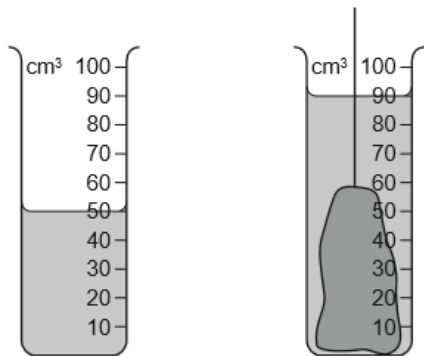
47 Find the mass of  $5cm^3$  of copper having a density of  $9g/cm^3$ ?

- $m = \rho \times V$   
 $m = 5cm^3 \times 9g/cm^3 = 45g$

48 A container is filled with 5kg of paint. The density of the paint is  $2 g/cm^3$ . What is the volume of container is needed?

- $\rho = \frac{M}{V}$  making volume the subject we have
- $V = \frac{M}{\rho} \Rightarrow V = \frac{5}{2} = 2.5m^3$

49 An object of mass 100 g is immersed in water as shown in the diagram below.



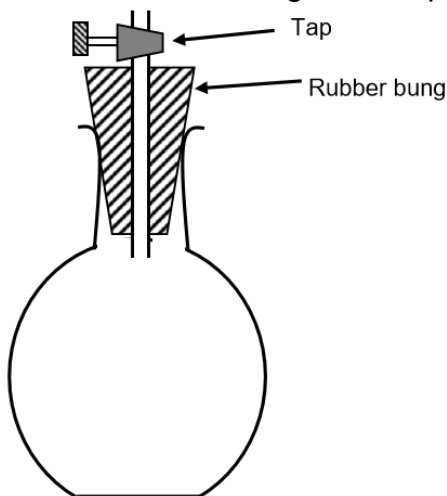
What is the density of the material from which the object is made?

- $\rho = \frac{M}{V}$  from the diagram the  $volume = 90 - 50 = 40cm^3$
- $\rho = \frac{100g}{40cm^3} = 2.5g/cm^3$

- 50 A stone of mass 400g is lowered into a measuring cylinder containing water. The water level rises from  $300\text{cm}^3$  to  $500\text{cm}^3$ . What is the density of the stone?

- $\rho = \frac{M}{V}$      $\text{Volume} = 500 - 300 = 200$
- $\rho = \frac{400\text{g}}{200} = 2\text{g/cm}^3$

- 51 The figure below represents a thick-walled bottle used to carry out an experiment to determine the density of air. The bottle was fitted with a rubber bung and a tap.



The following results were obtained:

Mass of the bottle containing air = 410g

Mass of empty (evacuated) bottle = 409g

Mass of bottle filled with air = 510g

- (a) What mass of water was needed to fill the bottle?

- $\text{mass} = 1150\text{g} - 409\text{g} = 741\text{g}$

- (b) What was the internal volume of the bottle? Take the density of water as  $1\text{g/cm}^3$ .

- Density  $\rho = \frac{M}{V}$  rearranging the equation we have

- $V = \frac{M}{\rho}$
- $V = \frac{741}{1} = 741 \text{ cm}^3$

(c) What mass of air filled the bottle?

- $\text{Mass of air} = 410 - 409 = 1 \text{ g}$

(d) What was the density of the air?

- Density  $\rho = \frac{M}{V}$
- $\rho = \frac{1}{741} = 1.3 \times 10^{-3} \text{ g/cm}^3$

52 The diagram below shows the dimensions of a metal block whose mass is 80g.

53

54 The name given to a point on any object where the weight of an object is concentrated is called.....

- Centre of mass

55 What is a scalar quantity?

- These are quantities which have magnitude but no direction.

56 Give any five examples of scalar quantities?

- Mass
- Speed

- Distance
- Temperature
- Density
- Time

57 What are vector quantities?

- These are quantities with both magnitude and direction.

58 Give any four examples of vector quantities?

- Velocity
- Acceleration
- Weight
- Displacement

59 What is distance?

- This is the length between two points.

60 What is displacement?

- This is the length between two points in a specified direction.

61 The rate of change of distance is called.....

- Speed

62 What is the SI unit for speed?

- Metres per second m/s

63 What is the formula used to calculate speed?

- $Speed = \frac{total\ distance}{time\ taken}$

64 What is meant by acceleration?

- This is the rate of change of velocity.

65 What is the SI unit for acceleration?

- $\text{m/s}^2$

66 what is the formula used to calculate acceleration?

- $\text{acceleration} = \frac{\text{final velocity} - \text{initial velocity}}{\text{time taken}} \left[ a = \frac{v-u}{t} \right]$

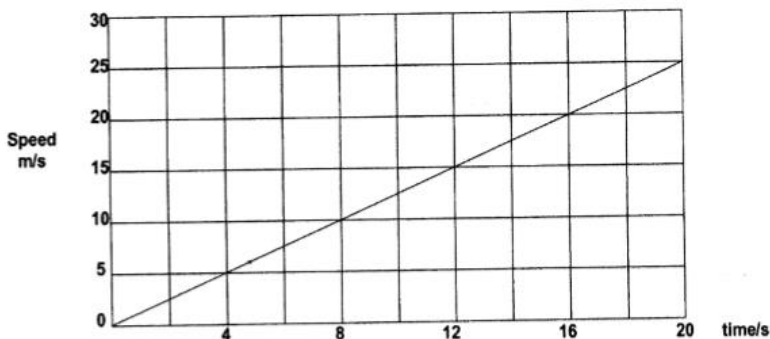
67 A car accelerates from a standing start and reaches a velocity of  $18\text{m/s}$  after  $6.0$  second. calculate its acceleration.

- $\text{acceleration } a = \frac{v-u}{t}$
- $a = \frac{18\text{m/s} - 0\text{m/s}}{6\text{s}} = 3\text{m/s}^2$

68 A car driver brakes getly. Her car slows down from  $23\text{m/s}$  to  $11\text{m/s}$  in  $20\text{s}$ . calculate the magnitude of her deceleration.

- $\text{acceleration} = \frac{v-u}{t}$
- $a = \frac{\frac{11\text{m}}{\text{s}} - \frac{20\text{m}}{\text{s}}}{20\text{s}} = 0.45 \frac{\text{m}^2}{\text{s}}$

69 The figure below shows a graph of how the speed of the car changed over 20 seconds as the car accelerated along a straight road.



(a) Calculate the acceleration of the car.



- *Acceleration*  $a = \frac{v-u}{t}$
- $a = \frac{25-0}{20} = 1.25\text{m/s}^2$

(b) The mass of the car was 1200kg. Calculate the force which produced the acceleration in (a).

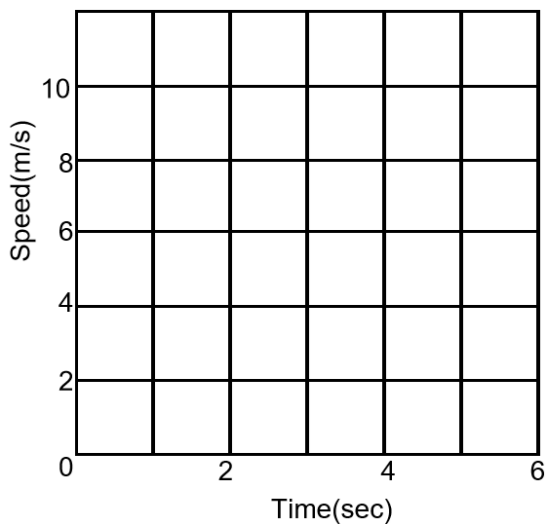
- *Force*  $F = ma$
- $F = 1200\text{kg} \times 1.25 \frac{\text{m}^2}{\text{s}} = 1500\text{N}$

(c) Calculate the distance travelled by the car during the 20 seconds.

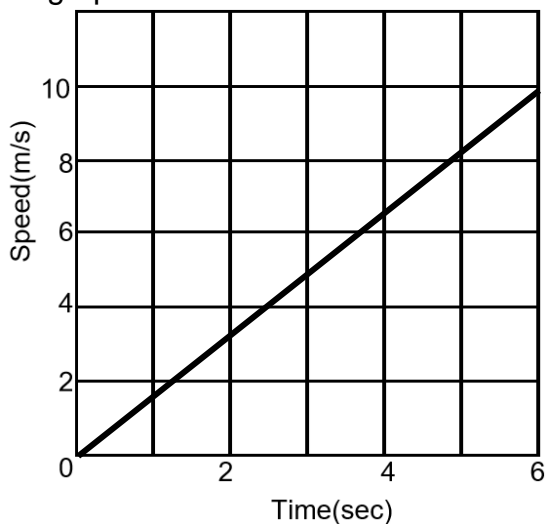
- *Total distance* = *area under the graph*
- $A = \frac{1}{2}bh$
- $A = \frac{1}{2} \times 20 \times 25 = 250\text{m}$

70 A car of mass 1400kg starts from rest and moves along a straight road with a constant acceleration to reach a speed of 10m/s in 6 seconds.

(a) On the axes below ,draw a graph of speed against time for the first 6 seconds of the motion.



- The graph is shown below



(b) For the motion of the car in the first 6 seconds ,calculate the

(i) distance travelled by the car.

- Distance is equal to area under the graph.

- $distance = \frac{1}{2}bh$

- $Distance = \frac{1}{2} \times 6 \times 10 = 30m$

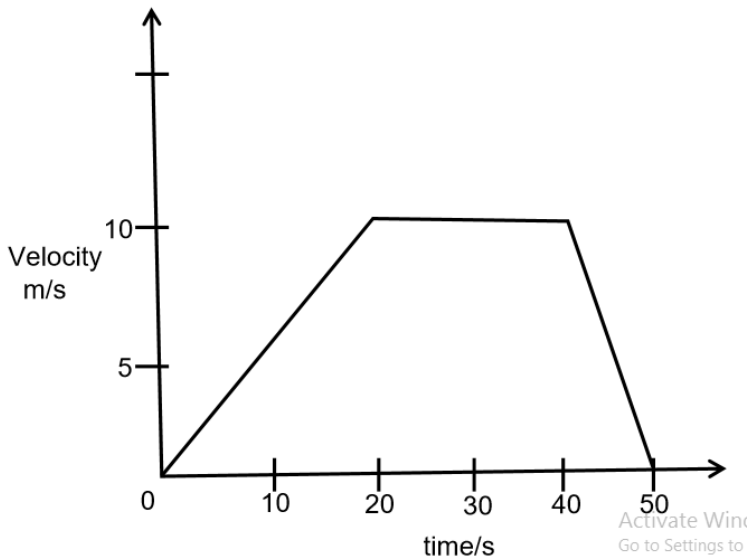
(ii) Acceleration of the car.

- Acceleration  $a = \frac{v-u}{t}$
- $a = \frac{10\text{m/s}-0\text{m/s}}{6\text{s}} = 1.67\text{m/s}^2$

(iii) Resultant force acting on the car.

- Resultant force  $F = ma$
- $F = 1400\text{kg} \times 1.67\text{m/s}^2 = 2338\text{N}$

71 The figure below shows a velocity time graph of an object along a straight road.



(a) What is the total time for the journey?

- The total time for the journey is 50seconds

(b) What is the maximum velocity for the journey?

- Maximum velocity is 10m/s

(c) What is the acceleration for the first part of the journey?

- The first part of the journey is the first 20 seconds.

- $a = \frac{v-u}{t}$

- $a = \frac{10-0}{20} = 0.5m/s^2$

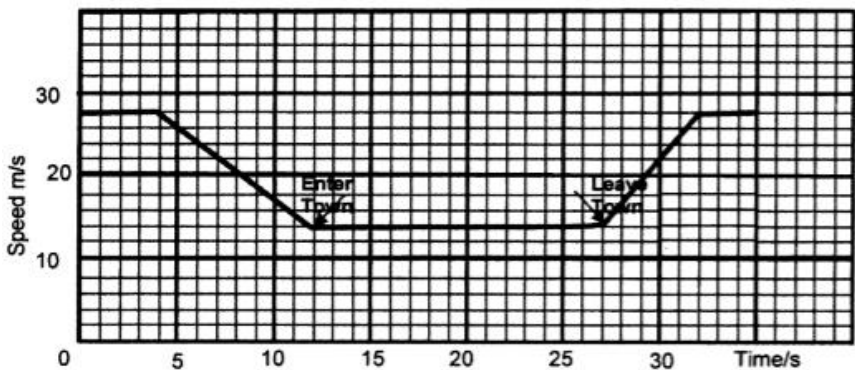
(d) Calculate the total distance covered by the car.

- Total distance traveled is equal to the area under the graph.

- $A = \frac{1}{2}(a + b)h$  note that area under graph is atrapezium

- $A = \frac{1}{2}(50 + 20)10 = 350m$

72 The figure below represets the motion of a car along a straight road.As the car approaches a small town,it slows down.The car travels at a constant speed from the start of the town to the end of the town.After passing thogh the town ,the car speeds up.



(a) (i) What was the speed of the car in the town?

- The speed was  $14m/s$

(ii) Detetrmine the time taken by the car to pass through the town.

- $Time\ taken = 27 - 12 = 15\ seconds$

(iii) Calculate the distance travelled by the car in the town.

- Distance is equal to the area under the graph. To find distance we find the area under graph as the car was in town. This is a rectangle.
- $D = l \times b$
- $D = 15 \times 14 = 210\ metres$

(b) The car accelerates after passing through the town. Calculate the acceleration. Give the units of your answer.

- $Acceleration\ a = \frac{v-u}{t} \quad a = \frac{28-14}{32-27} = 2.8\ m/s^2$

73 Leaving a bus stop, a bus reaches a velocity of 8.0 m/s after 10 s. Calculate the acceleration of the bus.

- $Acceleration\ a = \frac{v-u}{t}$
- $a = \frac{8.0\ m/s - 0\ m/s}{10\ s} = 0.8\ m/s^2$

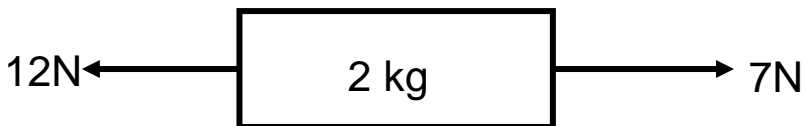
74 A sprinter starting from rest has an acceleration of 5 m/s<sup>2</sup> during the first 2.0 seconds of a race. Calculate her velocity after 2.0 seconds.

- $a = \frac{v-u}{t}$  rearranging the equation gives
- $v = u + at$
- $v = 0\ m/s + 5\ m/s^2 \times 2\ s = 10\ m/s$

75 A train slows down from 60 m/s to 20 m/s in 50 s. Calculate the magnitude of the deceleration of the train.

- $a = \frac{v-u}{t}$
- $a = \frac{20-60}{50} = -0.8\ m/s^2$

- 76 What is force?
- Force is a pull or push exerted on an object.
- 77 What are the SI units for force?
- Newtons (N)
- 78 Mention any four examples of force.
- Weight
  - Friction
  - Electric force
  - Magnetic force
- 79 What is the name of the instrument used in the measurement of force?
- Spring balance
- 80 What is friction?
- Friction is the force that resists the movement of one surface across another surface.
- 81 The diagram below shows a box containing a mass of 2kg in which two forces are applied 7N to the right and 12N to the left. Calculate the resultant force.



- $Resultant\ force = 12N - 7N = 5N$
- 82 What is the formula used to calculate force?
- $Force = mass \times acceleration$  [ $F = ma$ ]

83 What force is needed to give a mass of 80kg an acceleration of  $10\text{m/s}^2$ ?

- $F = ma \Rightarrow F = 80\text{kg} \times 10\text{m/s}^2 = 800\text{N}$

84 What is the acceleration given to an object with a mass of 60kg when a force of 100N acts on it?

- $a = \frac{F}{m}$  substituting we have

$$a = \frac{100}{60} = 1.66\text{m/s}^2$$

85 The ball is kicked with a force of 40N. This causes the ball to accelerate by  $8\text{m/s}^2$ . What is the mass of the body?

- $F = ma \Rightarrow m = \frac{F}{a}$  substituting we have

$$m = \frac{40}{8} = 5\text{kg}$$

86 A body has a mass of 2kg. It accelerates from 20m/s to 40m/s in 4 seconds. What is the resultant force of this body?

- $F = ma$  we first find acceleration

- $a = \frac{v-u}{t} = \frac{40\text{m/s}-20\text{m/s}}{4} = 5\text{m/s}^2$

- $F = 2\text{kg} \times 5\text{m/s}^2 = 10\text{N}$

87 What does Newton's first law of motion state?

- A body continues in its state of motion unless an external force is applied to it.

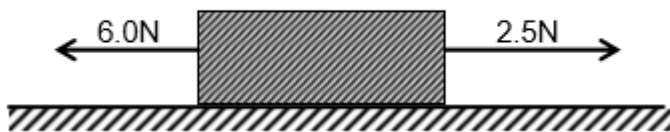
88 What does Newton's second law of motion state?

- Acceleration is directly proportional to the force producing it but inversely proportional to mass.

89 Mention any three things a force can do to an object when applied to it?

- It can cause objects to start moving
- It can cause objects to speed up or slow down
- It can change the direction of their movement
- It can deform or break up objects.

90 The figure below shows an object of mass 0.7kg resting on a horizontal surface.



If the object is pulled to the left by a force of 6.0N and to the right by a force of 2.5N and assuming that no other forces act on the object.

(a) Calculate the resultant force.

- *Resultant force*  $= 6.0N - 2.5N = 3.5N$

(b) Calculate the acceleration produced by the resultant force.

- $F = ma$  making  $a$  the subject we have
- $a = \frac{F}{m} \Rightarrow a = \frac{3.5N}{0.7kg} = 5m/s^2$

(c) Explain why in practice the actual acceleration for the object may be lower than your answer in (b).

- Some force might have been used to overcome friction.

91 A car accelerates uniformly from rest to a speed of 20m/s in 8seconds. The mass of the car is 1200kg.

(a) Calculate the acceleration of the car.

- *Acceleration*  $a = \frac{v-u}{t}$
- $a = \frac{20m/s - 0m/s}{8s} = 2.5m/s^2$



(b) Calculate the minimum force needed to produce the acceleration in (a).

- *Minimum force*  $F = ma$
- $F = 1200\text{kg} \times 2.5\text{m/s}^2 = 3000\text{N}$

(c) Explain why the engine must produce a larger force if this acceleration is to be achieved.

- The force is required to overcome friction and air resistance.

92 What is weight?

- This is the pull of gravity.

93 What is the difference between mass and weight? Give four.

- Weight is measured in Newtons while mass is measured in kilograms
- Weight is a force while mass is the measure of inertia
- Weight is measured using a spring balance while mass is measured using a beam balance or electronic balance.
- Weight varies from place to place while mass is constant.

94 What two factors will make an object stable?

- The centre of gravity should be as low as possible
- The base area should be as large as possible.

95 A mass of an object is 50kg on earth, what will be its mass on the moon?

- The mass will be 50kg (mass does not change)

96 What is the formula used to calculate weight?

- $Weight = mass \times gravitational\ field\ strength$
- $W = mg$

97 An object has a mass of 20kg on the earth. What is the mass of the object on the moon where the gravitational field strength is  $10N/kg$ ?

- 20kg (mass does not change)

98 Calculate the weight of an object of mass 20kg on the earth.

- $W = mg$  notice  $g = 10m/s^2$  on earth  
 $W = 20kg \times 10m/s^2 = 200N$

99 An object weighs 8.5N on the moon where the gravitational field strength is  $1.7N/kg$ . What is the mass of the object?

- $W = mg \Rightarrow m = \frac{W}{g}$   
 $m = \frac{8.5N}{1.7N/kg} = 5kg$

100 The value of  $g$  is  $10N/kg$  on the earth and  $1.5N/kg$  on the moon. An astronaut who has a mass of 90kg on the Earth, goes to the moon. What are the values of:

(a) His weight on the Earth,

- $W = mg$
- $W = 90 \times 10 = 900N$

(b) His mass on the Moon

- $Mass = 90kg$

(c) His weight on the Moon?

- $W = mg$
- $W = 90 \times 1.5 = 135N$

101 A girl who has a mass of 50kg runs up some stairs in 7.0seconds.The stairs are 8.0m high. Take the gravitational field strength as 10N/kg. What is :-

(a) The girls weight?

- $W = mg$
- $W = 50kg \times 10N/kg = 500N$

(b) The girls potential energy when she is at the top of the stairs?

- $P.E = mgh$
- $P.E = 50kg \times 10N/kg \times 8.0m = 4000J$

(c) Her power output?

- $P = \frac{W}{t}$  note that work is the same as potential energy.
- $P = \frac{4000}{7.0} = 571.43Watts.$

102 Define work and power.

- Work is the product of the force and the distance moved in the direction of the force.
- Power is the rate of doing work.

103 A pupil of mass 50kg runs up a flight of stairs each 25cm high in a time of 20 seconds.[Take  $g=10N/kg$ ]

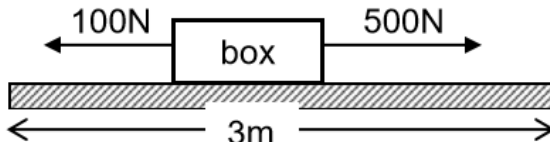
(a) Calculate the pupils gain in potential energy.

- $P.E = mgh$
- $Height = 25 \times 20cm = 500cm$ .Note that the height is in cm so there is need to convert it to m.
- $height = \frac{500}{100} = 5metres$
- $P.E = 50kg \times 10N/kg \times 5m = 2500J$

(b) Calculate the useful power developed by the pupil in climbing the stairs.

- $Power = \frac{work}{time}$  note that work is the same as potential energy.
- $Power = \frac{2500}{20} = 125Watts$

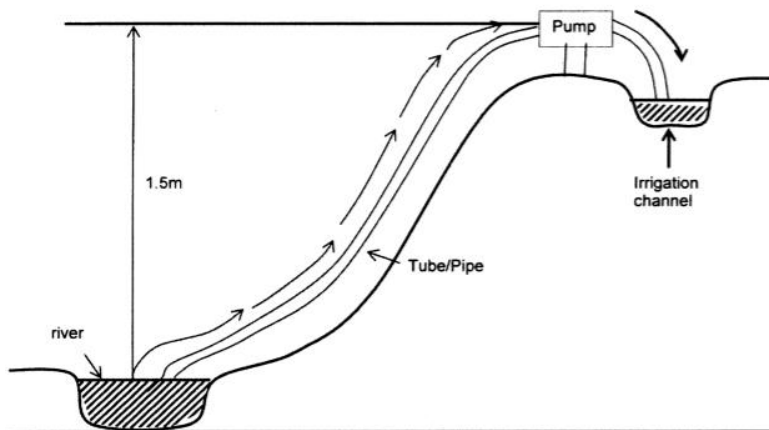
104 A person exerts a horizontal force of 500N on a box, which also experiences a friction force of 100N.



How much work is done against friction when the box moves a horizontal distance of 3m?

- $W = F \times d$
- $Resultant\ force = 500N - 100N = 400N$
- $W = 400N \times 3m = 1200J$

105 The figure below shows water being pumped from a river into an irrigation channel. The water is lifted to a height of 1.5m. The pump is able to lift 50kg of water each second. The gravitational field strength is 10N/kg.



(a) Calculate the work done when 50kg of water is lifted to a height of 1.5m.

- $W = F \times d$  and  $F = ma$
- Therefore the formula becomes  $W = m \times a \times d$
- $W = 50\text{kg} \times 10 \times 1.5 = 750\text{J}$

(b) The pump used 1200J of energy to lift 50kg of water to a height of 1.5m. Explain the difference between this value and the value calculated in (a).

- The calculated value is smaller than the used energy, because some of the energy is used to overcome friction force as the water is being pumped up.

(c) Calculate the efficiency of the pump.

- $\text{Efficiency} = \frac{\text{work input}}{\text{work output}} \times 100\%$
- $\text{Efficiency} = \frac{750\text{J}}{1200\text{J}} \times 100\% = 62.5\%$

106 A girl whose mass is 45kg carries a box of mass 25kg up a flight of steps. There are 40 steps each 40cm high. She takes 16s to climb up the stairs. (take  $g = 10\text{m/s}^2$ ).

(a) What is her weight?

- ☐  $Weight\ W = mg$
- ☐  $W = 45 \times 10 = 450N$

(b) What is the weight of the box?

- ☐  $Weight\ of\ the\ box\ W = mg$
- ☐  $W = 25 \times 10 = 250N$

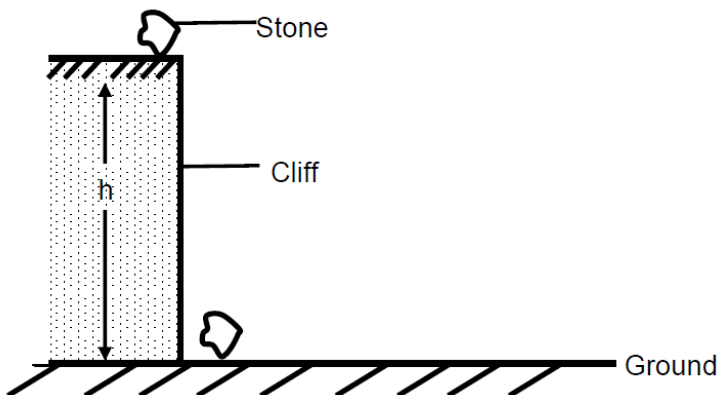
(c) Calculate the total gravitational potential energy of the girl and the box when she reaches the top.

- ☐  $potential\ energy\ P.E = mgh$
- ☐  $Height = 40 \times 40cm = 1600cm$
- ☐ Notice that height should always be in metres.
- ☐ Converting this we have  $\frac{1600}{100} = 16m$
- ☐  $P.E = (45 + 25) \times 10 \times 16 = 11200J$

(d) Calculate the total power.

- ☐  $power\ P = \frac{W}{t}$  work is the same as P.E
- ☐  $P = \frac{11200}{16} = 700Watts$

107 The figure below shows a stone of mass 2kg which drops from the top of a cliff and takes two seconds to strike the ground. Acceleration of free fall,  $g = 10m/s^2$ .



(a) Name the form of energy possessed by the stone before it falls.

- Potential energy

(b) Determine the height of the cliff

- Height  $h = \frac{1}{2}gt^2$
- Height  $h = \frac{1}{2} \times 10 \times 2^2 = 20m$

(c) Calculate

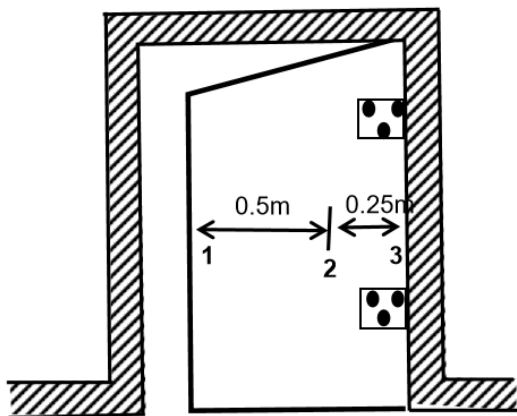
(i) The kinetic energy of the stone when half way down.

- $P.E = mgh$
- $P.E = 2 \times 10 \times 20 = 400J$
- Notice that as the stone falls the potential energy will be converted to kinetic energy. When half way down half of the potential energy will be converted to kinetic energy. Therefore
- $K.E = \frac{1}{2} \times 400J = 200J$

(ii) The final velocity of the stone as it strikes the ground.

- Use the formula  $K.E = \frac{1}{2}MV^2$
- Just before the stone strikes the ground it will have the kinetic energy same as the potential energy at the top of the cliff.  $K.E = 400J$ .
- Using this we have
- $400 = \frac{1}{2} \times 2 \times V^2$
- $400 = V^2$
- $\sqrt{400} = \sqrt{V^2}$
- $20 = V$
- Therefore the velocity is  $20m/s$ .

108 The figure below shows a door well secured on the door frame.

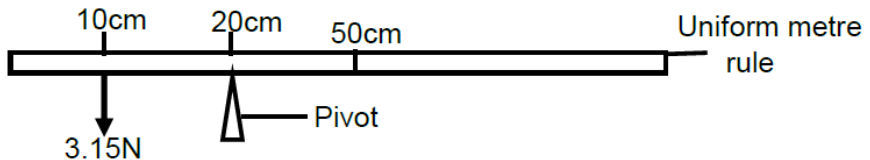


- (a) What is meant by moment of force? Include its SI unit?
- Moment of a force about a point is defined as the product of the force and the perpendicular distance of its line of action from the pivot.
- (b) Calculate the moment of force if a force of 10N is applied at point 1 to open or close the door.
- $Moment\ M = F \times d$
  - $M = 10 \times (0.5 + 0.25) = 7.5Nm$
- (c) Explain why it is easier to open or close the door if the handle is fixed at point 1 than at point 2 or 3.
- Pushing the door at 1 will produce a greater effect because of the greater perpendicular distance of the force from the pivot. Hence a smaller effort is required at 1.

109 What is meant by the 'moment' of a force about a point?



- Moment of a force about a point is defined as the product of the force and the perpendicular distance of its line of action from the pivot.
- (b) Moment of a force depends on two factors; what are they?
- Magnitude of a force
  - The perpendicular distance from the pivot
- (c) The figure below shows a uniform metre rule which is pivoted at the 20cm mark and balanced horizontally by an object of weight 3.15N placed at the 10cm mark.



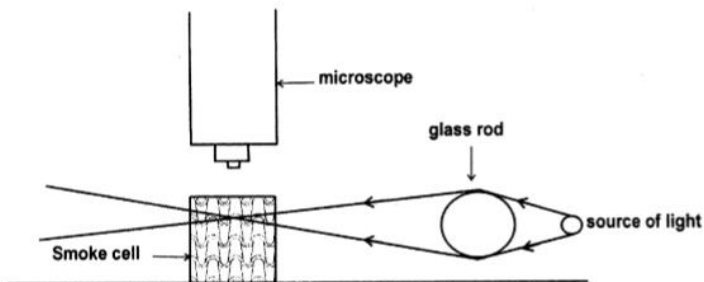
Calculate the weight of the metre rule.

- The weight of the object is concentrated at the 50cm mark.
- Using the principle of moments we have
- *clockwise moment = anticlockwise moment*
- $F_1 \times d_1 = F_2 \times d_2$
- $3.15 \times 10 = F_2 \times 30$
- $31.5 = 30F_2$
- $\frac{31.5}{30} = F_2$
- Therefore  $F_2 = 1.05\text{N}$ . hence the weight of the plank is 1.05N

110 What is conduction?

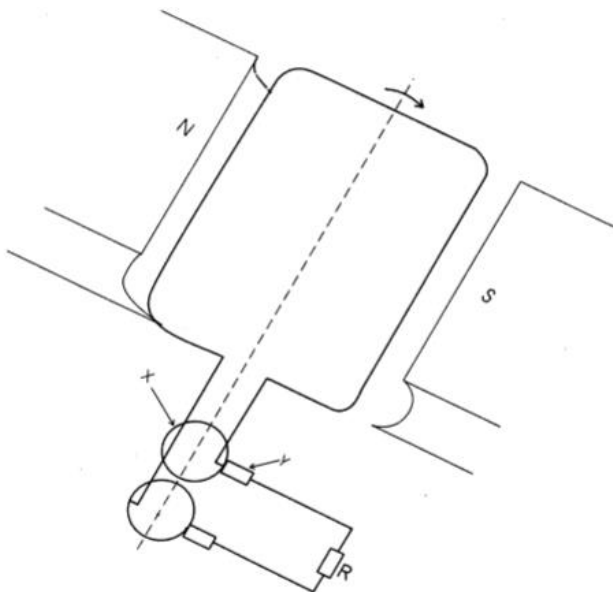
- This is the transfer of thermal energy(heat) through matter from places of higher temperature to places of lower temperature without the movement of the matter as a whole.

- 111 The figure below shows one form of an apparatus used to observe Brownian motion of smoke particles in air. A pupil looking through the microscope sees tiny bright specks which he described as “dancing about”.



- (a) What are the bright specks?
- Smoke particles
- (b) Why are the specks “dancing about”?
- This is due to collisions with fast-moving air molecules in the cell.
- (c) State the conclusion that can be drawn from Brownian motion.
- The random movements of smoke particles are due to their random collisions with the air molecules. It predicts that the molecules are moving randomly.

- 112 The diagram below shows a simple a.c generator.



(a) Name the parts X and Y.

- X slip ring
- Y carbon brushes

(b) Name three ways in which the generator would be made to produce more voltage.

- By using a coil with more turns
- By using a stronger magnet
- Winding the coil round a soft iron core
- Rotaing the coil faster.

113 The figure below shows some of the components of the electromengnetic spectrum.

Radio waves	microwaves	Infra-red	Visible light	A	X-ray	Gamma-rays
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(a) What is represnted by component A?

- Ultra violet light

(b) State the speed of the following components in a vacuum.

(i) Infra-red

- $3 \times 10^8$
- All electromagnetic waves travel at the speed of light in a vacuum

(ii) Gamma rays

- $3 \times 10^8$
- All electromagnetic waves travel at the speed of light in a vacuum

(c) All electromagnetic waves are transverse.

(i) What is the meaning of the term “transverse”

- The direction of oscillation is perpendicular to the direction of the wave.

(ii) Give another example of a transverse wave ,but which is not an electromagnetic wave.

- Water wave.

114 Light and gamma rays are both examples of electromagnetic radiation.

(a) Name two other types of electromagnetic-radiation.

- Ultra violet light
- Infra-red
- X-rays
- Microwaves
- Radio waves

(b) State the difference between light and gamma rays.

- Light has a longer wavelength compared to that of gamma rays
-

(c) The speed of light is  $3 \times 10^8 \text{ m/s}$ . Calculate the frequency of yellow light of wavelength  $6 \times 10^{-7}$ .

- We use the formula  $v = f\lambda$  and rearranging the equation we have

- $f = \frac{v}{\lambda}$

- $f = \frac{3 \times 10^8 \text{ m/s}}{6 \times 10^{-7} \text{ m}} = 5 \times 10^{14} \text{ Hz}$

115 A radio station transmits waves at a frequency of  $80 \times 10^6 \text{ Hz}$ .

(a) What is meant by the frequency of the radio wave?

.....  
.....

- Frequency of the radio wave is the number of waves passing a certain point per second.

(b) If the velocity of the electromagnetic waves is  $3 \times 10^8 \text{ m/s}$ , calculate the wavelength of the radio waves.

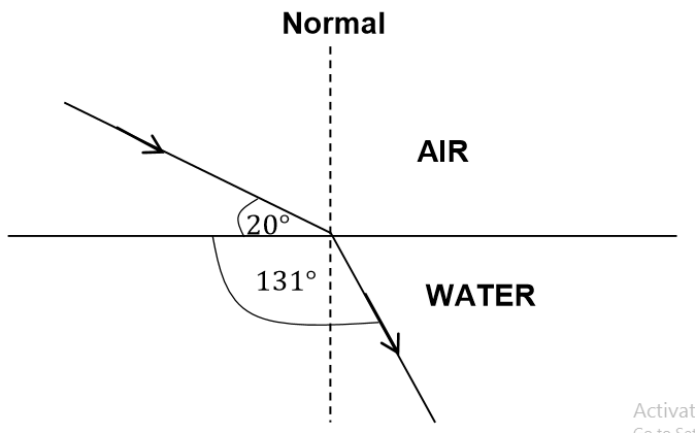
- We use the formula  $v = \lambda f$

- Rearranging the equation we have  $\lambda = \frac{v}{f}$  substituting we have

- $\lambda = \frac{3 \times 10^8}{80 \times 10^6} = 3.75 \text{ m}$

- Therefore the wavelength of the radio wave is  $3.75 \text{ m}$ .

116 The diagram below shows a ray of light from air to water. The diagram is not drawn to scale.



(a) Determine the:

(i) The angle of incidence

- $\text{Angle of incidence} = 90^\circ - 20^\circ = 70^\circ$

(ii) Angle of refraction

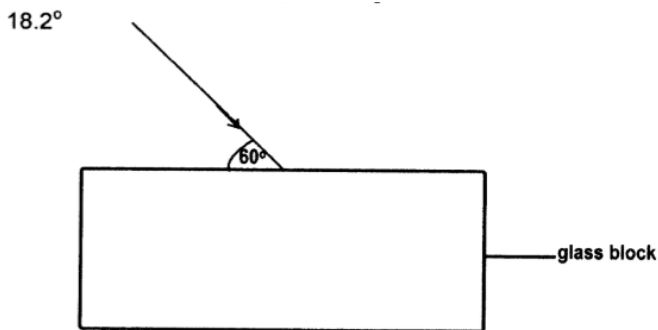
- $\text{Angle of refraction} = 131^\circ - 90^\circ = 41^\circ$

(b) Calculate the refractive index.

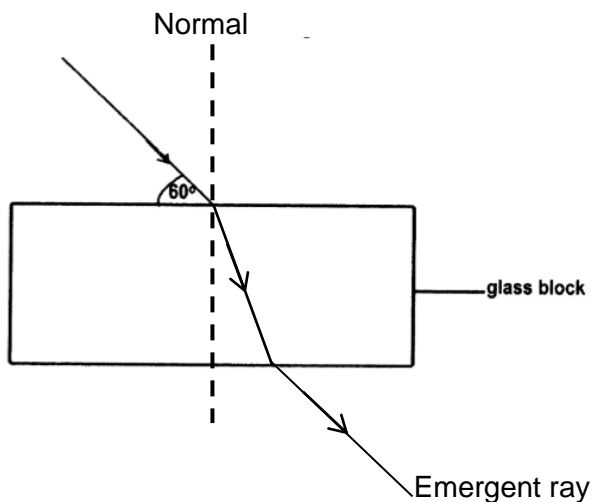
- $\text{Refractive index} = \frac{\sin i}{\sin r}$
- $\text{refractive index} = \frac{\sin 70^\circ}{\sin 41^\circ} = 1.46$

117 (a) The figure below shows a ray of light incident on a rectangular block. Complete the path taken by the ray of light through and out of the block. The angle of refraction is

18.2°.



(b) The completed ray diagram is shown below.



If the ray of light strikes the glass block at an angle of  $60^\circ$  as shown in the figure. Find

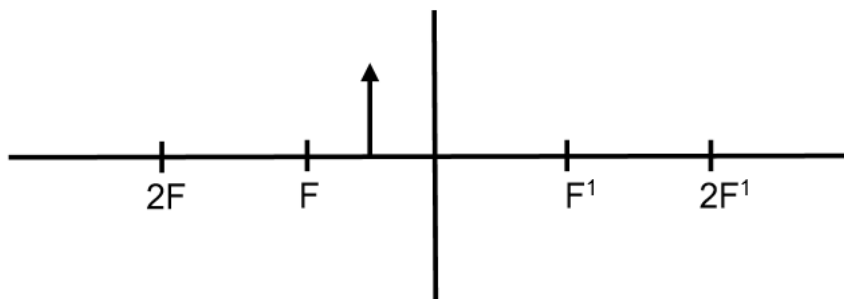
(i) The angle of incidence

- $\text{Angle of incidence} = 90^\circ - 60^\circ = 30^\circ$

(ii) The refractive index of the glass block.

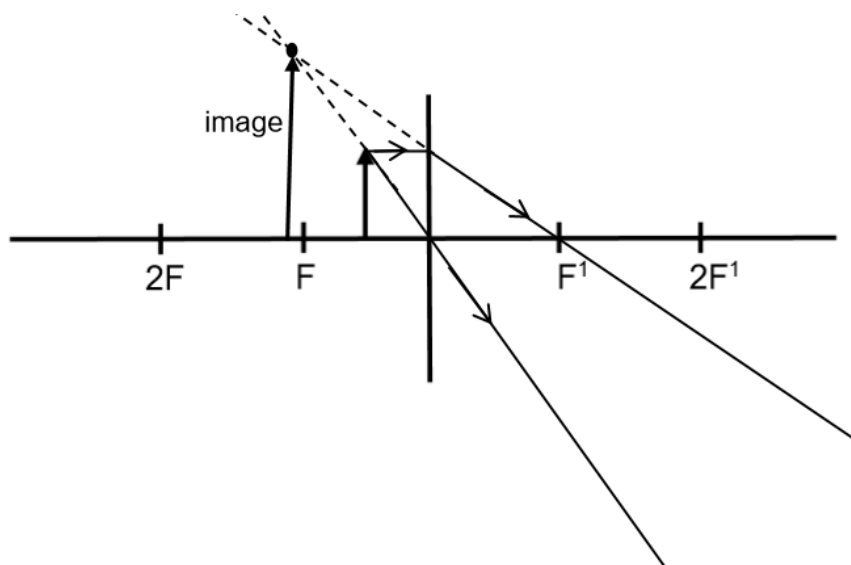
- $\text{Refractive index} = \frac{\sin i}{\sin r} = \frac{\sin 30}{\sin 18} =$

118 The figure below show an incomplete ray diagram.



(a) Complete the ray diagram above to show the position of the image.

- The completed ray diagram is shown below

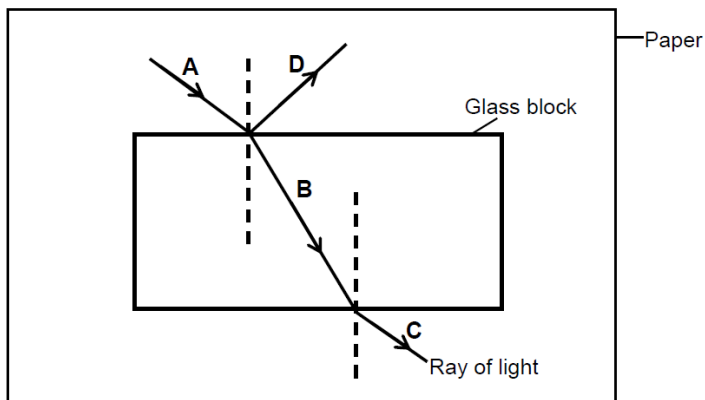


(b) Give two characteristics of the image formed.

- The image is magnified
- The image is upright
- The image is on the same side as the object
- The image is virtual



107 The figure below shows a ray of light entering and leaving a glass block.



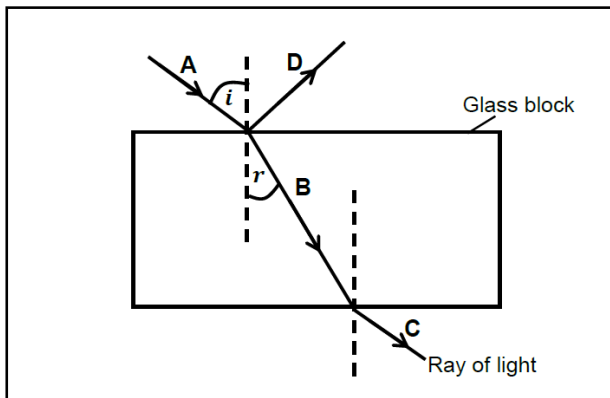
(a) Name the rays labelled A to D.

- A.....
- B.....
- C.....
- D.....

- A incident ray
- B refracted ray
- Emergent ray
- D the reflected ray

(b) On the diagram, indicate  $i$  and  $r$  for angles of incidence and refraction.

- The angles are shown below on the diagram.

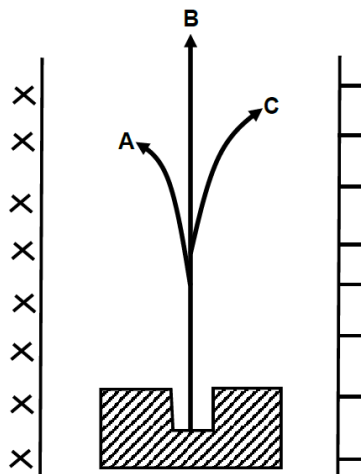


Paper

(c) For a certain piece of glass block the angle of incidence was found to be  $25^\circ$  and angle of refraction was found to be  $16^\circ$ . using this information, calculate the refractive index for this piece of glass block to two decimal places.

- $\text{Refractive index } n = \frac{\sin i}{\sin r}$
- $\text{refractive index} = \frac{\sin 25^\circ}{\sin 16^\circ} = \frac{0.4226}{0.2756} = 1.53$

108 The figure shows a stream of  $\alpha$ ,  $\beta$  and  $\gamma$  rays passed through a uniform electric field represented by tracks **A**, **B** and **C**.



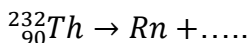
(a) Identify the tracks marked **A** , **B** and **C** representing the radiations.

- A alpha particles( $\alpha$ )
- B gamma rays( $\gamma$ )
- C beta particle ( $\beta$ )

(b) What is the charge for the radiation represented by the track marked B?

- Positively charged

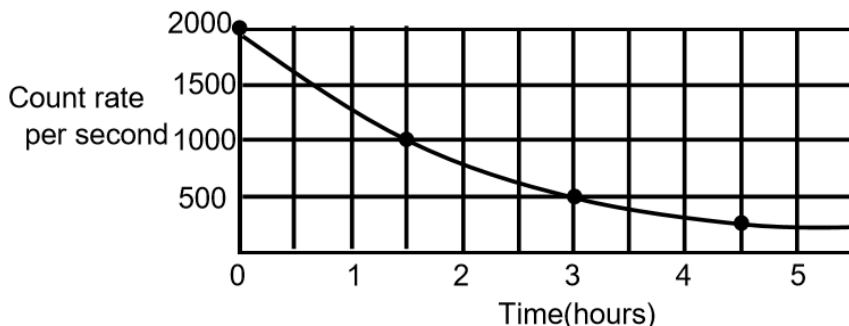
(c) Thorium nucleus undergoes alpha-decay by emitting one particle to form a daughter element whose symbol is *Rn*.



Complete the equation above that represent the decay of the Thorium nucleus; include the nucleon and proton numbers of the particles.

- The completed equation is shown below.
- ${}_{90}^{232}\text{Th} \rightarrow {}_{88}^{228}\text{Rn} + {}_2^4\text{He} + \text{energy}$

109 A detector of nuclear radiation was set up to measure the decay of a radioactive substance. The figure below shows the results of the experiment.



- (a) (i) What is the half-life of the substance?
- From the graph the half-life is 1.5 hours
- (ii) Clearly explain how you obtained your answer to (a)(i) above.
- (b) List any three properties of a beta-particle.
- They are fast moving electrons which are negatively charged
  - They have a moderate ionizing power.
  - They are deflected by both an electric field and magnetic fields.
- (c) Describe how you would show that the radioactive source is emitting only beta-particles.
- First, insert a piece of paper between the source and detector. There should be no change in the count rate, showing that  $\alpha$  –particles are not present. Then insert a sheet of aluminum 3mm thick between source and detector. The count rate is then found to fall to 0. This shows that beta particles are present and gamma rays are not present.

110 (a) For one neutral atom of lead [ $^{214}_{82}\text{Pb}$ ], state the number of:

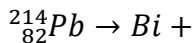
(i) Neutrons

- $\text{Neutrons} = 214 - 82 = 132$

(ii) Electrons

- $\text{Electrons} = 82$

- (b) Lead nucleus can undergo decay by the emission of beta particle to produce a bismuth nucleus. Complete the equation below to represent the decay of lead nucleus.



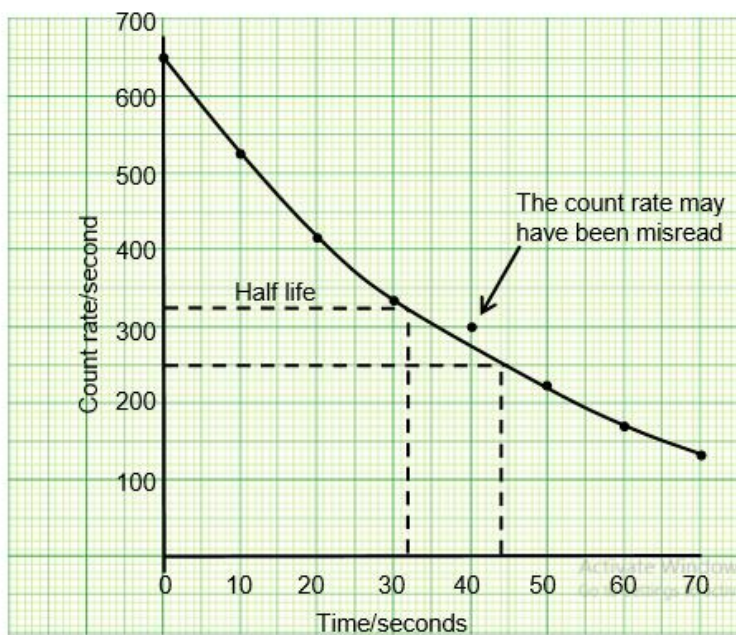
- If completed the equation will be
- ${}^{214}_{82}\text{Pb} \rightarrow {}^{214}_{83}\text{Bi} + {}^0_{-1}\text{e} + \text{energy}$

111 The ratemeter (counter) was used at intervals of 10 minutes to measure the activity of a radioactive source and the following results were obtained.

Time(minutes)	0	10	20	30	40	50	60	70
Count rate(counts per second)	650	520	416	333	300	213	170	136

(a) Plot a graph of count rate against time.

- The graph is shown below.



(b) What count rate appears to have been misread and should therefore be ignored?

- The count rate that may have been misread is 300.

(c) At what time was the count rate 250 counts per second?

- Draw a line at 250 on the count rate to meet the curve where it meets the curve. The time is 44 seconds.

(d) What is the half-life of the source?

- $Half\ life = \frac{1}{2} \times 650 = 325^{th}$
- *From the graph half life = 32 minutes*

112 In an experiment to determine the half-life of radon-220 ( $^{220}_{86}Rn$ ) the following results were obtained, after allowing for the background count.

Time/s	0	10	20	30	40	50	60	70
Count rate/ $s^{-1}$	30	26	23	21	18	16	14	12

(a) By plotting of the count rate (vertically) against time (horizontally) determine the half-life of  $^{220}_{86}Rn$ . Show clearly on the graph how you obtained your answer.

- The graph is shown below

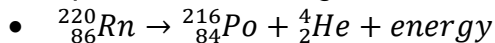


- $Half\ life = \frac{1}{2} \times 30 = 15^{th}$
- From the graph half life = 55 seconds

(b) What is the origin of the background count?

- Cosmic radiations

(c)  $^{220}_{86}Rn$  emits alpha particle. When it does so, it becomes an isotope of an element of polonium (Po), Write an equation to represent this change.



113 The nucleus of a boron atom may be represented by the symbol  $^{11}_5B$ . How many protons and neutrons does this nucleus have?

	Protons	Neutrons
<b>A</b>	5	6
<b>B</b>	5	11
<b>C</b>	6	5
<b>D</b>	6	11

- 114 A  ${}_{92}^{235}\text{U}$  nucleus decays by the emission of an  $\alpha$  –particle.what are the proton and nucleon number of the resulting nucleus?

	Proton number	Nucleon number
<b>A</b>	90	231
<b>B</b>	90	235
<b>C</b>	91	231
<b>D</b>	93	235

- 115 A neutral atom has 17 electrons, 17 protons and 18 neutrons. What is the nucleon number (mass number)?

**A** 17  
**B** 34  
**C** 35  
**D** 52

- 116 Why are radioactive sources stored in boxes lined with lead?

**A** Lead absorbs radiation and stops it from escaping into the room  
**B** Lead absorbs the radioactive source and makes it safe to handle  
**C** Lead completely stops the source from decaying and so it lasts longer  
**D** Lead slows down the rate at which radioactive source decays.

- 117 Why are  $\gamma$  –rays not deflected by a magnetic field?

**A** They are strongly penetrating  
**B** They are weak ionizing  
**C** They have no charge  
**D** They have no mass

- 118 How many electrons, neutrons and protons does an atom of iodine  ${}_{53}^{127}\text{I}$  contain?

	Electrons	Neutrons	Protons
<b>A</b>	53	74	53
<b>B</b>	53	127	53
<b>C</b>	74	74	53
<b>D</b>	74	53	74

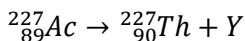


- 119 In an experiment to find the half-life of a radioactive isotope, the following results were obtained.

Activity/counts per min	4100	2800	1900	1300	900	600
Time/min	0	2	4	6	8	10

What is the approximate half-life of the isotope?

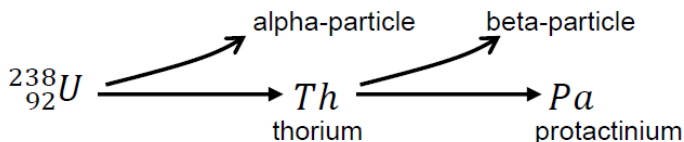
- A** 2min  
**B** 4min  
**C** 6min  
**D** 8min
- 120 The equation represents actinium decaying to thorium.



- 121 Which particle does Y represent?

- A** A helium nucleus  
**B** A neutron  
**C** An atom  
**D** An electron

- 122 The Uranium atom  ${}_{92}^{238}\text{U}$  emits an alpha –particle to become thorium, which then emits a beta particle to become protactinium.



What is the proton number (atomic number) of protactinium?

- A** 89  
**B** 90  
**C** 91  
**D** 95
- 123 A nucleus is represented by the symbol  ${}_{37}^{81}\text{X}$ . What does the nucleus contain?
- A** 37 electrons and 44 protons  
**B** 37 neutrons and 81 protons  
**C** 37 protons and 44 neutrons  
**D** 37 protons and 81 neutrons
- 124 Which type of radiation can be stopped completely by a thin piece of cardboard?

- A Alpha-particles
- B Beta-particles
- C Gamma-rays
- D X-rays

125 Boxes which are used to store radioactive substances are lined with lead. Why is this so?

- A It is a good thermal conductor
- B It prevents background radiation from entering the box and contaminating the contents
- C It prevents much of the radiation from escaping into the surrounding.
- D It stops the box from being knocked over easily

126 A nuclide is represented by  ${}_{17}^{35}\text{Cl}$ . How many neutrons and protons does each nucleus contain?

	Neutrons	Protons
A	18	35
B	18	17
C	17	18
D	17	18

127 What is the nucleon number (mass number) of a nuclide?

- A The number of neutrons
- B The number of protons
- C The number of neutrons and protons
- D The number of protons and electrons

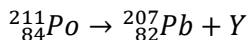
128 An element has a half-life of 2500 years. If there was 10g of radioactive atoms at the start, how much would be left after 10,000 years?

- A 5
- B  $5/2$
- C  $5/4$
- D  $5/8$

129 What is the effect on the nucleus of a radioactive substance when it undergoes  $\alpha$  –decay?

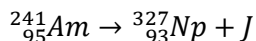
- A The nucleus does not lose any mass
- B The nucleus loses two units of negative charge
- C The nucleus loses two units of mass and two units of positive charge
- D The nucleus loses four units of mass

- 130 Polonium disintegrates to lead (Pb) accompanied by an emission of some radiation. The equation is shown below.



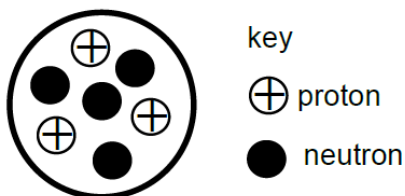
The radiation Y is

- A Gamma ray
  - B X-ray
  - C Alpha particle
  - D Beta particle
- 131 An atom of a radioactive element has 86 electrons. If the nucleon number is 222, the number of neutrons is.....
- A 86
  - B 136
  - C 222
  - D 308
- 132 The following equation represents the decay of Americium-241.



In this equation J could be.....

- A An electron
  - B An alpha particle
  - C Hydrogen gas
  - D A proton
- 133 The diagram below represents a nucleus of an element X.

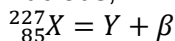


Which of the following represents the nuclide of this element?

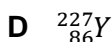
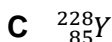
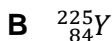
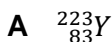
- A  ${}^3_4\text{X}$
- B  ${}^4_3\text{X}$
- C  ${}^7_3\text{X}$



- 134 A radioactive nucleus X, decays by emitting a beta-particle to form a nucleus, Y.



What represents nucleus Y?



- 135 A sample contains 12 000 radioactive atoms of a particular nuclide. After an interval of two half-lives, how many atoms have disintegrated?

**A** 0

**B** 3000

**C** 6000

**D** 9000

- 136 How many neutrons and protons does one atom of substance  ${}^A_ZX$  have in its nucleus?

	Number of neutrons	Number of protons
<b>A</b>	Z-A	A
<b>B</b>	A-Z	Z
<b>C</b>	Z	A
<b>D</b>	A	Z

- 137 The table shows how the activity of a radioactive substance changes over a period of time. (Allowance has been made for the background radiation).

Time/minutes	0	5	10	15	20	25	30	35	40
Activity/count per second	114	102	90	83	73	65	57	51	45

What is the half-life of the substance?

**A** 73minutes

**B** 57minutes

**C** 30minutes

**D** 20 minutes

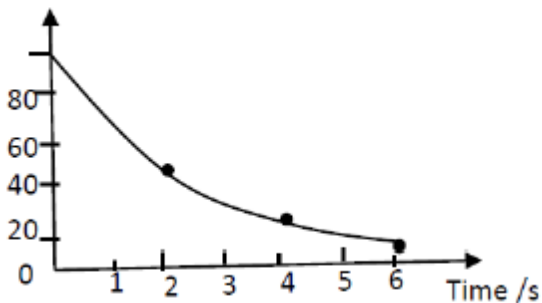
- 138 What particles are present in the nucleus of the oxygen nuclide  $^{17}_8\text{O}$ ?

	Neutrons	Protons
<b>A</b>	9	8
<b>B</b>	17	8
<b>C</b>	8	9
<b>D</b>	9	17

- 139 How many protons, neutrons and electrons are present in a neutral atom of sodium  $^{23}_{11}\text{Na}$ .

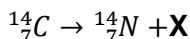
	Protons	Neutrons	Electrons
<b>A</b>	11	12	11
<b>B</b>	11	12	11
<b>C</b>	12	11	12
<b>D</b>	12	23	12

- 140 The decay curve below shows how the activity of a radioactive nuclide varies with time.



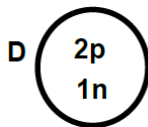
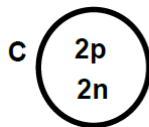
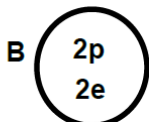
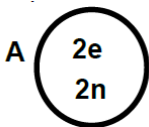
The half-life of the nuclide is.....

- A** 1s  
**B** 2s  
**C** 3s  
**D** 4s
- 141 The equation represents the decay of carbon-14 to nitrogen-14.



Which of the following is true about **X**?

- A** It can be repelled by a proton  
**B** It can be repelled by an electron  
**C** It can be repelled by an electron  
**D** It is an electromagnetic wave
- 142 The radioisotope sodium-24, has a half-life of 15hours.How long would an 8g sample of sodium-24 take to decay to 1g?
- A** 45 hours  
**B** 60 hours  
**C** 90 hours  
**D** 120 hours
- 143 Half of a radioactive substance decays after half a second. If the initial mass of the material is 100g, how much of it remains undecayed after  $1\frac{1}{2}$  seconds?
- A** 6.5g  
**B** 12.5g  
**C** 25.0g  
**D** 50.0g
- 144 Each of the figures **A**,**B** ,**C** and **D** represents a nucleus of an element. The letters **p**, **e** and **n** in the nuclei represent protons, electrons and neutrons respectively. Which of these is an alpha particle?



- 145 A 300g radioactive sample remained with 37.5g of this sample after 39 years. Determine the half-life of this sample.
- A** 58 years  
**B** 30 years  
**C** 26years  
**D** 13 years
- 146 What material is used for making containers in which radioactive substances are stored and what is the reason for choosing this material?

	Material	Reason
<b>A</b>	Aluminium	Absorbs radioactive source
<b>B</b>	Plastic	Stops radiation from escaping

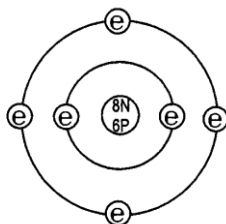
<b>C</b>	Lead	Stops radiation from escaping
<b>D</b>	paper	Absorbs radioactive source

- 147 The fact that it is a matter of pure chance whether or not a particular radioactive nucleus will decay during a certain period of time implies that radioactive decay is.....
- A** a time consuming process
  - B** a rotten process
  - C** a random process
  - D** a regular process

148

The symbol above is used to warn the presence of .....

- A** Gamma rays
  - B** A radioactive material
  - C** Cancer burns
  - D** Radiation burns
- 149 A radioactive substance has a mass of 100g and a half-life of 2minutes.How much of this substance remains undecayed after 6 minutes?
- A** 12.5g
  - B** 25g
  - C** 50g
  - D** 75.5g
- 150 The diagram below shows the structure of an atom of carbon.



**Key**

⊕ = electron

n = neutron

p = proton

- 151 What is the nuclide notation of this atom?

- A**  ${}^8_6\text{C}$
- B**  ${}^{12}_6\text{C}$
- C**  ${}^{14}_6\text{C}$

**D**  ${}^{20}_{14}\text{C}$

- 152 The table below shows the possible properties of radioactive emissions. Which emission represents an alpha particle?

Emission	Charged	Deflected in magnetic field	Ionizing effect
A	Yes	Yes	Weak
B	Yes	No	Weak
C	No	Yes	None
D	No	Yes	None

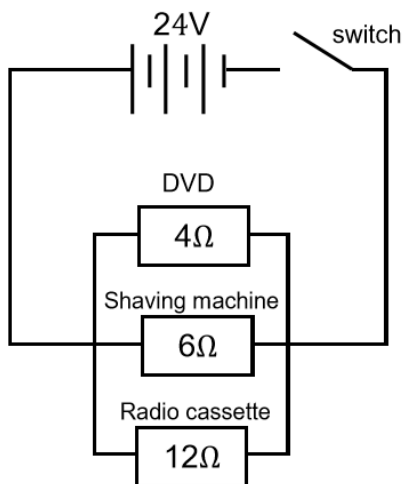
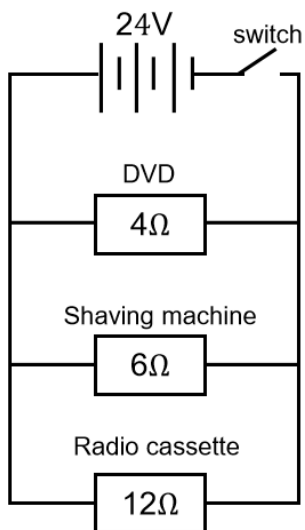
- 153 In a fission reactor, which particle causes a Uranium-235 nucleus to split?

**A** Proton  
**B** Neutron  
**C** Gamma ray  
**D** Alpha particle

- 154 A  $4\Omega$  DVD,  $6\Omega$  shaving machine and a  $12\Omega$  radio cassette are connected at the same time in parallel across 24V power supply.

(a) Draw a circuit diagram to represent this information.

- The diagram can be drawn in any of the following ways.





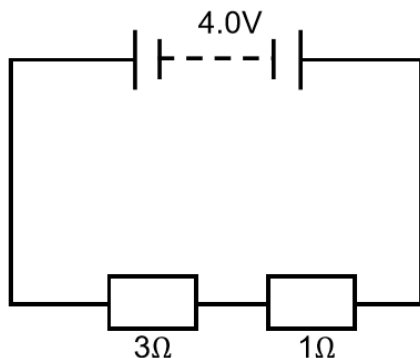
(b) Find the total resistance in the circuit

- $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$
- $\frac{1}{R} = \frac{1}{4} + \frac{1}{6} + \frac{1}{12}$
- $\frac{1}{R} = \frac{6}{12} \Rightarrow \text{total resistance} = \frac{12}{6} = 2\Omega$

(c) Calculate the current in each appliance.

- Current in the DVD
- $I = \frac{V}{R}$
- $I = \frac{24}{4} = 6A$
- Current in the shaving machine
- $I = \frac{V}{R}$
- $I = \frac{24}{6} = 4A$
- Current in the radio cassette
- $I = \frac{V}{R}$
- $I = \frac{24}{12} = 2A$

155 Study the circuit diagram below.



(a) Calculate the current through the battery.

- $I = \frac{V}{R}$

- $I = \frac{4.0}{3+1} = 1A$

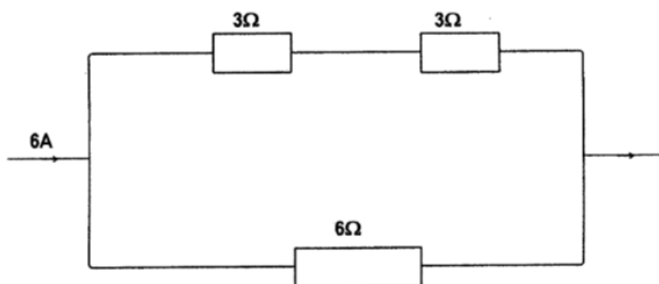
(b) (i) How long would it take a charge of 2.0C to flow through the battery?

- *charge*  $Q = It$  rearranging the formula we have
- $t = \frac{Q}{I}$
- $t = \frac{2}{1} = 2seconds$

(ii) How much energy would be used in moving this charge round the circuit?

- *Energy*  $E = VIt$
- $E = 4 \times 1 \times 2 = 8Joules$

156 (a) The figure below shows a network of resistors.



(i) What current flows in the  $6\Omega$  resistor?

- The current in the  $6\Omega$  resistor is 3A.
- Notice that current is distributed equally since this a parallel connection.

(ii) What charge passes through the  $6\Omega$  resistor for 3 seconds?

- $Q = It$
- $Q = 3 \times 3 = 9coulombs$

(iii) What is the potential difference across the  $6\Omega$  resistor?

- Potential difference  $V = IR$
- $V = 3 \times 6 = 18V$

(b) A 2KW, 250V electric fire is connected to a 250V mains.

(i) How much current does the electric fire take?

- Power  $P = VI$  rearranging the equation we have
- $I = \frac{P}{V}$  notice that the power is in Kilowatts
- $I = \frac{2 \times 1000}{250} = \frac{2000}{250} = 8A$

(ii) What is the cost of running the electric fire for 5 hours if the cost of a unit (KWh) of electrical energy is K900?

- Energy(in Kwh)  $E = Power(KW) \times time(hours)$
- $E = 2KW \times 9hours = 18KWh$
- We then use proportion.
- $1KWh = K900$
- $18KWh = x$
- Cross multiplying we have
- $x = 18 \times 900 = K16,200$
- Therefore the cost is K16,200

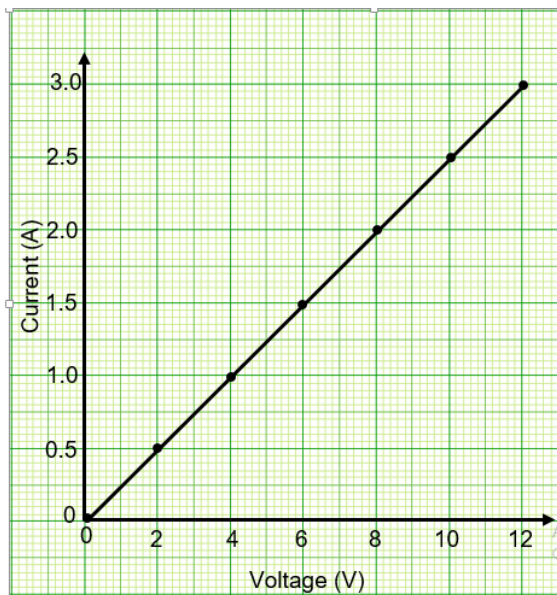
157 (a) State the difference between 'Electric charge and electric current'?

- Electric charge Electric current is the rate of flow of electric charge

(b) Below is a table of results obtained from an experiment to determine the relationship between the voltage and current through a metallic conductor.

Voltage(V)	0	2	4	6	8	10	12
Current(A)	0	0.5	1.0	1.5	2.0	2.5	3.0

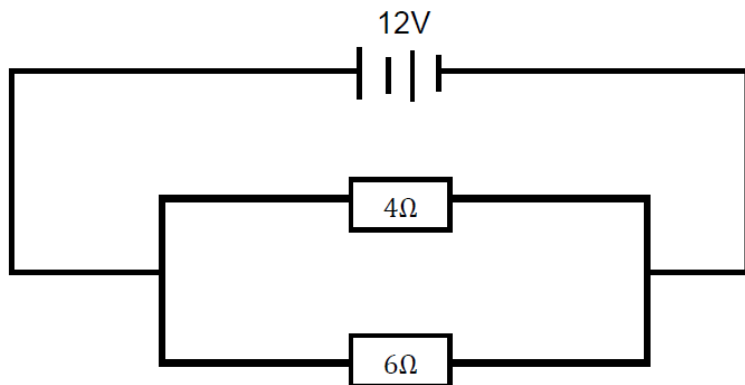
- (i) Plot a graph of voltage against current.
- The plotted graph is shown below.



(ii) Calculate the resistance of the metallic conductor.

- Resistance  $R = \frac{V}{I}$
- Resistance  $R = \frac{2}{0.5} = 4\Omega$

(c) The figure below shows  $4\Omega$  and  $6\Omega$  resistors connected in parallel.



(i) Find the effective resistance

- Notice that this is a parallel circuit

- $\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2}$

- $\frac{1}{R} = \frac{1}{4} + \frac{1}{6}$

- $\frac{1}{R} = \frac{5}{12}$

- $5R = 12$

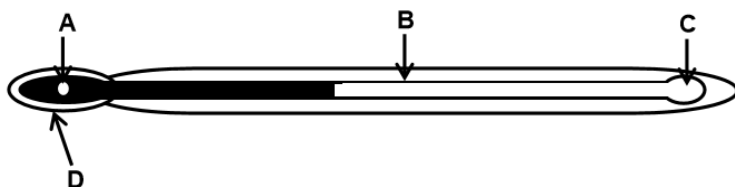
- $R = \frac{12}{5} = 2.4\Omega$

(ii) Determine the current in the circuit.

- *Current*  $I = \frac{V}{R}$

- $I = \frac{12}{2.4} = 5A$

158 The figure below shows a laboratory thermometer.



(a) Name the substance labelled A.

- Mercury

(b) Name the section labelled B.

- Capillary bore

(c) Why is part B narrow?

- 

(d) Explain why the wall of the thermometer bulb marked D is thin.

- This allows for rapid conduction of heat through the thin glass wall to the mercury contained in the bulb.

(e) Give two advantages of a thermocouple thermometer compared with a mercury thermometer for measuring temperature.

- They can measure a very wide range of temperatures from about  $250^{\circ}\text{C}$  to  $1500^{\circ}\text{C}$ .
- They can measure rapid changing temperatures
- They have very long threads hence they can measure temperature from a distance.

159 Two metal plates A and B, one with shiny surfaces and the other painted black are heated to a temperature of  $100^{\circ}\text{C}$ . The metal plates are then placed in the open air on insulating materials and allowed to cool. The table below shows the results obtained with time.

Time in seconds	Temperature of metal plate in $^{\circ}\text{C}$	
	A	B
0	100	100
30	92	85
60	87	74
90	84	67
120	81	63
150	79	60

(a) By what process(es) of heat transfer are the metal plates losing heat to the surrounding?

- Convection

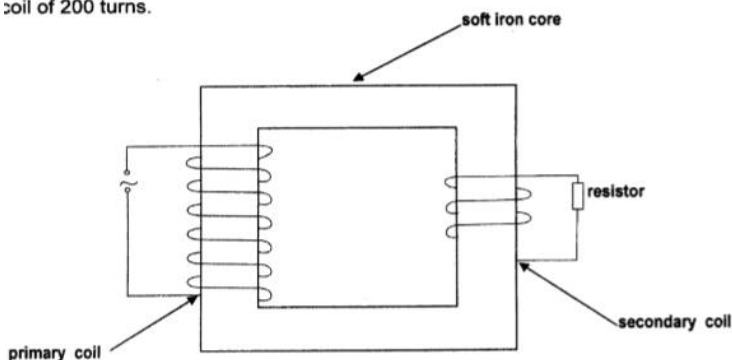
(b) Which metal plate is losing heat faster?

- Metal plate B

(c) State, with reason which metal plate **A** or **B** has shiny surfaces.

- Metal plate B
- Reason:

160 The figure represents a transformer with a primary coil of 400 turns and a secondary coil of 200 turns.  
coil of 200 turns.



(a) The primary coil is connected to the 240V a.c mains.  
Calculate the secondary voltage.

- We use the ratio
- $\frac{N_P}{N_S} = \frac{V_P}{V_S}$
- $\frac{400}{200} = \frac{240}{V_S}$  cross multiplying we have
- $400V_P = 200 \times 240$
- $V_S = \frac{48000}{400} = 120V$

(b) Explain how the transformer works.

- When an alternating current flows through the primary coil, a changing magnetic flux is produced in the soft iron core. There is a changing magnetic flux linkage in the secondary coil. An induced a.c voltage is

produced in the secondary coil due to electromagnetic induction.

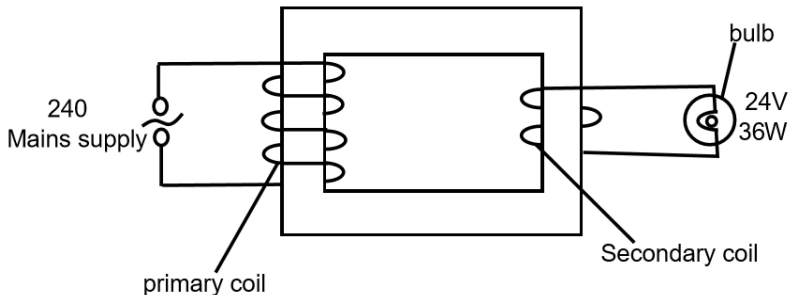
(c) Why is soft iron core used instead of steel?

- Soft iron core can be magnetized and demagnetized easily as compared to steel.

(d) If the current in the primary coil is 3A, calculate the current in the secondary coil of the transformer, assuming the transformer is 100% efficient.

- We use the ratio
- $\frac{V_P}{V_S} = \frac{I_S}{I_P}$  replacing we have
- $\frac{240}{120} = \frac{I_S}{3}$  cross multiplying we have
- $120I_S = 240 \times 3$
- $I_S = \frac{720}{120} = 6A$

161 The figure shows a simple transformer which can be used to light a bulb. The bulb is labelled.



162 When the mains supply is switched on, the bulb is very bright.

(a) State one way in which the potential difference across the bulb can be decreased without changing the mains supply.

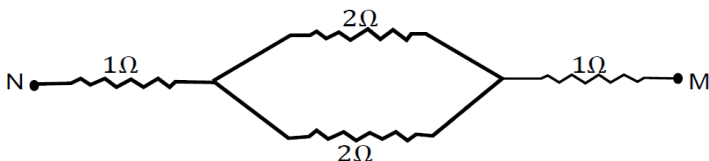
- By reducing the number of turns in the primary coil.

(b) For the lamp operating at the correct brightness, calculate:



- (i) The current in the secondary coil,
- Power  $P = VI$  rearranging the equation we have
  - $I = \frac{P}{V}$
  - $I = \frac{36}{24} = 1.5A$
- (ii) The current in the primary coil, assume that the transformer is 100% efficient.
- We use the ratio
  - $\frac{V_P}{V_S} = \frac{I_S}{I_P}$  replacing we have
  - $\frac{240}{24} = \frac{1.5}{I_P}$  cross multiplying we have
  - $240I_P = 24 \times 1.5$
  - $I_P = \frac{36}{240} = 0.15A$

163 The figure below shows part of a circuit in which current is flowing.



If the p.d between N and M is 3V, the current is.....

- A** 1A  
**B** 3A  
**C** 6A  
**D** 12A

- We first find the total resistance  $\frac{1}{R} = \frac{1}{2} + \frac{1}{2} = 1\Omega$
- The total resistance =  $1\Omega + 1\Omega + 1\Omega = 3\Omega$
- $I = \frac{V}{R} = \frac{3V}{3\Omega} = 1A$
- The correct answer is A

164 A heater used on a 250V mains circuit has a 5A fuse in its plug. Which is the highest rating for this heater?

- A** 50W
- B** 1000W
- C** 1250W
- D** 2000W

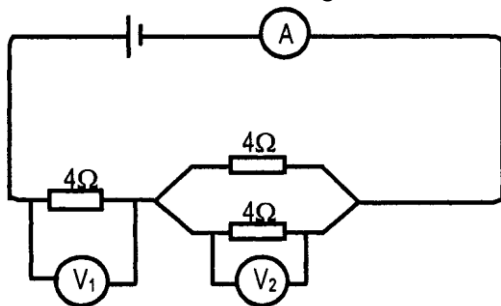
- Notice that the current in a circuit should be slightly lower than the fuse used. This implies that if the fuse used is 5A then the current in the circuit might be 4A.
- $P = VI$
- $P = 250V \times 4A = 1000W$
- The correct answer is B

165 Which of the following is the same as coulomb?

- A** V/A
- B** As
- C** Ws
- D** V/ $\Omega$

- The correct answer is C

166 In the circuit shown the reading on the ammeter is 1A.



What readings are shown by the voltmeters  $V_1$  and  $V_2$ ?

	$V_1$	$V_2$
<b>A</b>	2V	2V
<b>B</b>	4V	2V
<b>C</b>	2V	4V
<b>D</b>	4V	4V

- To find the voltmeter reading finds the p.d across the  $4\Omega$  resistor.
- $V=IR$
- $V=1 \times 4 = 4V$  therefore the voltage in  $V_1=4V$
- The correct answer is B

167 Which of the following equations cannot be used to determine electrical energy?

**A**  $E=VQ$

**B**  $E=VIt$

**C**  $E=I^2Rt$

**D**  $E=\frac{V^2t}{I}$

- The correct answer is B

168 An electrical appliance is rated 250V, 500W. Find the cost of using this appliance for 120minutes if the electrical energy costs K100 per unit?

**A** K100

**B** K200

**C** K800

**D** K1200

- $E = P \times t$
- $E = \frac{5000}{1000} \times \frac{12}{60} = 1Kwh$
- Therefore the cost of electricity is K100
- The correct answer is A

169 Which of the following quantities is expressed in the same unit as potential difference?

**A** Positive charge

**B** Electromotive force

**C** Electric current

**D** Electric power

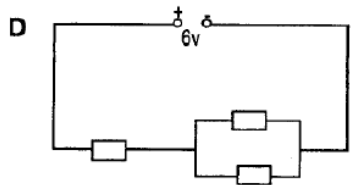
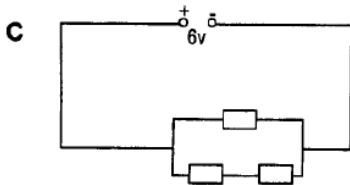
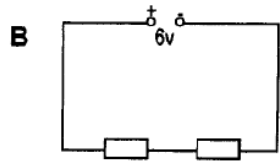
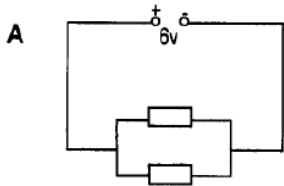
- The correct answer is electromotive force
- The correct answer is B

170 The formulae used to calculate electric power is.....

- A  $P=IV$
- B  $P=VR$
- C  $P=VQ$
- D  $P=wt$

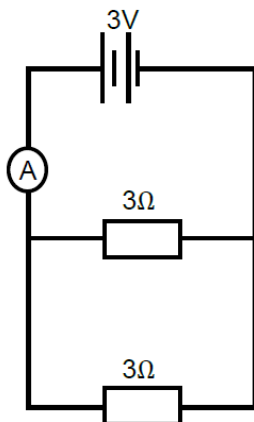
- The correct answer is A.this is a fact.

171 Which of the following circuits containing identical resistors will give the highest current?



- The one with the lowest resistance will give the highest current.

172 The diagram below represents a parallel circuit.

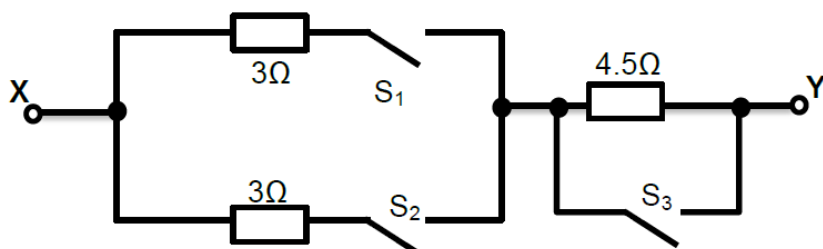


The current through the ammeter is.....

- A** 0.5A
- B** 1.0A
- C** 2.0A
- D** 9.0A

- The correct answer is C

- 173 The diagram below shows a circuit in which all the switches are open.



Which switch positions give a resistance of  $6.0\Omega$  between X and Y?

	<b>S<sub>1</sub></b>	<b>S<sub>2</sub></b>	<b>S<sub>3</sub></b>
<b>A</b>	Closed	Closed	Closed
<b>B</b>	Closed	Closed	Open
<b>C</b>	Closed	Open	Closed
<b>D</b>	Closed	Open	Open

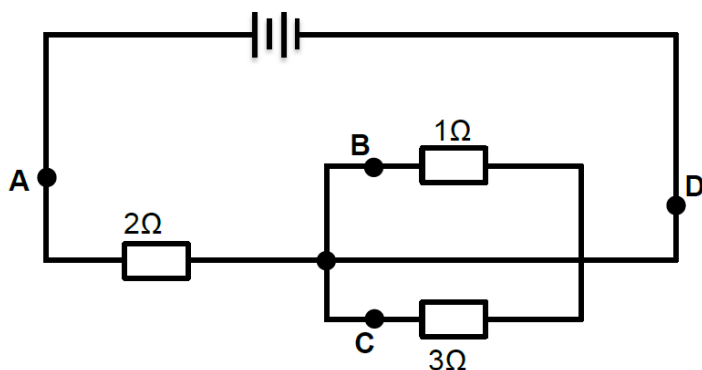
- The correct answer is B

- 174 The rate at which electric charge flows in a circuit is measured in.....

- A** amperes
- B** coulombs
- C** ohms
- D** volts

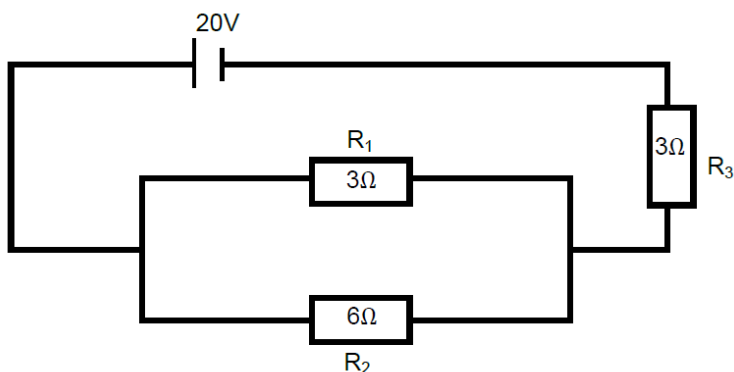
- the correct answer is A

- 175 The diagram below shows an electric circuit. At which position in this circuit is the current the smallest?



- The correct answer is A

176 The diagram below shows a circuit with three resistors.



What is the p.d across  $R_1$ ?

- A** 5V
- B** 10V
- C** 15V
- D** 20V

- The correct answer is B

177 A 240KV electrical transmission system carries a power of 12MV.  
What is the current in the wires?

- A** 0.02A
- B** 0.05A
- C** 20.00A
- D** 50.00A

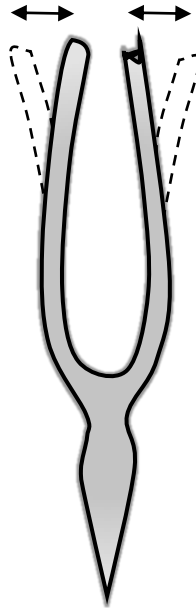
- The correct answer is C

178 The figure below shows a circuit diagram.

179 The figure below shows a vibrating tuning fork, Y in air.

180

181 a



## RELIGIOUS EDUCATION QUESTIONS AND ANSWERS

- 1 What is prayer?
  - Prayer is talking to God and listening.
- 2 Give any three reasons why Christians should pray?
  - To seek guidance
  - Ask for protection
  - To praise God
- 3 When should Christians pray?
  - You can pray at anytime, anywhere

- A good time to pray is when reading the Bible each day
- Christians should also come together for prayer.

4 Mention the three types of prayer.

- Private prayer
- Community prayer
- Prayer of action

5 What type of prayer involves an individual communicating with God?

- Private prayer

6 What type of prayer involves reaching out to others for example helping the poor and the needy?

- Prayer of action

7 What is community prayer?

- This is when a group of people meet together to pray.

8 Mention any four methods of prayer that are practiced by a lot of people?

- Worship and thanksgiving
- Confession
- Intercession
- For yourself

9 Give any four examples of occasions when Jesus went alone to pray?

- After he was baptized
- After he had healed many people
- When he became very busy teaching and healing
- Before going to the cross
- Before the transfiguration
- Before He spoke of His coming suffering



- When He gave thanks for food provided

10 Narrate the Lord's pattern of prayer?

- One day Jesus was praying in a certain place.
- When he finished one of disciples asked him to teach them how to pray.
- Jesus said to them, when you pray say this:
- Father, may your Holy name be honored
- May your kingdom come
- Give us day by day the food we need
- Forgive us our sins as we forgive those who do us wrong.
- Do not lead us into temptation but deliver us from the evil one.

11 What does the phrase "Forgive us our sins as we forgive everyone" mean in the Lord's pattern of prayer?

- God can be trusted to forgive us if we forgive those who wrong us.

12 What does the phrase "lead us not into temptation" mean in the Lord's pattern of prayer?

13