# SUCCESS IN SCIENCE

PHYSICS VOLUME FOUR

Instant Revision from E.C.Z Question Papers

GRADE 10 -12   **2009 – 2019**
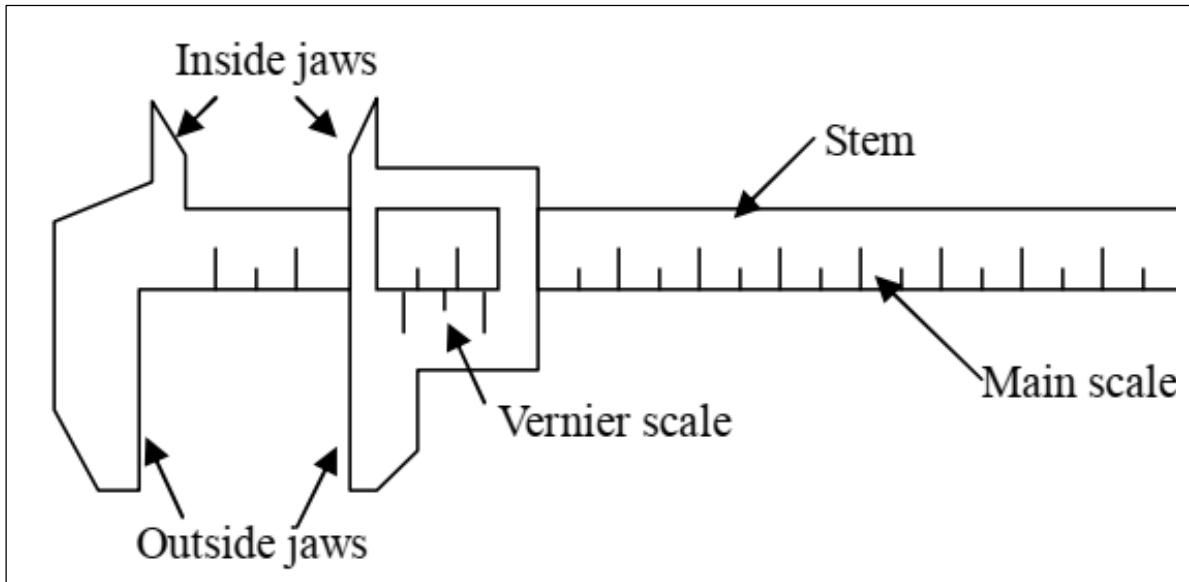
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GRADE 10 E.C.Z QUESTIONS

2009 QUESTION PAPER 1

1. All measurable features or properties of objects are called …

   A. S.I units   B. Measurement   C.   Physical quantities   D.   Images

2. Which of the following numbers has four significant figures?

   A.   0.0002   B.   0.0020   C.   0.0200   D.   0.2000

3. A motorist travels 320km at 80km/h and then 320km at 100km/h. what is the average speed of the motorist for the entire trip?

   A. 84km/h   B. 89km/h   C. 90km/h   D. 91km/h

4. A stone of mass 400g is lowered into a measuring cylinder containing water. The water level rises from 300cm^3 to 500cm^3. What is the density of the stone?

   A. 0.50g/cm^3 B. 0.80g/cm^3 C. 1.33g/cm^3 D. 2.00g/cm^3

5. A force acts on a mass of 1kg producing an acceleration of 1m/s^2. This force is called …

   A.   Tension (T)   B. Newton (N)   C. Weight (W)   D. Friction (f)

6. A uniform plank of length 10cm is in equilibrium as shown in the figure below.
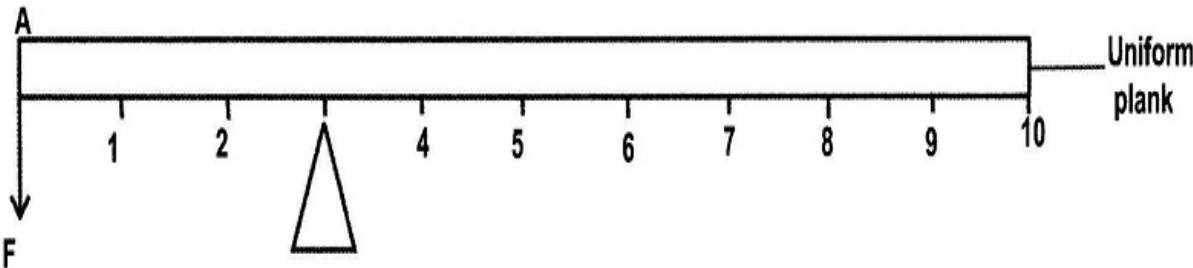
   A force of 100N is applied at point A in the direction shown. What is the weight of the plank?

   A.   50N   B. 100N   C. 150N   D. 200N

7. A ball of mass 5kg moves vertically upwards from ground level till it reaches a maximum height of 4m. What is its kinetic energy when it is half way up? Assume g=10m/s^2.

   A. 5J   B. 50J   C. 100J   D. 200J

2010 QUESTION PAPER 1

8. A plumber needs to measure the internal diameter of a water pipe as accurately as possible. The instrument that should be used is the …

A. vernier calipers
B. Engineer's calipers
C. Measuring tape
D. Metre rule

9. Starting from rest at t=0, an object moves in a straight line with a constant acceleration of $2cm/s^2$. At what time is the speed of the object 20m/s?

A. 1s   B. 10s   C. 100s   D. 1000s

10. Which property of the body <u>cannot</u> be changed if a force is applied to it?

A. velocity   B. Volume   C. Shape   D. Mass

11. Give the name of the force which gives a mass of 1kg an acceleration of $1m/s^2$.

A. Weight   B. Friction   C. Newton   D. Centripetal force

12. A load is to be moving using a wheelbarrow. The total mass of the load and wheelbarrow is 60kg. the gravitational field strength is 10N/kg …
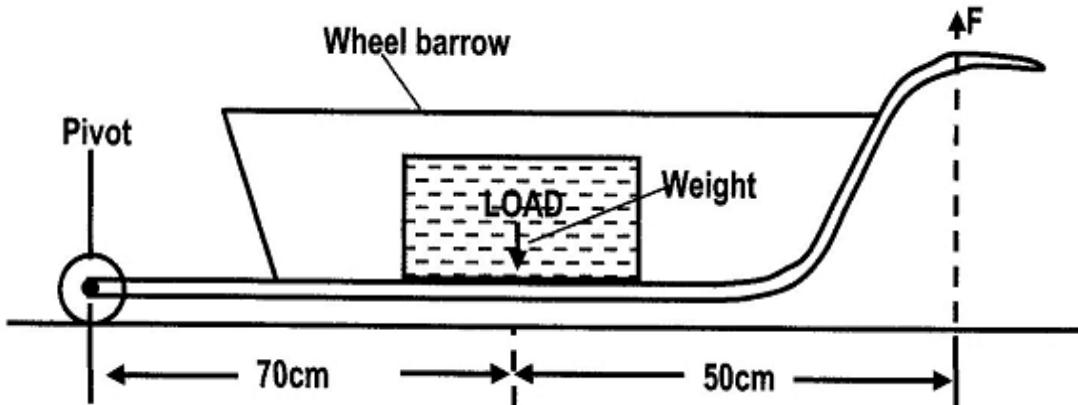
What is the size of force F needed just to lift the loaded wheelbarrow?

A. 350N   B. 430N   C. 600N   D. 840N

2011 QUESTION PAPER 1

13. Which of the following is not an S.I unit?

A. m/s   B. N   C. ℃   D. W

14. The diagram below shows a velocity-time graph for a man who moves from village X to village Y on a bicycle.
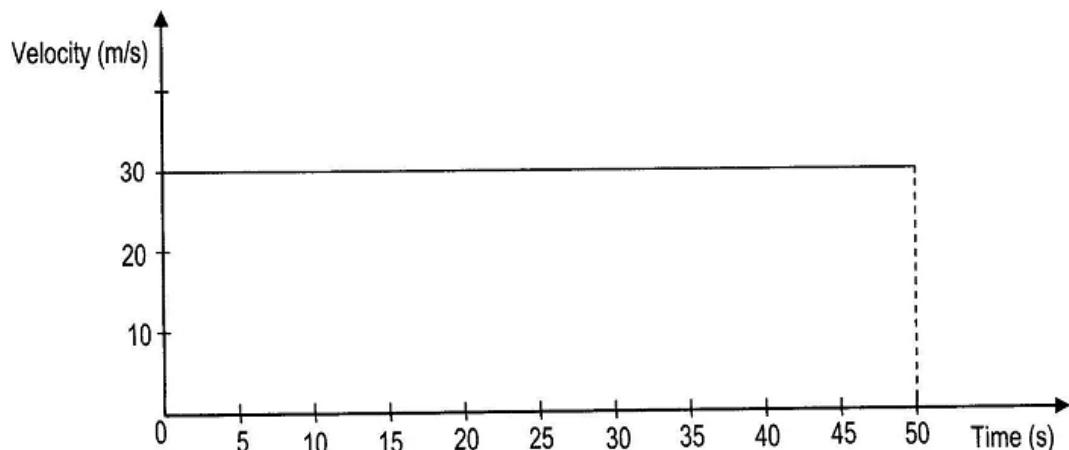

Which of the following is true? The …

A. Distance moved by the man in 50s in 30m

B. Acceleration of a man in 50s is 0m/s^2

C. acceleration of a man in 50s is 150m/s^2

D. final velocity of a man after 50s is 1500m/s

15. What is the weight of a 500g mass on the moon where gravitational field strength is 1.6N/kg?

A. 0.8N   B. 8N   C. 312.5N   D. 800N

16. A man of mass 80kg lies on the ground as shown below.
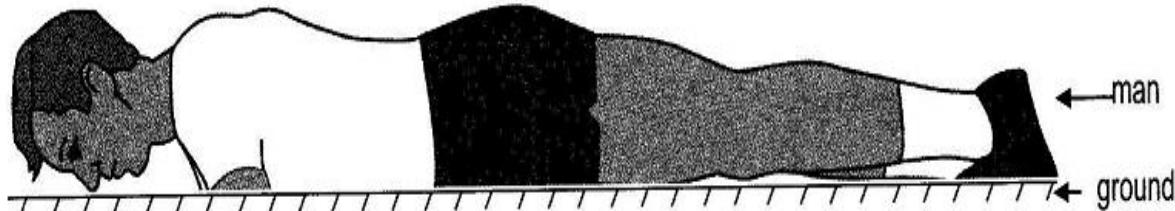
Assuming the acceleration of free fall, $g=10\text{m/s}^2$, the gravitational potential energy of the man is …

A. 0J   B. 8J   C. 88J   D. 800J

17. A stone of mass 24g and a density 2.5g/cm^3 is split into two pieces of mass 18g and 6g respectively. What is the density of the smaller piece?

A. 0.8g/cm^3 B. 1.3g/cm^3 C. 2.5g/cm^3 D. 4.0g/cm^3

18. The diagram shows a pulley system being used to lift a block from the ground.


What is the velocity ratio of the pulley system?

A. 0   B. 1   C. 2   D. 3
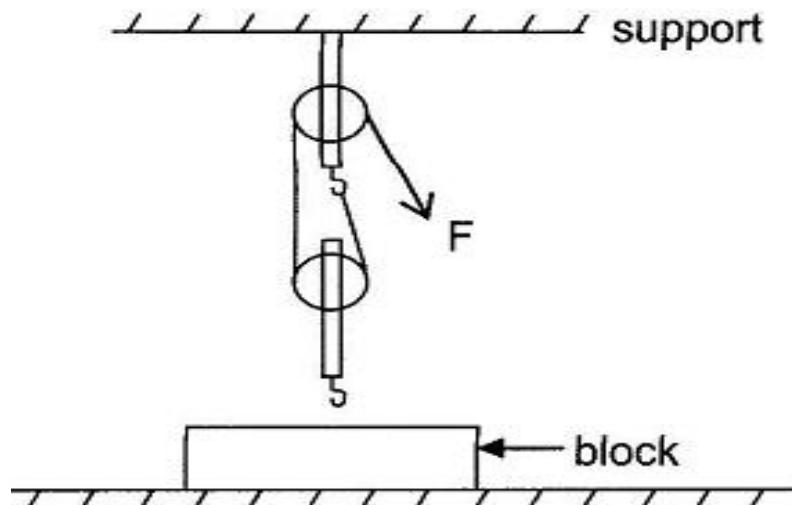
2012 QUESTION PAPER 1

**19.** The diagram shows part of a vernier calipers used to measure the width of a rectangular glass block.
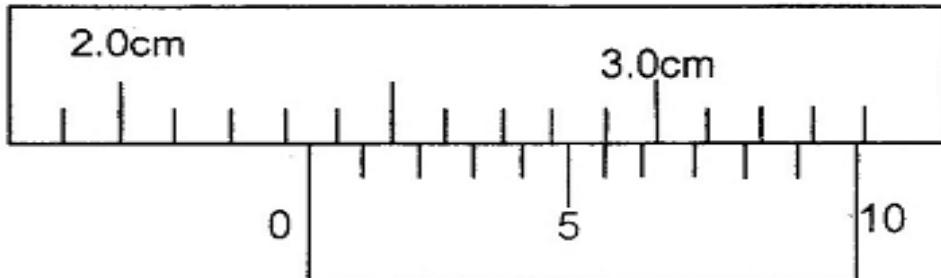
The correct reading is …

A. 1.46 cm   B. 2.25 cm   C. 2.36 cm   D. 2.54 cm

20. Which of the following represents an S.I unit?

Name	symbol
A. Gram	g
B. Second	s
C. Centimeter	cm
D. Kilojoule	Kj

21. Which of the following graphs represents an increasing velocity?

A

Acceleration ↑

———————— →time

B

Velocity ↑

———————— →time

C

Displacement ↑

→time

D

Displacement ↑

→time
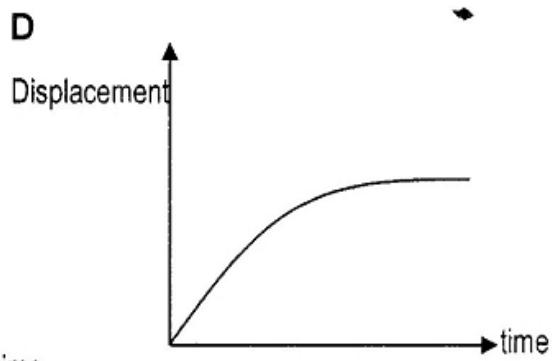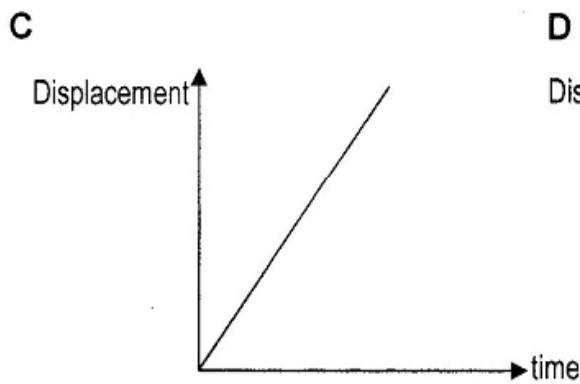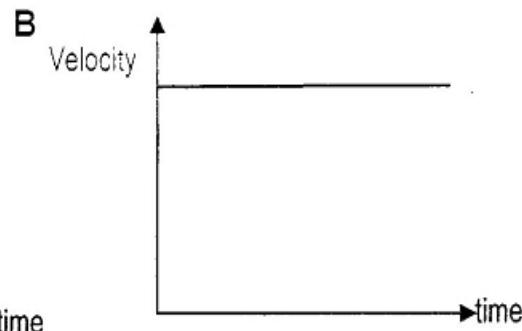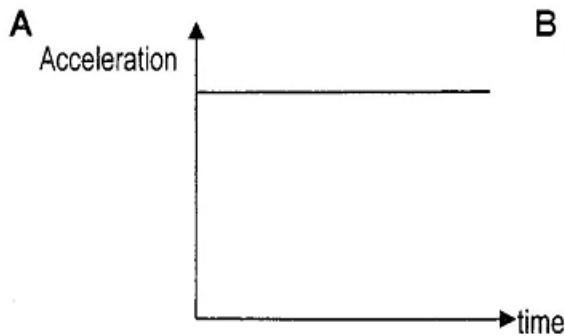
22. The diagram below shows a cross-section through the centre of a triangular prism. **M** is the position of the centre of mass of the prism.

P———————Q

•M

————Triangular prism

R
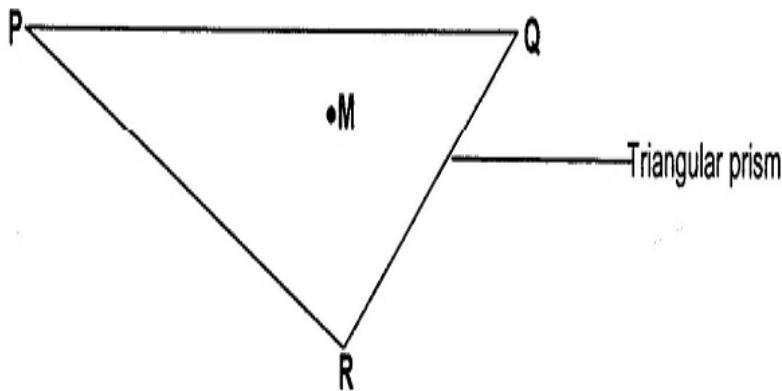
PQ may be considered to have a maximum stability because …

A. It has the greatest contact base area.

B. It is above **M** and far away from **R**.

C. The centre of mass **M** is the furthest from point **P.**

D. The centre of mass **M** has the greatest vertical height at this base.

23. The graph below was obtained by a pupil in a physics experiment to investigate the effects of forces on a spring.
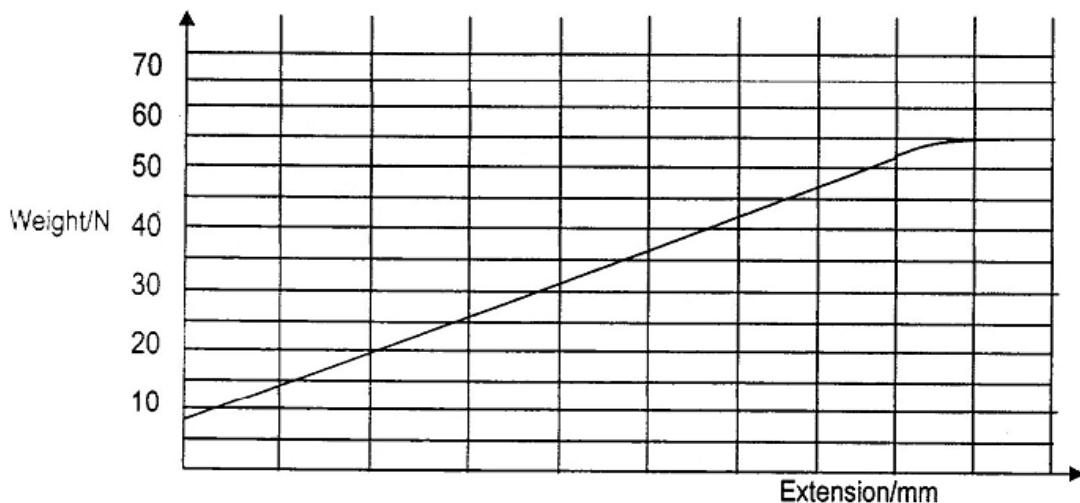

What is the approximate value of the force required to start pulling the turns of the spring away from each other?

A. 5.0N   B. 7.5N   C. 10.0N   D. 15.0N

24. A person exerts a horizontal force of 500N on a box, which also experiences a friction force of 100N.
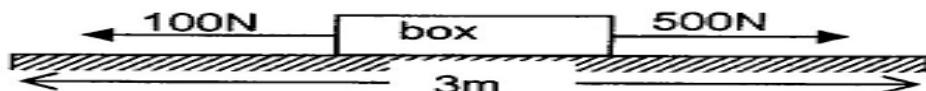
How much work is done against friction when the box moves a horizontal distance of 3m?

A. 1800J   B. 1500J   C. 1200J   D. 300J

25. The diagram shows an ideal system of pulleys.
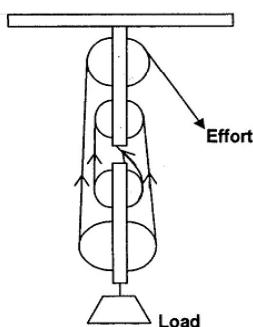

The mechanical advantage of the system is …

A. 6   B. 5   C. 4   D. 2

2013 QUESTION PAPER 1

**26.** The diagram below represents a pendulum.
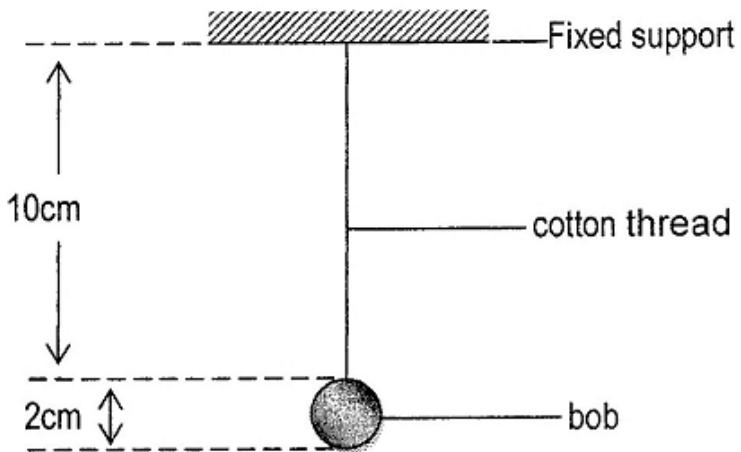

The length of the pendulum is ……

   A. 2cm   B. 10cm   C. 11cm   D. 12cm

27. Which of the following numbers has three significant figures?

A. 0.0003   B. 0.0030   C. 0.0300   D. 0.3000

28. Which graph represents the motion of the body thrown vertically upwards into the air with negligible air resistance?
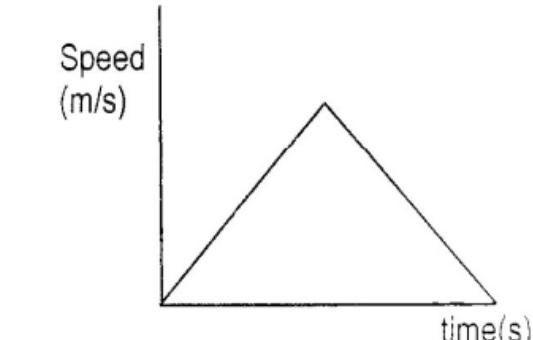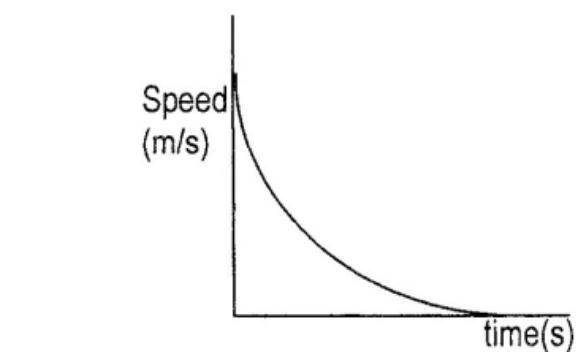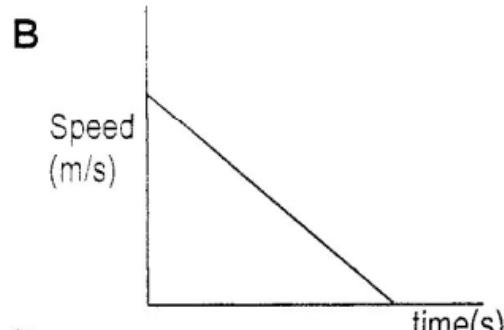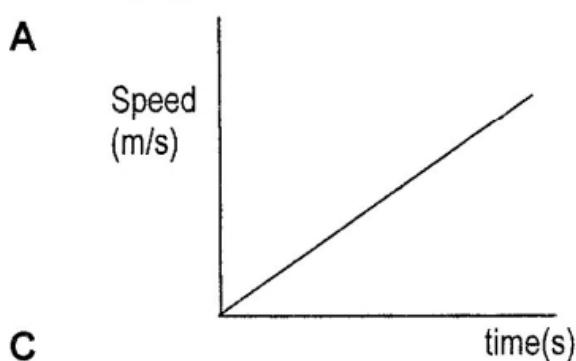
29. An Astronaut goes to the moon where the gravitational field strength is 1.6N/kg. what will be the changes, if any, in his mass and weight when he lands on the moon?

	Mass	Weight
A	Same on earth and moon	Less on moon
B	Less on moon	Same on earth and moon
C	Less on earth	Less on moon
D	More on earth	More on moon

30. A body has a mass of 2kg. it accelerates from 20m/s to 40m/s in 4s. the resultant force is …

A.   8N   B. 10N   C. 20N   D. 30N

**31.** A force of 500N is applied to a box in the direction shown to move it up an incline.
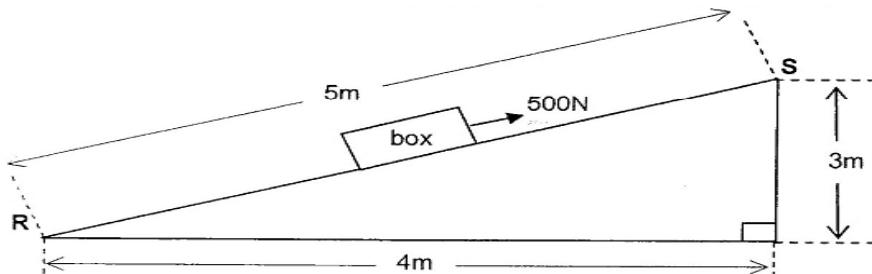
It takes 3s to move this box from R to S. the useful power generated is …

A.   500.0 W   B.   666.7 W   C. 833.3 W   D. 1500.0 W

2015 QUESTION PAPER 1

32. The diagram below shows part of the micrometer screw gauge. What is the reading shown in the diagram?
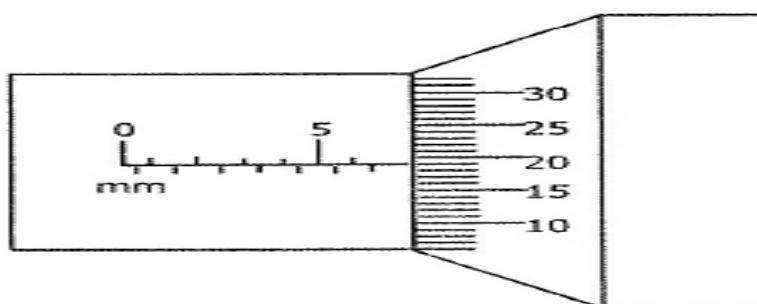
A. 6.69 mm   B. 6.86 mm   C. 6.68 mm   D. 5. 68 mm

33. The velocity time graph for the motion of a trolley is shown below.
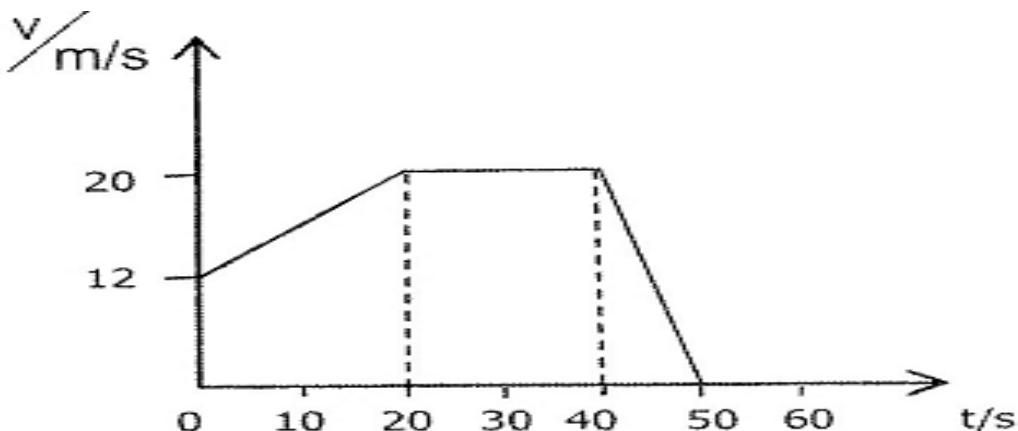
What distance did the trolley travel when there was no resultant force acting on it?

A. 200 m   B. 320 m   C. 400 m   D. 520 m

34. Which of the following quantities changes when a body is accelerating?

A. Mass of the body   B. Weight of the body

C. velocity of the body   D. force acting on the body

35. To find density of the liquid, a pupil noticed that 90g of the liquid occupied the same volume as 114g of water of density 1000kg/m³. What was the density of the liquid?

A. 0.79g/cm³   B. 1.27g/cm³   C. 2.04g/cm³   D. 4.90g/cm³

36. A number of forces are acting on a body as shown in the diagram below
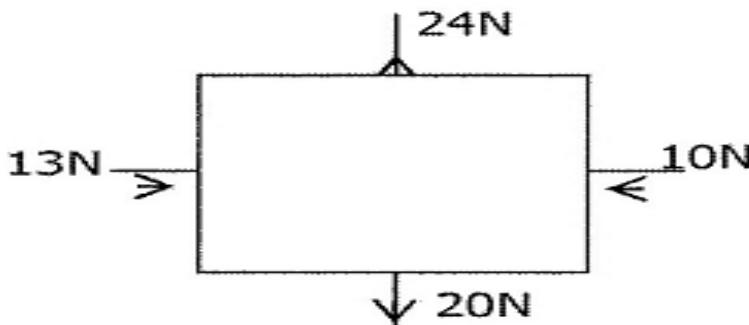

What is the magnitude of the resultant force acting on the body?

A. 0 N   B. 3 N   C. 5 N   D. 12 N

37. A toy car of mass 600g moves through 6 m in 2s. The average kinetic energy of the toy car is ….

A. 0.0227 J   B. 0.27 J   C. 2.7 J   D. 66.67 J

**38.** The diagram below shows an inclined plane used to lift a load of 2000 N.
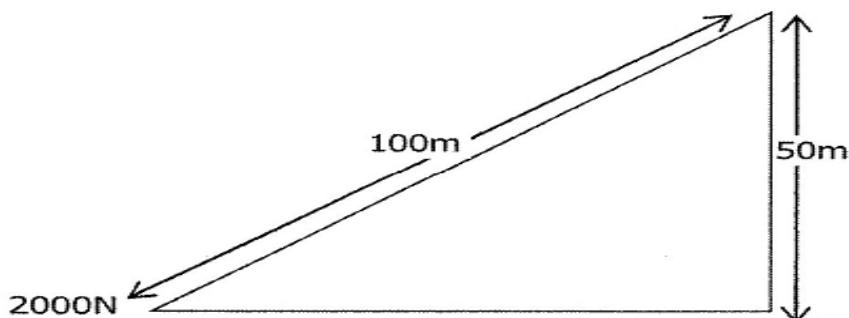
What is the velocity ratio of the inclined plane as a simple machine?

   A. 40.0   B. 20   C. 2.0   D. 0.5

## *2017 G.C.E QUESTION PAPER 1*

39. The diagram below shows part of the ruler used to find the length of the nail.
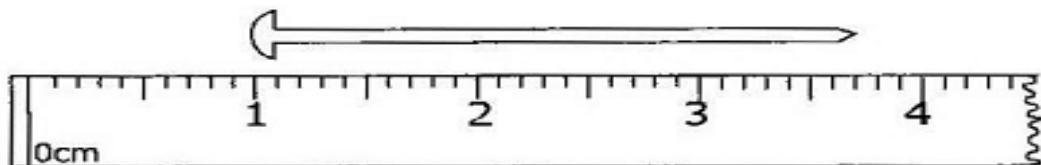
What is the length of the nail?

   A. 2.2 cm   B. 2.7 cm   C. 3.2 cm   D. 3.7 cm

40. The diagram below shows a block of wood of density 0.6g/cm^3.
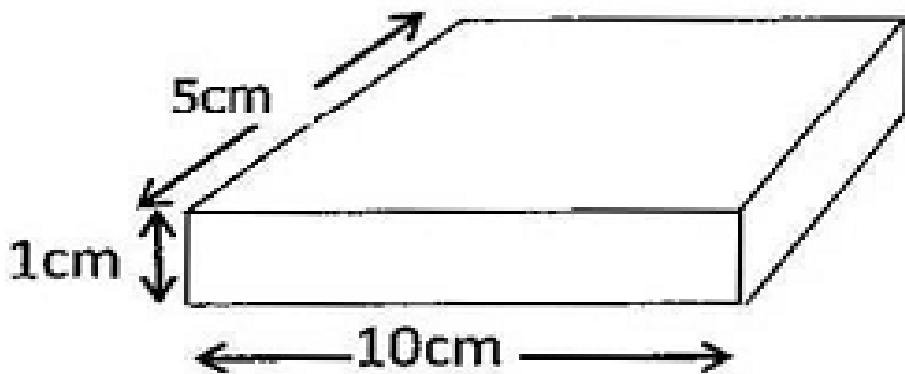
What is the mass of the block?

A. 30g   B. 50g   C. 300g   D. 500g

41. The diagram below shows a graph of how a distance covered by a woman varies with time as she takes a walk from her home to the market.
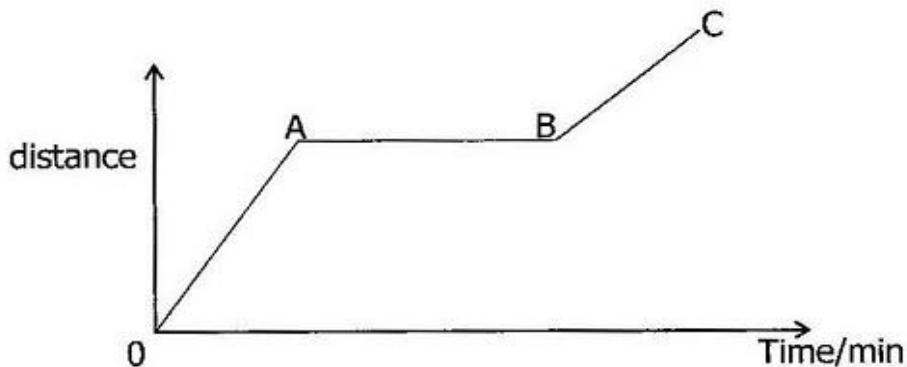
What was happening in the region AB during the woman's walk? She ..

A. Walked with a constant

B. walked faster than before

C. walked slower than before

D. stopped walking

42. A parachutist of mass 60kg falls with a constant velocity of 5m/s together with a parachute of mass 20kg. Taking g to be 10N/kg what is the resultant force on the system?

A. 0 N   B. 400 N   C. 600 N   D. 800 N

43. The diagram below shows a frictionless pulley used to lift an 8000 N block of concrete.
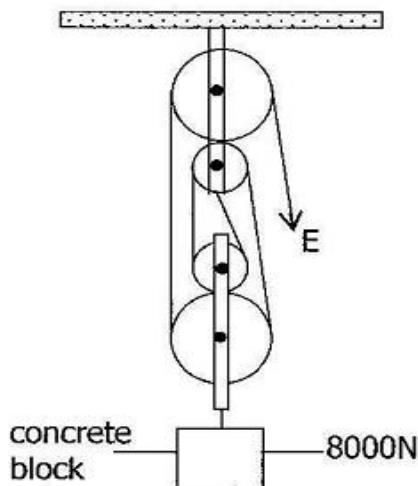
What is the minimum effort required to raise the block?

A. 1600N   B. 2000N   C. 3600N   D. 8000N

44. The diagram below shows a model of a crane with a counter balance weighing 200N. This counter balance can be moved further or closed to 0 to accommodate different loads.
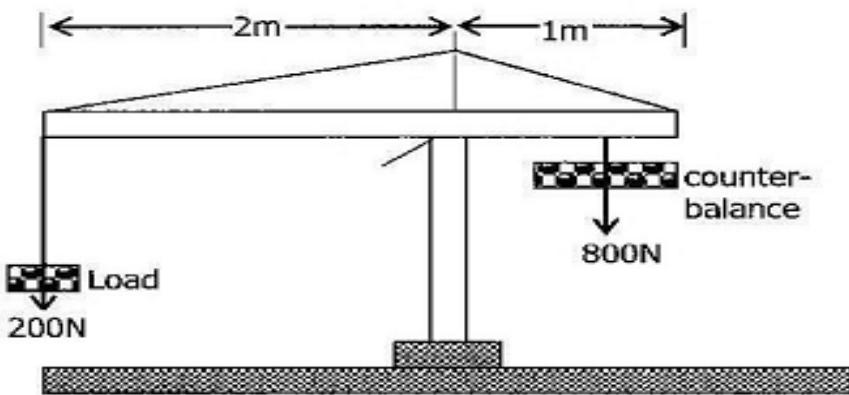
What is the maxmum load the crane can safely lift?

A. 200N   B. 400N   C. 600N   D. 1000N

45. A dog running at constant speed of 3m/s increases its speed to 7m/s upon seeing a lion. If the mass of the dog is 20kg, the work it does in achieving the new speed is

A. 40 J   B. 160 J   C. 400 J   D. 580 J

2018 G.C.E QUESTION PAPER 1

46. The radius of the object measures 28.0 mm. this value is the same as ....

A. 2.80×10^{-2} k m   B. 2.80×10^{-2} m

C. 2.80×10^{-2} cm   D. 2.80×10^{-2} mm

47. Which statement best describe the vernier calipers and the micrometer screw gauge?

	Micrometer Screw Gauge	**Vernier Calipers**
A.	Measures length	measures radius
B.	Measures radius	measures length
C.	Measures internal diameters	measures external diameter
D.	Measures external diameter	measures internal diameter

48. The speed – time graph below shows the movement of a car.
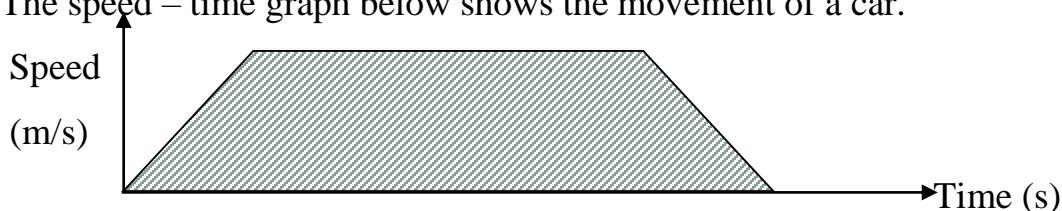
What does the shaded area of the graph represent? The …..

A. Average acceleration of car   C.   Average speed of a car.
B. Total distance travelled by the car.   D.   total travelling time of the car.

49. A stone of mass 400g is lowered into a measuring cylinder containing water. The water level rises from 300cm³ to 500cm³. What is the density of the stone?

   A. $0.50g/cm^3$ B. $0.60g/cm^3$ C. $1.33g/cm^3$ D. $2.00g/cm^3$

50. Power is measured in watts. What is the symbol for millions of watts?

   A.   mw   B.   mW   C .   MW   D. Mw

51. A feather falling freely in air suddenly reaches a terminal velocity. Which graph represents the motion of the feather?
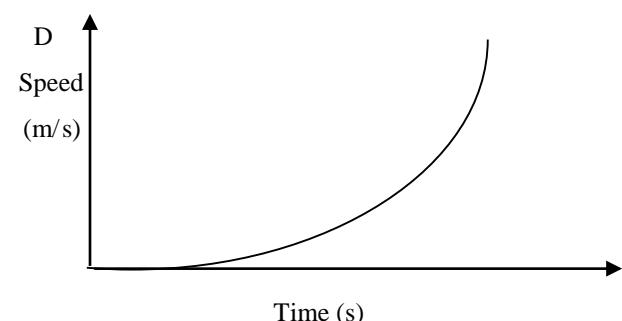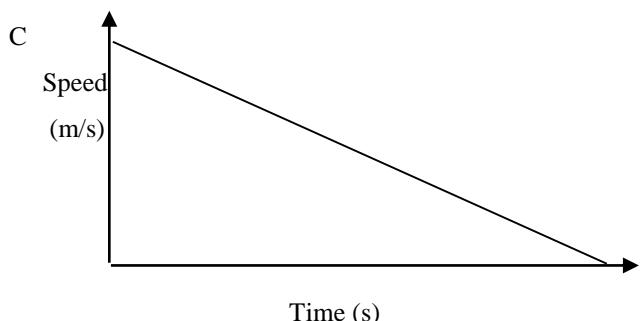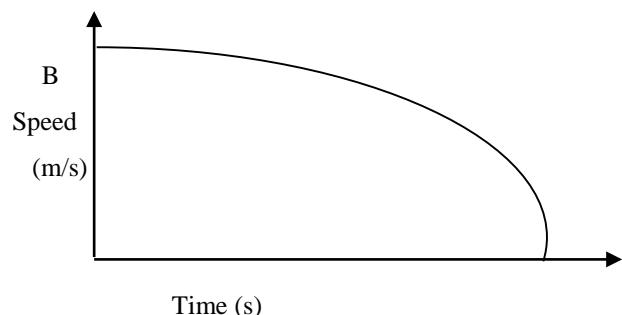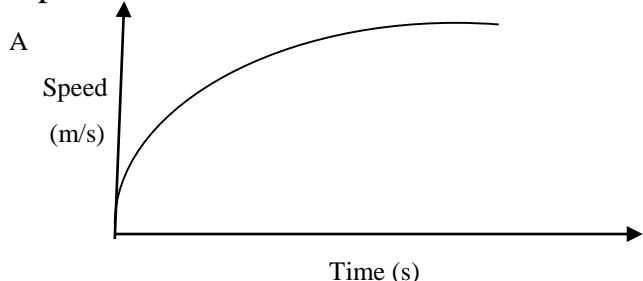
52. A learner weighing 800N runs up 20 stairs each 20cm high in 4s. how much power is exerted by the learner?

   A. 300 W   B. 400 W   C. 600 W   D. 800 W

53. The table below shows the weights and masses of four objects on different plants. On which plant is the gravitational field strength is the largest?

|	Weight / N	Mass / kg
A	2.0	20
B	4.0	30
C	6.0	40
D	8.0	50

2019 G.C.E QUESTION PAPER 1

54. The diagram below shows 4 identical metal bars placed between two wooden blocks on a ruler.
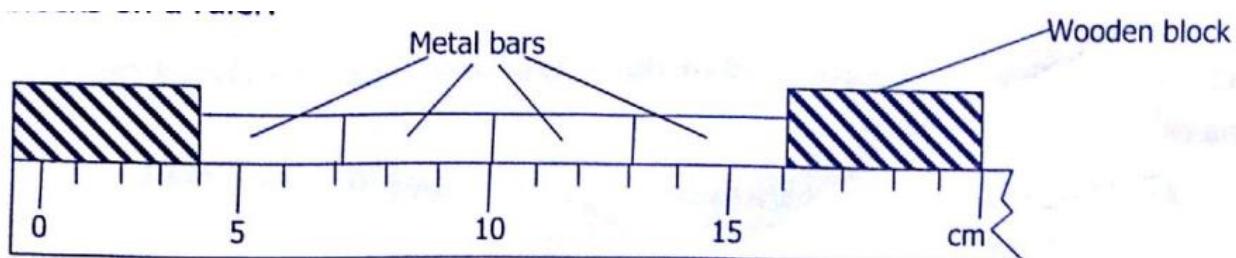

What is the diameter of one metal bar?

A. 1.0 cm   B. 2.0 cm   C. 3.0 cm   D.   4.0 cm

55. Which of the following would change the period of oscillation of a pendulum?

A. Thickness of the string   C.   Mass of the pendulum of bob

B. Length of the pendulum   D.   Volume of the pendulum bob

56. The diagram below is a graph showing the movement of a car over a period of 70 seconds.
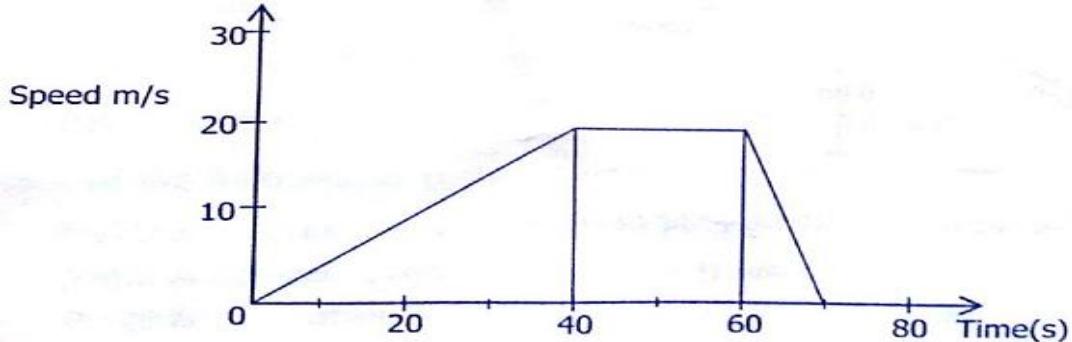
What distance was travelled by the car while its speed was decreasing?

A. 100 m   B.   200 m   C.   400 m   D. 500 m

**57.** The diagram below shows a 200g object on a frictionless surface acted upon by 3 forces.

Which of the following is correct about the acceration and direction of the movement of the object?

	Acceleration (m/s²)	Direction of movement
A	0.05	Left
B	0.05	Right
C	5.0	Right
D	500	Left

58. Why would a mechanic prefer to use a longer spanner to loosen a nut than a short one? A longer spanner would ……………………

A. Add grease to the nut.   C. Give a greater turning effect

B. Allow a mechanic to apply more force.   D. take a longer time to loosen the nut

59. A drum of water of weight 2000N is rolled up a plank of length 2m unto a platform of 0.8m high.
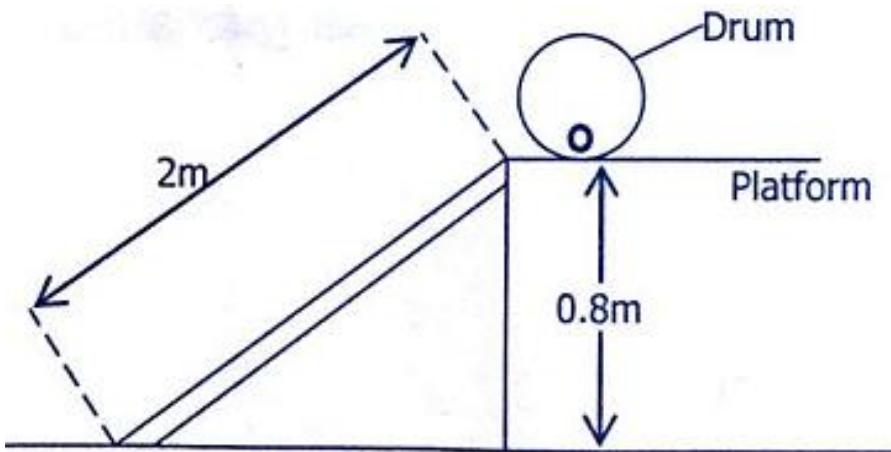
What is the work done on the drum against gravity?

A. 1000J   B. 1600J   C. 2500J   D. 4000J

60. A crane lifts a 600kg mass through a vertical height of 12m in 18 seconds. What is the crane's power output?

A.   4 000W

B.   6 000W

C.   10 000W

D.   72 000W

2009 QUESTION PAPER 2

61. Figure 1.1 shows a graph of how the speed of a car changed over 20s as the car accelerated along a straight road.
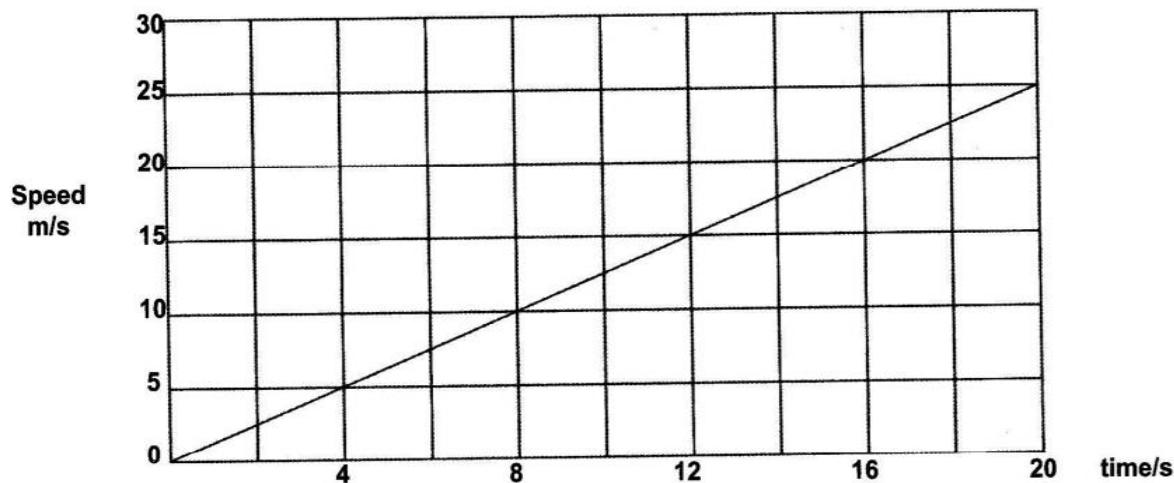
(a) Calculate the acceleration of   [2]

(b) The mass of the car was 1200kg. calculate the force which produced the acceleration in (a)   [2]

(c) Calculate the distance travelled by the car during the 20s.   [2]

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

(a) The girl's weight?   [1]

(b) The girl's potential energy when she is at the top of the stairs?   [2]

(c) Her power output?   [2]

63. (a)   Figure below shows a bus.
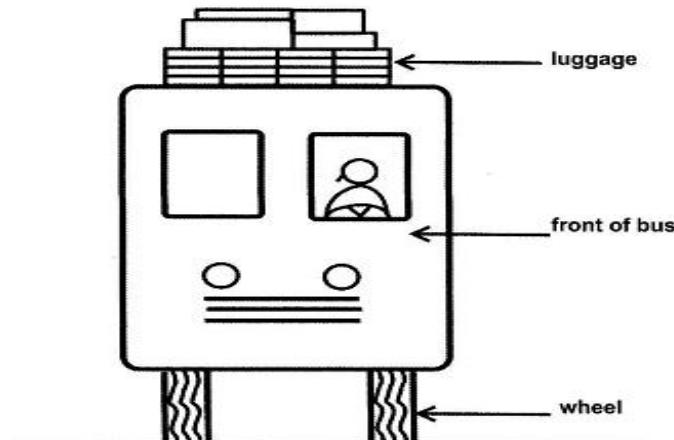
State 3 modifications that should be made in the design of the bus to make it more stable. [3]

(b) An astronaut with a mass 75kg on Earth travels to the moon whose gravitational field strength is 1.6N/kg.

   (i)   What is meant by mass? [1]

   (ii)   What is the mass of an astronaut on the moon? [1]

   (iii)   What is his weight on the moon? [1]

64. The diagram below shows the gear wheels. The driving wheel has 36 teeth and the driven wheel has 12 teeth.
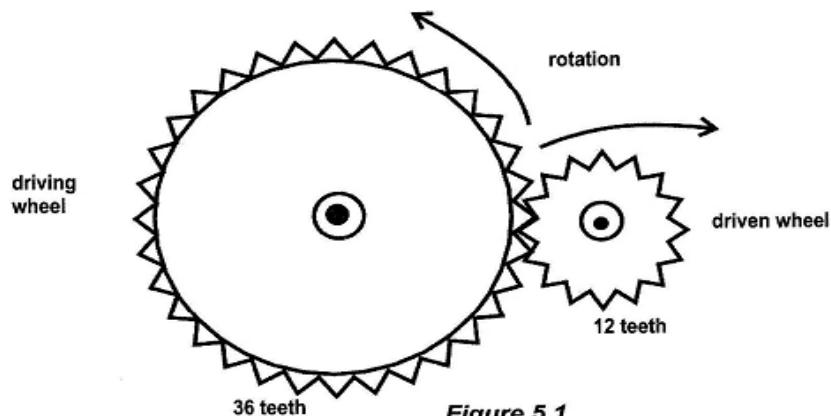

Figure 5.1

(a) Find the velocity ratio. [2]

(b) If the driven wheel makes 15 rotations, how many rotations would the driving wheel make? [2]

2010 QUESTION PAPER 2

65. The diagram below shows part of a micrometer screw gauge, an instrument used to measure a physical quantity.
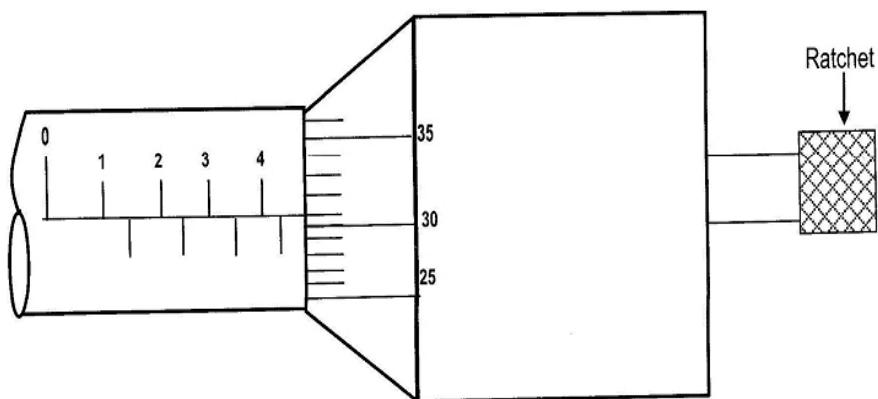
(a) What is the reading shown on the micrometer? [1]

(b) What physical quantity is measured by the instrument? [1]

(c) What is the function n of the ratchet? [1]

66. The diagram below shows a simple pendulum that oscillates between position A and C. It takes 2.05s to go from A to C and back to mid-point B.
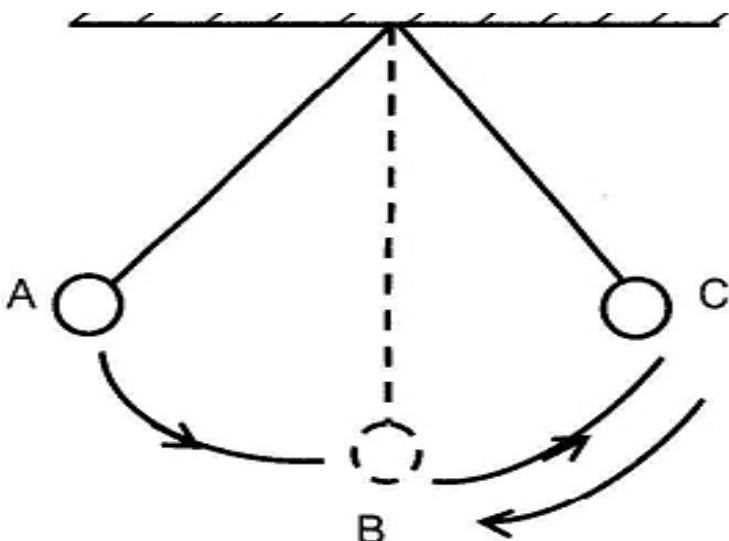
(a) (i) Calculate the period of the pendulum. [2]

(ii) Calculate the frequency of the pendulum. [2]

(b) Briefly describe how the period of a pendulum would be measured. [1]

67. (a) The diagram shows a uniform metre rule of mass 120g suspended at its mid-point from a spring balance, which is calibrated in Newtons (N).
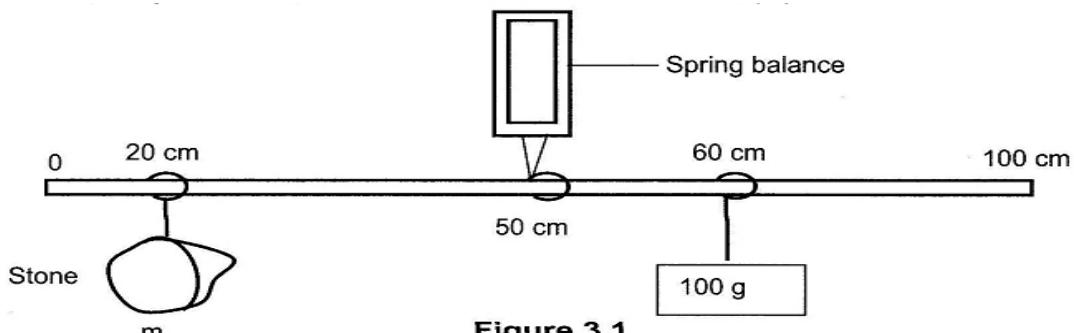

Figure 3.1

A stone, suspended at the 20 cm mark, is balanced by a 100g mass suspended on the 60 cm mark. Assume g =10m/s².

(a) Calculate the mass of the stone. [2]

(b) Why does the mass of the metre rule play no part in the calculation in (a)? [1]

(c) What is the reading on the spring balance? [2]

68.Figure 4.1 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 tap.
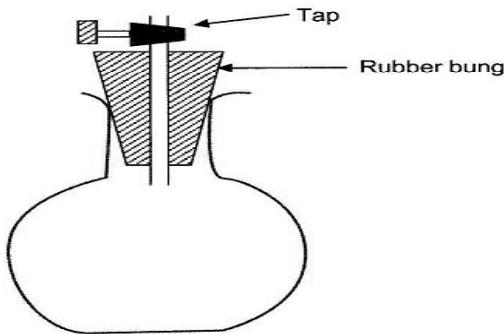

The following results were obtained:
- mass of the bottle containing air $= 410g$
- Mass of empty (evacuated) bottle $= 409g$
- Mass of bottle filled with water $= 1150g$

(a) What mass of water was needed to fill the bottle?   [1]

(b) What was the internal volume of the bottle? Take the density of water as $1g/cm^3$ [2]

(c) What mass of air filled the bottle?   [1]

(d) What was the density of air?   [2]

69. The diagram below shows the path taken by a ball thrown vertically up into the air.
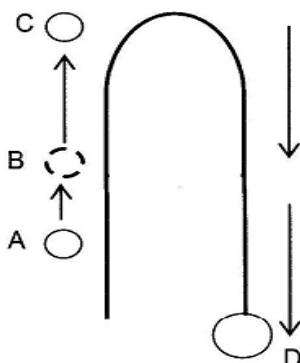
(a) (i) State at which position A, B, C or D the ball travels fastest.   [1]

   (ii) Explain your answer in (i)   [1]

(b) Wind is a renewable source of energy. The windmill is used for electrical generation and to pump water.

   (i)   What is meant by renewable source of energy?   [1]

   (ii)   State one disadvantage of depending on wind energy.   [1]

   (iii) Give an example of non-renewable source of energy   [1]

70. The diagram below shows an arrangement for demonstrating the relationship between force and acceleration.
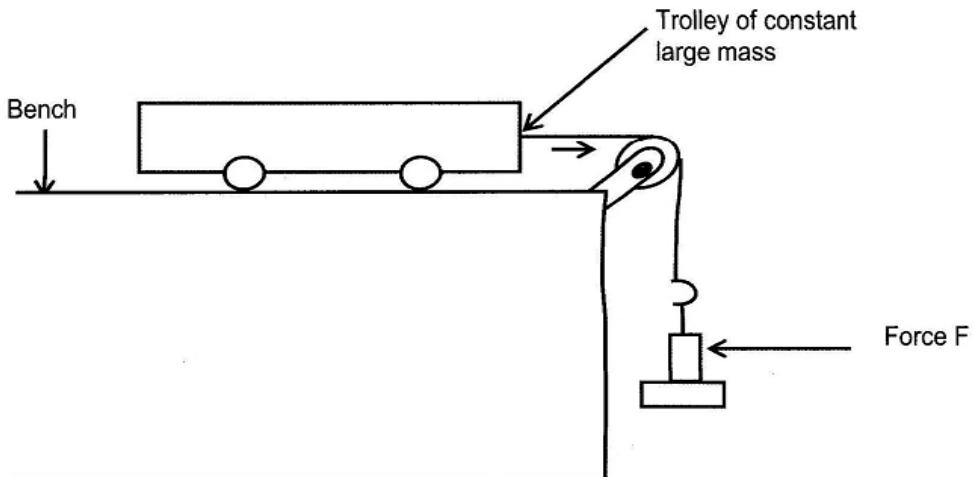
In one experiment, the mass of the trolley was kept constant. The time **t** for the trolley to move a distance of 1.00m from rest was determined for various values of the pulling force **F**. the acceleration **a** was then calculated using the equation $S = \frac{1}{2}at^2$, where $S = 1.00m$. The following various were obtained.

F/N	0.40	0.80	1.20	1.60	2.00
a (m/s^2)	0.08	0.22	0.43	0.57	0.74

(a) Plot a graph of **F** against **a**. [5]

(b) (i) Determine the slope/gradient of your graph. [2]

(ii) What physical quantity does the gradient represent? [1]

(c) In this experiment explain why a pulling force is needed to give zero acceleration. [2]

2011 QUESTION PAPER 2

**71.** A cyclist accelerates uniformly from rest to a velocity of 10m/s in 3s. He then moves with a constant velocity of 10m/s for 6s, before decelerating uniformly to rest in a further 5s.

(a) Draw a velocity-time graph representing the cyclist's motion. [3]

(b) Calculate the distance travelled by the cyclist during the journey. [2]

72. (a) What is meant by the Centre of mass of an object? [1]

(b) Explain why a minibus is more likely to topple over when the roof rack is heavily loaded than when the roof rack is empty. [1]

(c) A metre rule is supported on a knife-edge placed at the 40cm mark. It is found that the metre rule balances when a mass of 45g is suspended from the 15cm mark as shown below.
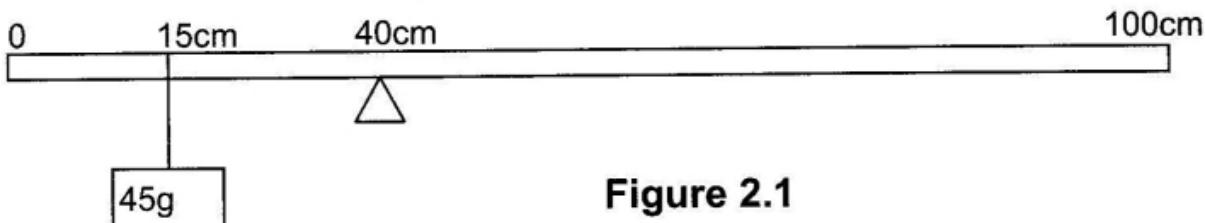
Figure 2.1

If the Centre of mass of a metre rule is at the 52.5cm mark, calculate the mass of the metre rule. [2]

73. 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 steps.

(take $g = 10m/s^2$)

(a) What is her weight? [1]

(b) What is the weight of the box? [1]

(c) Calculate the total potential energy of the girl and the box when she reaches the top. [2]

(d) Calculate the total power. [2]

74. (a) Define density of a substance. [1]

(b) Describe an experiment you would perform to determine the density of an irregularly shaped object such as a stone.

(c) An empty tin of mass 20g and capacity 25cm³ was used to measure the density of mercury. When filled of mercury, the mass of the tin and mercury was 360g. What is the density of mercury? [4]

2012 QUESTION PAPER 2

75.(a) The figure below shows part of a vernier calipers used to measure a physical quantity.
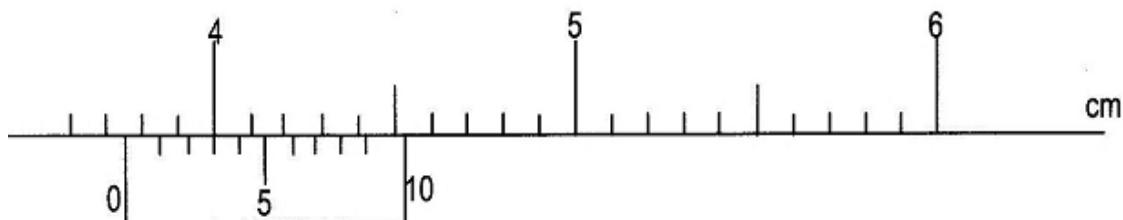
(i) What is the reading shown above on the vernier caliper? [2]

(ii) What physical quantity does the vernier caliper measure? [1]

(c) State two precautions that must be taken when taking measurements using a micrometer screw gauge. [2]

76. Figure below shows a velocity time graph of an object moving along a straight road.
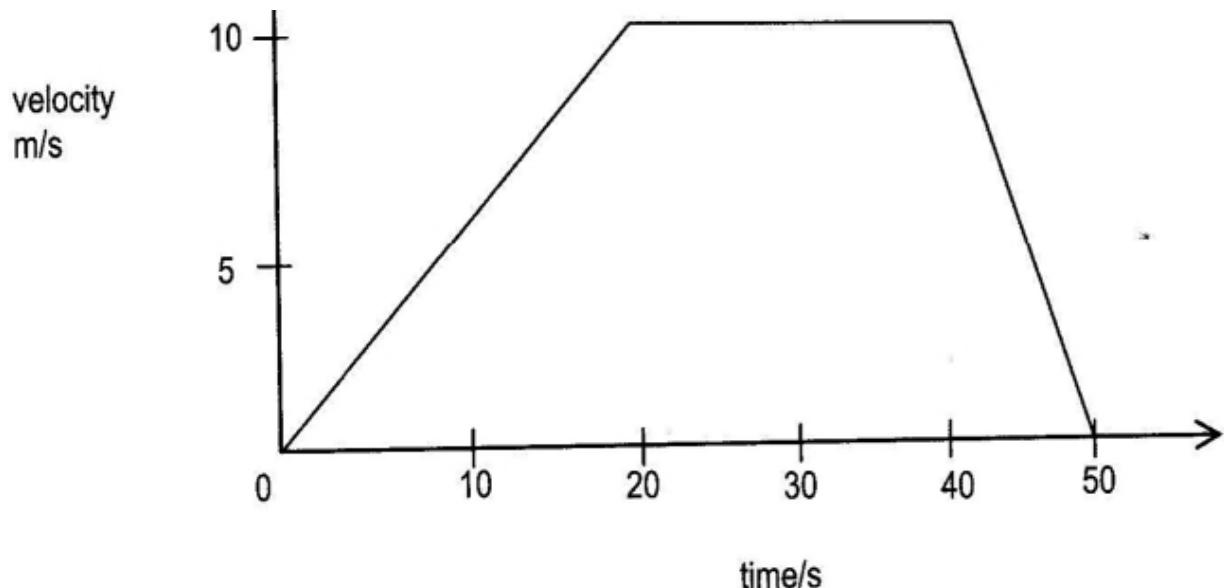
(a) What is the total time for the whole journey? [1]

(b) What is the maximum velocity for the journey? [1]

(c) What is the acceleration during the first part of the journey? [1]

(d) Calculate the total distance covered by the car. [3]

77. Figure below shows an object of mass 0.7kg resting on 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;

(i) The resultant force [1]

(ii) The acceleration produced by the resultant forces in (i) [2]

(b) Explain why in practice the actual acceleration for the object may be lower than your answer to (a) (ii) above. [1]

78. (a) Define **work** and **power**. [2]

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

(i) The pupil's gain in potential energy. [2]

(ii) The useful power developed by the pupil in climbing the stairs. [2]

79. (a) Describe an experiment you would carry out to determine the density of an irregularly shaped object which floats on water. [5]

(b) The figure below shows a uniform metre rule balance horizontal on a knife-edge placed at the 58.cm mark when a mass of 20g is suspended from the end.
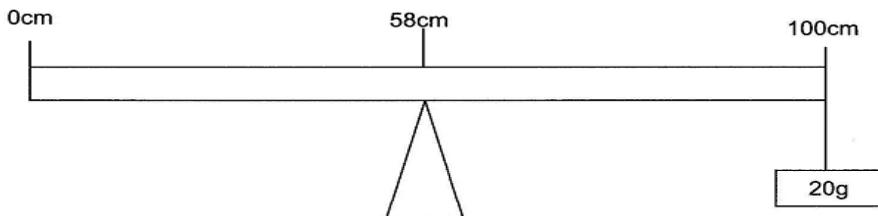

(i) Find the mass of a metre rule. [2]

(ii) What is the weight of the rule (Taking g = 10m/s^2)? [2]

(c) A candle stand has a wide heavy base. Explain why the base has both heavy mass and wide area. [1]

2013 QUESTION PAPER 2

80. The figure below shows a simple bottle opener made by fixing two screws into a piece of wood.

(a) What is meant by a simple machine?   [1]

(b) Which of the points **X**, **Y** or **Z** is;

   (i) The pivot   (ii)   the effort   [2]

(c) Is the force applied at **X** less or greater than the force applied at Z?   [1]

(d) State **one** modification that should be made on the design of the bottle opener so that less effort is used to open the bottle.   [1]
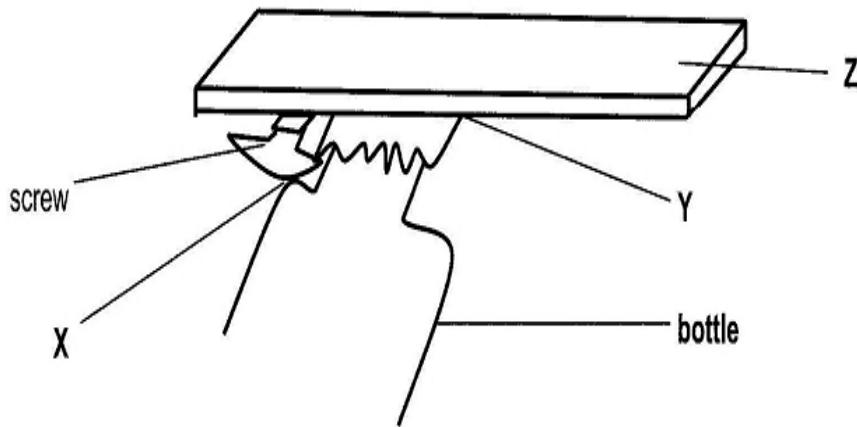
81. A car of mass 1400kg starts from rest and moves along a straight road with a constant acceleration to reach a speed of 10m/s in 6s.

(a) On the axes below, draw a graph of speed against time for the first 6s of the motion. [1]
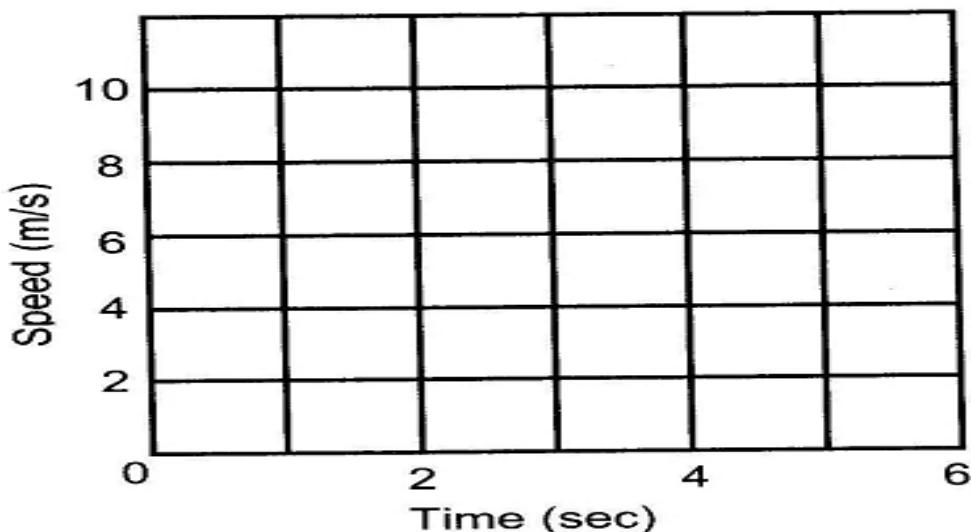
(b) For the motion of the car in the first 6s, calculate the

    (i)   Distance travelled by the car   [1]

    (ii)   Acceleration of the car   [1]

    (iii)   Resultant force acting on the car   [1]

82. (a) State one difference between mass and weight.   [1]

(b) What two factors that will make an object stable?   [2]

(c) A mass of an object is 50kg on earth, what will be its mass on moon?   [1]

83. (a) Briefly describe how the mass of a liquid can be determined. Show how the final result can be calculated.   [3]

(b) An empty relative density bottle has a mass of 35g. When filled with water, its mass becomes 85g. Calculate the

    (i)   Mass of water.   [1]

    (ii)   Volume of the bottle (take the density of water to be $1g/cm^3$)   [2]

**84.** The figure below shows a door well secured on the door frame.
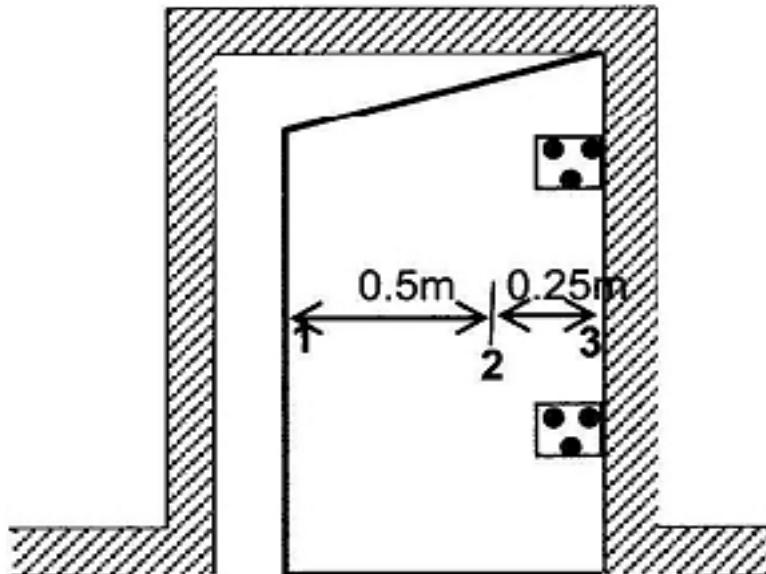
(a) What is meant by moment of force? Include its SI unit.   [1]

(b) Calculate the moment of force if a force of 10N is applied at point 1 to open or close the door.   [2]

(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**.   [2]

2016 G.C.E QUESTION PAPER 1

85. The figure below shows an experiment which was carried out to measure the time interval of a simple pendulum.
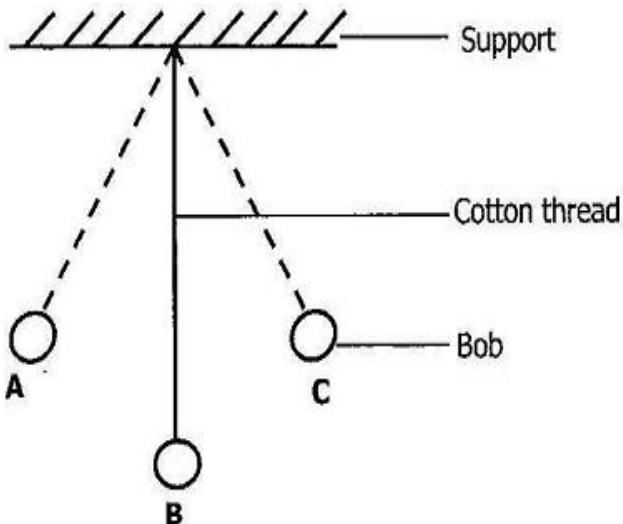
The bob was oscillating between A and C.

(a) State the meaning of the term 'Oscillation'.   [1]

(b) If the pendulum bob took 0.20s to swing from A to C, calculate the period.   [2]

(c) Using your answer in (b), determine the frequency of the bob.   [2]

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

(a) state

(i) An instrument commonly used in the laboratory for measuring the amount of material in a body.   [1]

(ii) The mass of the 200kg lion on Earth.   [1]

(b) Calculate the weight of the lion on Earth.   [2]

87. (a) What is meant by the 'moment' of a force about a point?   [1]

(b) Moment of a force about a point depends on two factors; what are they?   [1]

(c) The figure below shows a uniform metre rule which is pivoted at the 20cm mark and balanced horizontally by an object of weight 3.25N placed at the 10cm mark.
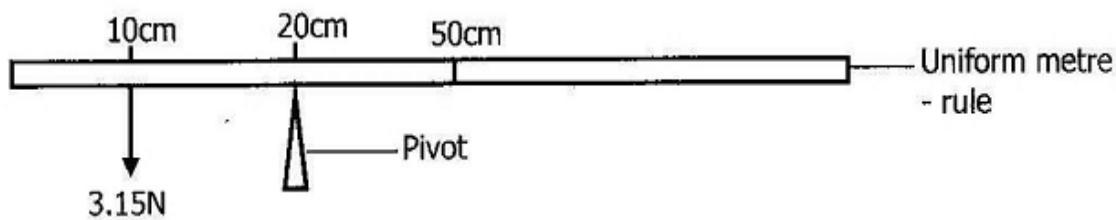
Calculate the weight of the metre rule. [2]

88. 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, $g = 10m/s^2$.
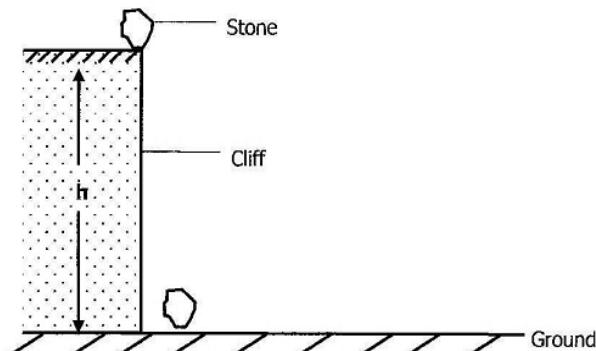
(a) Name the form of energy possessed by the stone before it falls. [1]

(b) Determine the height h of the cliff. [2]

(c) Calculate

(i) The kinetic energy of the stone when half way down. [2]

(ii) The final velocity of the stone as it strikes the ground. [2]

89. (a) State two effects that a simple machine can do to make work easier for a man. [2]

(b) Explain why the efficiency of a simple machine

(i) is normally less than 100% [1]

(ii) Cannot exceed 100% [1]

(c) Draw a labeled diagram to show a block and tackle pulley system of velocity ratio 4. [2]

(d) John uses the machine in 29 (c) to raise a 60N load from the ground to a distance of 0.4m. The effort used by John to do the work is 20N. Calculate:

(i) The mechanical advantage and [2]

(ii) Efficiency of the machine [2]

2017 G.C.E QUESTION PAPER 1

90. The figure below shows part of vernier calipers.
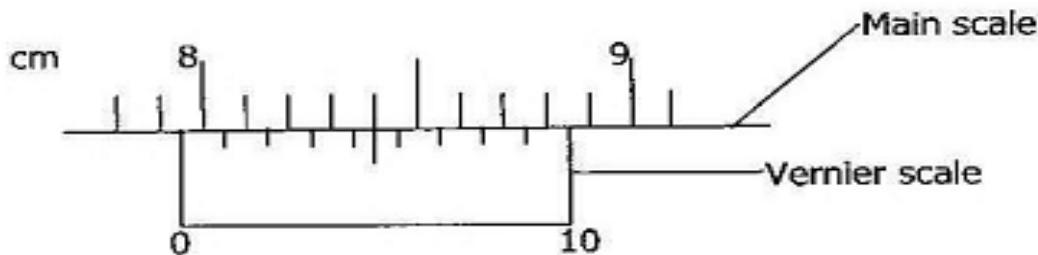

(a) What is the reading of the vernier calipers?   [2]

(b) Write in words the SI units of the following physical quantities and state their symbols.

SI unit in words	**SI unit in symbol**	
(i) Velocity……………………………………	……………………	[1]
(ii) Temperature……………………………………	……………………	[1]
(iii) Acceleration ……………………………………	……………………	[1]

91. (a) What is the difference between density and relative density?   [1]

(b) The diagram below shows a cuboid container that has a 5cm square base and contains water to a height of 6cm.
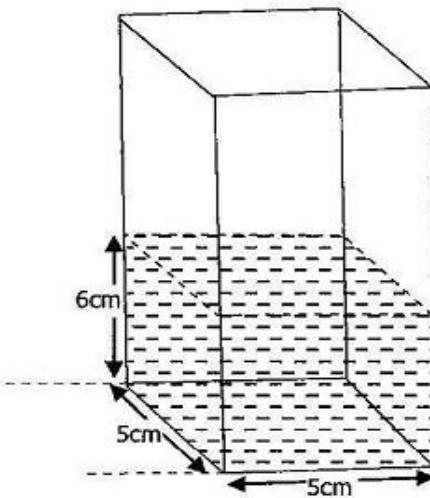
(i)   What is the volume of the water?   [1]

(ii) A stone is immersed into the water in the cuboid causing the water to rise to a height of 8cm. determine the volume of the stone.   [2]

(iii) If the mass of the stone is 80kg, calculate the density of the stone.   [2]

92. The figure below shows a ramp being used to lift a box weighing 480N through a distance of 3 meters and height of 1 meter by applying a force F of 200N.
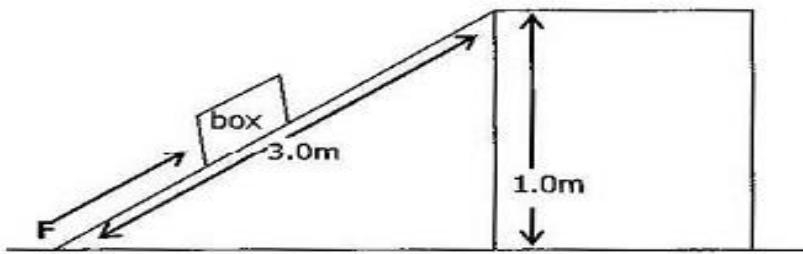
(a) State the meaning of the term 'simple machine'. [1]

(b) Calculate the mechanical advantage of the ramp shown above. [2]

(c) Calculate the efficiency of the ramp. [2]

93. An automobile of mass 2000kg started from rest position and increased its speed uniformly to 9m/s in 30s. It maintained this speed for another 500s.

(a) Sketch the speed time graph of the automobile for the journey described. [3]

(b) Calculate the uniform acceleration of the automobile. [2]

(c) How much force was required to produce this acceleration? [1]

(d) Calculate the distance covered by the automobile when it was moving at constant speed. [2]

(e) What was the average speed of the automobile for the journey described? [2]

2018 G.C.E QUESTION PAPER 1

94. A stone of mass 0.5kg was thrown vertically upwards and caught at the same position. Neglecting air resistance, complete the following table.

Position	Just after throwing	At the highest point	Just before being caught
Force on the stone	5N down	(ii)	(v)
Acceleration	(i)	(iii)	10m/s^2 down
Speed	8m/s	(iv)	(vi)

95. (a) Define **density** [1]

(b) Liquid **A** of weight 2N and density 1g/cm^3 is mixed with liquid **B** of volume 100cm^3 and density 2g/cm^3.

  (i) Calculate the mass of the mixture [2]

  (ii) What is the volume of the mixture? [2]

96. A body start from rest and moves with uniform acceleration of 2m/s² in a straight line.

(i)   What is the final velocity after 5s?   [2]

(ii)   How far has it travelled in this time?   [2]

(iii) After how long will the body be 100m from its starting point?   [2]

97. The figure below shows a crane lifting some bricks during the building of a house. The weight of the bricks products a turning effect of moment on the arm of the crane about the pivot **P**. the weight of the bricks is 12000N.
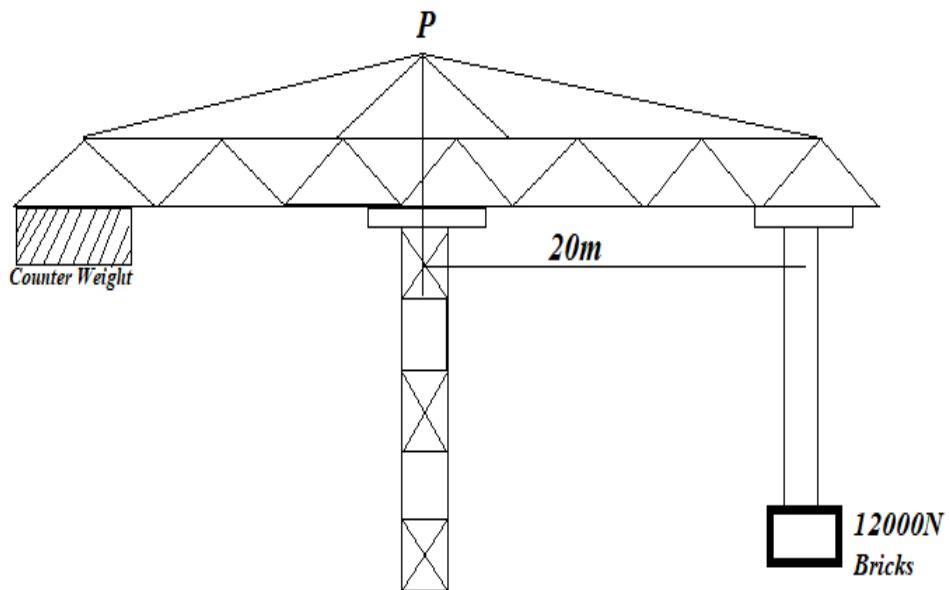
(a) Calculate the moment of this force using the distance marked on the diagram above. [2]

(b) Calculate the useful work done by the crane in lifting 12000N through a height of 15m.   [2]

98. The diagram below shows a motor used to operate a lift (elevator). There is a man in the lift. The input power of the motor is 6200 watts.
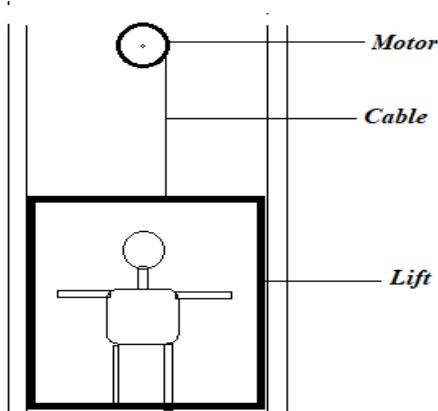

(a) Define **power**.   [1]

(b) The lift and the man have a total mass of 580kg. The lift moves up a distance of 12m in 15s.

(i)   Calculate the tension (force) in the cable when the lift is moving at constant speed. [2]

(ii)   Calculate the increase in gravitational potential energy of the lift and the man.   [2]

(iii)   Calculate the efficiency of the motor.   [2]

2019 G.C.E QUESTION PAPER 1

99. The diagram below shows a uniform plank of length 100cm kept in equilibrium by a 3kg and 1kg mass placed 10cm and 20cm from each end respectively.
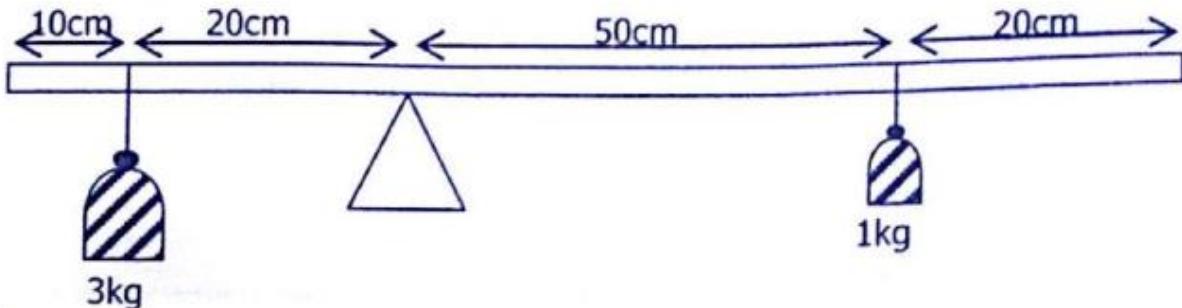

(a) Calculate the

(i)   moment of the 3kg mass   [2]

(ii)   weight of the plank   [2]

(b) State one application of the above set up.   [1]

100. The diagram below shows a displacement – time graph for the motion of a dog over a period of 12s.
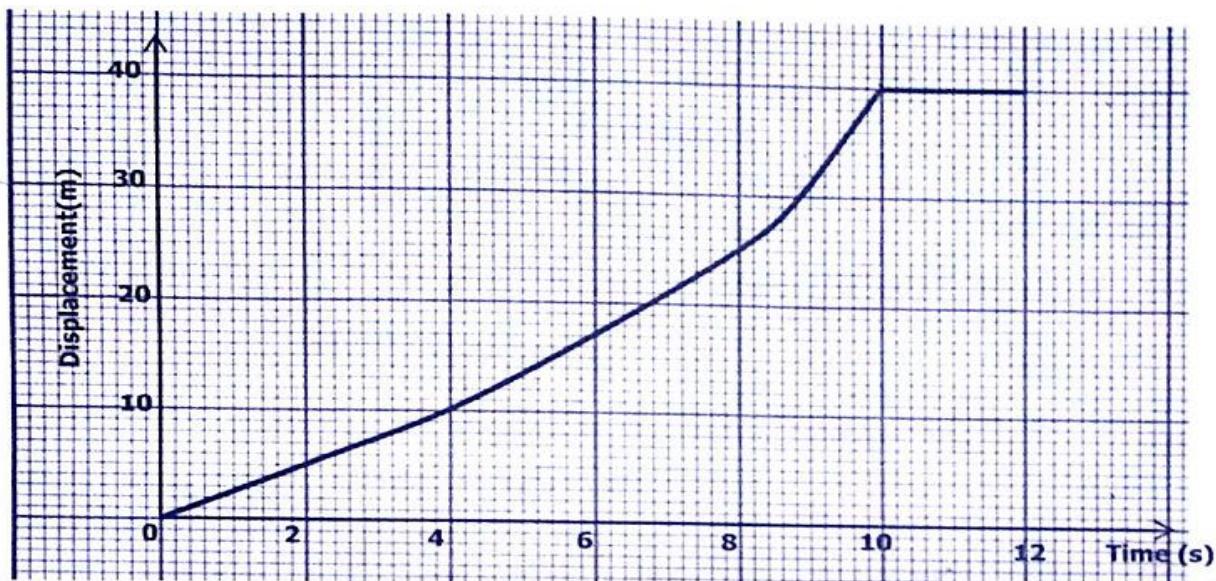
a. Use the graph to calculate

    (i)   The velocity of the dog at 10s.   [2]

    (ii)   The acceleration of the dog from 0 to 10 seconds.   [2]

b. From the graph, determine the time when the dog is not moving.   [1]

101. The diagram below shows a spring catapult design by a pupil for a science project. The catapult consists of movable plunger with a spring attached to it.
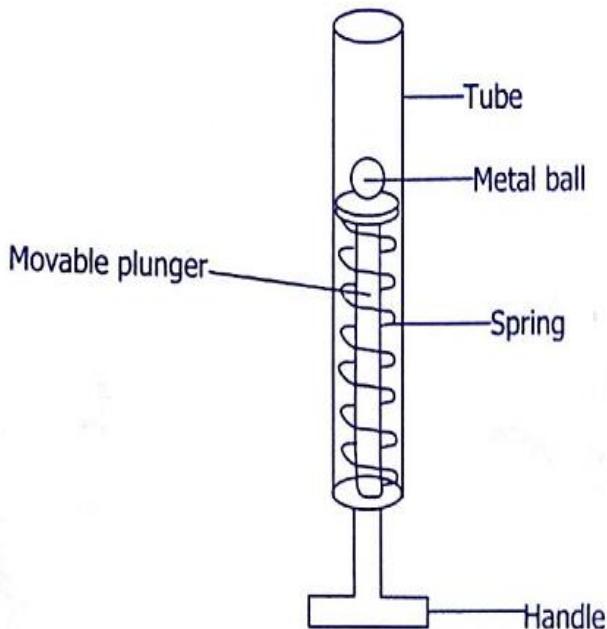
 A metal ball of mass 0.2kg was placed on the metal plate and the handle of the catapult pulled to fully compress the spring. On release of the handle, the ball was projected 1.5m vertically.

(a) Name the type of energy stored in a compressed spring.   [1]

(b) Calculate the maximum potential energy acquired by the ball from the catapult.   [2]

(c) Give one reason why the potential energy you have calculated in (b) is

    less than the original stored energy of the spring.   [2]

102. The diagram below shows a block and tackle pulley system used to lift a load of 200kg.
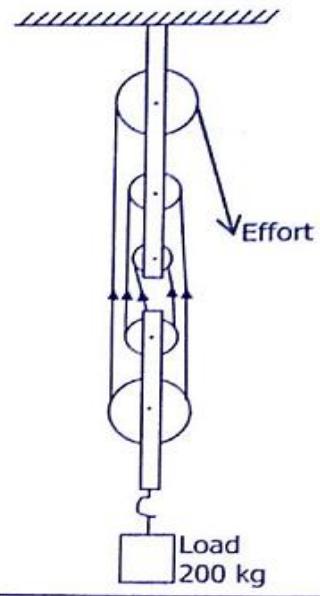
(a) State the velocity ratio of the pulley system in the diagram above. [1]

(b) If the machine has an efficiency of 80%, calculate the effort applied. [3]

103. The table below shows the thinking distance for various speeds for a driver to react and apply brakes before stopping.

| Thinking distance (m)	0	9	12	15
Speed (km/h)	0	48	64	80

(a) (i) On a graph paper, draw a graph of thinking distance against speed. [4]

(ii) Use your graph to determine the thinking distance for the driver at 32km/hr. [2]

(b) The driver then drinks two bottles of alcohol. After sometime his thinking time was measured as 1.0 second.

(i) Calculate the thinking distance for the driver when driving at 32km/hr. [3]

(ii) What was the effect of the alcohol on the thinking distance of the driver? [1]

<div align="center">END OF GRADE 10 QUESTIONS</div>

GRADE 11 E.C.Z QUESTIONS

2009 QUESTION PAPER 1

1. An experiment is arranged as shown below.
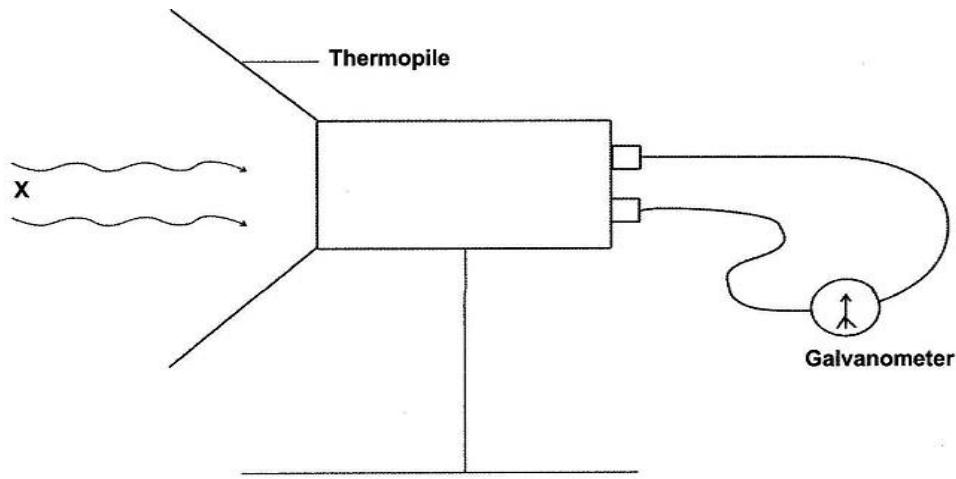
X is a radiation entering the thermopile. If the galvanometer needle shows a deflection,

A. X has a shorter wavelength than X-rays.

B. X has a longer wavelength than X-rays.

C. X has a lower frequency than Radio waves.

D. X has the same frequency as light.

2. The diagram shows a ray of red light passing from air into glass.
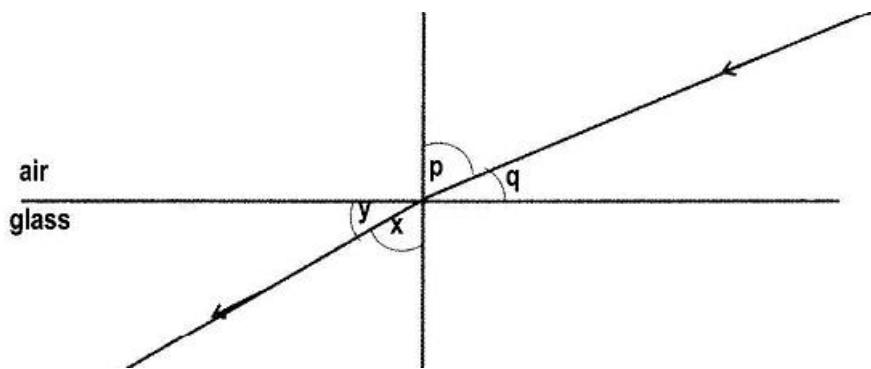

Which ratio gives the refractive index for red light?

A $\dfrac{\sin p}{\sin x}$ B $\dfrac{\sin p}{\sin y}$ C $\dfrac{\sin q}{\sin x}$ D $\dfrac{\sin q}{\sin y}$

3. A loud sound is made in front of a tall building. An echo is heard 4 seconds after the sound is produced. If the speed of sound in air is 320m/s, how far away is the building?

A. 80m   **B**. 160m   C. 640m   **D**. 1280m

4. The figure below shows the magnetic field lines on two pieces of permanent magnets.
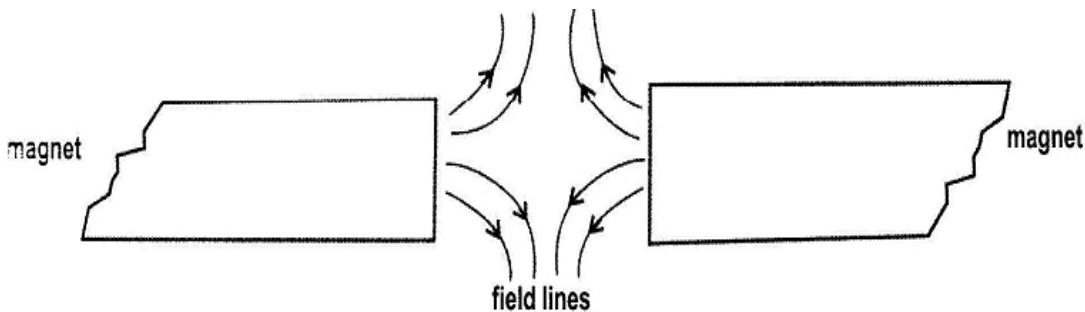

The field pattern is produced by • • •

A. Two north poles

B. two south poles

C. a north pole and a south pole

D. a south pole and an unmagnetized iron bar

2010 QUESTION PAPER 1

5. The diagram below shows a copper disc **X** with a circular hole **Y.**
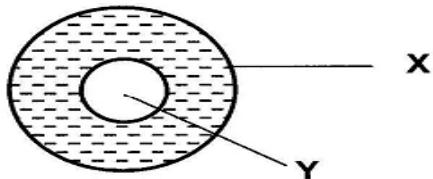
When the disc is heated...

A. the area of x increases and the area of y decreases

B. the area of x decreases and the area of y increases

C. x and y have the same area as before

D. the area of x increases and the area of y stays the same

6. Which of the following contains the molecules with the highest average speed?

A	B	C	D
Ice cube at -10°C	Water at room temperature	Wood at room temperature	Steam at 110°C
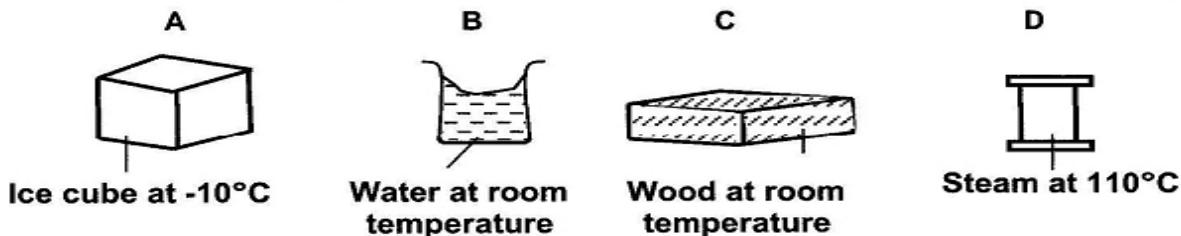
7. The diagram below shows the cross-section of a water wave.
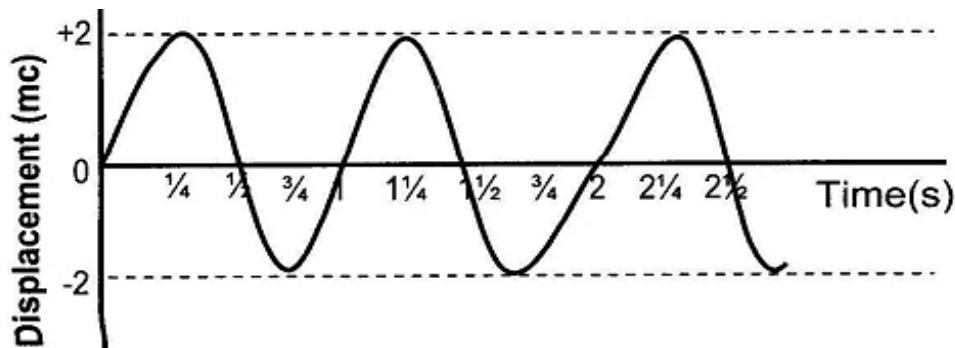
The values that correctly represent the period and frequency of this wave are shown • • •

	Period (s)	Frequency (Hz)
A	0	1
B	1	1
C	1	2
D	2	1

8. A typist uses new carbon-paper under her top typing paper for making a copy of a letter. When she holds the carbon-paper close to a plane mirror, she can read the letter. This is because the mirror • • •

A. Produces a laterally inverted image

B. forms an image the same size as the object

C. forms a virtual image

D. forms an image the same distance.

9. Echo-sounding equipment on a ship receives sound pulses reflected from the sea bed 0.03 seconds after they were sent out. If the speed of sound in sea water is 1500m/s, what is the depth of water under the ship?

   A. 22.5m   B. 45.0m   **C**. 25 000m   **D**. 50 000m

   ### *2011 QUESTION PAPER 1*

10. Which substance does not contract if cooled from 2°C to 0°C?

    A. Pure oil   B. Pure water   **C**. Brass   D. Gold

11. What happens when a liquid is being heated at its boiling point? The
    A. molecules become bigger.   B. intermolecular spaces increase.

    C. intermolecular spaces decrease.   D. number of molecules increases.

12. The diagram shows a displacement-time graph for a transverse wave.
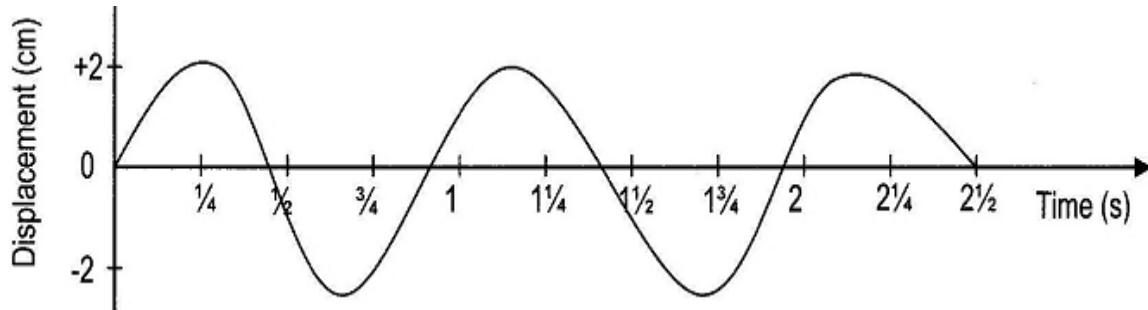
    How long does it take to make 2.5 waves?

    A. ¾ s   **B**   . 1½ s   **C**. 2¼ s   **D**. 2½ s

13. Which statement about refraction is true? When light passes from air to glass, it ...

    A. speeds up and wavelength decreases.

    B. slows down and wavelength decreases.

    C. speeds up and the frequency decreases.

    D. slows down and the frequency decreases.

14. In order to produce a sound wave, there should always be....

   **A**. a drum.   **B**. vibrations.   **C**. longitudinal waves.   **D**. air.

2012 QUESTION PAPER 1

15. Heat travels in a solid by conduction. Heat flows from one end of a solid to the other by the•••

   A. flow of electrons and convection currents.

   B. flow of electrons and movement of atoms.

   C   vibration of atoms and convection currents.

   D   vibration of atoms and flow of electrons.

16. The diagram shows a thermocouple thermometer.
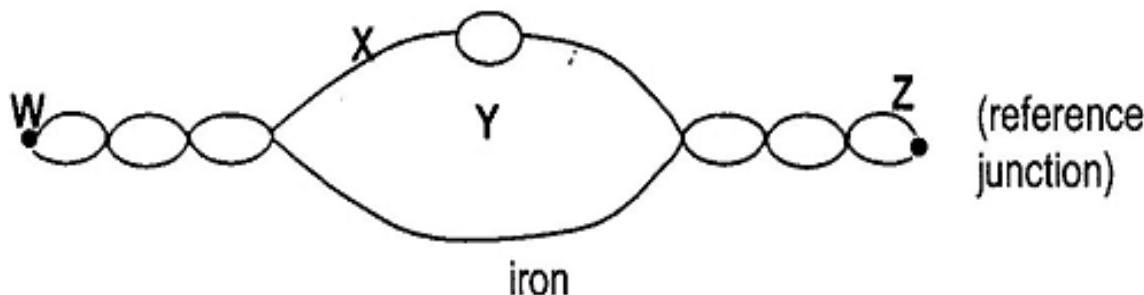
iron

   Which of the following is true?

   A   Side **W** is the cold junction.

   C   The letter **Y** represents a thermometer.

   B   Material **X** is made of iron.

   D   The instrument is calibrated at boiling point of water.

17. The diagram below represents a sound wave.
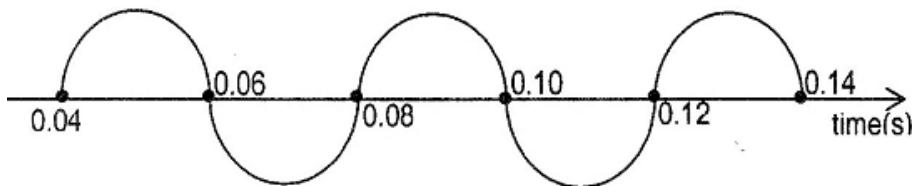
   In a space of 120cm there are ten compressions and ten rarefactions.

   What is the speed of the sound wave?

   A. 150cm/s   **B**. 300cm/s   **C**. 340cm/s   **D**. 350cmis

18. The diagram shows a sound wave reflected from a brick wall.
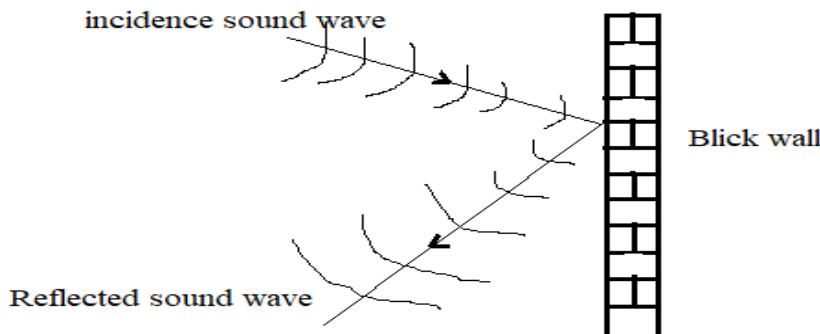
Compared with the incident wave, the reflected wave has…..

A. a greater amplitude.

B a shorter wavelength.

C the same speed.

D. the same velocity.

19. Which of the following is a property of magnetic field lines?

A They run from South Pole to North Pole.

B They cross each other at the poles.

C They run from North Pole to the South Pole.

**D** Magnetic field is weak when they are close.

2013 QUESTION PAPER 1

20. Which of the following gives the states of matter in which molecules at a given temperature have the highest speed and the strongest cohesive force?

	Highest speed	**Strongest force between them**
A	Gas	Solid
B	Gas	Gas
C	Solid	Gas
D	Solid	Solid

21. Warm water which is left in a clay pot gradually cools. This is because….

A. heat no longer reaches the water.

B. of evaporation of water from the pot

C. there is no condensation.

D. of convection currents in water.

**22.** The figure below shows a graph of wave motion.
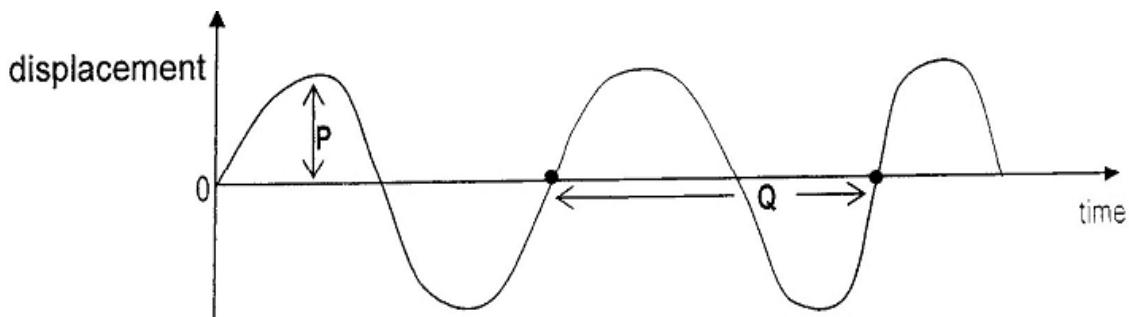
Which quantities are shown by distance **P** and **Q**?

| **P**	**Q**
A. Amplitude	Period
B. Half the amplitude	period
C. amplitude	wavelength
D. half the amplitude	wavelength.

23. All of the following are properties of a radio wave **except** • •

A   it causes particles of a medium to vibrate perpendicular to its direction.

B   it travels with a speed approximately 3×10^8 m/s in air

C   It is undeflected by electric or magnetic fields.

D   It does not travel in a vacuum.

24. The diagram below shows a bar of iron placed near a magnet. Both the iron bar and the magnet remain undisturbed.
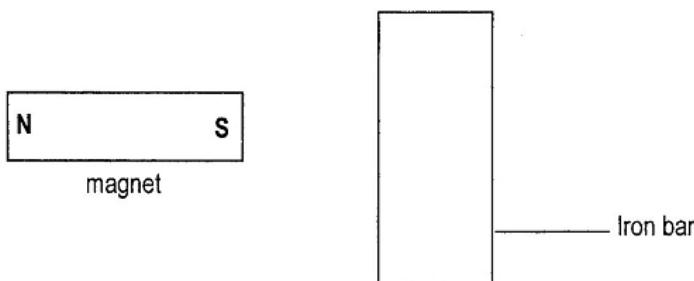

Which of the following correctly shows the magnetic poles on the Iron bar?

A
N   S

B
S   N

C
S
N

D
N
S
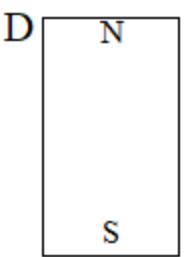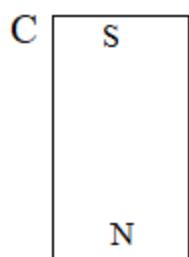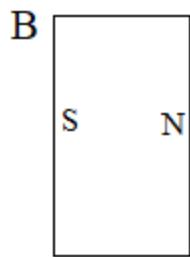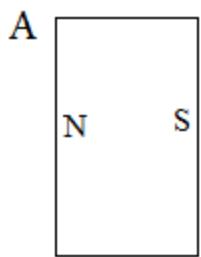
2015 QUESTION PAPER 1

25. Which of the following processes shows that particles of matter are in a random motion?

A. A small drop of oil spreads into a large circular patch on water.

B. Particles of smoke are seen to move haphazardly.

C. Bromine gas spreads slowly into a vacuum.

D. Particles of smoke are seen to move in one direction only.

26. Which of the following describes the difference between x-rays and gamma rays?

A. Gamma rays and x-rays have different sources.

B. C. Gamma rays travel faster than x-rays.

C. Gamma rays have a longer wavelength than x-rays.

D. D. Gamma rays do not affect photographic films.

27. A ripple tank with a vibrator hitting the surface of water with a frequency of 60Hz produces 10 complete waves in a distance of 15 cm. What is the velocity of the water waves produced?

A 0.9m/s   B. 9m/s   C. 90m/s   D. 900m/s

28. When a sound wave passes through air, the particles of air ...

A. Oscillate perpendicular to the direction of the wave.

B. Oscillate parallel to the direction of the wave

C. Oscillate up and down

D. Do not move at all.

29. A ray of light from a ray box is directed on one side of a parallel sided glass block. Which diagram shows the path of the ray of light through the glass block?
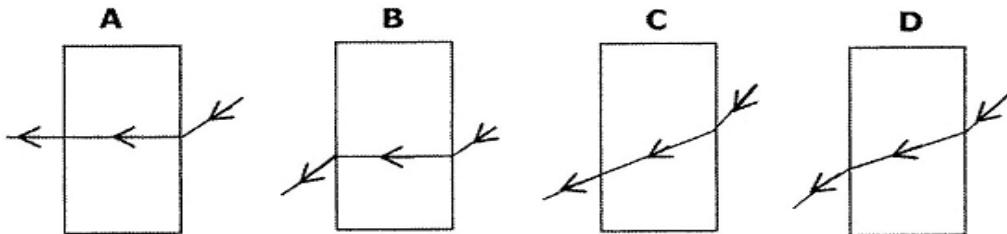
30. The diagram below shows a soft iron rod placed inside a solenoid connected to a d.c supply. The ends of the soft iron rod are marked **X** and **Y.**
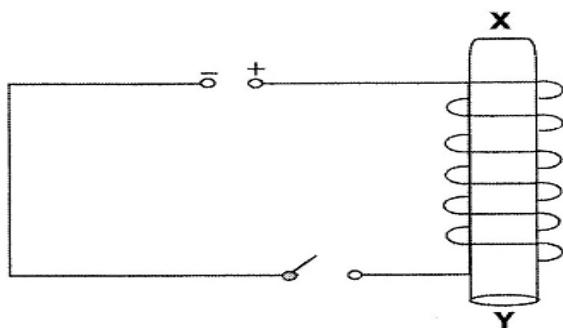
When current is switched on which of the following occurs?

A. X attracts pieces of iron filings.

B. Y becomes the North Pole

C. X becomes the South Pole.

D. Y does not attract pieces of iron filings.

2017 G.C.E QUESTION PAPER 1

31. A thermo flask contains a vacuum. What is the purpose of this vacuum?

Prevents ...

A. conduction and radiation.   B. conduction and convection.

C. radiation and convection.   **D**. conduction, convection and radiation.

32. Molecules of a liquid evaporate from a container and the temperature of the liquid left in the container changes. From which part of the body of the liquid do the molecules escape and what is the effect on the temperature of the liquid left in the container?

	Molecules escape from	Temperature of liquid left in container
A.	All parts of the liquid	Decreases
B.	All parts of the liquid	Increases
C.	Only the liquid surface	Decreases
D.	Only the liquid surface	Increases

33. The diagram below represents a transverse wave.
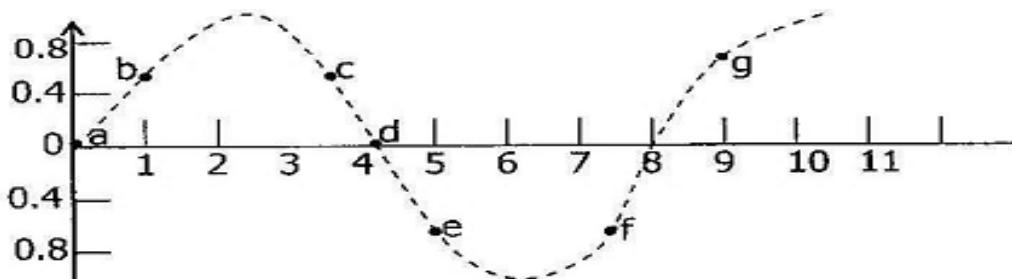
Between which two marked points is the distance equal to the wavelength
of the wave?

A. a and d   B. c and g   C. b and g   D. e and f

34. A lighted candle is placed in front of a loudspeaker that produces a loud,
steady sound at regular intervals.
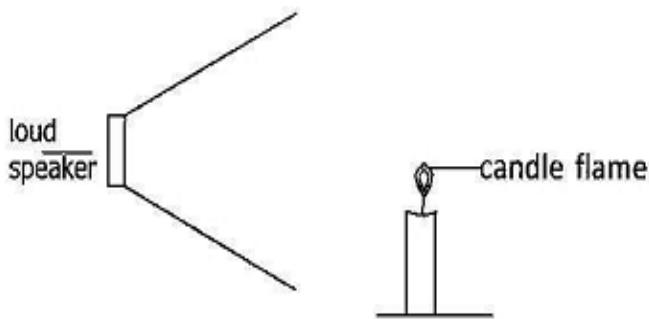
What type of wave is produced by the speaker and in which direction does it cause
the flame to tilt?

	Type of wave	Direction
A	Longitudinal	↕
B	Transverse	↕
C	Transverse	↔
D	Longitudinal	↔

35. The diagrams below show three rays of light incident on the boundary between a glass block and air. The angles of incidence are different.
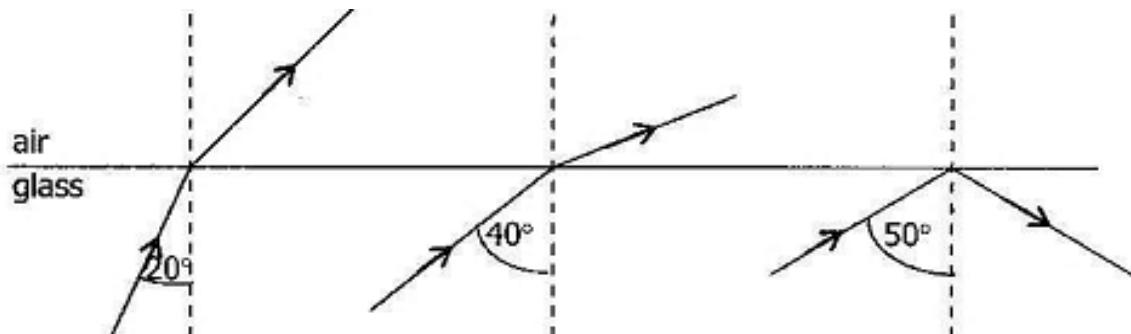

What is the possible critical angle?

A. 60° **B.** 45° **C.** 30° **D.** 15°

36. The diagram below shows an object placed under water and being viewed from the top
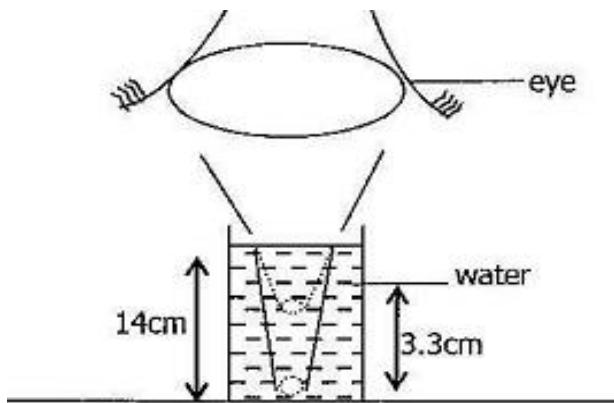
What is the refractive index of water?

A. 1.31 B. 1.50 C. 1.60 D. 1.60

37. The diagram below shows a steel magnet being withdrawn from a coil of wire in the direction shown to a point as far away as possible.
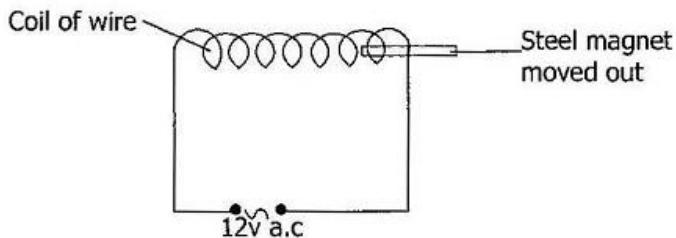

What is the effect on the steel magnet, due to this action?

A. No change B. Becomes magnetized
C. Becomes demagnetized D. Becomes a stronger magnet

2019 G.C.E QUESTION PAPER 1

38. The diagrams below show a bimetallic strip before and when it was dipped in a liquid of temperature – 20 °C.
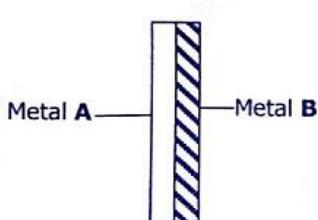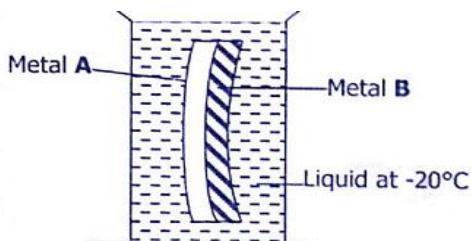
Before dipping   When dipped

Which of the following is correct?

A. Metal **A** is a poor conductor of heat than metal **B**.

B. Metal **B** is a better conductor of heat than metal **A**

C. Metal **A** contrasts more than metal **B** when cooled.

D. When cooled metal **B** contrast more than metal **A**.

39. A bicycle pump contains 70cm^3 of air at a pressure of 1.0 atmosphere and temperature of 7 °C. what is the pressure when the air is compressed to 30 cm^3 at temperature of 27 °C?

    A. 0.4 atmospheres   B. 2.5 atmospheres

    C. 280 atmospheres   D. 300 atmospheres

40. The diagram below represents positions at one particular time on a longitudinal wave.
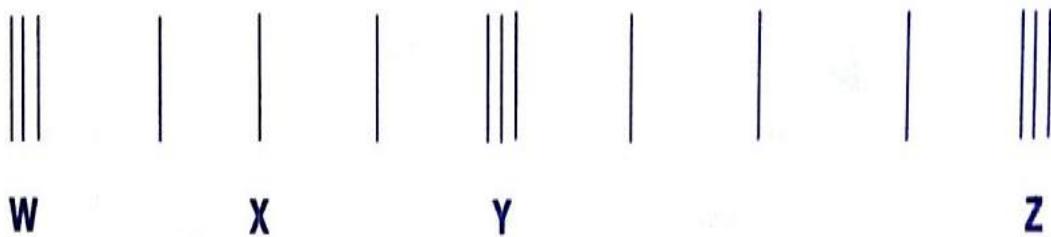
Which positions are one wavelength apart?

    A. **W** and **X**   B. **W** and **Z**   C. **X** and **Z**   D. **Y** and **Z**

41. Which of the following of sound frequencies has the highest pitch?

    A. 150 Hz   B. 200Hz   C. 400Hz   D. 500Hz

42. The diagram below shows a ray of light from air into a rectangular glass block.
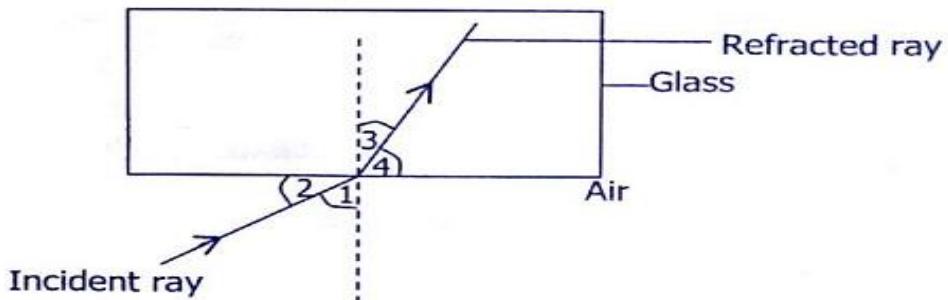
A $n = \dfrac{\sin 1}{\sin 3}$ 　　　　B $n = \dfrac{\sin 2}{\sin 3}$ 　　　　C $n = \dfrac{\sin 3}{\sin 1}$ 　　　　D $n = \dfrac{\sin 4}{\sin 2}$

43. The diagram below shows how an image is formed from an object placed in front of a converging lens.

1 cm represents 2cm

Object

F

F

Image: real, inverted, 18 cm from lens, 4 cm high
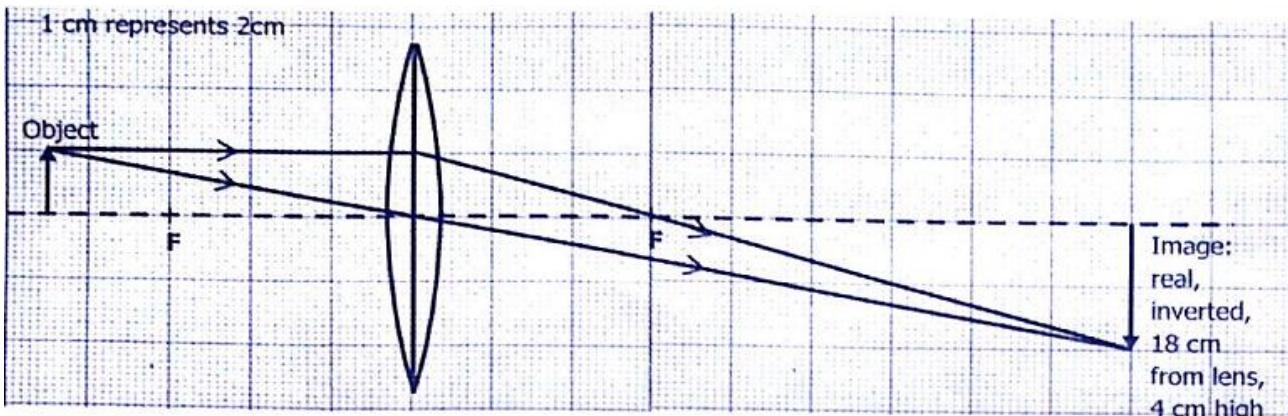
What is the magnification?

    A. 0.2　　　　　　　B. 1.8　　　C. 2.0　　　　　　　D. 4.5

44. The diagram below show magnetic field patterns between North and South poles of magnets.

1　　N　　S

2　　N　　S

3　　N　　S

4　　N　　S
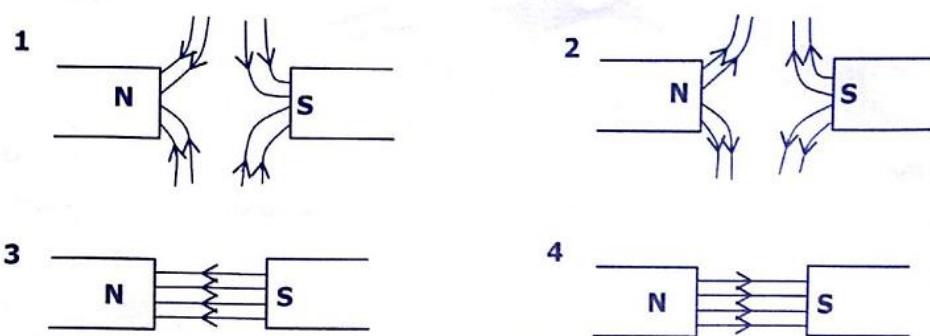
Which of numbered diagram shows the correct magnetic field pattern?

    A. 1　　　　　B. 2　　　　　　C. 3　　　　　　　D. 4

2009 QUESTION PAPER 1

**45.** **Figure 3.1** 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"
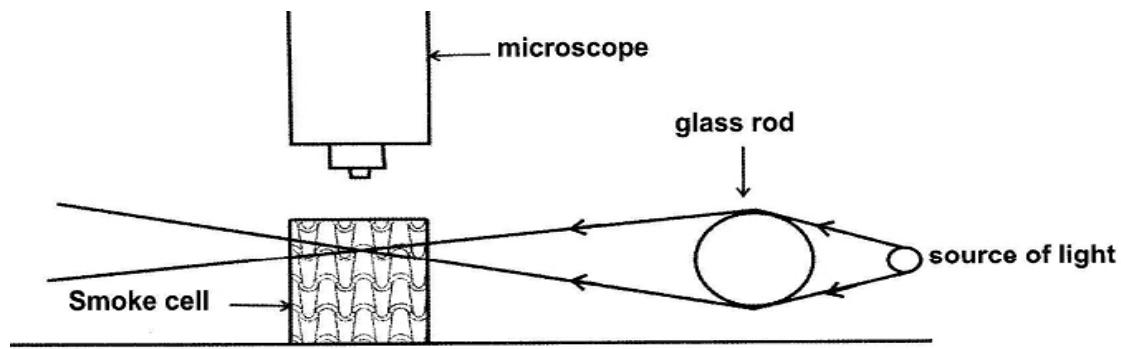
(a) What are the bright specks? [1]

(b) Why are the specks "dancing about"? [1]

(c) State the conclusion **that can** be drawn from Brownian motion. [1]

46. (a) Figure 6.1 shows a ray of light incident on a rectangular glass block. Complete the path taken by the ray of light through and out of the block. The angle of refraction is 18.2° [2]
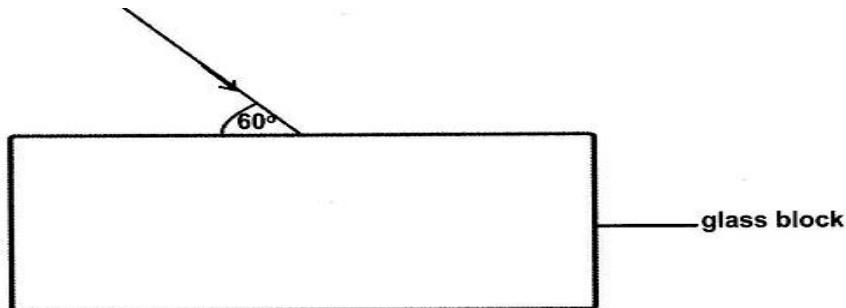
(b) If the ray strikes the glass block at an angle of 60° as shown in **Figure 6.1.** Find...

(i) the angle of incidence. [1]

(ii) the refractive index of the glass block. Use the data below.

$\sin 18.2° = 0.3125$, $\sin 30° = 0.500$, $\sin 45° = 0.707$ and $\sin 60° = 0.866$. [2]

47. **Figure 7.1** shows how the temperature of two identical cans, one with polished surface and the other one with black painted surface, varied over a short period of time after they were placed into strong sunlight.
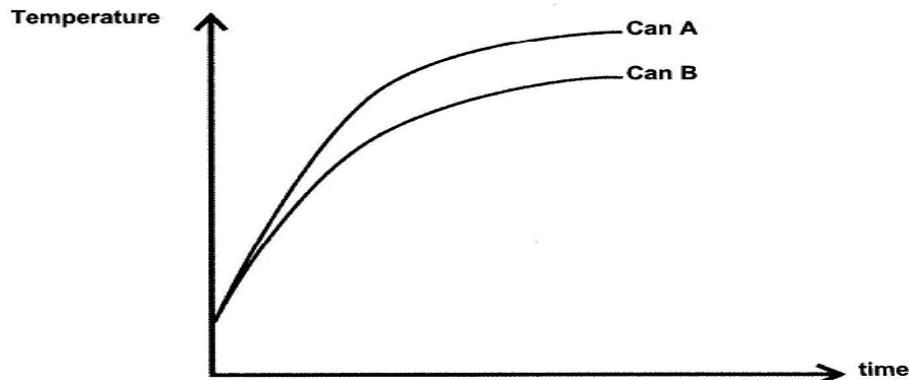
(a)   State the name of the process that transfers energy to the cans.

(b) Which Can **A** or **B** is with the polished surface?

(c)   Give a reason for your answer.

48. (a) Describe an experiment you would perform to determine the focal length of a converging lens using a distant object.   [5]

(b) An object 2cm high is placed 30cm from a converging lens of focal length 10cm. Find by scale drawing the position and size of the image.   [5]

2010 QUESTION PAPER 2

49. **(a) Figure 6.1** shows a cooler box used to keep food cool.
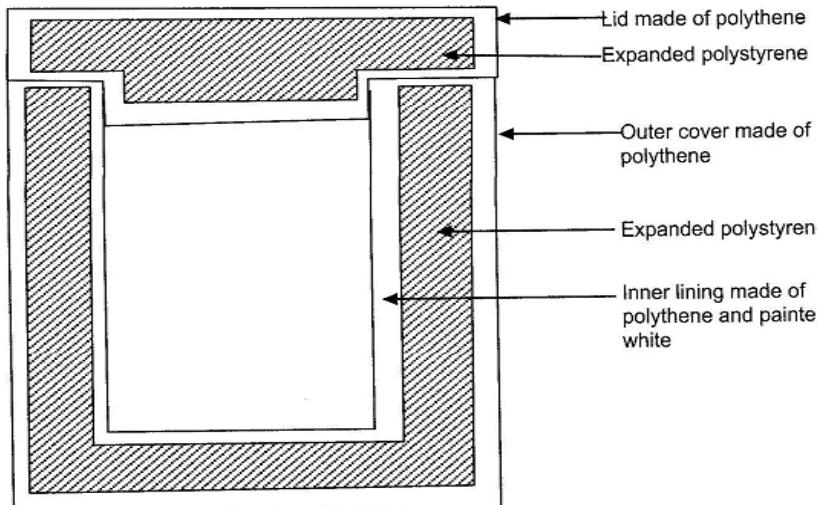
(a) Describe how the cooler box keeps food cool for a long period. [2]

(b) With the aid of a labeled diagram describe an experiment to determine the lower fixed point of a thermometer. [4]

50. **Figure 7.1** shows some of the components of the electromagnetic spectrum.

Radio waves	Microwaves	Infra-red	Visible light	A	X-ray	Gramma-rays

(a) What component is represented by **A**? **[1]**

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

(i) infra-red [1]

(ii) gamma rays [1]

(c) All electromagnetic waves are <u>transverse.</u>

(i) What is the meaning of the term "transverse"? [1]

(ii) Give another example of a transverse wave, but which is not an electromagnetic wave. [1]

51. Four rods of identical dimensions but made of different materials are painted white. Two of the rods are magnets, one is made of iron and the remaining one is made of copper. How would you determine the identity of each rod using only the provided loads? [4]

52. (a). Describe an experiment you would perform to demonstrate that water is a poor conductor of heat. [4]

(b) **Figure 11.1** shows, the essential features of a solar heating panel. A small electric pump circulates a liquid through the pipes.
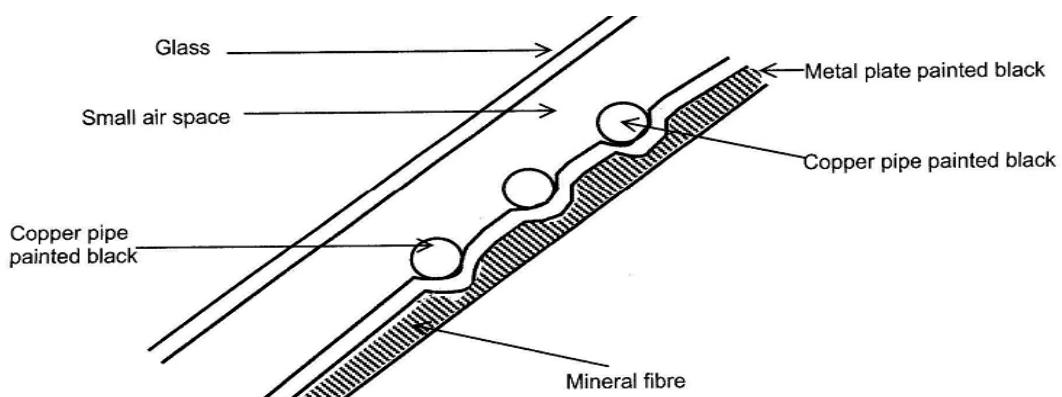
State why,

 (i) the pipes and back plate are blackened   [2]

(ii) there is a mineral fibre backing to the panel   [2]

(iii) the glass sheet increases the energy collected by the panel by a

large factor.   [2]

2011 QUESTION PAPER 2

53. (a) The diagram below represents a bar of soft iron which is to be magnetized with a north pole at end **A.**

Complete the diagram to show how you would arrange a coil connected to a cell to achieve this. Make clear on your diagram the windings of the coil and the polarity of each cell terminal.   [3]
**(b)** What would be the effect of disconnecting the cell on the magnetization of the bar?

54. (a) The pressure of air in a tyre of an empty lorry is 3.0×10^5Pa and the volume of the air in the tyre is $0.080m^3$. Calculate the volume of the air in the tyre when the lorry is loaded until the pressure of the air in the tyre rises to 3.6×10^5Pa.   [3]
(b) The tyre pressure of a lorry that has been moving for some time is usually greater than the pressure when the lorry has been standing at rest. Why is this so?   [2]

55. Two successive crests of an approaching water wave are separated by a distance of 1.5m. It takes 0.2s for one crest to cover the distance of 1.5m.

(a) At what speed is the wave travelling?   [2]

(b) What is the frequency of the wave?   [2]

(c) Distinguish between the nature of water wave and a sound wave.   [2]

56. A 4cm high object is placed 8cm from a convex lens of focal length 3cm. Draw a scale diagram to find the position and size of the image. [2]

(a) Position of the image

(b) Size of the image [2]

57. Figure 8.1 shows a diagram of a clinical thermometer with some features labelled.
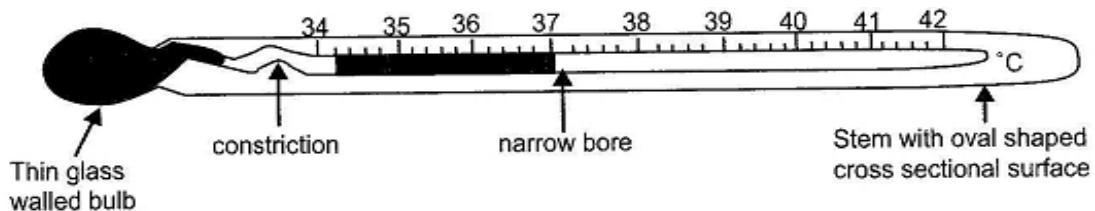
Explain why it has each of the following features:-

(a) A thin glass walled bulb,

(b) A constriction

(c) A short range of temperature calibration,

(d) A narrow bore,

(e) An oval shaped glass stem. [5]

2012 QUESTION PAPER 2

58. Figure 5.1 shows a laboratory thermometer.
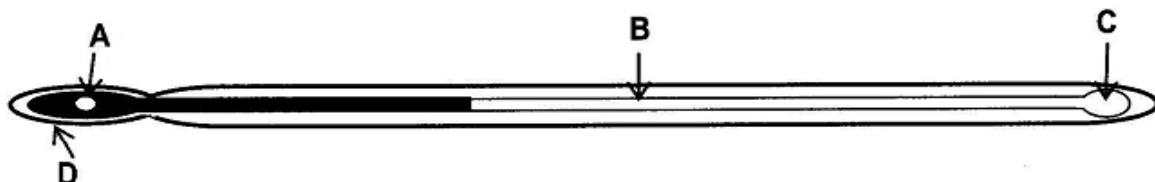
(a) Name the substance labelled **A.**

(b) Name the section labelled **B.**

(c) Why is part **B** narrow?

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

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

59. (a) Light and gamma rays are both examples of electromagnetic radiation.

   (i) Name two other types of electromagnetic radiation.   [2]

   (ii) State two differences between light and gamma rays.   [2]

   (b) The speed of light is 3×10^8 m/s. Calculate the frequency of yellow light of wavelength 6×10^{-7} m.   [3]

60. Figure 7.1 shows a ray of light from air to water. The diagram is **not** drawn to scale.
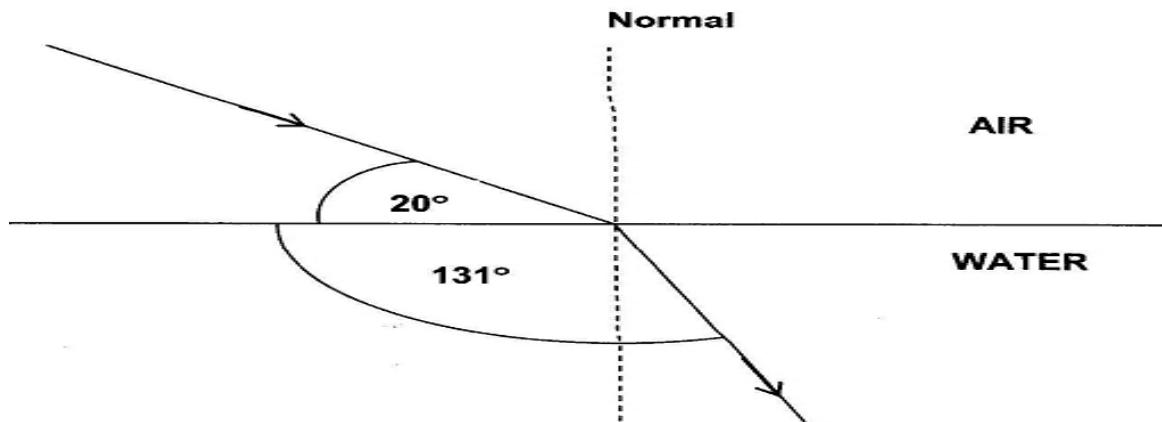
   (a) Determine the:

   (i) angle of incidence.   (ii) Angle of refraction.   [2]

   (b) Calculate the refractive index.   [1]

61. Figure 8.1 shows a boat which uses ultrasonic waves to calculate the depth of the sea.
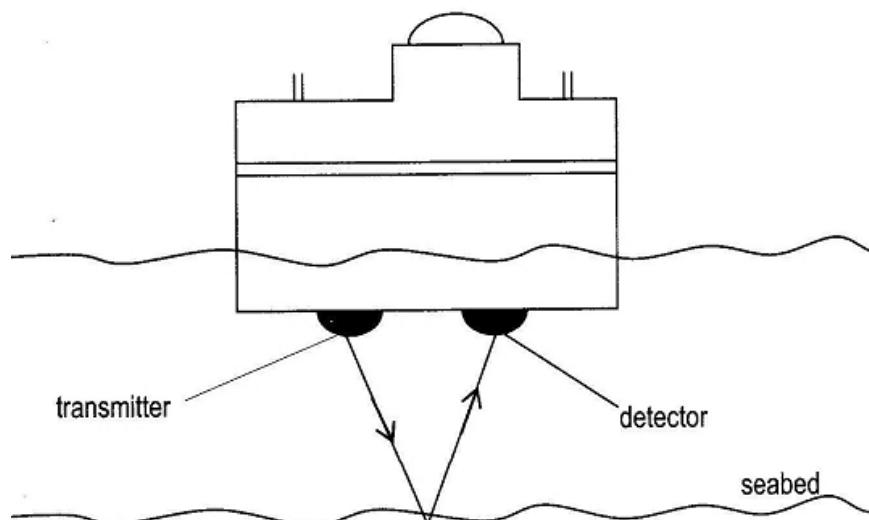
The speed of sound in water is 1400m/s and an ultrasonic wave has a frequency of 28000 Hz.

(a) Calculate the wavelength of the ultrasonic wave in water.

(b) The pulse takes 0.2s to travel from the transmitter to seabed and back to the detector. Calculate the distance to the seabed.

2013 QUESTION PAPER 2

62. **Figure 6.1** below shows how the temperature of some liquid in a beaker changed as it was heated until it boiled.
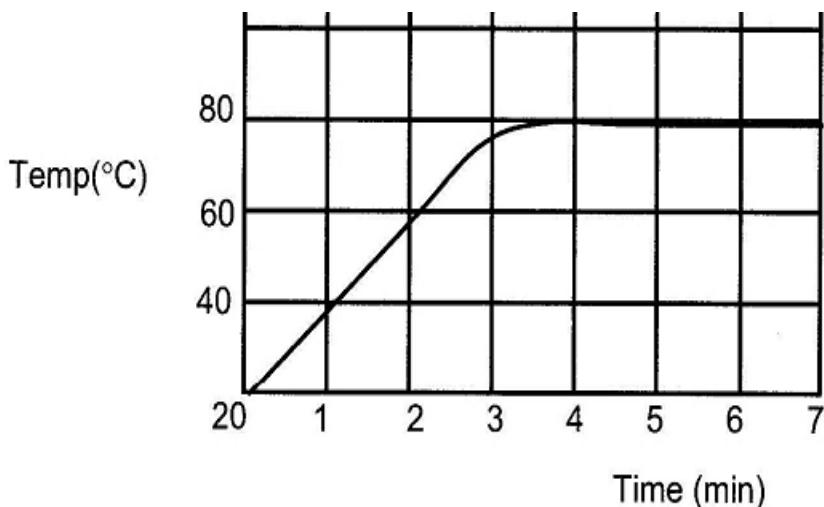
(a) What was the boiling point of the liquid?

(b) State and explain what difference, if any, there would be in the final temperature if the liquid was heated more strongly.

(c) State **two** differences between boiling and evaporation.

63. Figure 7.1 below shows an incomplete ray diagram
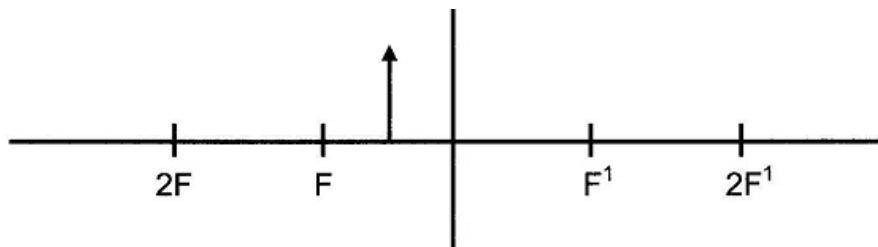
(a) Complete the ray diagram above to show the position of the image.   [3]

(b) Give two characteristics of the image formed.

64. **(a)** Describe an experiment to show that a blackened metal surface is a better absorber of infrared radiation than a polished metal surface at the same temperature. [5]

(b) An electric light bulb quickly reaches a constant high temperature when switched on. Explain how heat is lost from the bulb and also why the temperature of the bulb becomes constant.

65. **(a)** Describe an experiment to determine the upper fixed point of a liquid — in glass thermometer. [4]

(b) (i) The volume of a gas at a temperature of -73°C and a pressure of 380mm Hg is 1000cm^3. Find the volume of the same gas at a pressure 760mm Hg and temperature of 127°C.

(ii) State **two** advantages of mercury over alcohol as thermometric liquid. [2]

(c) Give two advantages of a thermocouple thermometer over liquid in glass thermometers.

2016 G.C.E QUESTION PAPER 2

66. Two metal plates **A** and **B,** one with shiny surfaces and the other painted black are heated to a temperature of 100°C. The metal plates are then placed in the open air or insulating materials and allowed to cool. The table below shows the results obtained with time.

Time in seconds	Temperature of metal plate in ºC	
	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?

(b) Which metal plate is losing heat faster?

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

67. ***Figure 61*** shows a vibrating tuning form, **Y** in air.
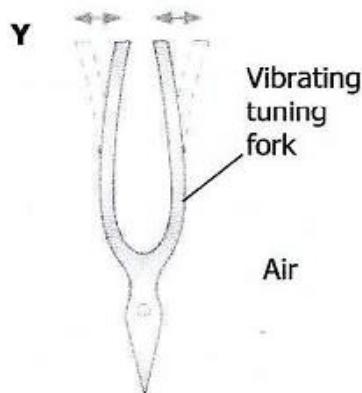
**(a)** State the nature of wave produced by the tuning fork. *[1]*

(b) Show diagrammatically the regions created by the wave produced, as it passes through the air.

(c) Explain what happens to the speed of the wave in **(a)** if the rate of vibration of **Y** increases but the length of the wave produced remains the same.

68. **Figure 7.1** shows a ray of light entering and leaving a glass block.
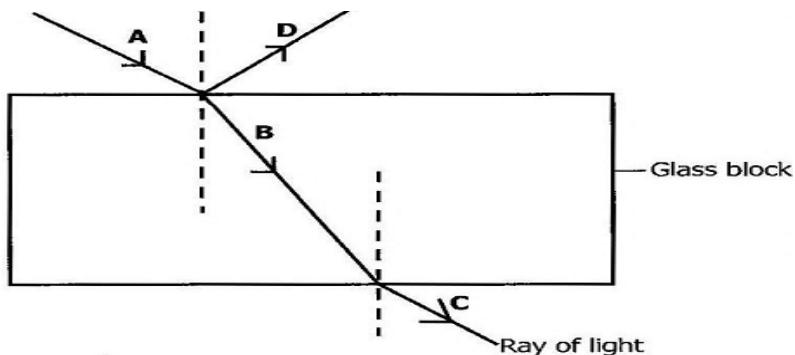
(a) Name the rays labelled **A** to **D**

(b) On the diagram, indicate i and **r** for angles of incidence and refraction respectively.   **[1]**

(c) For a certain piece of glass block the angle of incidence was found to be 25° and angle of refraction was found to be 16°. Using this information, Calculate the refractive index for this piece of glass block to two decimal places.

69. **Figure 8.1** shows a metal bar placed inside a vertical solenoid, above a small pile of iron nails.
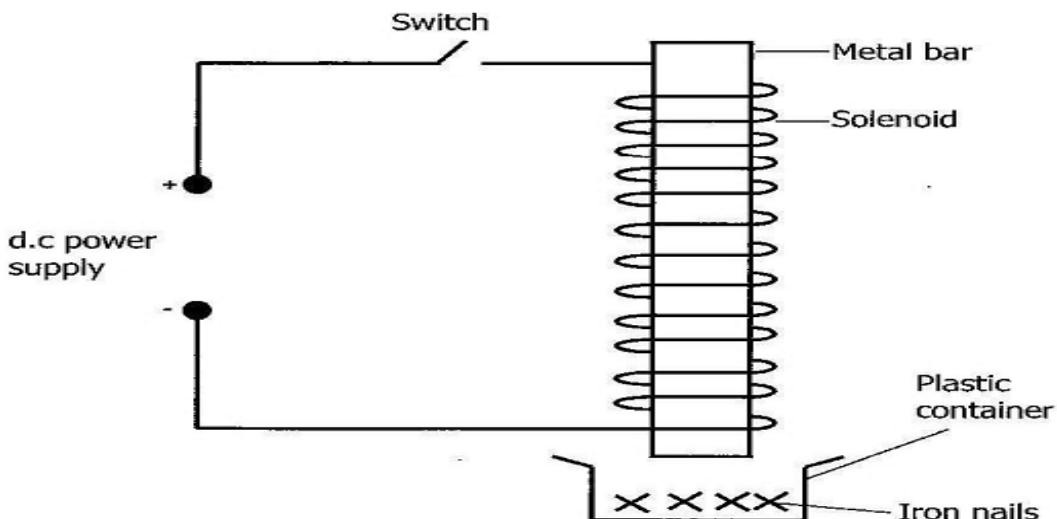
Describe the behavior of the iron nails when the switch above is on for several seconds, then off, if the metal is made from...

(i)   Aluminium   (ii) Iron   (iii) Steel   [5]

70. **(a)** Distinguish between transverse and longitudinal waves. Include one example of each type of wave.

(b) Describe an experiment to show reflection of water waves.   [5]

(c)   Figure 11.1 shows a displacement-time graph for a water wave moving in the direction x.
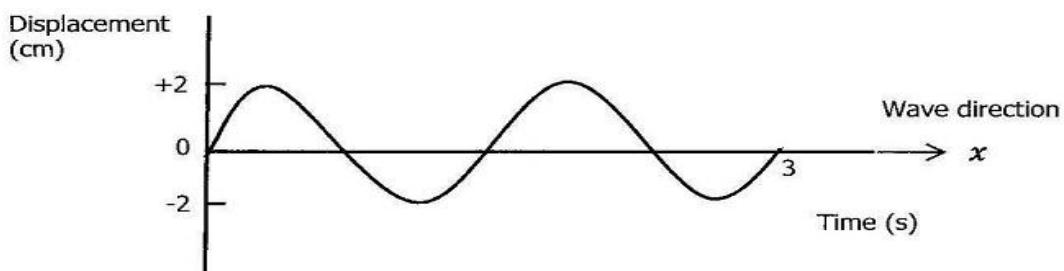
(i)   State the period of the wave   [1]

(ii)   If the speed of the water wave is 0.2m/s, calculate the wavelength. [2]

2017 G.C.E QUESTION PAPER 1

71. **Figure B4.1** shows a glass syringe with a sealed tip containing a gas at an initial pressure of 360Pa placed in hot water. After a few minutes the piston in the syringe moved up.
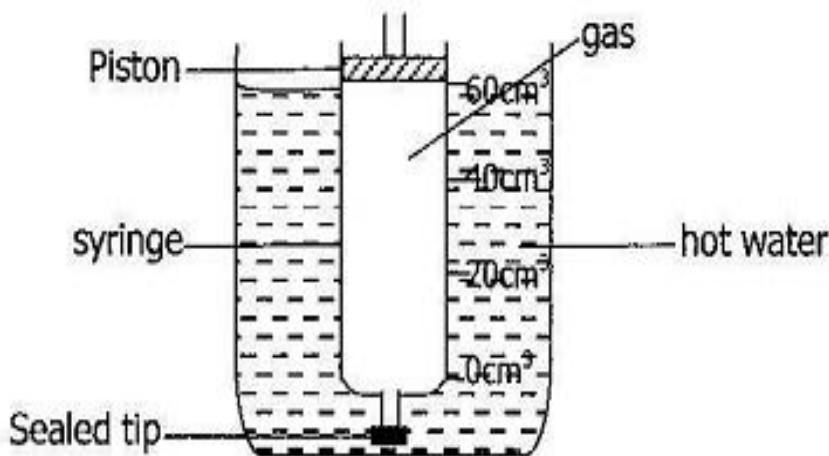

(a) Using the kinetic theory explain why the piston in the syringe moved upwards when the syringe was placed in hot water.

(b) The piston was pushed downwards to 20cm^3 while the temperature was kept constant.

(i) In terms of the kinetic theory explain why the pressure of the gas in the syringe increases.

(ii) Calculate the pressure of gas in the syringe.

72. **Figure B5.1** shows various **Regions** of the Electromagnetic Spectrum.

K	L	M	Visible light	Ultra violet	N	O

(a) What is the name of component **N?**

(b) Give **one** practical use of Region **M.**

(c) State **one** property which is the same for all Electromagnetic Waves.

(d) State **one** possible source of the radiation from Region **O.**

73. ***Figure B6.1*** shows a converging lens of focal length 2.0cm used to produce an image of an object 2.0cm tall placed 5cm from the lens . Using the information given above,

(i) Draw to scale on ***figure B6.1,*** a ray diagram to locate the image formed. [3]

(ii) Calculate the magnification of the image formed.

74. ***Figure B7.1*** shows magnetic field lines between the poles of two magnets.
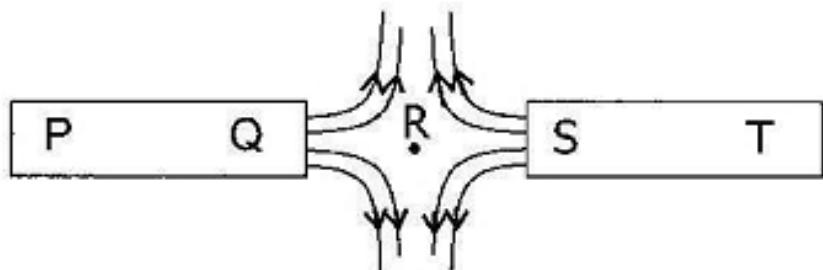
(a) Name point **R.**

(b) If **P** is a south pole what are the poles **Q** and **T?**

(c) Explain how soft iron keepers help magnets retain their magnetism for a longer period of time.

(d) State **two** differences between iron and steel as magnetic materials.

2019 G.C.E QUESTION PAPER 1

75. Figure B5.1 is a graph of how a wave is propagated.
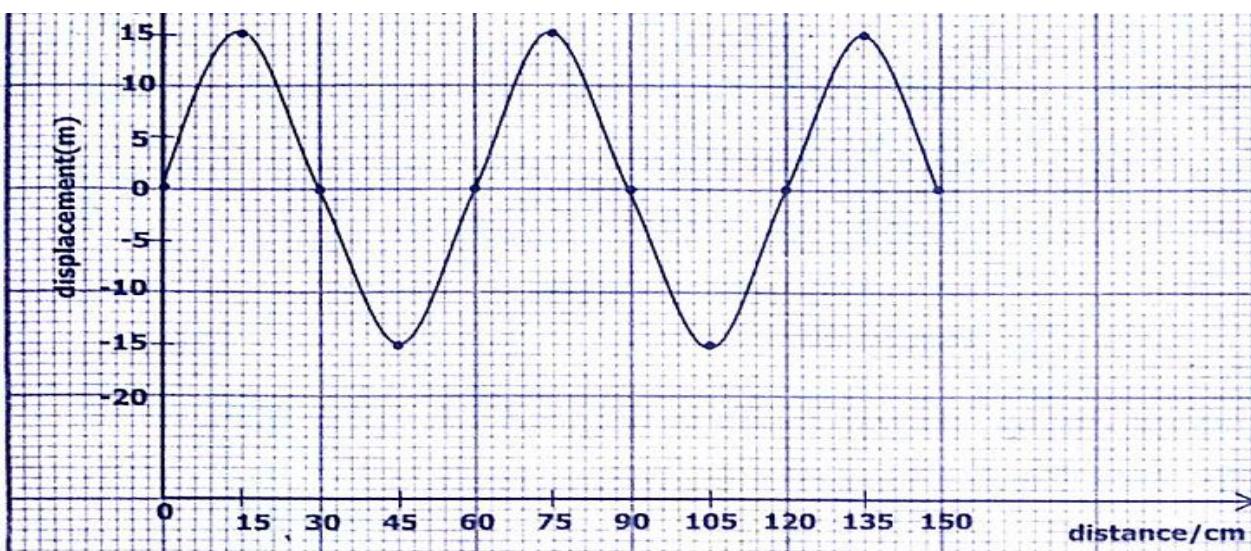
(a) From the graph determine the

   (i) Amplitude of the wave.   (ii) Wavelength of the wave   [2]

(b) Calculate the frequency of the wave if it travels at 3m/s.   [3]

76. The diagram below shows an iron core electromagnet.
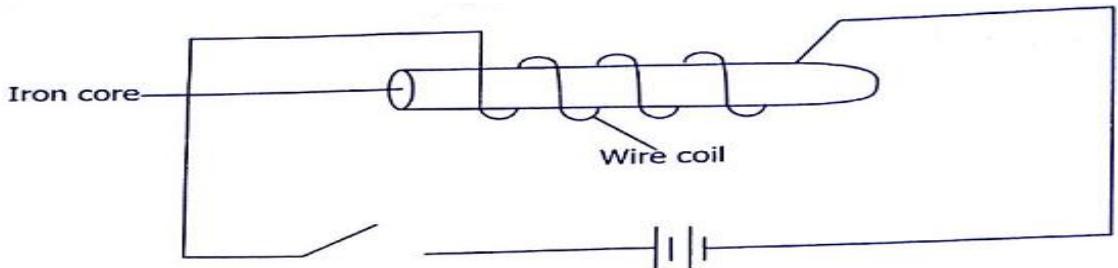
(a) State two ways in which the strength of the electromagnet can be increased.   [2]

(b) Explain why the core of the electromagnet is made of iron instead of steel.   [2]

77. (a) The table below shows the results obtained in an experiment to determine refractive index of paraffin using real and apparent depth.

Real depth (cm)	4.0	6.0	8.0	10.0	12.0	14.0
Apparent depth (cm)	2.8	4.2	5.6	7.0	8.4	9.8

(i)   Draw a graph of real depth against apparent depth using the values in table above.   [4]

(ii)   What does the gradient of the line in the graph you plotted in (a)(i) above represent.   [1]

(iii)   Using the graph determine the refractive index of paraffin.   [2]

(b) The refractive index of oil is 1.45 and that of water is 1.33. What angle does a ray of light incident to oil at 40° make with water when oil floating on water. [3]

GRADE 12 E.C.Z QUESTIONS

2009 QUESTION PAPER 1

1. The figure below shows part of a circuit in which current is flowing.
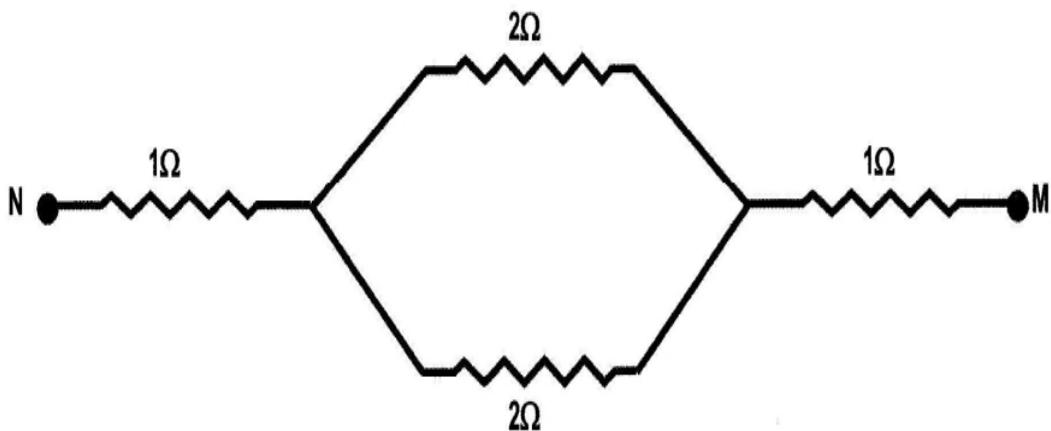
   If the p.d between N and M is 3V, the current is ...

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

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

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

3. Induced current is such that it opposes the change which is causing it. This is • •

   A. Ohm's law   **B**. Snell's law   **C**. Faraday's law   **D**. Lenz's law

4. Which of the following may not help to minimize the energy losses in a transformer?

   A. Using thicker copper wire   **B**. Using thinner copper wire

   C. Using a laminated iron ore   **D**. Ensuring an efficient core design

5. Which of the following is **not** a correct statement about cathode rays?

   A. They have a positive charge
   B. They travel in straight lines
   C. They are streams of electrons
   **D**. They are deflected by magnetic and electric fields

6. The radium nucleus, $^{226}_{86}Ra$ decays to Radon (Rn) as shown: $^{226}_{88}Ra$ → X + $^{222}_{86}Rn$.

   What is X?

   A. an X-ray   B. a gamma-ray   C. a Beta particle   D. an alpha particle

7. Compared to the charge and mass of a proton, an electron has •••

   A. the same charge and a smaller mass   B. the same charge and the same mass

   C. an opposite charge and a smaller mass   D. an opposite charge and the same mass

2010 QUESTION PAPER 1

8. Which of the following units is the same as a coulomb?

   A. V/A   B. As   **C. ws**   **D**. V/Ω

9. A metal ball is charged by induction. To do this, a positively charged rod is held close to one side of the ball and the other side is earthed. The diagram that shows the charge distribution at this stage of the experiment is .....
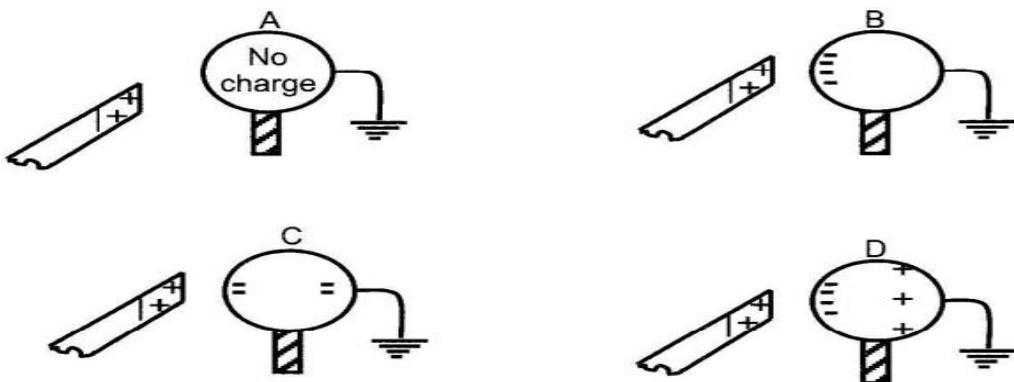
10. In the circuit shown the reading on the ammeter is 1A.
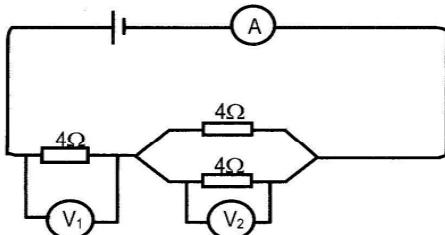
What readings are shown by the voltmeters V1 and V2?

	V₁	V₂
A	2V	2V
B	4V	2V
C	2V	4V
D	4V	4V

11. Which of the following equations <u>cannot</u> be used to determine electrical energy?

   A. $E = VQ$ B. $E = VIt$ C. $E = I^2Rt$ D. $E = \dfrac{V^2t}{I}$

12. An electrical appliance **is** rated 250v, 500w. Find the cost of using this appliance for 120 minutes if electrical energy costs K100 per unit.

    A. K100

    B. K200

    C. K800

    D. K1200

13. Study the figure below and answer the question that follows.
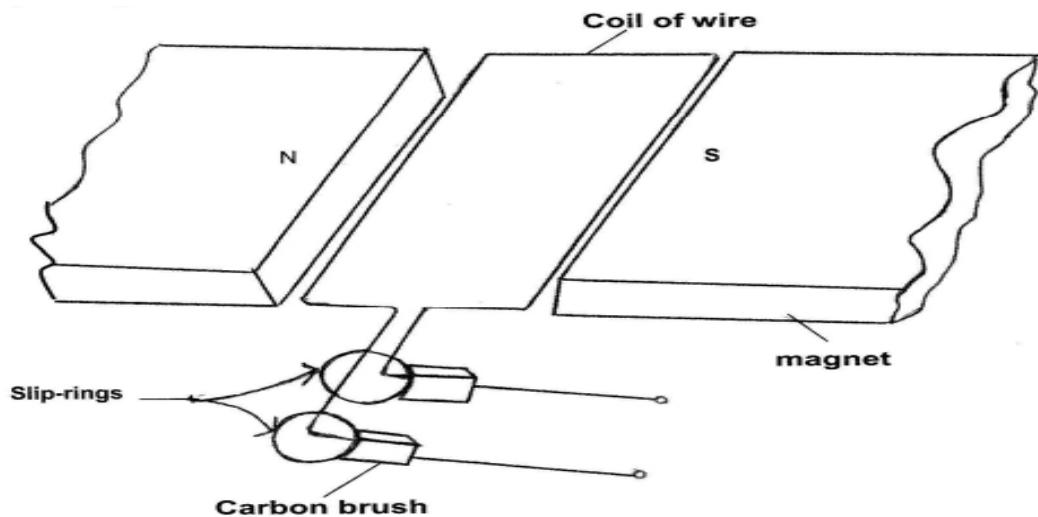
The figure …

A. represents a direct current generator

B. requires current for the coil to rotate

C. produces current by electromagnetic induction

D. uses a commutator to produce an alternating current

14. An ideal transformer (one which is 100% efficient) …

A. changes a.c. to d.c.

B. does not lose any energy.

 C. has same number of turns in primary and secondary

D. has more power in secondary than in primary.

15. The figure below represents a Cathode Ray Oscilloscope.
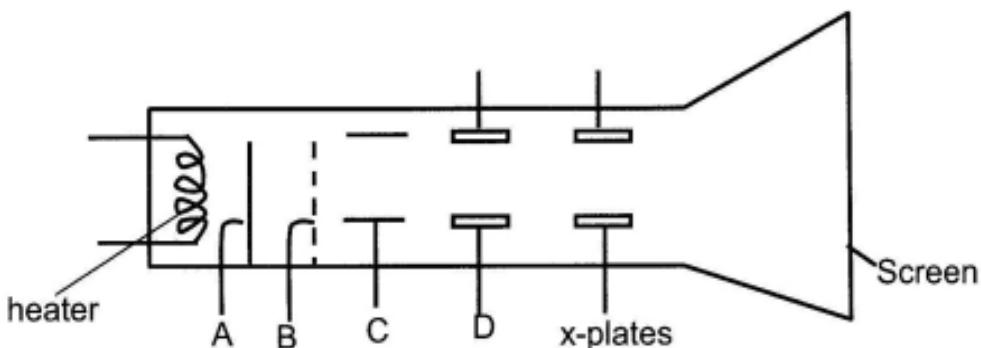
Which of the parts labeled **A, B, C** or **D** accelerates the electrons towards the screen?

16. 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.

17. The symbol BELOW is used to warn of the presence of ...

   A.   gamma rays.

   B.   radioactive material.

   C.   cancer cells.

   D.   radiation burns

2011 QUESTION PAPER 1

18. The figure shows a negatively charged polythene rod moving closer to a metal sphere, which is on an insulator. There's a wire from the sphere to the ground. Which of the following is true?
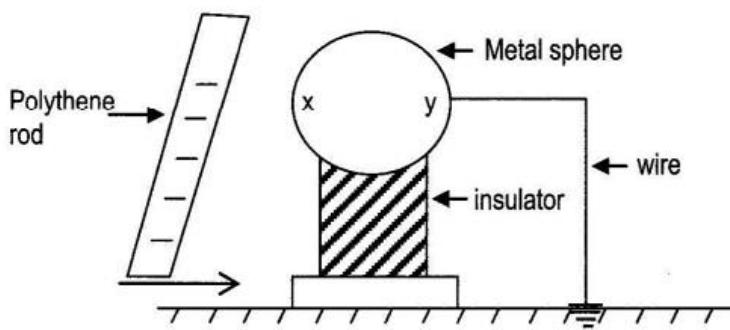
A. Side '**x**' of the sphere is charged negatively.

B. Side '**x**' of the sphere receives protons from side '**y**'

C. Conventional current flows to the sphere.

D. Side '**y**' of the sphere receives protons from side '**x**'.

19. 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

20. Which of the following circuits containing identical resistors will give the highest current?
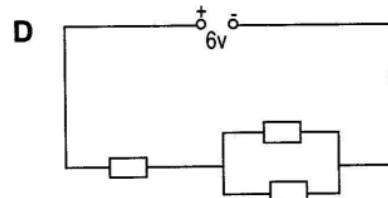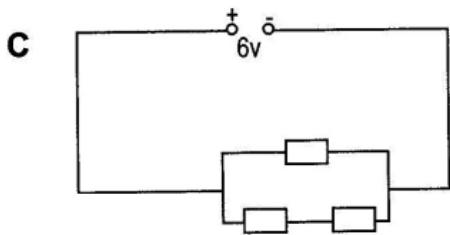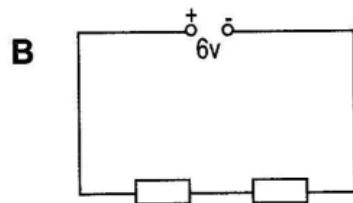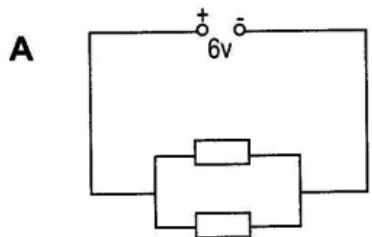
21. The formulae used to find electrical power is • • •

A. $P = IV.$ B. $P = VR.$

C. $P = VQ.$ D. $P = wt.$

22. A transformer is used to convert 240V to 12V in order to power a table lamp. If the current in the primary coil is 0.2A, what is the current in the secondary coil? (Assume that the transformer is ideal)

A. 0.01A   B. 0.10A   C. 0.20A   D. 4.00A

23. The diagram shows a magnet moving into a solenoid. Which of the following is true?
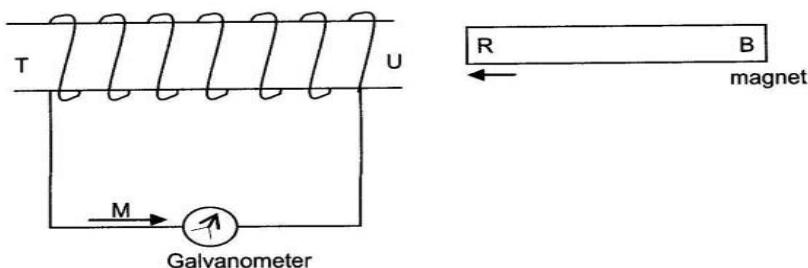
A. If '**R**' is a south pole, the induced current flows in the direction shown by arrow '**M**'.

B. If '**R**' is a north pole, the induced current flows in the direction shown by arrow '**M**'

C. If '**B**' is a south pole, the induced current on face '**T**' of the solenoid flows clockwise.

D. If '**B**' is a north pole no current is induced in the solenoid.

24. Which part of the Cathode Ray Oscilloscope helps the emitted electrons to come together to form a fine beam?

A. Control grid

B. Cathode

C. Anode

D. X-plates

25. **The** diagram shows the structure of an atom of carbon.

Key
(e)= electron

n = neutron

p = proton
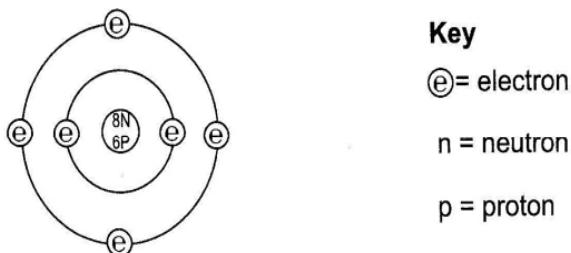
What is the nuclide notation of this atom?

A $^{8}_{6}C$

B $^{12}_{6}C$

C $^{14}_{6}C$

D $^{20}_{14}C$

26. A radioactive substance has a mass of 100g and a half-life of 2 minutes. How much of this substance remains undecayed after 6 minutes?

A. 12.5g

B. 25g

C. 50g

D. 75.5g

2012 QUESTION PAPER 1

27. The diagram below shows an experimental set up on electrostatics.
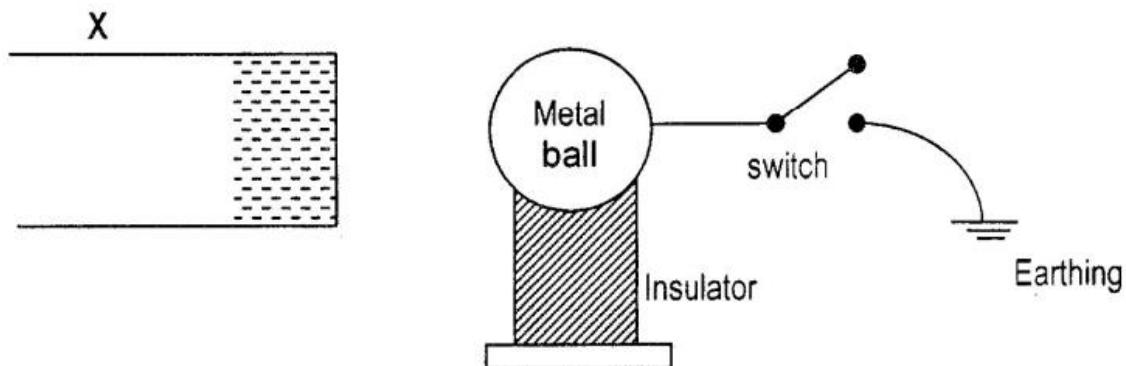
When the switch is closed • • •

A   protons flow from the metal ball to the ground.

B   electrons flow from the metal ball to the ground.

C   protons flow from the ground to the metal ball.

D   electrons flow from the ground to the metal ball

28. The instrument commonly used for measuring the charge which is passing per second is •••.

A   an ammeter.   B   a voltmeter.

C   a cathode ray oscilloscope.   D   a gold leaf electroscope.

29. The figure below shows a circuit diagram.
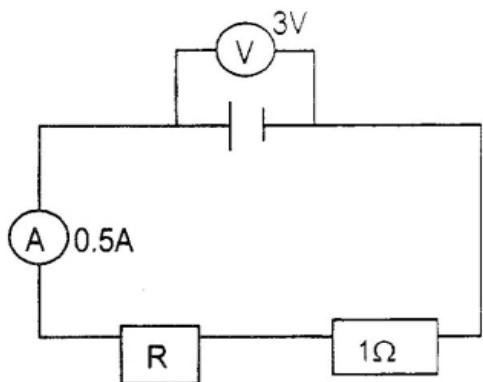
The value of the resistor **R** is....

A   0.5Q

B   1.5Q

C   5.00

D   6.052

30. What is the cost of running a 750W electric fan for 4 hours and a 2kW heater for 2 hours if electric energy costs K150 per kWh?

A K500   B K650   C K700   D K1, 050

31. The diagram below shows a transformer used in a laboratory during an experiment.
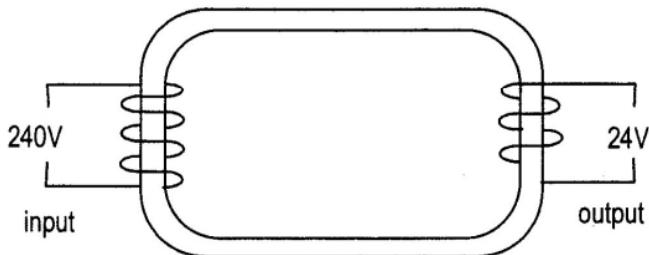
If 0.2A current flows through the input, the size of current given out at the output is•••

A. 0.1A   B. 0.2A   C. 2.0A   D. 10.0A

32. The brightness of a spot of light on a CRO screen may be changed by varying the potential difference across the

A X-plates.   B Y-plates.   C Control grid.   D glass envelope.

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

Emission	Charged	Defected in magnetic field	Ionising effect
A	Yes	Yes	Weak
B	Yes	No	Weak
C	No	Yes	None
D	No	Yes	None

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

A Proton   B Neutron   C Gamma ray   D Alpha particle

## *2013 QUESTION PAPER 1*

35. In wiring a house a switch is always connected to the live wire. This is ...
    A. because no current flows through the neutral wire.
    B. to avoid short circuits and overheating of elements.
    C. because the circuit can never be switched off if the switch is on the neutral wire.
    D. to make it easier to isolate any device connected in the circuit thus making it safe.

36. An electric appliance is rated 5000W, 250V. A man uses this appliance for 10 hours and pays K25.00 for the electrical energy used. What is the cost of electrical energy per unit?

A K0.10   B. K0.50   C. K0.80   D. K2.00

37. A positively charged sphere is moved close to an isolated metal bar.
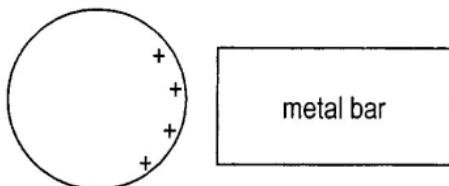
Which diagram shows the charges induced on the bar?
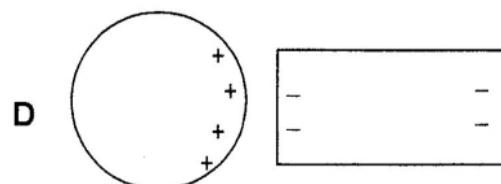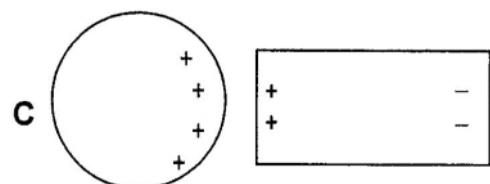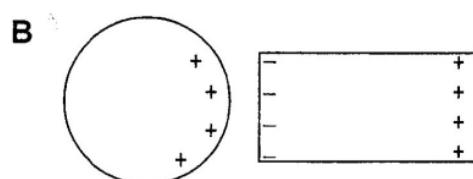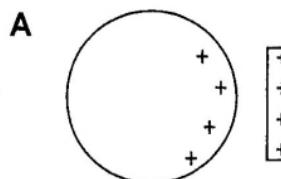
38. The diagram below represents a parallel circuit.
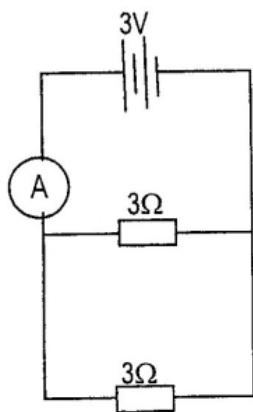
The current through the ammeter,

A. 0.5A.

B. 1.0A.

C. 2.0A.

D. 9.0A.

39. Which of the following is true about cathode rays?

A. They carry a positive charge.   B. They can produce X-rays.

C. They are electromagnetic in nature.   D. They are lighter than electrons.

40. The diagram shows a coil in a magnetic field which is part of an a.c generator.
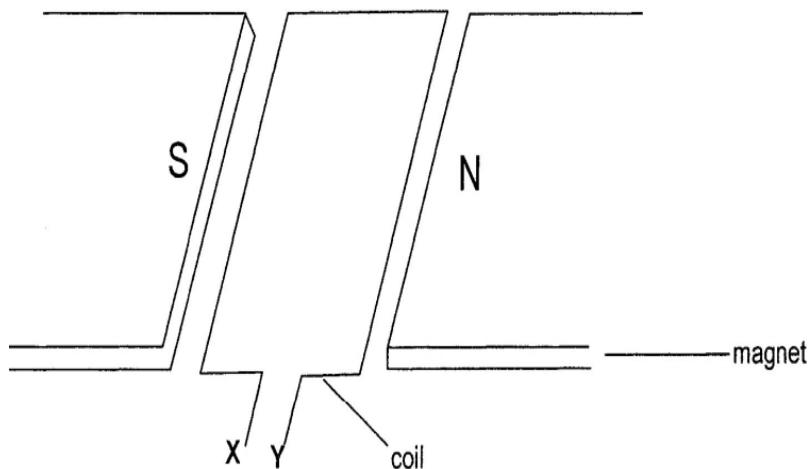
What must be connected directly to **X** and **Y?**

  A. split ring.   **B.** brushes
  C. slip ring.   **D.** d.c Supply

41. The radioisotope sodium — 24, has a half-life of 15 hours. 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

42. The equation represents the decay of carbon — 14 to nitrogen — 14.

$$^{14}_{6}C \ \dashrightarrow \ ^{14}_{7}N + X$$
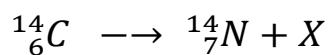
Which of the following is true about radiation **X?**

A. It can be repelled by a proton.   **B.** It can be repelled by an electron.

C. It is electrically   **D.** It is an electromagnetic wave.

2015 QUESTION PAPER 1

43. The diagram below shows a charged polyethene rod which is moved near to end **R** of a metal sphere mounted on an insulating stand?
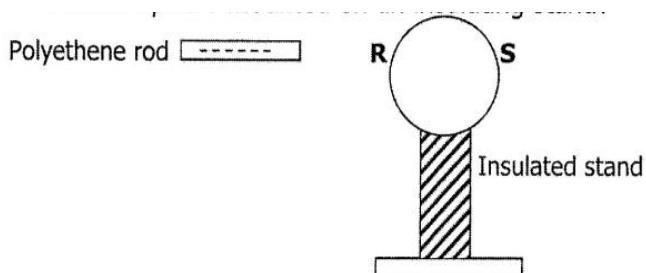
Which of the following shows the correct charge distribution on the sphere?
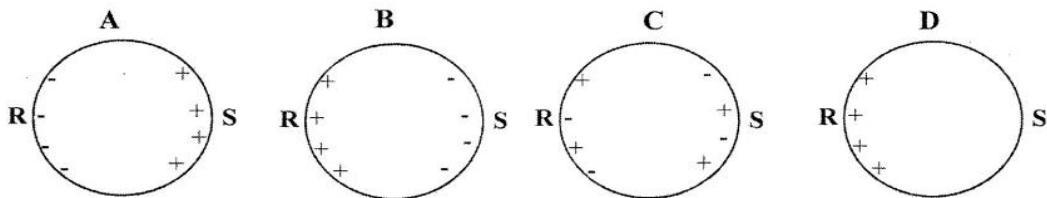
44. A battery moves a charge of 60C around a circuit at a constant rate in 20 seconds. What is the current flowing in the circuit?

A   80A   B   40A   C   3.0A   D   0.3A

45. A heater is connected to a 200V supply. If the heating element has a resistance of 10Ω, how much electrical energy is supplied to the heater in 2 minutes?

A 800 0003   B 480 0003   C 8 0003   D   4 000J

46. The diagram below shows an ideal transformer which is supplied with an alternating voltage of 240V and a current of 1A.
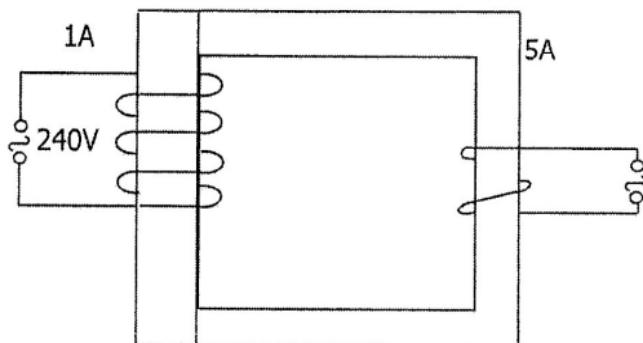

If the secondary current is 5A, what is the secondary voltage?

A 1400V

B 1200V

C 240V

D 48V

47. What is the purpose of **X-plates** and **Y-plates** in a Cathode Ray Tube?

	X – Plates	**Y – Plates**
A	Deflecting electrons horizontally	Deflecting electrons vertically
B	Deflecting electrons vertically	Deflecting electrons horizontally
C	Accelerating electrons	Deflecting electrons vertically
D	Deflecting electrons horizontally	Accelerating electrons

48. Which of the following radiations is NOT deflected by an electric field?

A Alpha   B   Beta   C   Gamma   D   Proton

49. The radioactive nucleus $^{90}_{38}Sr$ (strontium) undergoes beta decay.

Which of the following is the correct nuclear equation?

A $^{90}_{38}Sr \longrightarrow {}^{90}_{39}Y + \beta$ **B** $^{90}_{38}Sr \longrightarrow {}^{91}_{38}Y + \beta$

C $^{90}_{38}Sr \longrightarrow {}^{90}_{40}Y + \beta$ **D** $^{90}_{38}Sr \longrightarrow {}^{91}_{39}Y + \beta$
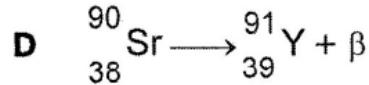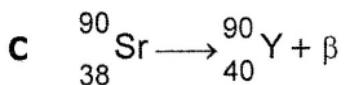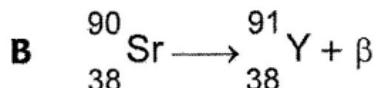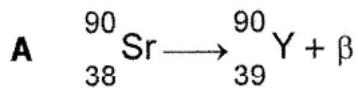
2017 G.C.E QUESTION PAPER 1

50. The diagram below shows an illustration of a transformer with 100 turns on the primary coil and 25 tu What is the voltage induced across the secondary coil?
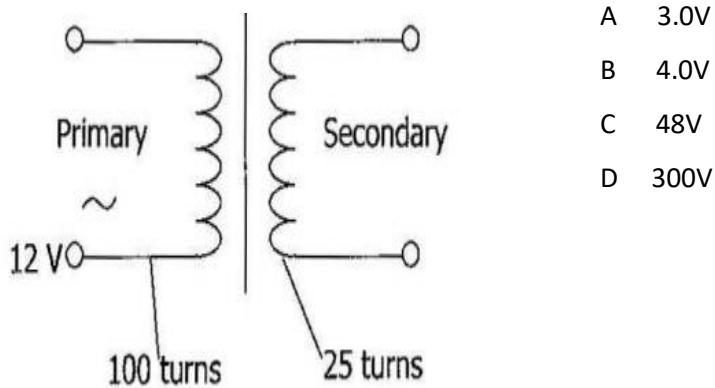
A   3.0V

B   4.0V

C   48V

D   300V

51. The diagram below shows a positively charged rod placed close to two metallic spheres **A** and **B** which are initially neutral. Which statement is correct? **A** has ...
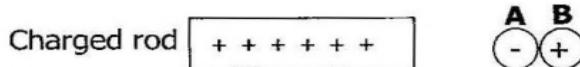
A   lost positive charges to sphere B.

B   gained electrons from sphere B.

C   has gained electrons from the charged rod.

D   has lost positive charges to the charged rod.

52. The diagram below shows a circuit with four ammeters connected at different positions and three resistors of different values. Which of the four ammeters labelled **A, B, C** or **D** would show the largest reading.
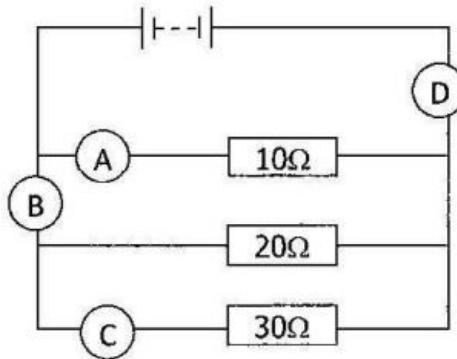
53. A Secretary in a Manager's office uses the following appliances with respective power ratings.

1 Electric kettle — 1200W   **2** Printer — 600W   **3** Computer — 100W

Given that the cost of electricity is K0.80/kWh, calculate the cost of operating all the three appliances at once for 12 hours.

A.   K 5.60   B.   K8.00   C.   K 16.30   D.   K 18.24

54. Which of the following is correct about the purpose of **X**-plates and **Y**-plates in a Cathode Ray Oscilloscope?

A.   Deflecting the electron beam vertically

B.   Deflecting the electron beam horizontally

C.   Deflecting the electron beam vertically and horizontally

D.   Increasing the speed of the electron beam towards the screen.

55. The diagram below shows a box used for storing radioactive sources.
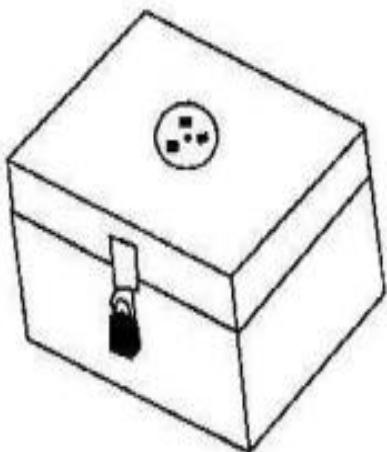
Which material is best for lining the box to prevent the escape of most radioactive emissions?

A   Lead

B   Steel

C   Copper

D   Aluminium

56. A negatively charged rod is held close to but not touching an insulated metal

    sphere.
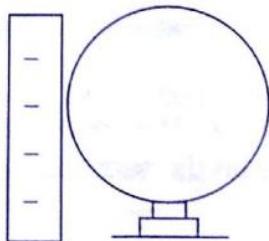
Which diagram below shows the charges that are induced on the sphere?
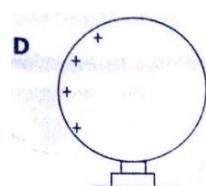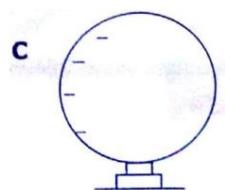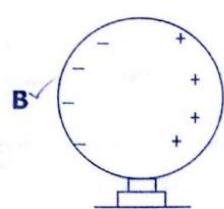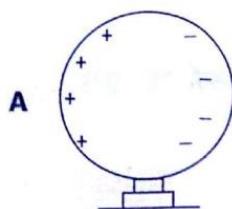
57. A small heater operates at 12V, 2A. How much energy will it use when it is

    switched on for 5 minutes?

    A. 30 J   B. 120 J   C. 1800 J   D. 7200 J

58. A transformer has 1000 turns on the primary coil. The voltage applied to the

    primary coil is 230V a.c. how many turns are on the secondary coil if the output

    voltage is 46V?

    A. 20   B. 200   C.   400   D.   800

59. What is the purpose of **X** – plates in a cathode ray oscilloscope? To…

    A. Deflect the electron beam vertically.

    B. Make the waveform brighter on the screen.

    C. Deflect the electron beam horizontally

    D. Produce a waveform across the screen.

60. A sodium nucleus decays by emission of Beta particle to form magnesium. Which

    equation is the correct representation of the decay?

A. $^{24}_{11}Na \; - -\to \; ^{20}_{9}Mg \; + \; ^{4}_{2}He$ C. $^{24}_{11}Na \; - -\to \; ^{24}_{12}Mg \; + \; ^{0}_{-1}e$

B. $^{24}_{11}Na \; - -\to \; ^{24}_{11}Mg \; + \; y$ D. $^{24}_{11}Na \; - -\to \; ^{28}_{13}Mg \; + \; ^{4}_{2}He$
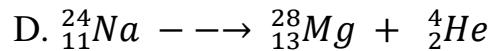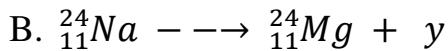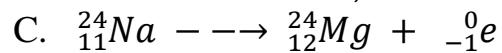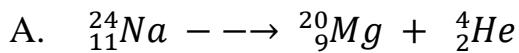
2009 QUESTION PAPER 2

61. **Figure 8.1** shows the diagram of a simple a.c generator.
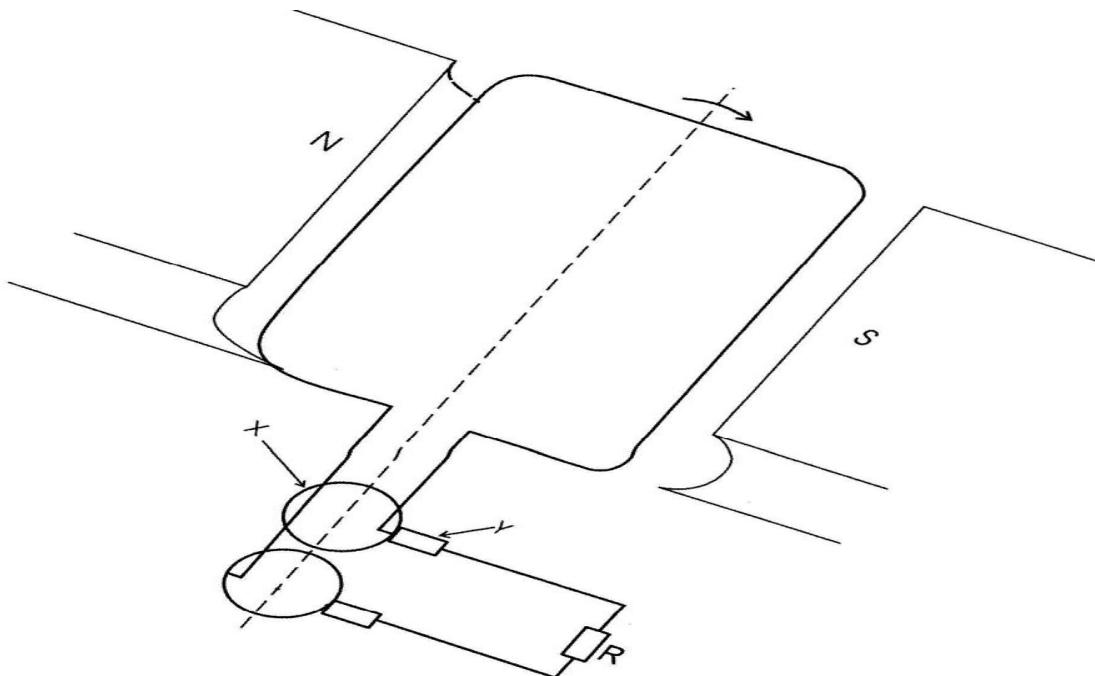
(a) Name the parts labelled X and Y.   [2]

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

voltage.   [3]

62. **(a) Figure 9.1** shows a network of resistors.
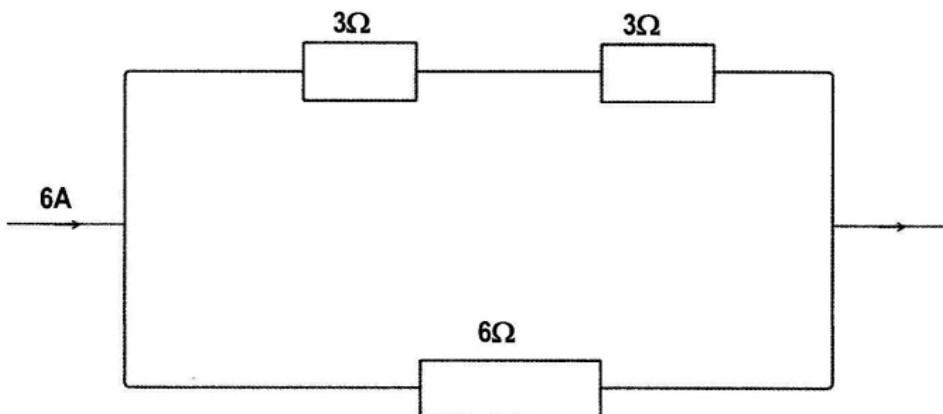
(i)   What current flows in the 6Ω resistor?   [1]

(ii)   What charge passes through the 6Ω resistor for 3 seconds?

(iii)   What is the potential difference across the 6Ω resistor?   [2]

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

(i) How much current does the electric fire take?   [2]

(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?   [2]

63. 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/5^{-1}	30	26	23	21	18	16	14	12

(a) By plotting the graph of the count rate (vertically) against time (horizontally), determine the half-life of radon – 220.   Show clearly on the graph how you obtained the answer.   [6]

(b) What is the origin of the background count?   [2]

(c) Radon – 220 emits alpha particle. When it does so, it becomes an isotope of an element polonium (Po). Write an equation to represent this change.   [2]

64. **Figure 12.1** represents a transformer with a primary coil of 400 turns and a secondary coil of 200 turns.
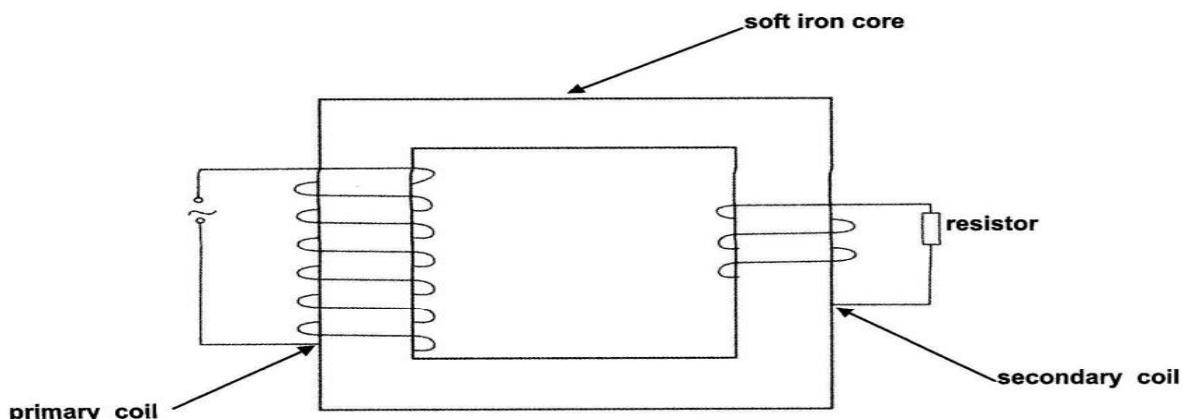
(a) The primary coil is connected to the 240V a.c mains. Calculate the secondary voltage.[2]

(b) Explain carefully how the transformer works. [4]

(c) Why is soft iron used for the core instead of steel? [2]

(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. [2]

2010 QUESTION PAPER 2

65. **Figure 9.1** shows a cathode ray oscilloscope (CRO)

Heater
-ve (cathode)
-ve (control grid)
+ve (Anode)
Y-plates
X-plates
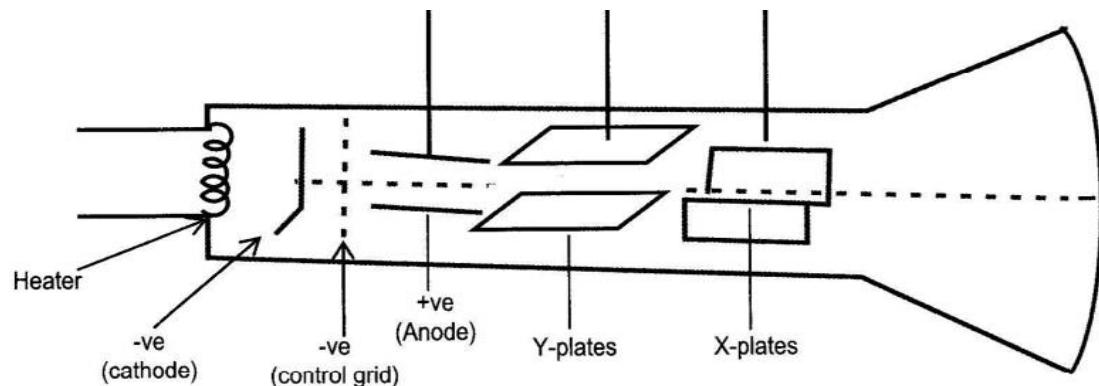
(a) Name the process by which electrons are produced in the CRO. [1]

(b) Why is the potential difference between the cathode and anode made very high? [2]

(c) Describe the use of:

(i)   the Y-plates   **(ii)**   the X-plates [2]

(d) Explain why the CRO should be evacuated. [1]

66. **(a) Figure 12.1** shows an incomplete circuit for an experiment to investigate how the resistance of a torch bulb varies with current flowing through it.

Bulb

3V
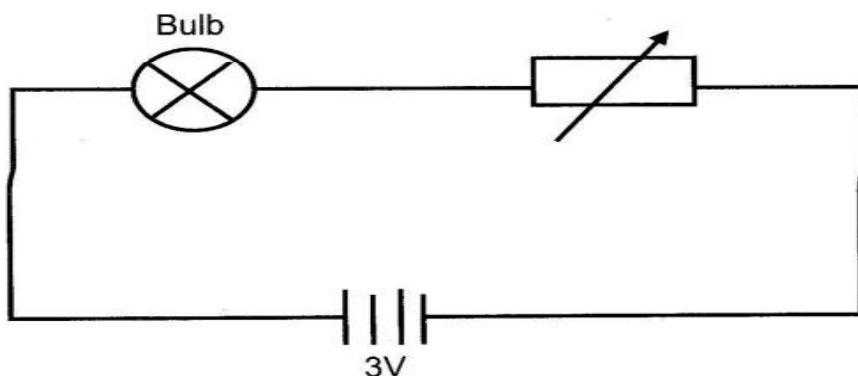
(i) Draw the circuit diagram and add to it an ammeter to measure the current through the bulb and voltmeter for measuring the potential difference (pd) across the bulb. [2]

(ii) State clearly how you would obtain the readings needed to carry out the investigation. [2]

(iii) How would you determine the resistance of the bulb? [2]

(b) (i) If the bulb is 2.5V and takes the current of 0.25A at its working temperature, calculate the resistance of the bulb. [2]

(ii) The resistance of the bulb when the filament is cold is 50. Sketch the graph you would expect to obtain if you plot resistance against current for the bulb. [2]

2011 QUESTION PAPER 2

67. **Figure 9.1** shows two metal spheres **A** and **B** being charged by induction using a negatively charged rod brought near **A.** In **figure 9.2,** the two spheres are separated. In **figure 9.3,** the charged rod is removed.
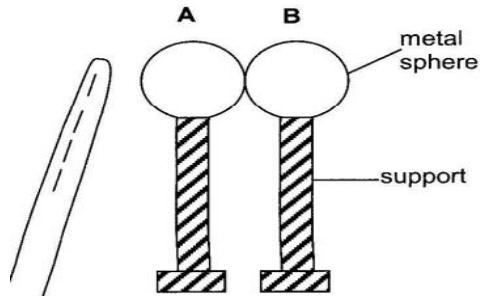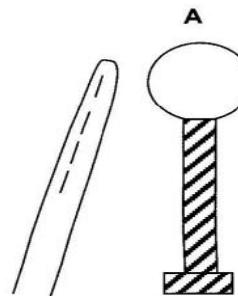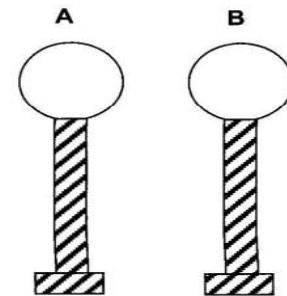
Figure 9.1   Figure 9.2   Figure 9.3

(a) What should be the nature of material used as the support of each sphere? [1]

(b) On each sphere in **9.1, 9.2** and **9.3,** indicate the charge distribution. [4]

68. Radioactive isotopes can be used to locate internal bleeding in the body. A commonly used radioactive isotope is iodine — 131 (^{131}I). This emits gamma radiation and has a half-life of 8 days.

(a) Describe what is meant by a radioactive isotope.   [2]

(b) Describe what is meant by half-life.   [2]

(c) The activity of a sample of iodine — 131 was measured over a period of 20 minutes on three separate occasions. The readings obtained were: - 338βq, 326βq, 356βq.

(i) Explain why the readings were not all the same.   [1]

(ii) Calculate the average count rate for the radioactive isotope. [1]

(d) A patient has internal bleeding from a blood vessel in her leg. A small quantity of the isotope ^{131}I is injected into her blood stream. A detector is used to find the internal bleeding. **Figure 11.1** shows the arrangement and the results of the test.
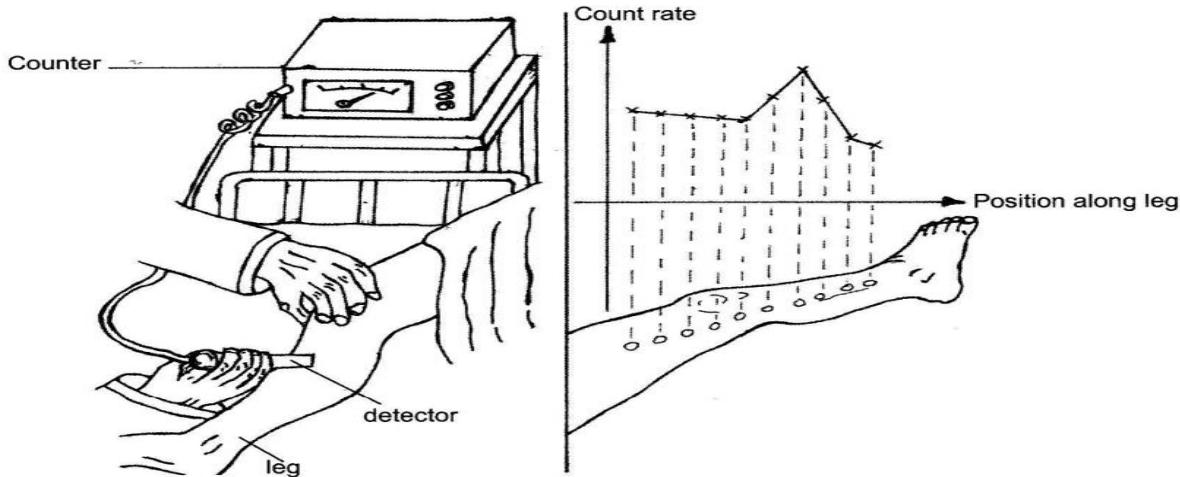
(i) State the name of a suitable detector.   [1]

(ii) The radioactive isotope used for this purpose is a gamma emitter and not an alpha emitter. Why is a gamma emitter used?   [2]

(iii) How will the doctor tell from the results where the internal bleeding is taking place?   [1]

69. **Figure 12.1** shows a bucket with a heating element at the bottom. The bucket has a plastic body with the outside casing of the element which is a metal.
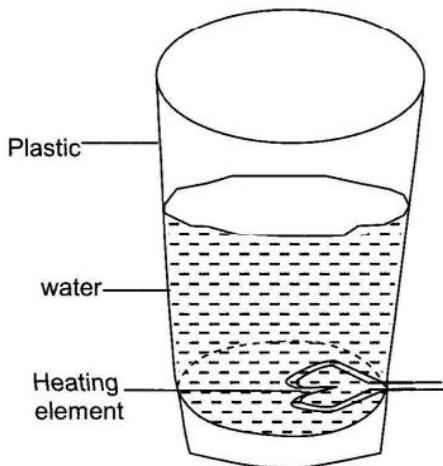
(a) Explain why;

(i) a fuse is included in the circuit and what happens when the fuse blows. [2]

(ii) the metal casing of the heating element is connected to the earth. [2]

(b) The electrical power input to the bucket is 2000W and the bucket is switched on for 6 minutes. Calculate the electrical energy, in joules supplied to the bucket. [3]

(c) Explain, in molecular terms, how evaporation causes loss of energy from the water when the element is switched off. [3]

2012 QUESTION PAPER 2

70. **Figure 9.1** shows a simple transformer which can be used to light a bulb. The bulb is labelled.
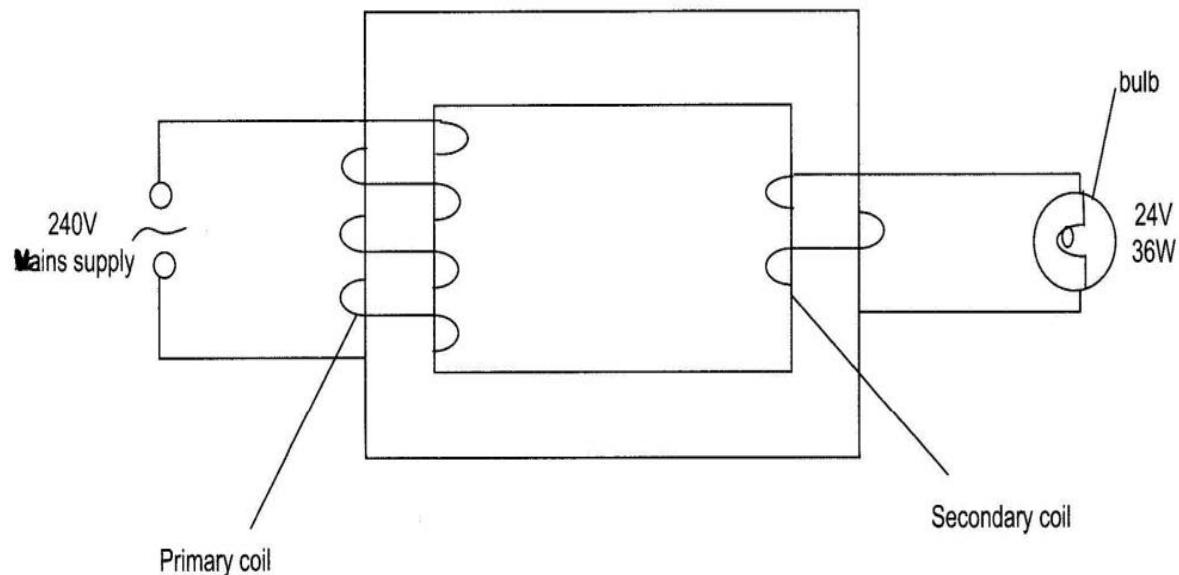
When the mains supply is switched on, the bulb is very bright.

(a) State one way in which the potential difference across the bulb can be decreased without changing the mains supply. [1]

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

(i)   the current in the secondary coil   [2]

(ii)   the current in the primary coil, assume that the transformer is 100% efficient   [2]

71. 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.   [5]

(b) What count rate appears to have been misread and should therefore be ignored?   [1]

(c) At what time was the count rate 250 counts per second?   [2]

(d) What is the half-life of the source?   [2]

72. A 4Ω DVD, 6Ω shaving machine and a 12Ω radio cassette are connected at the same time in parallel across 24V power supply.

(a) Draw a circuit diagram to represent this connection.   [2]

(b) Find the total resistance in the circuit offered by all the three appliances.   [2]

(c) Calculate the current in each appliance.   [6]

73. Study the circuit diagram in **Figure 8.1** below.

4.0V

3Ω   1Ω

(a) Calculate the current through the battery. [2]

(b) (i) How long would it take a charge of 2.0C to flow through the battery? [2]

(ii) How much energy would be used in moving this charge round the circuit? [2]

74. (a) For one neutral atom of lead $^{214}_{82}Pb$, state the number of;

(i) Neutrons   (ii) Electrons   [2]

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

$^{214}_{82}Pb \; - -\rightarrow \; Bi \; + \;$ _____ [2]

75. A detector of nuclear radiation was set up to measure the decay of a radioactive substance.

Figure 12.1 below shows the results of the experiment.

(a) (i) What is the half-life of the substance?   [1]

(ii) Clearly explain how you obtained your answer to **(a) (i)** above. [2]

(b) List any three properties of a beta-particle. [3]

(c) Describe how you would show that the radioactive source is emitting only beta-particles.

2016 G.C.E QUESTION PAPER 2

76. ***Figure 9.1*** shows a stream of α, β and γ rays passed through a uniform electric field represented by tracks **A, B** and **C.**
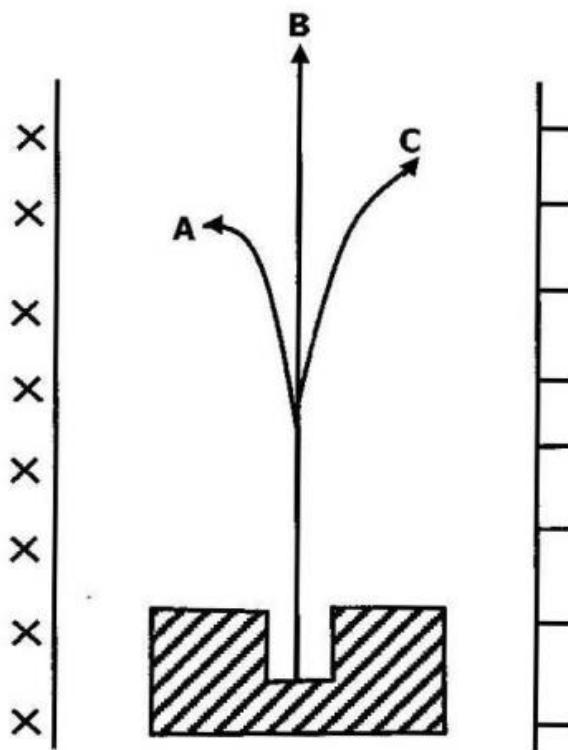
(a) Identify the tracks marked **A, B** and **C** representing the radiations. [1]

(b) What is the charge for the radiation represented by the track marked **B?** **[1]**

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

$$^{232}_{90}Th \longrightarrow Rn + \ldots$$
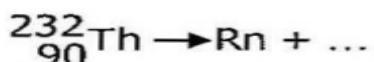
Complete the equation above that represent the decay of the Thorium nucleus; include the nucleon and proton numbers of the particles concerned. [2]

77. (a) State the difference between 'Electric charge and electric current. [1]

(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 [3]

(ii) Calculate the resistance of the metallic conductor [2]

(c) Figure 12.1 shows 4Q and 6Q resistors connected in parallel.
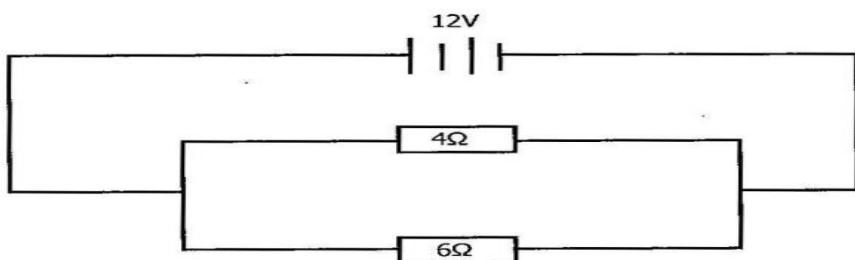
i. Find the effective resistance [2]

ii. Determine the current in the circuit. [2]

2017 G.C.E QUESTION PAPER 1

78. Polonium -210($^{210}_{84}Po$) can undergo radioactive decay by emitting an alpha particle to form lead (Pb).

(a) What is an alpha particle? [1]

(b) Write the equation for the radioactive decay of polonium — 210. [2]

(c) State **one** use of alpha radiation. [1]

79. *Figure 88.1* shows three resistors connected to a 12V battery.
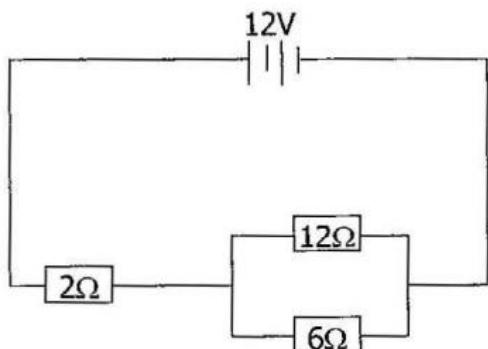
Calculate:

(a) the effective resistance between **X** and **Y** [2]

(b) the current flowing in the battery. [2]

(c) the current flowing through the 6Ω resistor. [2]

80. **Table C2.1** shows a table with corresponding values of potential difference across a torch bulb and the current flowing through the same torch bulb.

Pd/Volts	0.20	1.00	5.00	10.00	16.00	23.00	31.00	40.00
Current/Amperes	0.40	0.80	1.20	1.60	2.00	2.40	2.80	3.20

(a) Using correct circuit symbols, draw a clearly labelled diagram of a circuit which could have been used to obtain this data. [2]

(b) On the graph paper provided, and using the data in the figure above, plot a graph of the current on the X-axis and the p.d. on the Y-axis. [3]

(c) From the graph state whether or not the filament of the torch bulb is an ohmic conductor. Explain your answer. [2]

(d) (i) Use the graph you have drawn to determine the value of the p.d across the torch bulb when the current flowing through it is 2.6A. [1]

(ii) Calculate the resistance of the torch bulb when the current through it is 2.6A. [2]

81. A radioactive element $^{223}_{98}X$ emits one Beta particle followed by 2 Beta particles.

(a) What is a Beta particle? [1]

(b) Write the nucleon number and proton number of the remaining nuclide after the two emissions. [2]

(c) A 400g radioactive sample has a half-life of 4 years.

(i) On a graph paper plot a graph to show this decay curve after the period of 32 years. [5]

(ii) What period of time would it take for the sample to reduce to 40g? [1]

(iii) Name a source of gamma radiation. [1]

2018 G.C.E QUESTION PAPER 2

82. (a) A radioactive source emits beta particles, the count rate of which is on a scanner as follows:

Time/s	0	5	10	15	20
Count rate/minute	590	316	172	94	50

   (i)   Plot a graph of count rate against time. [4]

   (ii)   Explain the term half – life.   [1]

   (iii) From the graph, find the half-life of a source. [2]

(b) In 312s, seven-eighth of the original number of certain nuclides of the radioisotope has decayed. What is its half-life?   [3]

2019 G.C.E QUESTION PAPER 2

83. Figure B6.1 shows a Perspex disc fitted on a wooden stand.
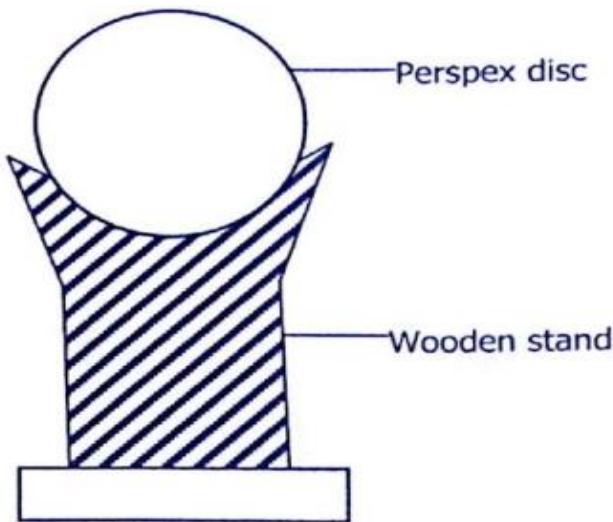
When rubbed with fur, electrons move from the Perspex disc to the fur.

(a) (i) what charge is induced in the Perspex disc?   [1]

   (ii) State the unit in which charge is measured. [1]

(b) Small pieces of paper brought near the Perspex disc stick to it. Explain why. [1]

(c) When a polyethene rod was rubbed with fur, it was able to attract small pieces of paper too. Name the type of charge induced in the polythene rod and explain using movement of electrons how charge was induced.

84. Figure B7.1 shows a circuit diagram connected to a 12V supply.
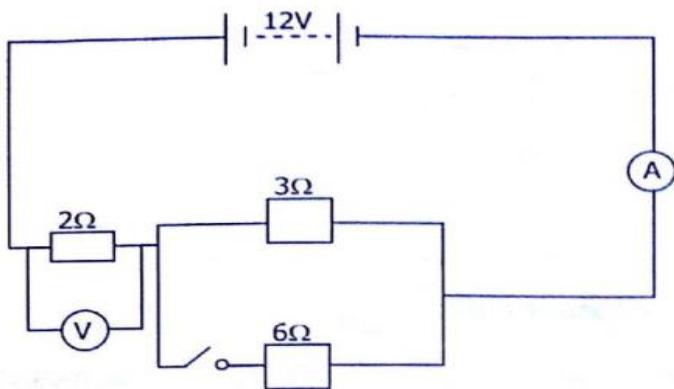
Calculate the

    a. Combined resistance of the 2Ω and 3Ω resistors.

    b. Total resistance in the circuit when the switch is closed.

    c. Potential difference across the 2Ω resistor.

    d. Total current flowing in the circuit when the switch is closed.

85. Figure 9.1 shows a decay curve of a radon nuclide.
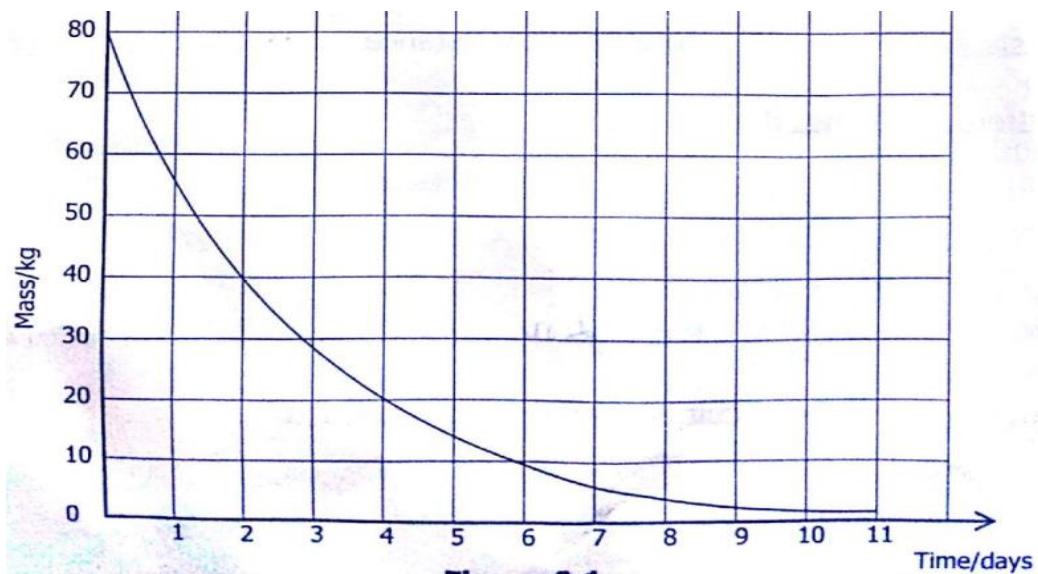
(a) Define nuclear fission.

(b) From the graph, determine the

    (i)   Original mass of nuclide.

    (ii)   Quantity of the nuclide that remained after 6 days.

    (iii)   Half-life of the nuclide.

86. (a) Sodium chloride salt containing sodium -24 is radioactive and is used in medicine. The sodium in the salt decays according to the equation.

$$^{24}_{11}Na \; --> \; ^{24}_{12}Mg \; + \; W \; + \; \gamma - radiation$$
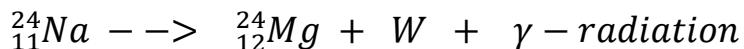
(i)   What is particle W?   [1]

(ii)   How many neutrons are in the nucleus of sodium – 24?   [1]

(iii)   Explain the difference between an atom of sodium – 24 and atom of sodium – 23.   [2]

(b) Gamma radiation is used to treat food so that it stays fresh. To check whether the treated food is safe for consumption, the count rates of three food samples **X, Y** and **Z** were measured before and after treatment with gamma rays. **Table C3.1** shows the results obtained.

Food sample	Count rate before treatment / counts per minute	Count rate after treatment / count per minute
X	30	33
Y	31	27
Z	30	31

(i) Explain why there is a measured count rate before the food sample are treated with gamma rays.   [1]

(ii) From the results, determine whether the food sample **Y** becomes radioactive or not.   [2]

(iii)   State one other use of gamma radiation. [1]

(iv)   State two safety precautions that must be followed when handling gamma radiation.   [2]

ANSWERS FOR GRADE 10 E.C.Z QUESTIONS

2009	11.C	21.C	*2015*	42.A	*2019*
1. C	12.A	22.B	32.A	43.B	*G.C.E*
2. D	*2011*	23.C	33.C	44.B	53.D
3. B	13.C	24.C	34.C	45.C	54.C
4. D	14.B	25.C	35.A	*2018 G.C.E*	55.B
5. B	15.A	*2013*	36.C	46.B	56.A
6. C	16.A	26.C	37.C	47.D	57.C
7. C	17.C	27.C	38.C	48.B	58.C
2010	18.C	28.B	*2017 G.C.E*	49.D	59.C
8. A	*2012*	29.A	39.B	50.C	60.A
9. D	19.C	30.B	40.A	51.A	
10.D	20.B	31.A	41.D	52.D	

ANSWERS FOR 2009 QUESTION PAPER 2

61.(a) $V = u + at$ » $25 = 0 + a(20)$ » $a = $ **_1.25m/s²_**

(b) $F = ma$ » $F = 1200 \times 1.25 = $ **_1500N_**

(c) $X = \frac{1}{2} l b$ » $X = \frac{1}{2} 20 \times 25 = $ **_250m_**

62.(a) $W = mg$ » $W = 50 \times 10 = $ **_500N_**

(b) $P.E = mgh$ » $P.E = 50 \times 10 \times 8 = $ **_4000J_**

(c) $P = \frac{W}{t}$ » $P = \frac{4000}{7} = $ **_571.42W_**

63.(a) – *Luggage case must be lowered hence lowering the Centre of mass.*

- Wheels should be wider enough to increase the base area.

- Lower the base of the bus to lower the Centre of mass.

(b) (i) **Mass** *is the quantities of matter in a substance.*

(ii) Mass = **_75kg_**

(iii) $W = mg$ » $W = 75 \times 1.6 = $ **_120N_**

64.(a) V.R $= \dfrac{Driving\ wheel}{Driven\ wheel} = \dfrac{36}{12} = \underline{\textbf{3}}$ (b) 1 rotation = 3 rotations

$$X \quad = \quad 15$$

$$X = \underline{\textbf{5 Rotations}}$$

ANSWERS FOR 2010 QUESTION PAPER 2

65. (a) S.R = 4.50 mm

    T.R = 0.31 mm

    F.R = *__4.81 mm__*

  (b) *__Length__*

  (c) Ratchet: *__to adjacent the spindle__*

66.(a)(i) T $=\dfrac{t}{n}$ » T = 2.05 $\div \dfrac{3}{4}$ therefore, T = *__0.37s__*

    (ii) $f = \dfrac{1}{T}$ » $f = \dfrac{1}{0.37}$ » $f =$ *__2.702 Hz__*

  (b) *Measure the length of the pendulum and set it into swinging while start the*

     stop watch and counting. Then calculate the period by using: $T = \dfrac{t}{n}$

67.(a) $m_1d_1 = m_2d_2$ » m_1 x 30 = 100 x 10 » $m_1 =$ *__33.33g__*

  (b) *Because the mass of the metre rule acts at its centre of mass (50.0 cm mark)*

     which is at the pivot. Therefore, the distance between the pivot and its mass is

     zero i.e. the moment is zero hence its mass is ignored.

  (c) W = mg » 0.253 x 10 = *__2.53N__*

68.(a) m = 1150 – 410 = *__740g__*

   (b) V $= \dfrac{m}{q} = \dfrac{740}{1} =$ *__740 cm³__*

   (c) m = 410 – 409 = *__1g__*

   (d) q $= \dfrac{m}{v} = \dfrac{1}{740} =$ *__0.0014g/cm³__*

69.(a) (i) at **A**

   (ii) *Because gravity has not yet acted on the ball which reduces its speed.*

   (b) (i) *is the source of energy which is always replenished.*

   (ii) *Wind fluctuates hence the energy is not constant always.*

   (iii) *Solar energy, hydropower*

70.(a)
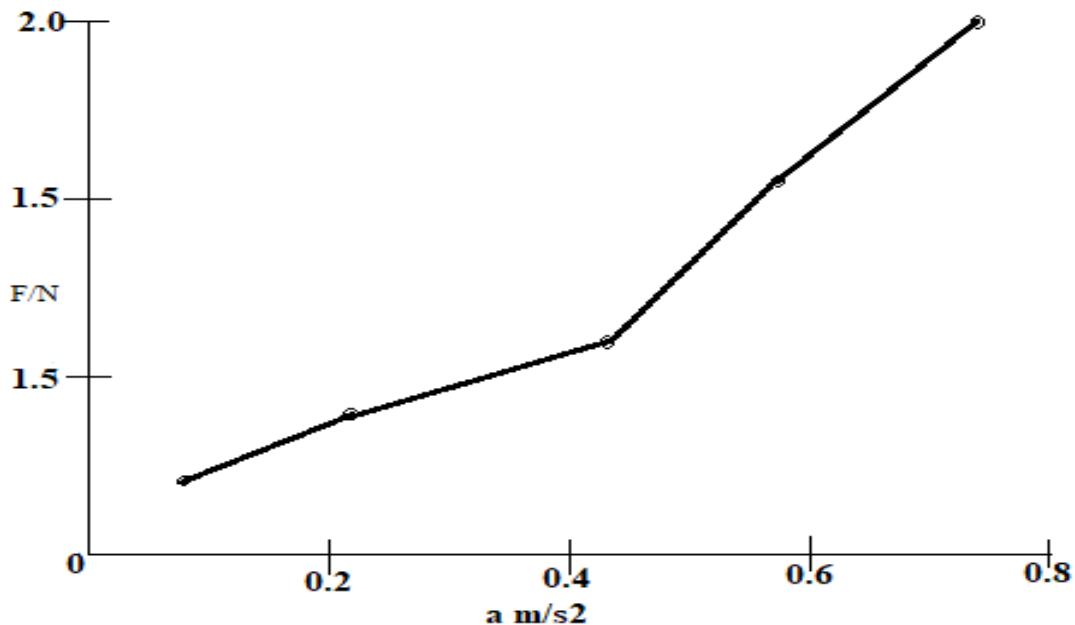
(b) (i) gradient $= \frac{y2-y1}{x2-x1} = \frac{1.2-0.4}{0.43-0.08}$ » Gradient $= \underline{\textbf{\textit{2.28}}}$

(ii) physical quantity $= \underline{\textbf{\textit{Mass}}}$

(c) *In order to know the minimum force required to accelerate the trolley.*

ANSWERS FOR 2011 QUESTION PAPER 2

71. (a)
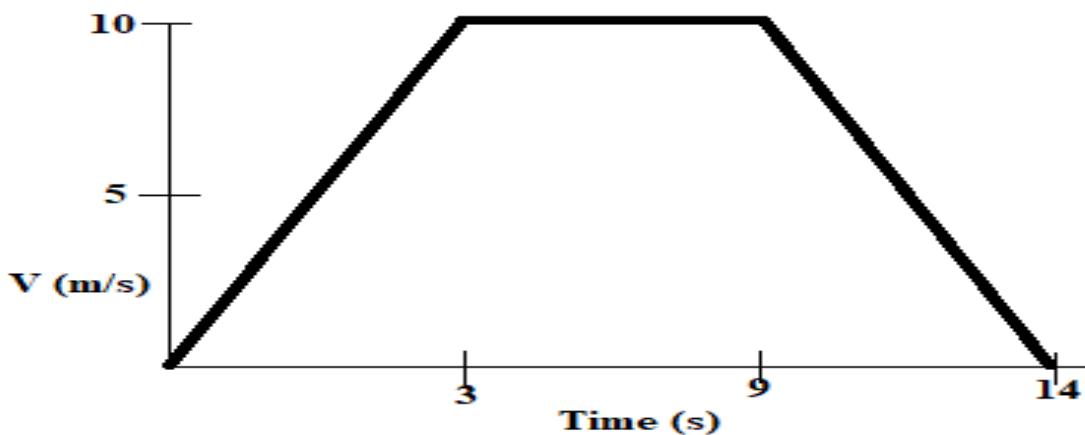
. (b) x = ½ (a + b) h = ½ (14 + 6) 10   »   X = **100m**

72. (a) Centre of mass *is a point through which the whole mass of a substance acts.*

(b) Because its centre of mass is raised up making it unstable.

(c) $m_1 d_1 = m_2 d_2$ » 45 x 25 = m_2 x 12.5   » $m_2 = \underline{\textbf{\textit{90g}}}$

73.(a) W= mg = 45x10 = **_450N_**

(b) W=mg = 25x10 = **_250N_**

(c) P.E = mgh = 70 x 10 x16

P.E = **_11200J_**

(d) $P = \dfrac{W}{t} = \dfrac{11200}{16} = $ **_700W_**

74.(a) Density *is mass per unit volume of a substance.*

(b) Put water in a measuring cylinder and record as V1. Lower a stone into it and record as V2. Calculate the volume of a stone as (V = V2 – V1). Measure the mass of a stone using an electronic balance. Calculate the density of a stone as

$\text{Density} = \dfrac{\text{Mass of stone}}{\text{Volume of a stone}}$

(c) $q = \dfrac{m}{V} = \dfrac{340}{25} = $ **_13.6g/cm³_**

75.(a) (i) M.R = 3.70 cm

V.R = 0.04 cm

F.R = **_3.74 cm_**

(ii) **_Length_**

(b) -zero the instrument,   -Clean the anvil and spindle

76.(a) Time = 50s

(b) velocity = 10m/s

(c) V = u + at » 20 = 0 + a (10)   »   a = **_2m/s²_**

(d) x = ½ (a + b) h = ½ (50+20) 10   »   X = **_350m_**

77.(*a*) (i) F_N = 6 – 2.5 = **_3.5N_**

(ii) F_N = ma » 3.5 = 0.7 x a   »   a = **_5m/s²_**.

(b) *Because of friction force and energy is lost in form of heat energy.*

78.(a) **_Work_** is a product of force and distance moved in the direction of force.

Power is the rate of doing work.

(b)(i) P.E = mgh = 50 x 10 x 5 = **_2500J_**

(ii) $P = \dfrac{W}{t} = \dfrac{2500}{20} = $ **_125W_**

79.(a) Put water in a measuring cylinder and record as V1. Tie a heavy sinking object whose volume is known on a floating object. Lower them together into a measuring cylinder and record V2. Calculate the volume of them as (V = V2 − V1) and get the volume of a floating object by subtracting the volume of a heavy sinking object. Measure the mass of a floating object by using an electronic balance. Calculate the density of a floating object as Density $= \frac{\text{Mass of a floating object}}{\text{Volume of a floating object}}$

(b)(i) m1d1 = m2d2 » m1 x 8 = 20 x 42 » m1 = ___105g___

(ii) W = mg = 0.105 x 10 = ___1.05N___

(c) to increase its stability

ANSWERS FOR 2013 QUESTION PAPER 2

**80.** (a) *Simple machine* is any device by means of which a force applied at one point can be used to overcome a force at a different point.

(b) (i) Point X   (ii) Point Z

(c) Greater than the force applied at Z

(d) Increase the distance between Z and the screw.

81.(a)
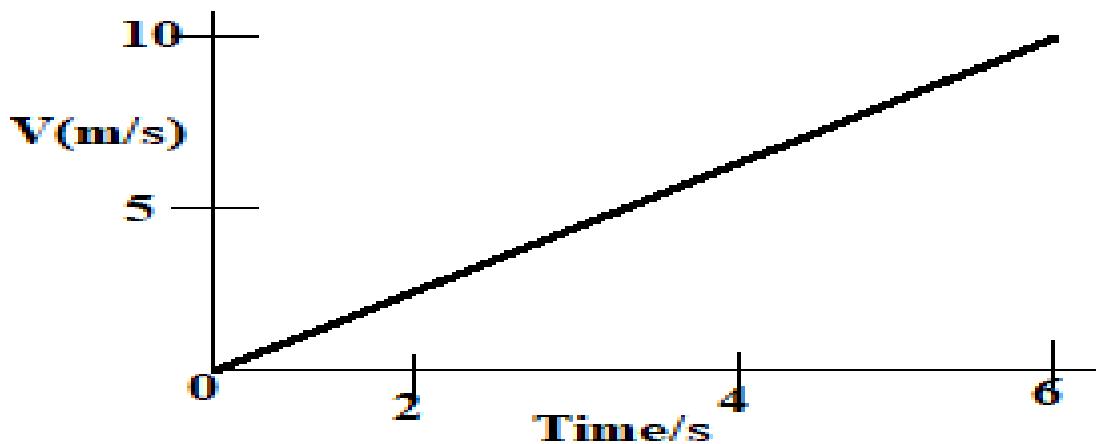
(b)(i) X = ½ (bh) = ½ x 10 x 6 = ___30m___

(ii) V = u + at » 10 = 0 + (a) (6) » a = 1.67m/s²

(iii) F = ma » F =1400x1.67 = ___2333.3N___

82. (a) Weight changes while mass does not change

(b) – large base area   - lower the centre of mass

(c) on moon = **_50kg_**

83. (a) Measure the mass of an empty beaker and record as m1. Add liquid in it and measure and record it as m2. Calculate its mass as m = m2 – m1

(b)(i) m = 85 – 35 = **_50g_**

84. (a) Moment is a turning effect of force about a certain point. Its S.I unit is Nm.

(b) M = Fd » M = 10 x 0.75 » M = **_7.5Nm_**

(c) the moment at point 1 is greater than at point 2 and 3

ANSWERS FOR 2016 G.C.E QUESTION PAPER 2

85. (a) Oscillating is the swinging of the bob

(b) $T = \dfrac{t}{n} = \dfrac{0.20}{0.5} = $ **_0.4s_**

(c) $f = \dfrac{1}{T} = \dfrac{1}{0.4} = $ **_2.5Hz_**

86.   (a) (i) *electronic balance*

(ii) mass = **_200kg_**m

(b) W = mg = 200 x 10 = **_2000N_**

87.   (a) Moment is a turning effect of force about a certain point

(b) centre of mass; size of base area

(c) F1d1 = F2d2 » 3.15 x 0.1 = F2 x 0.3   »   F2 = **_1.05N_**.

88.   (a) Gravitational potential energy

(b) X = ut + ½gt = (0x2) + (½ x 10 x 2²)   »   X = **_20m_**

(c)(i) K.E = ½mgh = ½ x 2 x 10 x 20 = **_200J_**

(ii) V = u + gt = 0 + 10 (2) = **_20m/s_**

89.   (a) Incline plane – *it moves or lifts loads*

Opener – *opening lids on bottle tops*

(b)(i) Because some energy will be lost in form of heat energy.

(ii) Because some energy will be lost in form of heat energy.

(c)
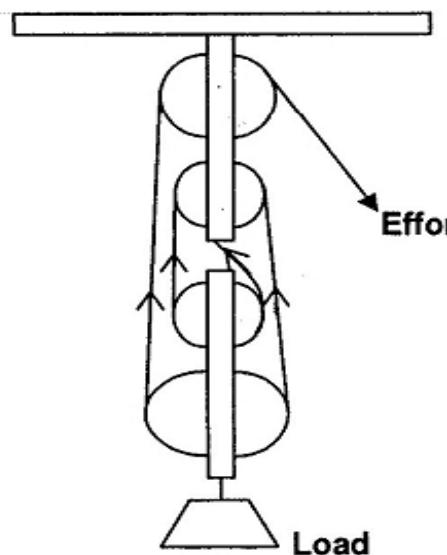
(d)(i) $M.A = \frac{Load}{Effort} = \frac{60}{20} = \underline{\textbf{3}}$

(ii) Efficiency $= \frac{M.A}{V.R} \times 100 = \frac{3}{4} \times 100 = \underline{\textbf{75\%}}$

ANSWERS FOR 2017 G.C.E QUESTION PAPER 2

90. (a) M.R = 7.90 cm

V.R = 0.05 cm

F.R = **7.95 cm**

S.I units in words	**S.I units in symbols**
(i) Metre per second	m/s
(ii) Kelvin	K
(iii) Metre per second squared	m/s^2

91. (a) Relative density has no unit while density has units.

(b)(i) $V = lbh = 5 \times 5 \; 6 = \underline{\textbf{150cm}^3}$ (ii) $V = 5 \times 5 \times 2 = \underline{\textbf{50 cm3}}$

(iii) $q = \frac{m}{V} = \frac{80}{50} = \underline{\textbf{1.6g/cm}^3}$

92. *(a) Simple machine* is any device by means of which a force applied at one point can be used to overcome a force at a different point.

(b) $M.A = \frac{Load}{Effort} = \frac{480}{200} = 2.4$ (c) Efficiency $= \frac{M.A}{V.R} \times 100 = \frac{2.4}{3} \times 100 = \underline{\textbf{80\%}}$

93. (a)
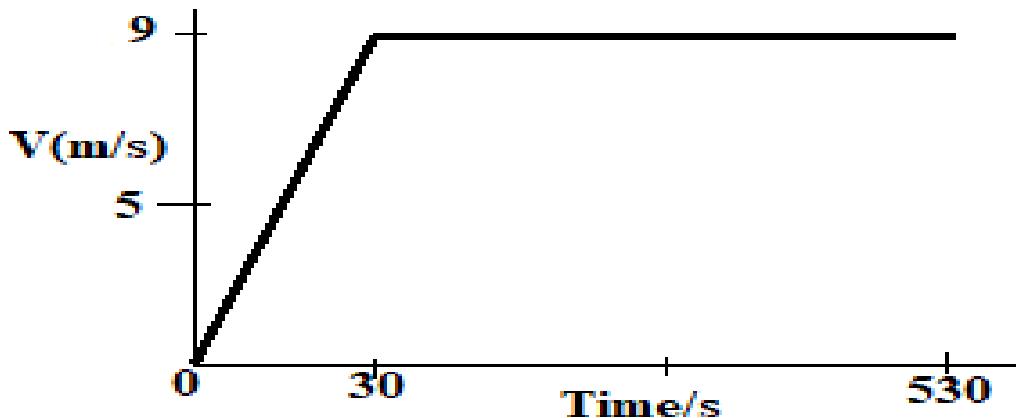
(b) V = ut + at » 9 = 0 + a (30) » a = **_0.3m/s²_**

(c) F = ma 2000 x 0.3 = 600N

(d) X = l x b = 500 x 9 = 4500m

(e) Average speed $= \dfrac{Total\ distance}{Total\ time} = \dfrac{4635}{530} = \boldsymbol{\underline{8.75m/s}}$

ANSWERS FOR 2018 G.C.E QUESTION PAPER 2

94. (i) **_10 m/s²_** (ii) **_5 N_** (iii) **_0 m/s²_** (iv) **_0m/s_** (v) **_-5N_** (vi) **_-8 m/s_**

95. (a) _Density_ is mass per unit volume

(b)(i) $M_m = M_A + M_B = 200 + 200 = \boldsymbol{\underline{400g}}$

(ii) $V_m = V_A + V_B = 200 + 100 = \boldsymbol{\underline{300\ cm^3}}$

96. (i) V = u + at = 0 + (2 x 5) = 10m/s

(ii) $v^2 = u^2 + 2ax$ » $10^2 = 0^2 + (2\ x2\ X)$ » x = **_25m_**

(iii) $x = ut + \tfrac{1}{2}at^2$ » $100 = (0xt) + \tfrac{1}{2}(2)(t^2)$ » t = **_10s_**

97. (a) M = Fd = 12000 x 20 = **_240000Nm_**

(b) W = Fx = 1200 x 15 = **_180000J_**

98. (a) _Power_ is rate of doing work

(b)(i) F = ma = 580 x 0 = **_0 N_**

(ii) P.E = mgh = 580 x10 x 12 = **_69600J_**

(iii) Efficiency $= \dfrac{power\ output}{power\ input} \times 100 = \dfrac{4640}{6200} \times 100 = \boldsymbol{\underline{74.84\%}}$

ANSWERS FOR 2019 QUESTION PAPER 2

99. (a)(i) M = Fd = (3 x 10) x 0.2 = **_6Nm_**

(ii) F1d1 = F2d2 + F3d3 » 30 x 0.2 = (F2 x 0.2) + (10 x0.5) » F2 = **_5N_**

(b) _Opening and closing a door_

100. (a)(i) $V = \dfrac{x}{t} = \dfrac{40}{10} =$ **_4m/s_**

(ii) v = u + at » 4 = 0 + a (10) » a = 0.4m/s^2

(b) Time = **_2s_**

**101.** (a) Elastic potential energy

(b) P.E = mgh = 0.2 x 10 x 1.5 = **_3J_**

(c) some energy is lost inform of heat energy

102. (a) V.R = **_4_**   (b) Effort = **_400N_**

103. (a)(i)
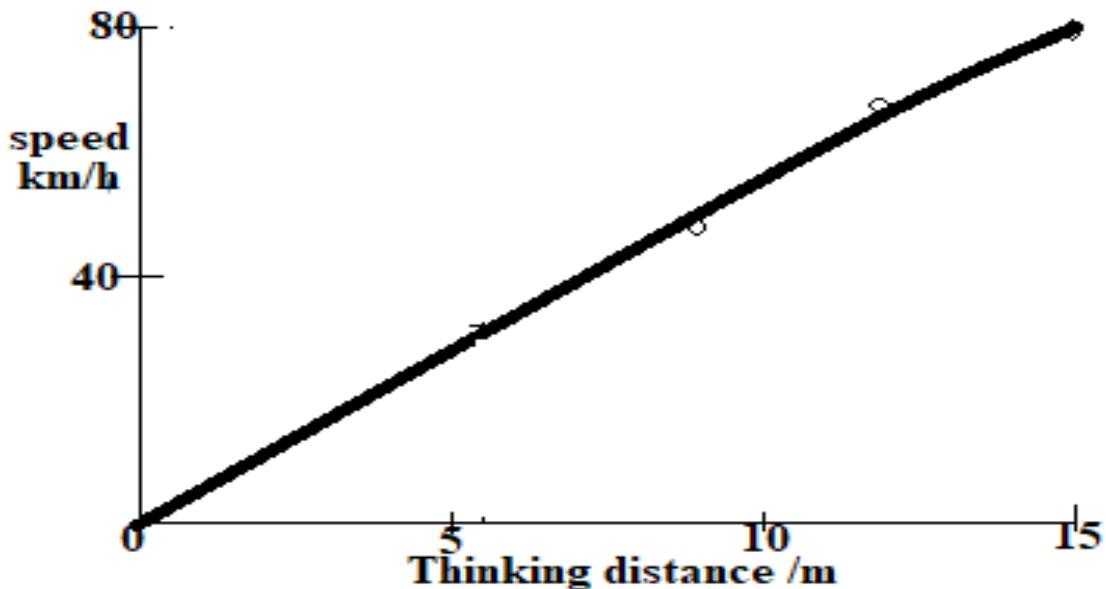
(ii) thinking distance = **_5.5 m_**

(b)(i) thinking distance = 8.89m

(ii) It has increased his thinking distance

ANSWERS FOR GRADE 11 E.C.Z QUESTIONS

2009 P1	9. A	17. B	*2015 P1*	33. C	42. A
1. B/C	*2011 P1*	18. B	25. B	34. D	43. C
2. A	10. B	19. C	26. C	35. B	44. D
3. C	11. B	*2013 P1*	27. C	36. A	
4. A	12. D	20. A	28. B	37. C	
2010 P1	13. B	21. B	29. D	*2019 G.C.E P1*	
5. A	14. D	22. C	30. A	38. C	
6. D	*2012 P1*	23. C	*2017 G.C.E P1*	39. B	
7. B	15. D	24. A	31. B	40. D	
8. A	16. A		32. C	41. D	

ANSWERS FOR 2009 QUESTION PAPER 2

45. (a) Smoke particles

(b) This is due to collisions with fast-moving air molecules in the cell.

(c) The random movements of smoke particles are due to their random collisions with the air molecules.it predicts that the molecules are moving randomly.

46. (a)
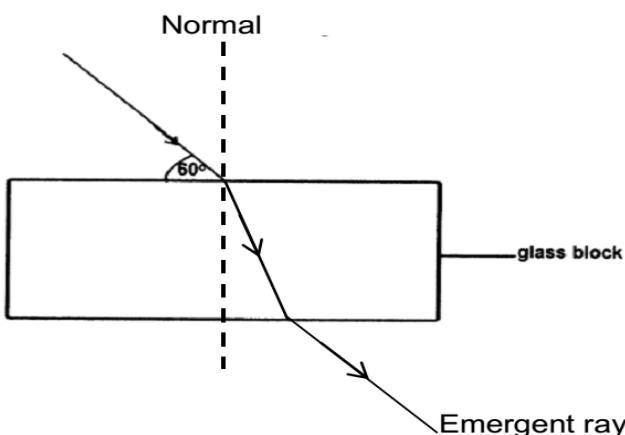
(b)(i) Angle of incidence (i)

$i = 90° - 60° = \underline{\textbf{\textit{30°}}}$

(ii) $n = \dfrac{\sin i}{\sin r} = \dfrac{\sin 30}{\sin 18.2} = \dfrac{0.5}{0.3125}$

$n = \underline{\textbf{\textit{1.6}}}$

b)(i) Angle of incidence (i)   » $i = 90° - 60° = \underline{\textbf{\textit{30°}}}$

(ii) $n = \dfrac{\sin i}{\sin r} = \dfrac{\sin 30}{\sin 18.2} = \dfrac{0.5}{0.3125}$ $n = \underline{\textbf{\textit{1.6}}}$

47. (a) radiation   (b) Can B

(c) because polished surface reflect heat hence low temp compared to Can A

48. (a)) To determine the focal length of a converging lens using a distant object. Take an optical bench and place it on a leveled surface. Then take a converging lens whose focal length is to be determined and place it on lens stand. After that place the lens stand on an optical bench at any measured position. Make sure the lens is facing toward the distance object. Take a screen and place it on optical bench so that the lens is between the screen and the distance object. Now adjust the distance between converging lens and the screen by moving a lens stand until the sharp image on the screen is obtained. Then measure the distance between the lens and the screen and this distance obtained is the focal length of the converging lens.

(b) Size of the Image = **_1.0 cm_** and Position of the Image = **_15.0 cm_**
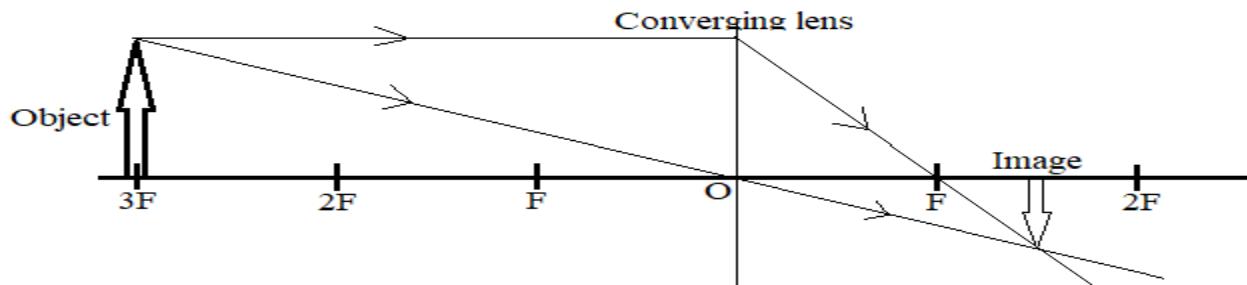
ANSWERS FOR 2010 QUESTION PAPER 2

49. (a) The inner painted white to prevent the loss of heat by radiation and the polyethene prevent the loss of heat by convection and conduction.

(b) To determine the lower fixed point of a thermometer place the thermometer bulb in melting ice. The mercury will contract hence the mercury thread will be lowered. Then measure the length of the mercury thread and mark its lower fixed point.
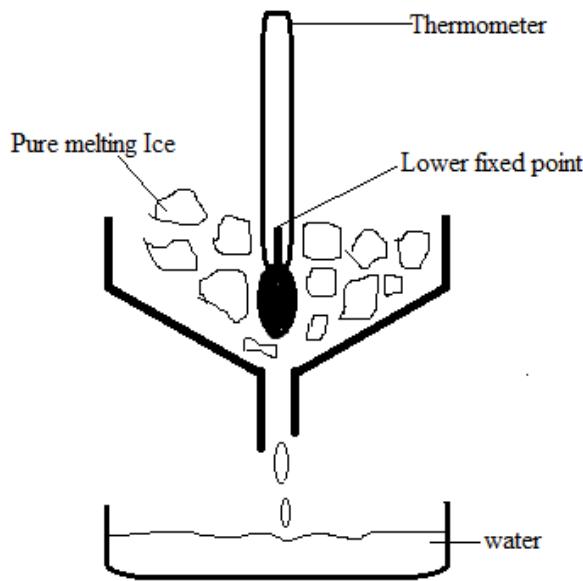
50. (a) A – Ultra – violet rays   (b) (i) 3.0×10^8 m/s   (ii) 3.0×10^8 m/s

(c)(i) A **transverse wave** is defined as a wave in which the vibrations of the particles are *at right angle* to the direction of the travel of the wave.

(ii) water waves, Rope waves, etc

51. Magnets can be identified by repulsion with another magnet. Hence bring the ends of each rod together one by one, the ones which will repels are magnets. Iron is a magnetic material while copper is a non –magnetic material, therefore, bring the remaining two rods to a magnet and the one which will attract is iron and that which will not attract is copper.

52. (a) Experiment to show that water is a bad conductor of heat. Put water in test tube and add an ice block with a wire gauze to make sure that the ice block is at the bottom of the test tube(The wire gauze prevents the ice from floating). Heat the test tube on top of water to make sure that the flame from the Bunsen burner must be placed on the top of water. (It prevents the convection of water.) When the water on the top begins to boil, the ice block at the bottom does not melt immediately this because Water is a bad conductor.

(b)(i) For easily absorbing of heat by radiation. (ii) To prevent the loss of heat by conduction and convection.

(iii) To reflect heat back hence no loss of heat out of the solar heating panel.

53. (a)

(b) The magnetized iron will lose its demagnetized immediately (it will lose its magnetic effect)

54. (a) P1 x V1 = P2 x V2 » V2 = P1 x V1 ÷ P2 »
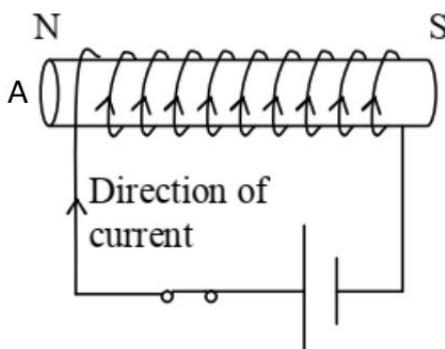
V2 = 300 000 x 0.080 ÷ 360 000 » V2 = **_0.067 cm³_**

(b) The friction force that occur between the tyres and the road surface heat the tyres which in return increases the temperature of air molecules in the tyres. When temperature of air molecules increases also the pressure increases because of increase of collision of air molecules with the wall of tyres.

55. (a) V = d ÷ t = 1.5 ÷ 0.2 = 7.5 m/s

(b) V = f x ʎ   »   7.5 = f x 1.5   »   f = **_5 Hz_**

(c) (1) Water waves have crest and troughs while sound waves have compression and rarefaction.

(2) Water waves the vibration of particles are at right angle to the direction of a wave while sound wave the vibration of particles are parallel to the direction of a wave.

56. Size of the image = 1.2 cm and Position of the image = 4.4 cm
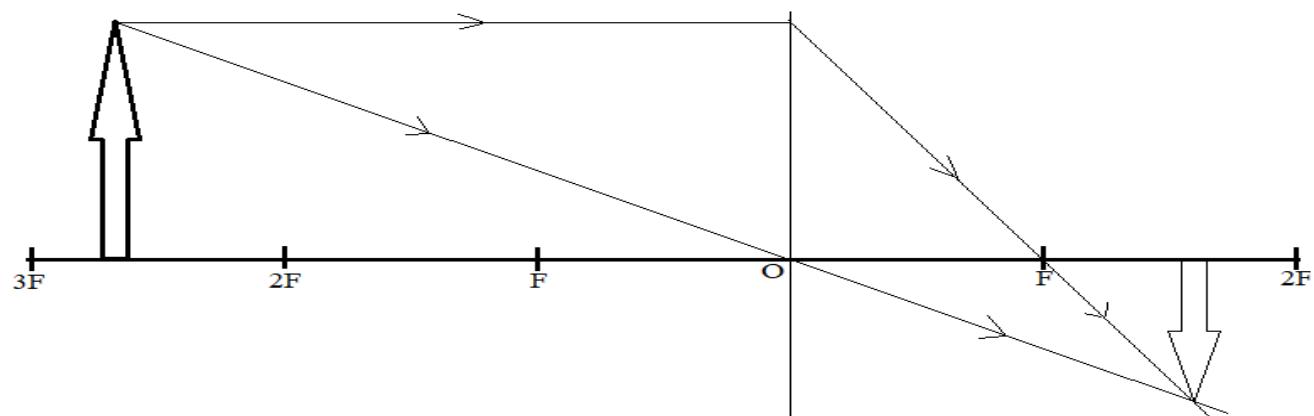
57. (a) for quick responsiveness   (b) it prevent the back flow of expanded mercury

(c) It gives greater accuracy

(d) it gives high sensitivity (just small expansion will be seen.

(e) It acts as a magnifying glass in one direction and magnifies the narrow thread of mercury making it easy to read.

ANSWERS FOR 2012 QUESTION PAPER 2

58. (a) A – Mercury   (b) B – Capillary tube   (c) To increase the sensitivity   (d) for quick responsiveness

(e) (1) Thermocouple can measure high temperature more than 1500 ºC while Mercury thermometer cannot measure temperature more than 100 ºC.

(2) Thermocouple is rapidly sensitive to temperature change than mercury thermometer.

59. (a)(i) X – ray, infra – red ray , etc.   (ii) (1) Light is luminous while gamma is not luminous.   (2) Light cannot pass through a aluminium plate while gamma can pass through aluminium plate.

(b) $V = f\lambda$ » $f = v \div \lambda$ » $f = 3 \times 10^{8} \div 6 \times 10^{-7} = $ ***5.0 x 10 $^{-14}$ Hz***

60. (a) (i) $i = 90^{\circ} - 20^{\circ} = $ ***70 º***   (ii) $r = 131^{\circ} - 90^{\circ} = $ ***41 º***   (b) $n = \sin i \div \sin r$ $= \sin 70 \div \sin 41 = $ ***1.46÷***

61. (a) $\lambda = V \div f = 1400 \div 28000 = $ ***0.05 m***   (b) $d = V \times t \div 2 = 1400 \times$ $0.2 \div 2 = $ ***140 m***

62. (a) Boiling point $= 80$ ºC   (b) The bonds that holds the atoms in the liquid will break there by increasing the temperature of liquid and the liquid will be more volatile.

(c) 1 – evaporation occurs at any temperature while boiling occurs at the boiling point of a substance.

2 – Evaporation occurs at the surface of liquid while boiling occurs within the liquid

63. (a)
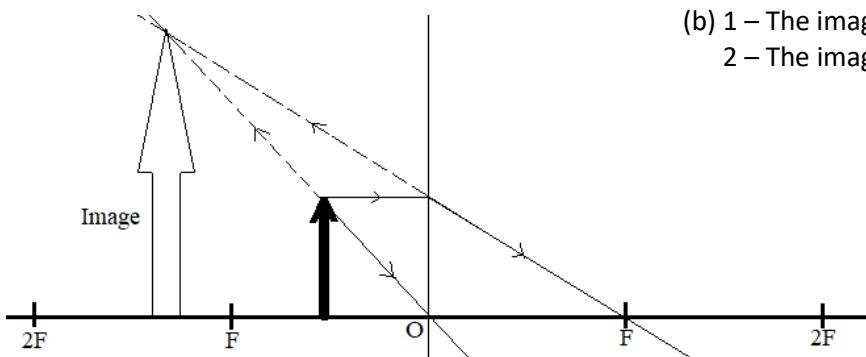
(b) 1 – The image is virtual.
2 – The image is magnified.

64. (a) Get two tins of the same size and one is painted black and the other one has a polished surface outside. Add same volume of water in both tins then put a source of heat (Bunsen burner/bulb) at the middle of the tins such that the distance between each tin to the source of heat is equal (same). Then start measuring temperature in each tin by using thermometers. The thermometer in the black tin shows a higher temperature reading than the one in the white tin. The black (dark) surface is a good absorber of heat

(b) Electricity runs through a tungsten filament and because it is so thin, it offers a good bit of resistance to the electricity. This resistance turns electrical energy into heat energy. The energy is enough to make the filament glow white – hot. When the filament warm – up its molecules vibrate harder and harder, causing acceleration of electric charge. The acceleration of electric charge produces electromagnetic radiation. This radiation transfers heat from the filament to the environment. The temperature of the bulb becomes constant because the rate of heat produced is equal to the rate of heat lost from the filament to the surrounding.

65. (a) To determine the upper fixed point of a thermometer place the thermometer bulb in steam (boiling pure water). The mercury will expand hence the mercury thread will be rise to the highest point. Then measure the length of the mercury thread and mark its highest point as upper fixed point.

(b)(i)

$$\frac{P_1 \times V_1}{T_1} = \frac{P_2 \times V_2}{T_2} \Rightarrow \frac{380 \times 1000}{200} = \frac{700 \times V_2}{400} \Rightarrow V_2 = \underline{\textbf{\textit{1000 cm3}}}$$

(ii) 1- mercury does not wet the glass while alcohol wet the glass. 2 – Mercury is silvery in colour hence easy to see while alcohol is colourless hence difficult to see.

(c)) (1) Thermocouple can measure high temperature more than 1500 °C while Mercury thermometer cannot measure temperature more than 100 °C.

(2) Thermocouple is rapidly sensitive to temperature change than mercury thermometer.

ANSWERS FOR 2016 G.C.E QUESTION PAPER 2

66. (a) Convection   (b) Metal plate **B**   (c) Metal **A,** because silvery surface is bad emitter of heat.

67. (a) Longitudinal waves   (b)

(C) the speed of sound will increase.

C – Compression

R – Rarefaction

68. (a) A – Incident ray, B – Refracted ray, C – Emergent ray and D – Reflected ray

(b) Angle between ray A and normal = i and angle between ray B and normal is r (mark these angles)

(c) $n = \dfrac{\sin i}{\sin r} = \dfrac{\sin 25}{\sin 16} = \dfrac{0.4226}{0.2756} = \underline{\textbf{\textit{1.53}}}$

69. (i) Aluminium is a non – magnetic material so it cannot magnetized hence no attraction of iron nails.

(ii) Iron – when the switch is ON, it will easily magnetize and more iron nails will be attracted to it and when the switch is OFF, it will easily demagnetize and lose all the iron nails.

(iii) Steel - when the switch is ON, it will hardly magnetize and small amount of iron nails will be attracted to it and when the switch is OFF, it will hardly demagnetize and lose some iron nails.

70. (a) **(1)** Transverse waves have crest and troughs while Longitudinal waves have compression and rarefaction.   **(2)** Transverse waves the vibration of particles are at right angle to the direction of a wave while Longitudinal wave the vibration of particles are parallel to the direction of a wave.

(b) Get a ripple tank and in the water place a vibrating bar which is connected to the power pack. Down a ripple tank put a white paper and on top of a ripple tank put a lamp. Then place a metal plate (barrier) in the ripple tank at an angle of 90 $^\circ$ to the direction of the wave.

(c)(i) T = t ÷ n = 3 ÷ 2 = 1.5s   (ii) ʎ = f ÷ V = 0.2 ÷ 0.67 = 0.300 m

ANSWERS FOR 2017 G.C.E QUESTION PAPER 1

71. (a) Air molecules will be heated which will cause them to expand hence pushing the piston upward.

(b)(i) Volume reduces which causes the increase of collision of gases hence high pressure.

(ii) P1 x V1 = P2 x V2 » 360 x 60 = P2 x 20 » P2 = ***1080 Pa***

72. (a) N = X – ray   (b) it is used to microwave oven. (c) They can pass through a vacuum. (d) Radioactive isotopes.

73. Size of the image = ***1.6 cm***   Position of the image = ***3.40 cm***
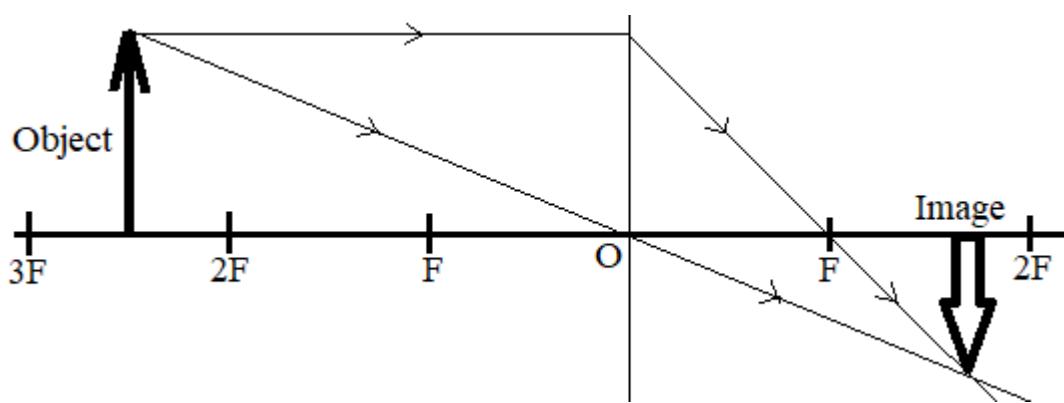
74. (a) R – Neutral point   (b) Q – north pole, T – South pole

(c) They prevent the magnetic field lines from coming out of the magnet.

(d) 1. Iron is easy to magnetize while steel is hard to magnetize. 2. Iron is easy to demagnetize while steel is hard to demagnetize.

ANSWERS FOR 2019 G.C.E QUESTION PAPER 1

75. (a) (i) Amplitude = 15m   (ii) wavelength = 60 cm

(b) f = $\Lambda \div$ V = 3.0 ÷ 0.6 = 5 Hz

76. (a) 1 – increase the number of turns on the coil.   2 – Increase the power supply to the coil.

(b) Because iron is strong and easily magnetize and it easily demagnetize.

77. (a)(i)

Apparent depth (cm)
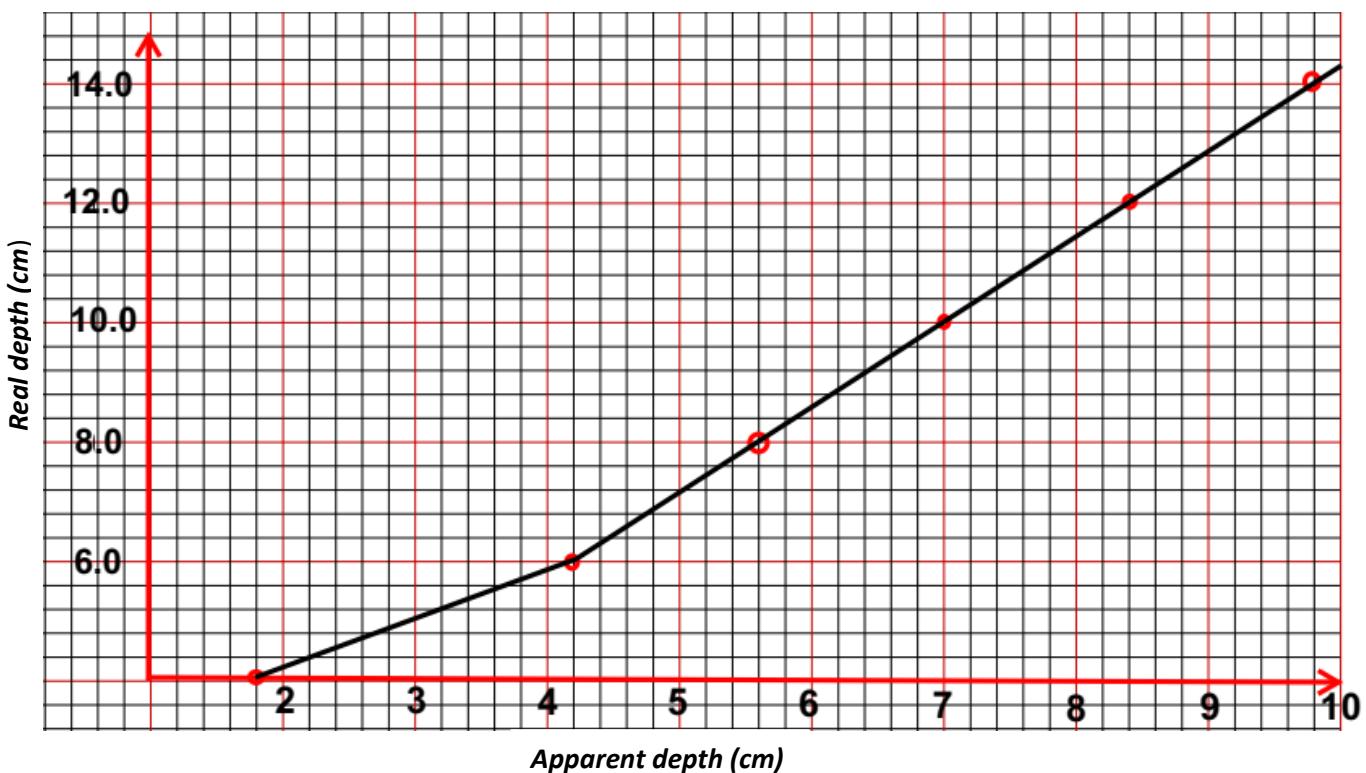
(ii) Refractive index of Paraffin

(iii) Gradient $= \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{12 - 6}{8.4 - 4.2} = \dfrac{6}{4.2} = \underline{\textbf{1.43}}$

(b) $\dfrac{n_{water}}{n_{oil}} = \dfrac{\sin i}{\sin r} \Rightarrow \dfrac{1.33}{1.45} = \dfrac{\sin i}{\sin 40} \Rightarrow \sin i = \dfrac{0.354906}{1.45}$

$\angle i = \sin^{-1}(0.5896) = \underline{\textbf{36.13}}°$

ANSWERS FOR GRADE 12 E.C.Z QUESTIONS

1. A	**11.**C	**21.**A	**31.**C	**41.**A	**51.**A
2. D	**12.**A	**22.**D	**32.**C	**42.**B	**52.**D
3. D	**13.**B	**23.**B	**33.**A	**43.**A	**53.**D
4. B	**14.**B	**24.**C	**34.**B	**44.**C	**54.**C
5. A	**15.**C	**25.**B	**35.**C	**45.**X	**55.**A
6. D	**16.**C	**26.**A	**36.**B	**46.**B	**56.**A
7. C	**17.**B	**27.**B	**37.**B	**47.**A	**57.**D
8. B	**18.**C	**28.**A	**38.**C	**48.**C	**58.**A
9. D	**19.**B	**29.**C	**39.**C	**49.**A	**59.**C
10.B	**20.**A	**30.**D	**40.**C	**50.**A	**60.**C ∗

ANSWERS FOR 2009 QUESTION PAPER 2

61.(a) X = Slip ring   Y = Carbon brush

(b) **1** - Rotate the coil faster.   **2**- Use stronger magnets **3.** – increase the number of turns on the coil.

62.(a)(i) Current (I) = **_3 A_**

(ii) Q = It = 3 x 3 = **_9 C_**   (iii) P.d = IV = 3 x 6 = **_18 V_**

(b) (i) P = VI » 2000 = 250 x I » I = **_8A_**

(ii) E = Pt = 2 x 5 = 10 kWh ∴ cost = 10 units x k900 = **_k9000_**

63.(a)
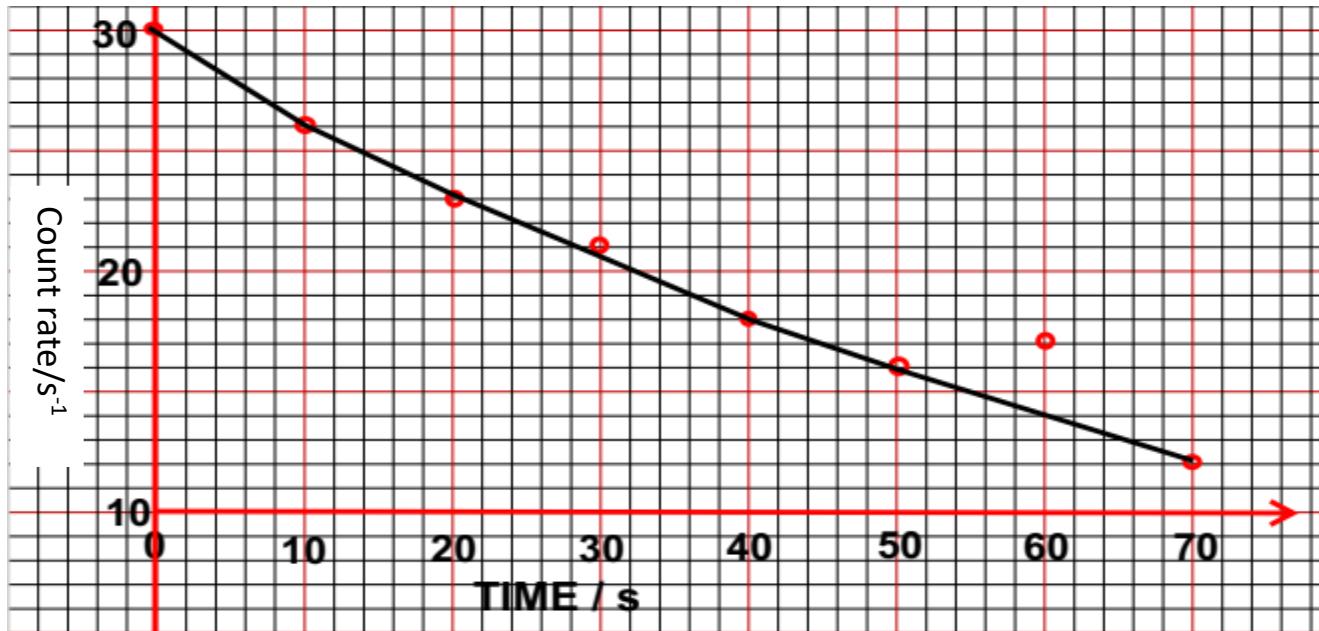
(b) From background radiation.   (c) $^{220}_{86}Rn \longrightarrow {}^{216}_{84}Po + {}^{4}_{2}He$
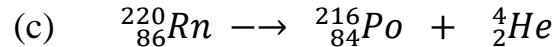
64 (a) $\frac{Vs}{Vp} = \frac{Ns}{Np} \implies \frac{Vs}{240}X\frac{200}{400} \implies Vs = \frac{240 \times 200}{400} = \underline{\textbf{\textit{120 V}}}$

64.(b) When A.C is connected to primary coil it creates magnetic field lines and as they grow toward the secondary coil, they are cut by the secondary coil thereby creating an induced current in the secondary coil. When the current alternate on the primary coil, the magnetic field lines dies away and they are cut as they are collapse, again induced current is produced on the secondary coil.

(c) 1 - Because iron is easy to magnetise.   **2** – Because Iron is easy to demagnetise'

ANSWERS FOR 2010 QUESTION PAPER 2

65.(a) Thermionic emission

(b) This is because anode has higher potential difference than cathode due to its greater ability to lose electrons.

(c) Y – Plate: Deflecting electron beam up and down.

   **Y - Plate:** Deflecting electron beam left and right.

(d) To prevent thermions (electrons) to ionise air and collide with them which can cause irregular image on the screen.
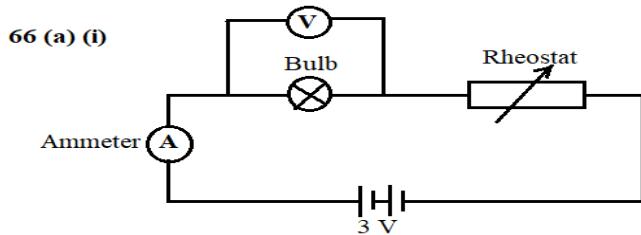
66 (a) (i)

66. (a) (ii) Set up the experiment as shown in a (a) (i) . Then alter the rheostat which changes both Potential difference and current. At each alternation read and record the potential difference and current. Use these values to determine the resistance of at each alternation.

66.(a)(iii) Read and record the value for voltmeter connected across the bulb as voltage. Again read and record the value for ammeter connected in series with the bulb as current. Then calculate the resistance by using the formula: $R = \dfrac{V}{I}$.

(b)(i) R = $\dfrac{V}{I} = \dfrac{2.5}{0.25} = \mathbf{10\ \Omega}$ 	**(ii)**
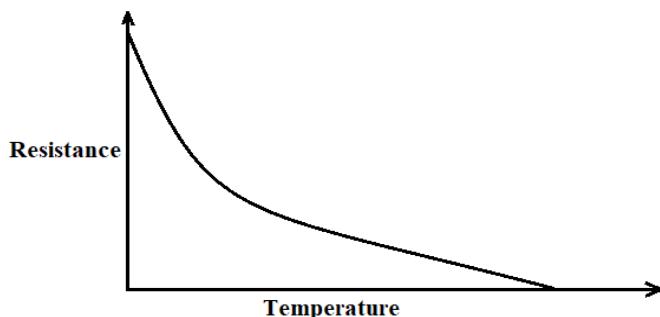
ANSWERS FOR 2011 QUESTION PAPER 2

67.(a) Wood 	**(b)**
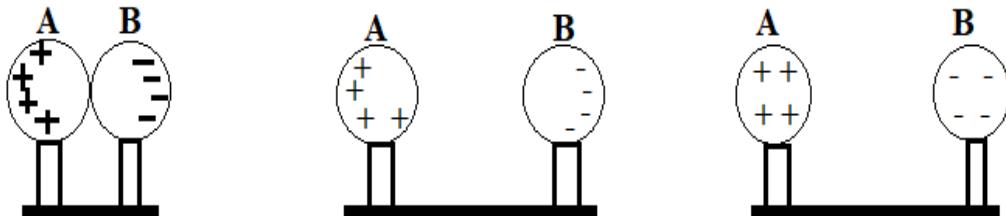
68.(a) Radioactive isotope is any element having several species with same chemical formula but different mass number whose nuclei are unstable and dissipate excess energy by spontaneously emitting radiation in the form of alpha, beta and gamma.

(b) Half – life is the time taken for the radioactive material to decay half of its mass.

(c)(i) Because at each occasion there was different background radiation.

(ii) Average count rate $= \dfrac{338+326+356}{3} = \underline{\mathbf{340\beta q}}$

(d)(i) Geiger – Muller (GM) tube.

(ii) Because gamma pass out of the body and its less likely to be observed by

cells than alpha radiation.

(iii) Where the injected radioactive is giving off large amount of energy in form of

gamma rays is the site of bleeding.

69. **(a) (i) The fuse** prevent too much current flowing into an electrical component.

When the fuse blows, the wire in the fuse milt whereby cutting the flow of current

hence prevent the electrical component to overheat or start fire.

(ii) If the LIVE WIRE get constant with the metal casing, the current will escapes

through the EARTH WIRE hence protecting the user from electric shock.

(b) E $=$ Pt $=$ 2000 x (6 x 60) $=$ **_720 000J_**

(c) The molecules near the surface move faster and have high kinetic energy than

those within the liquid. Due to their high kinetic energy, they break the

intermolecular forces and escape out of the liquid. In this, liquid loses its most

energetic ones are left behind. This average kinetic energy of the remaining

molecules therefore reduced and this results in a fall in temperature of the liquid.

ANSWERS FOR 2012 QUESTION PAPER 2

70. (a) By reducing the number turns on the secondary coil.

(b)(i) I $= \dfrac{P}{V} = \dfrac{36}{24} =$ **1. 5 *A***

(b)(ii) $\dfrac{Vs}{Vp} = \dfrac{Ip}{Is} \Rightarrow \dfrac{24}{240} = \dfrac{Ip}{1.5} \Rightarrow$ Is $= \dfrac{1.5 \times 24}{240} =$ **0.15 A**

71. (a)
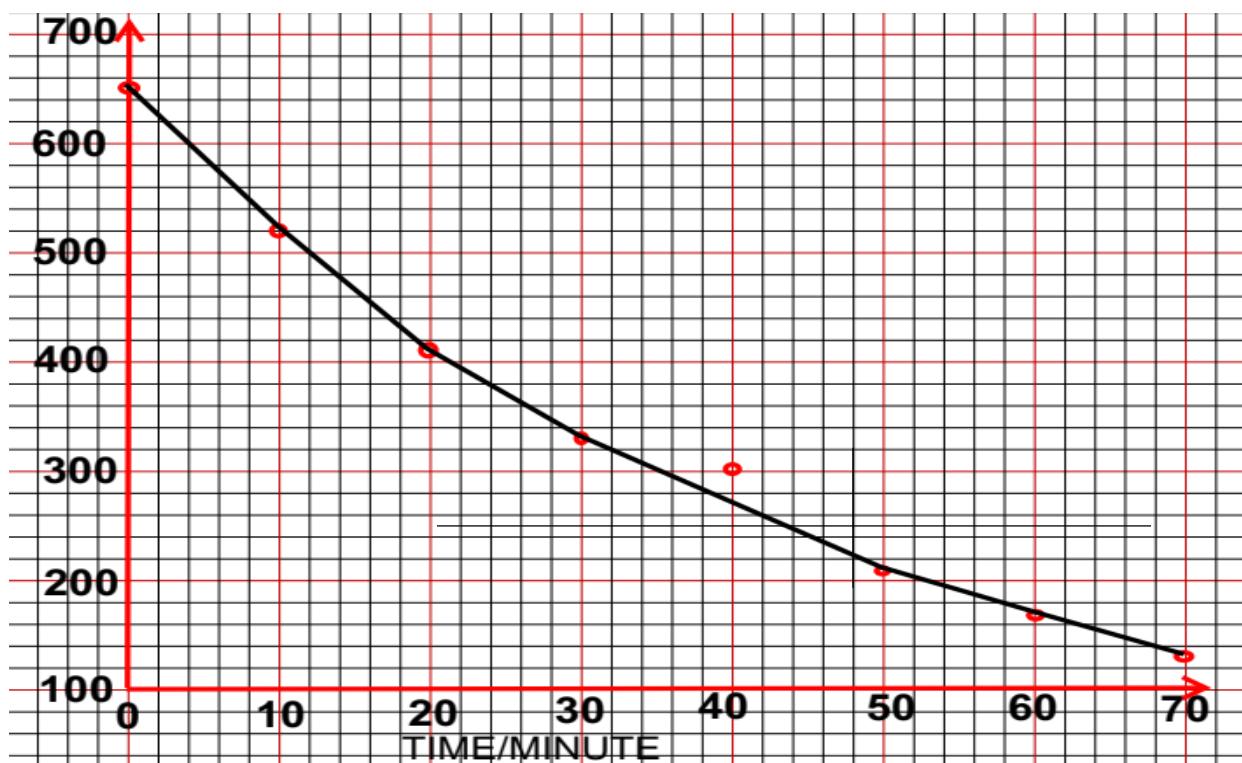
(b) Count rate = 300 counts/second.   (c) Time = ___44 minutes___

(d) Half – life = $\frac{28 + 34}{2}$ = ___31 minutes___

72.(a)   **(b)**
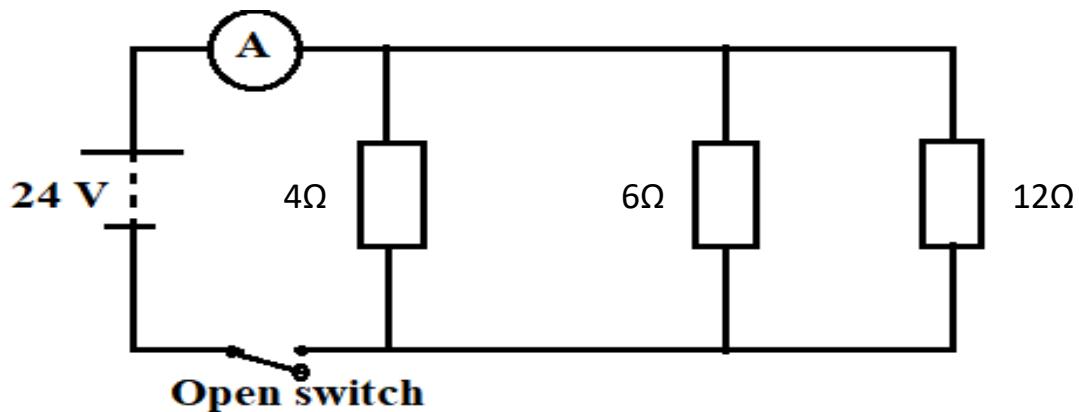
(b) $\frac{1}{R} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}$ » $\frac{1}{R} = \frac{1}{4} + \frac{1}{6} + \frac{1}{12}$ »

$\frac{1}{R} = \frac{3+2+1}{12}$ » $\frac{1}{R} = \frac{6}{12}$ » $R = 2\Omega$

(c)   4 Ω DVD : $I = \dfrac{V}{R} = \dfrac{24}{4} = \underline{\textbf{6 A}}$

6 Ω Shaving machine : $I = \dfrac{V}{R} = \dfrac{24}{6} = \underline{\textbf{4A}}$

12 Ω Radio cassette : $I = \dfrac{V}{R} = \dfrac{24}{12} = \underline{\textbf{2 A}}$

ANSWERS FOR 2013 QUESTION PAPER 2

73. (a) $I = \dfrac{V}{R} = \dfrac{4.0}{4.0} = \underline{\textbf{1A}}$ **(b)(i)** $t = \dfrac{Q}{I} = \dfrac{2.0}{1.0} = \underline{\textbf{2s}}$

(ii) E = VIt = 4 x 1 x 2 = $\underline{\textbf{8 J}}$

74.(a)(i) Neutron = 214 – 82 = 132   (ii) Electrons = 82

(b) $^{214}_{82}Pb \longrightarrow {}^{214}_{83}Bi + {}^{0}_{-1}e$
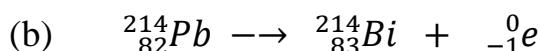
75.(a) (i) Half – life = 1.5 hrs

(ii) By determining the time taken for the radioactive substance to decay half of its mass.

(b) 1- It has a charge of negative one (-1).

2- It can be stopped by 5mm thick of aluminium.

3 – it is deflected toward positive terminal in electric field.

(d) Get a radioactive material, Count Meter, a sheet of paper and aluminium. Put a count meter and a radioactive substance apart so that the count meter can detect radiation from a radioactive substance. Then put a paper at the middle, if the count meter detect radiation then the substance is emitting either beta or gamma radiations because alpha radiation can be stopped by the paper and there could be no detection by a count meter. Remove a paper and put aluminium, and if the count meter detect any radiation meaning a substance is emitting gamma radiation because alpha and beta can be stopped by a sheet of aluminium.

ANSWERS FOR 2016 G.C.E QUESTION PAPER 2

76.(a) A – Beta radiation   B – Gamma radiation   C – Alpha radiation

(b) It has no charge (neutral)   (b) $^{232}_{90}Th \longrightarrow {}^{228}_{88}Rn + {}^{4}_{2}He$

77.(a) Electric charge is the product of current with time while electric current is the rate of flow charge.

(b)(i)

(b)(i) R $= \frac{V}{I} = \frac{6}{1.2} = $ **4Ω**

(c) (i) R $= \frac{R2+R1}{R2 \; x \; R2} = \frac{3+2}{2 \; x \; 3} = $ **2.4Ω**
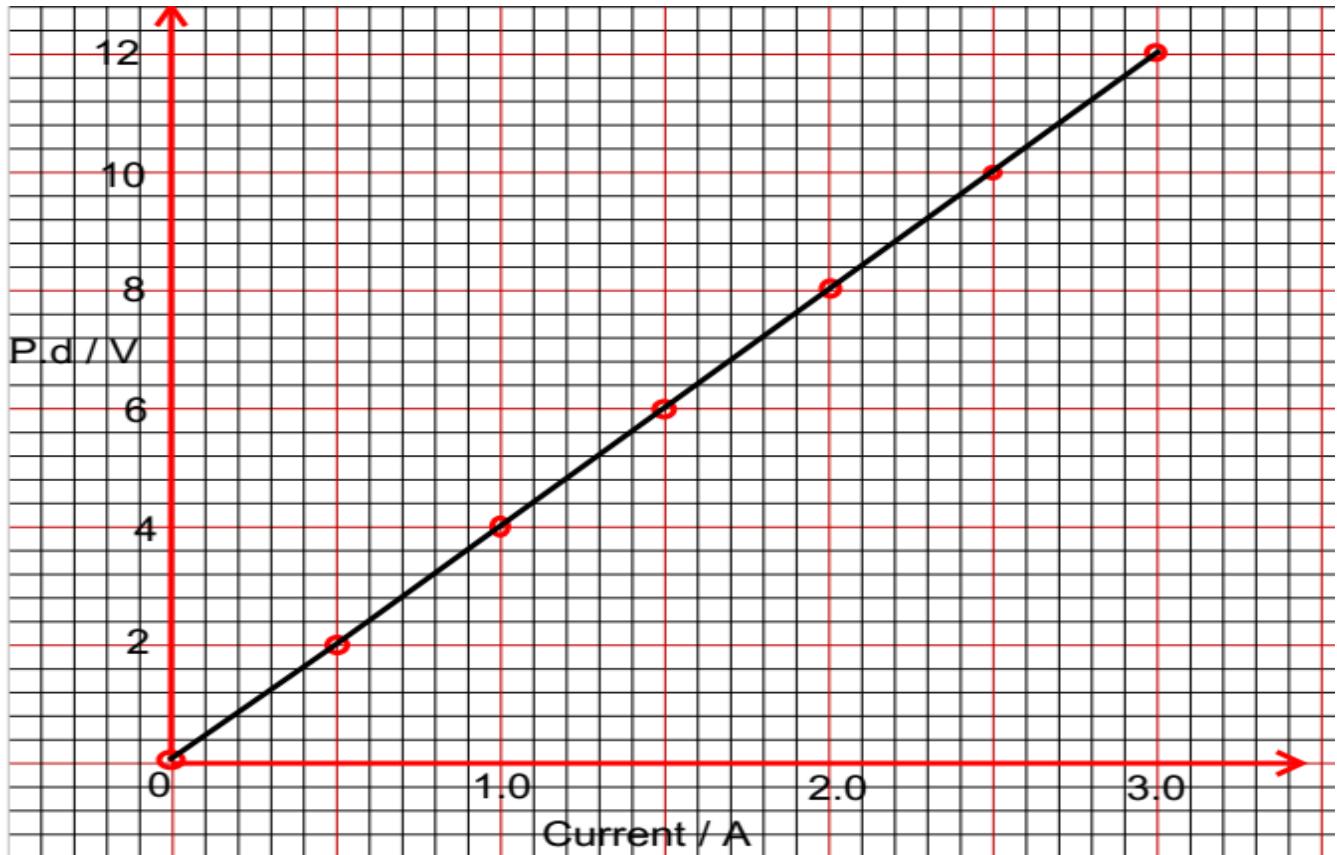
   (ii)   I $= \frac{V}{R} = \frac{12}{2.4} = $ **5A**

ANSWERS FOR 2017 G.C.E QUESTION PAPER 1

78. (a) Alpha particle is a radiation whose nature is like that of helium atom with a mass of

4 a.m.u and a charge of +2.

(b) $^{210}_{84}Po \longrightarrow \; ^{206}_{82}Rn \; + \; ^{4}_{2}He$
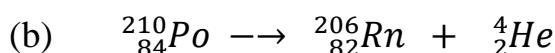
(c) Alpha – is used to detect smoke in industries.

79.(a) R $= \frac{R2 \; x \; R1}{R1+R2} = \frac{12 \; X \; 6}{6+12} = $ **4Ω**

(b) I $= \frac{V}{R} = \frac{12}{6} = $ **2A**

(c) I $= \frac{V}{R} = \frac{6}{6} = $ **1 A**

80.(a)

Bulb

Rheostat

Ammeter (A)

(b)

40.0 V
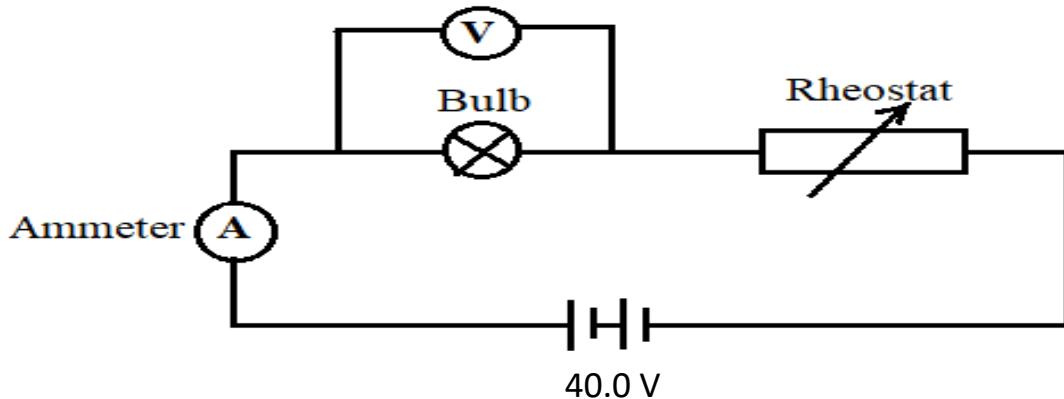
(b)

(b)
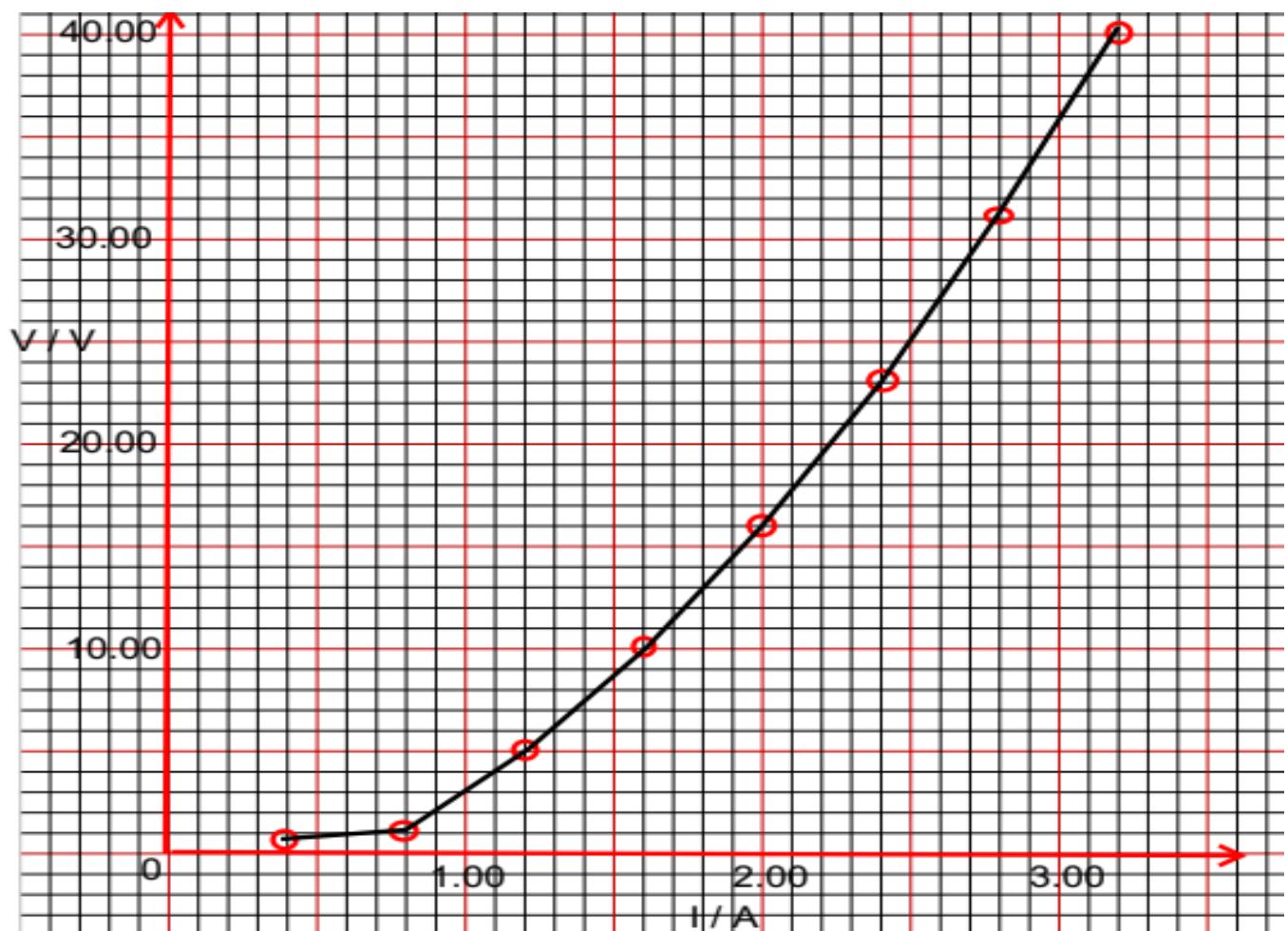
(c) Non – Ohmic because the graph has not obeyed ohm's law. (the graph is not straight)

(d) (i) Potential difference = **27 V**

(ii) $R = \dfrac{V}{I} = \dfrac{27}{2.6} = 10.3846 = \underline{\textbf{10.39 }\Omega}$

81.(a) A beta particle is a particle whose nature is like that of an electron with zero mass and a charge of -1.

(b) Nucleon number = 223 and Proton number = 98

(c)(i)
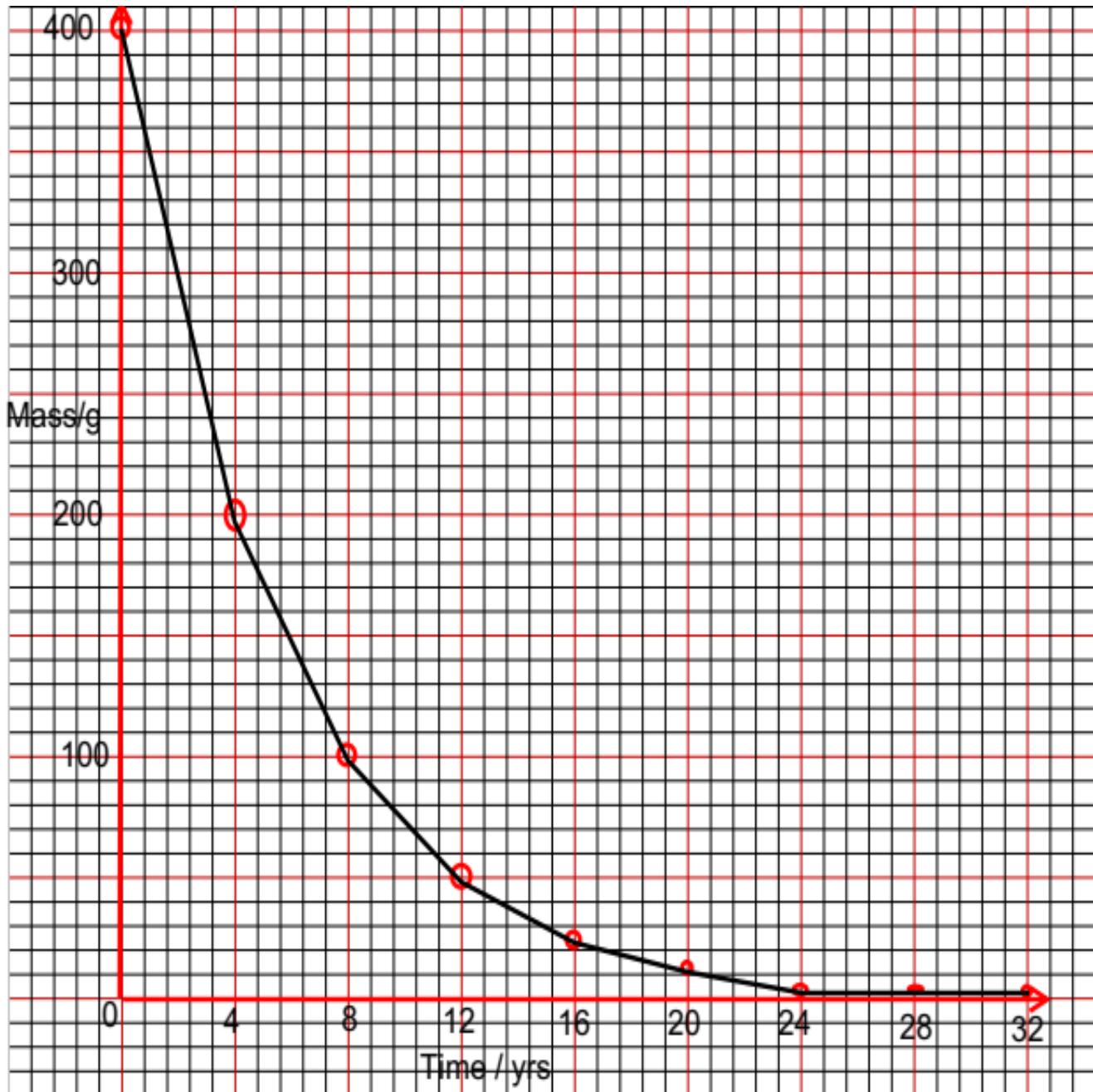
(c)(ii)

$$\frac{A}{A_0} = \left(\frac{1}{2}\right)^{\frac{t}{T}} \Rightarrow \frac{40}{400} = (0.5)^{\frac{t}{T}} \Rightarrow \log 0.1 = \frac{t}{4} \times \log 0.5 \Rightarrow t = \underline{12.86 \text{ years}}$$

(iii) Any hottest substance (sun), and Uranium

ANSWERS FOR 2018 G.C.E QUESTION PAPER 1

82.(a)(i)
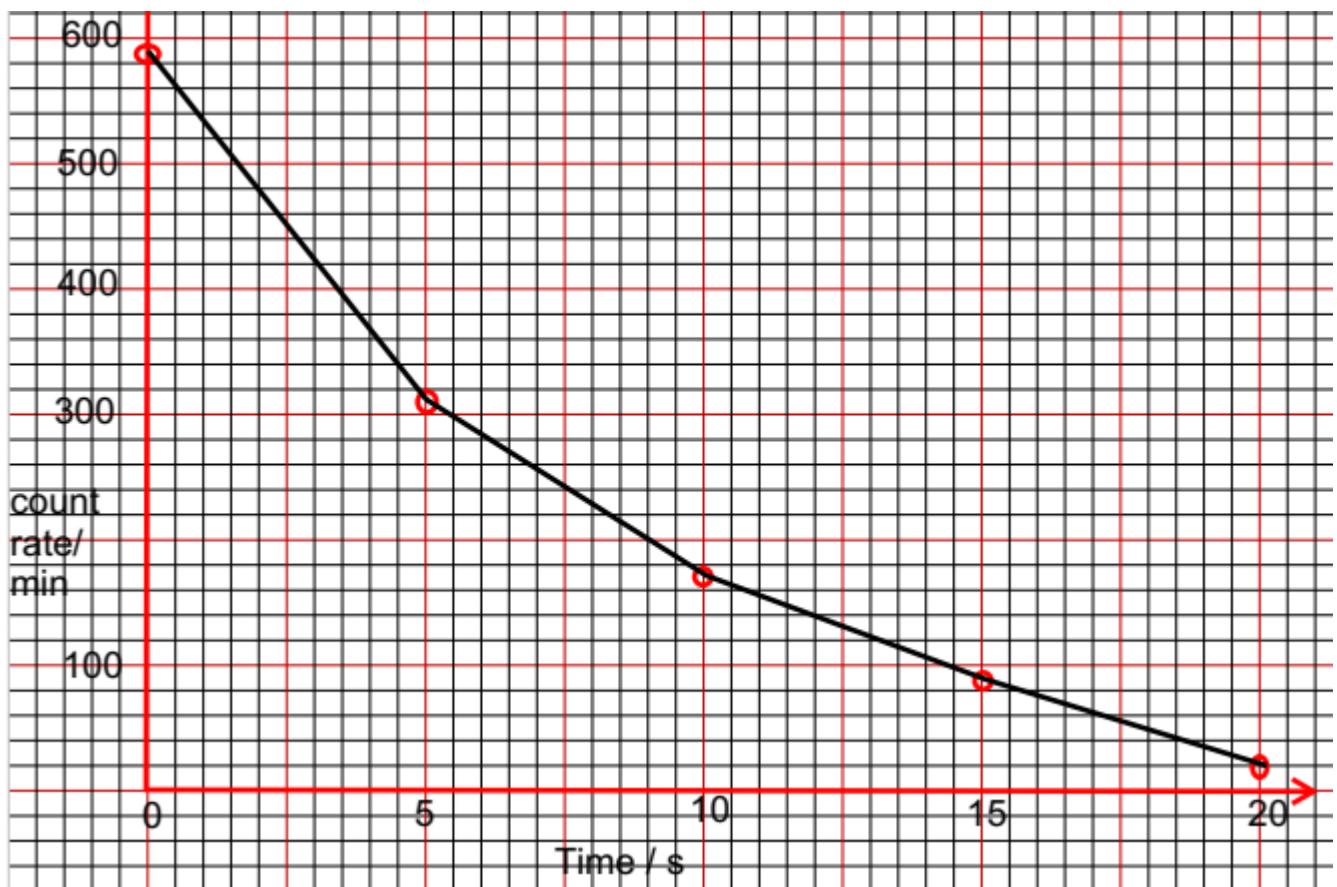
(ii) Half – Life is the time taken for a radioactive substance to decay half of its mass.

(iii) Half – life = (6s + 6s) ÷ 2 = _**6 seconds**_

(b)

$$\frac{A}{A_0} = \left(\frac{1}{2}\right)^{\frac{t}{T}} \Rightarrow \frac{7}{8} = (0.5)^{\frac{t}{T}} \Rightarrow \log 0.875 = \frac{312}{T} \text{ X } \log 0.5 \Rightarrow T = \underline{1619.93 \text{ seconds}}$$

ANSWERS FOR 2019 G.C.E QUESTION PAPER 1

83.(a)(i) Positive charge   (ii) coulomb (C)

(b) A paper is induced by a charged Perspex disc and the paper rather polarized therefore, the negative and positive charges move on a separate side and that side where negative charges are, attracted to the rod because unlike terms attract.

(c) Negative charge – because some electrons escape from fur and move to the polythene hence the it increases in the number of electrons therefore, it will be negatively charged and the fur decreases in the number of electrons hence it will be positively charged.

84. (a) $R = R1 + \frac{1}{R2}$　»　$R = 2 + \frac{1}{3} = 2.33\Omega$

(b) $R = \frac{R2 \, x \, R3}{R3+R2} + R1 = \frac{3 \, x \, 6}{6+3} + 2 = 4\Omega$

(c) $V = IR = 3 \, x \, 2 = 6$ V　　　(d) $I = \frac{V}{R} = \frac{12}{4} = 3$ A

85. (a) Nuclear fission is the splitting of a nucleus of an atom due to neutron bombardment to release a large amount of energy.

(b)(i) Original mass = **_80 Kg_**　　　(ii) quantity remained = **_10 kg_**

(iii) Half – life = **_2 days_**

86. (a)(i) Beta particle (ii) Neurons = 24

(iii) Sodium – 24 has 13 neutrons in its nucleus whereas sodium – 23 has 12 neutrons in its nucleus.

(b)(i) To know the amount of background radiation.

(ii) It has not become radioactive because the number of count rate is high before the treatment than after the treatment. This means there were more radiations in food sample before than after.

(iii) It is used in the treatment of cancer.

(iv) - Point the source of radiation away from the people.

- Wear gloves and use tongs when handling substances that emit radiations.