

SCIENTIFIC INVESTIGATIONS AND SKILLS

SECTION A

2021 – 1

Which of the following is a symbol for SI unit of time?

- A. s
- B. min
- C. hr
- D. yr.

2021 – 2

Which of the following led to the development of Physics?

- A. Need to observe scientific phenomena
- B. Need to predict scientific phenomena
- C. Need to explain scientific phenomena
- D. Need to test scientific phenomena

2021 – 7

Which instrument would be used to accurately measure volume of liquid in an experiment?

- A. Beaker
- B. Measuring cylinder
- C. Volumetric flask
- D. One-mark pipette

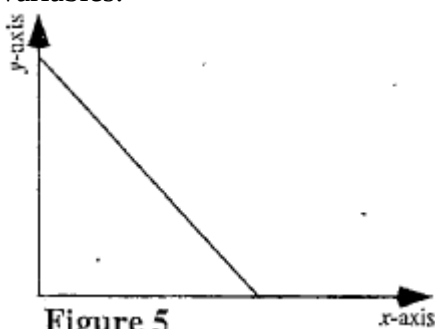
2021 – 17

What is the last stage of scientific investigation?

- A. Drawing conclusion
- B. Recording data
- C. Interpreting data
- D. Testing hypothesis.

[2005-28]

Figure 5 shows a graph of the relationship between independent and dependent variables.



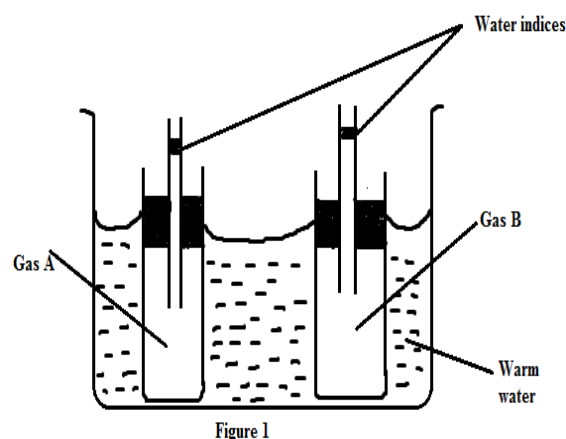
Which of the following statements is true about the graph?

- A. As independent variable increases, the dependent variable decreases.
- B. As dependent variable increases, the independent variable remains the same.

- C. As independent variable decreases, the dependent variable increases.
- D. As independent variable increases, the dependent variable increases also.

2015

Figure 1 is a diagram showing a set-up of an experiment. Use it to answer Questions 8 and 9



8. What is the aim of the experiment?
 - A. To compare the movement of water indices
 - B. To compare expansion of gases
 - C. To investigate the effect of heat on liquids
 - D. To compare expansion of liquids
9. What is the function of the water in the beaker?
 - A. To heat the gases
 - B. To hold the gases
 - C. To keep out atmospheric air
 - D. To maintain pressure of gases

2013 Q1

A student conducted an experiment to find out the effect of length of nichrome wire on electrical resistance. Which of the following was the independent variable in the experiment?

- A. Length of nichrome wire
- B. Number of cells
- C. Amount of current

- D. Resistance of nichrome wire

Answers to the questions

2021 – 1. A
2021 – 2. C
2021 – 7. B
2021 – 17. A

2005-28. A
2015 – 8. B
2015 – 9.A
2013 – 1. A

SECTION B

2014 – 31a

Why it is important to control variables that are not tested in an experiment? (1 mark)

- To maintain the accuracy of results of the experiment

2011-37.

A student carried out an experiment to find out whether sugar dissolves faster in liquid X than in liquid Y.

- What would be the hypothesis in the experiment? (1 mark)
 - Sugar dissolves faster in liquid X than liquid Y or Sugar dissolves faster in liquid Y than in liquid X
- Identify any **three** variables that were controlled in the experiment. (3 marks)
 - Temperature of liquid, amount of liquid, amount of sugar, time taken for solubility

2010-36.

- What is the purpose of a conclusion during scientific investigation? (1 mark)
 - To relate conclusions to hypothesis.
- Draw a safety symbol that could be used to show that a substance is harmful in a laboratory. (1 mark)



2009-32.

- Why is it important to wear shoes in a laboratory? (1 mark)
 - To avoid stepping on pieces of broken glass accidentally
 - What does 'interpolation' mean in graph? (1 mark)
 - Interpolation means reading values between consecutive recorded values
- c. A student conducted an experiment to investigate the relationship between the quantity of water and the time taken to heat it to 60°C.
- State any **three** materials that were used in the investigation. (3 marks)
 - Beaker, stopwatch, thermometer
 - Mention any **two** errors that could arise from the investigation. (2 marks)
 - misreading the scale of the measuring cylinder
 - poor timing when controlling the stop watch
 - misreading the scale of the thermometer

2008-32

- Apart from using graphs, give any **two** ways of presenting data. (2 marks)
 - Table, pie chart
- Mention any **two** advantages of presenting data in form of a graph. (2 marks)
 - It provides the relationships between quantities quite accurately.
 - Errors associated with experimental results are averaged.

2008-40.

- Give any **two** laboratory safety measures. (2 marks)
 - Never drink, taste, or eat anything in the laboratory
 - Never run or play in the laboratory
- Draw the symbol that is used to represent poisonous and toxic substances. (2 marks)





2007-38.

- a. State the purpose of an investigation. (1 mark)
➤ To develop our knowledge and understanding about something.
- b. **Table 4** shows data collected by a student in an investigation.

Table 4

Age of child (months)	Mass of child (Kg)
1	
2	
3	
4	

- (i) What was the aim of the investigation? (1 mark)
➤ To find the relationship between the age and the mass of children
- (ii) What conclusion can be drawn from the investigation? (1 mark)
➤ A child's mass increases as the age increases.

2006-38.

- a. State any **two** sources of error in scientific investigations. (2 marks)
➤ Inaccurate observation
➤ Using improper apparatus
- b. When investigating time taken for a duck egg and a chicken egg to cook, a student boiled a duck egg in a frying pan using an electric stove set at maximum. She then boiled a chicken egg in a frying pan using the same electric stove set at maximum.
- (i) Identify a variable in this experiment that was controlled. (1 mark)
➤ Temperature
- (ii) Name the variable that needed controlling. (1 mark)
➤ Temperature
➤ Type of material
- (iii) What is the importance of repeating an investigation? **(1 mark)**
➤ It helps a researcher to have accurate results
➤ It helps to minimise errors that arise in the experiment

2004-36.

- a. What form of accident in a laboratory can be avoided by taking the following measures?
- (i) Washing hands after handling chemicals **(1 mark)**
➤ Toxic substances entering our body through eyes or the mouth
- (ii) Wearing shoes **(1 mark)**
➤ Stepping on sharp objects
- b. State **two** consequences of laboratory accidents. **(2 marks)**
➤ Injury
➤ Breaking of instruments

2008-42.

- c. State any **two** sources of error in the experiment described in **42.a. (2 marks)**
➤ poor apparatus
➤ inaccuracy of observation

2004-43.

- a. State the final stage in a scientific investigation. (1 mark)
 ➤ Drawing a conclusion

FORCE SECTION A

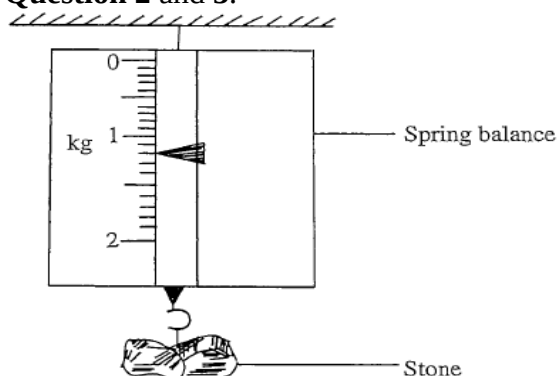
2021 – 3

What happens to the weight of a body when its mass is doubled?

- A. It remains the same
- B. It is halved
- C. It increases
- D. It doubles**

[2012-2,3]

Figure 1 is a diagram showing a box hanging on an instrument. Use it to answer **Question 2** and **3**.



2012-2.

The instrument in Figure 1 is called a

- A. beam balance
- B. spring balance**
- C. scale balance
- D. weight balance

2012-3.

What is the mass of the box?

- A. 2.3g
- B. 2.6g**
- C. 26g
- D. 260g

2011-2.

Figure 1 is a diagram showing a box hanging on a spring balance.

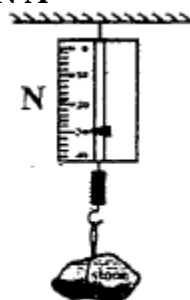


Figure 4

What is the mass of the box?

- A. 2kg
- B. 20kg**
- C. 200kg
- D. 2000kg

2009-23.

An object has a mass of 60 kg on earth. What will be its mass on the moon?

- A. 10 kg
- B. 60 kg**
- C. 360 kg
- D. 600 kg

2007-16.

What is the net force on a 600g mass resting on the ground?

- A. 0N
- B. 0.6N**
- C. 6N
- D. 60N

2004-12.

Figure 4 shows a spring balance with a stone hung on it.

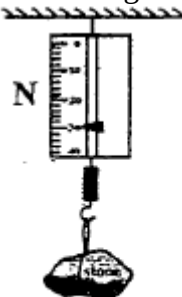


Figure 4

What is the mass of the stone?

- A. 300N
- B. 30N**
- C. 30kg

D. 3kg

2004-17.

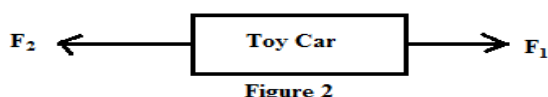
Which of the following represents only forces?

- A. mass, magnetic attraction, weight
- B. repulsion, weight, friction
- C. friction, magnet, weight
- D. weight, repulsion, mass

2003-18.

What is the mass of an astronaut on the moon if his mass on the earth is 90kg?

- A. 900kg
- B. 540kg
- C. 150kg
- D. 90kg



What would happen to the toy car if two equal but opposite forces were applied to the car at the same time?

- A. It would stop moving.
- B. It would change direction.
- C. It would move towards F_1 at a higher speed.
- D. It would continue moving towards F_1 at the same speed

2010-11.

Which of the following is **not** an effect of force on an object?

- A. change in size
- B. change in speed
- C. change in mass
- D. change in direction

2006-4.

If a force is exerted on an object in the direction of its motion, the object will

- A. accelerate.
- B. decelerate.
- C. change direction.
- D. stop moving.

[2004-7,8]

Figure 2 is a diagram showing forces acting on a plank. Use it to answer questions 7 and 8.

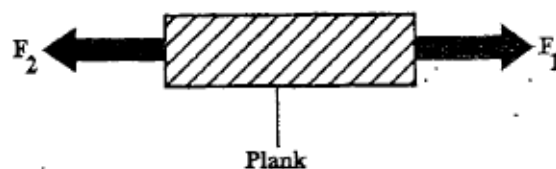


Figure 2

2004-7.

If the plank is at rest and two equal forces are exerted on it at the same time, what will happen to the plank?

- A. It will move towards F_1 .
- B. It will move towards F_2 .
- C. It will either move upwards or downwards.
- D. It will remain at rest.

2004-8.

If $F_1 = 10\text{N}$ and $F_2 = 15\text{N}$, what will happen to the plank?

- A. It will remain at rest.
- B. It will move towards F_2 .
- C. It will move towards F_1 .
- D. It will either move upwards or downwards.

3. Friction

2012-5.

Which of the following are ways of reducing friction?

- 1. using lubricants
 - 2. using rollers
 - 3. using long planks
 - 4. using ball bearings
- A. 1, 2 and 3
 - B. 1, 3 and 4
 - C. 1, 2 and 4
 - D. 2, 3 and 4

2007-15.

Which one of the following is an advantage of friction in everyday life?

- A. produces heat during the movement of bicycle parts
- B. makes the parachute of a falling man to land quickly
- C. makes cars and bicycles to accelerate
- D. makes nails and screws to be held in wood

2006-10.

Which of the following are ways of reducing friction on an inclined plane?

1. applying oil on it
2. reducing its length
3. polishing its surface
4. increasing the area of contact

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

ANSWERS TO THE QUESTIONS

Force and mass

2012-2. B
2012-3. C
2011-2. B
2009-23. B
2007-16. A
2004-12. D
2004-17. B
2003-18. D

Motion

2010-2. D
2010-11. C
2006-4. A
2004-7. D
2004-8. B

Friction

2012-5. C
2007-15. D
2006-10. A

SECTION B

2021 – 32b

Explain the effect of unbalanced forces on an object in motion. (5 marks)

- When greater force acts in the direction in which the body is moving and there is less opposite force, the body continue moving with greater speed in the direction it was moving. When greater force acts in the opposite direction it was moving and less force acts in the direction it was moving, the body moves in the opposite direction it was moving.

2012-31.

a. Define “force”. (1 mark)

- Pull or push on an object

2008-39.

Figure 9 is a diagram showing a stone hanging on a spring balance.

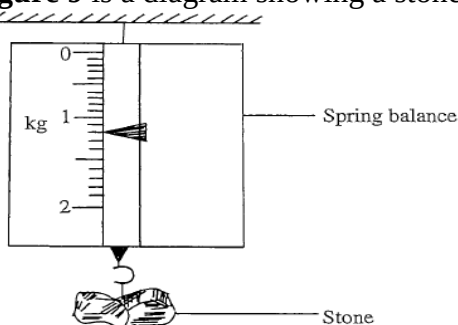


Figure 9

a. What is the reading of the spring balance? (1 mark)

- 1.2kg

b. Calculate the weight of the stone. (2 marks)

- 1 kg is equal to 10 N. $1.2 \text{ kg} \times 10 \text{ N/kg} = 12.0 \text{ N}$

2. Motion

2009-34.

a. State the SI unit of force. (1 mark)

- Newton

b. Give any **three** effects of the force on an object. (3 marks)



- change the speed of moving object
- change the shape of object
- change the direction of motion

2009-39.

Figure 10 is a diagram of a balloon filled with air and supported by a string passing through a straw attached to the balloon.

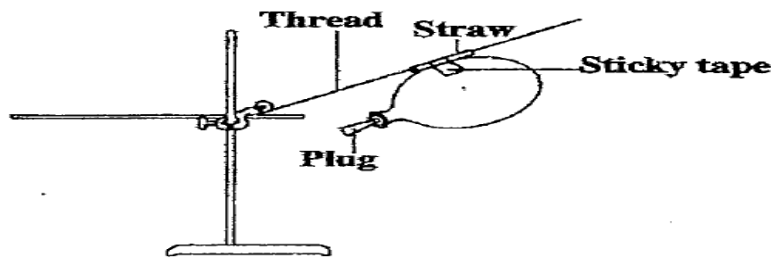


Figure 10

What will happen if the plug is removed releasing the air? **(1 mark)**

- The balloon will go up along the thread and get smaller.
- b. Explain your answer to 39.a. **(2 marks)**

When the plug is removed, the air in the balloon vents downward. Then the force is applied in the opposite direction.

2003-39.

- a. **Figure 13** shows forces **F₁** and **F₂** acting on a stationary object

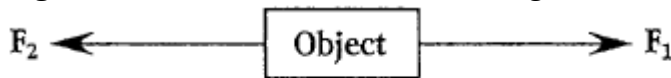


Figure 13

- (i) If **F₁** is 20N and **F₂** is 20N, work out the resultant force acting on the object. **(2 marks)**

- 0N ($20 - 20 = 0$)

- (ii) What will happen to the object in 39. a. (i)? **(1 mark)**

- The object will remain at rest.

3. Friction

2012-31.

- b. Mention any **three** advantage of friction in our daily lives. **(3 marks)**

- Walking
- making screws and nails work
- making things stop motion
- writing

2011-33.

- a. What form of energy is produced as a result of friction between two objects? **(1 mark)**

- Heat energy

- b. Mention any three disadvantages of friction on a bicycle. **(3 marks)**

- Friction causes wear and tear.
- Friction slows down motion.
- Friction causes noise pollution

2008-35.

- a. Give **two** ways in which friction is important in everyday life. **(2 marks)**

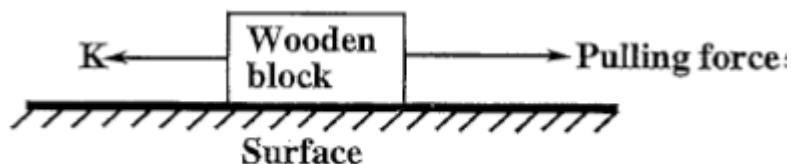
- Walking
- Making screw and nails work

- b. Why does a stone which is thrown into the air return to the earth? **(1 mark)**

- Because of gravitational force

2007-39.

Figure 9 is a diagram of a wooden block being pulled across a surface.



a. Name the force marked **K**. (1 mark)

➤ Frictional force

b. When the pulling force is increased, what will happen to the following?

(i) force marked **K**: (1 mark)

➤ It will decrease

(ii) motion of the block: (1 mark)

➤ The block will move towards the pulling force

2004-40.

a. Describe how you would make a ball point casing move small pieces of paper without touching the papers. (3marks)

➤ Rub the ball point casing with the hair and bring it close to pieces of paper. Then the ball point casing would attract the pieces of paper.

b. Give one advantage of a frictional force. (1 mark)

➤ frictional force helps walking.

➤ A frictional force makes things stop moving.

➤ A frictional force makes screws and nails work.

2003-39.

b. Mention **one** disadvantage of frictional force. (1 mark)

➤ It produces noise.

➤ It wears out things.

➤ It slows down movement

2020 -3

Give any two effects of balanced forces

• They make a body to be at equilibrium

• They cause no motion

1. Force and mass

2012-42.

a. State any **two** differences between “weight” and “mass” of an object. (2 marks)

➤ Mass is quantity of matter in object, while weight is pulled of the earth.

➤ Mass does not change in magnitude, while weight changes in magnitude depending on the environment.

2. Motion

2012-42.

b. Explain why a force **does not** always cause motion. (3 marks)

➤ because of static frictional force which prevents a body from starting moving hence no motion is caused

WORK AND ENERGY

1. Work

2010-3.

Which of the following energy changes takes place when a mango fruit falls from a tree?

A. *kinetic → potential → heat + sound*

B. *potential → kinetic → heat + sound*

C. *chemical → kinetic → potential*

D. *chemical → kinetic → heat + sound*

2004-1.

The ability to do work is

A. power.

B. *friction.*

C. *motion.*

D. *energy*

.

2. Energy

2012-4.

Which of the following is the SI unit of energy?

A. *joule*

B. *newton per metre*

C. *newton*

D. *watt*



2011-1.

Which of the following devices changes heat energy to electrical energy?

- A. *thermocouple*
- B. *thermostat*
- C. *dynamo*
- D. *motor*

2010-4.

How much work is done if an effort of 500N is applied to drag a load on an inclined plane 200cm long?

- A. *2.5 J*
- B. *250 J*
- C. *1,000 J*
- D. *100,000J*

2010-28.

Which of the following devices converts heat energy to electrical energy?

- A. *bicycle dynamo*
- B. *electric motor*
- C. *thermostat*
- D. *thermocouple*

2009-24.

Which one of the following transducers changes sound energy to electrical energy?

- A. *Thermocouple*
- B. *Loudspeaker*
- C. *Electric guitar*
- D. *Microphone*

2004-3.

Which of the following transducers converts sound energy into electrical energy?

- A. *amplifier*
- B. *loudspeaker*
- C. *bulb*
- D. *microphone*

2004-24.

Mechanical Energy can be in a form of

- A. *Potential energy or Kinetic energy.*
- B. *Kinetic energy or Sound energy.*
- C. *Potential energy or Sound energy.*
- D. *Kinetic energy or Electrical energy.*

[2003-3,4]

Figure 1 shows a pendulum oscillating between points **Y** and **Z**. Use it to answer **Questions 3 and 4**.

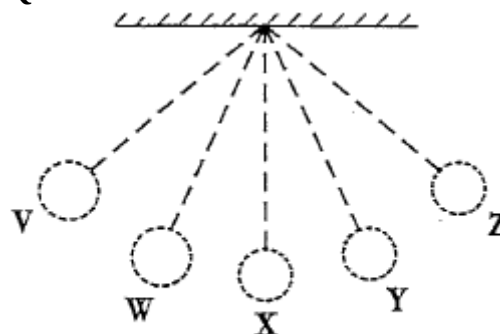


Figure 1

2003-3.

At which positions does the pendulum have no kinetic energy?

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

2003-4.

Where does the pendulum have maximum speed?

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

ANSWERS TO THE QUESTIONS

1. Work

- 2010-3. B
- 2004-1. D

2. Energy

- 2012-4. A
- 2011-1. A

- 2010-4. C
- 2010-28. D
- 2009-24. D
- 2004-3. D
- 2004-24. A
- 2003-3. D
- 2003-4. C

SECTION B

1. Work

2012-33. A student raises a load of 300 N through a height of 4 m.

a. Calculate the work done in Nm. (3 marks)

➤ $300\text{N} \times 4\text{m} = 1200\text{Nm}$

2. Energy

2012-33.

A student raises a load of 300 N through a height of 4 m.

b. What is the amount of energy gained by the load? (1 mark)

➤ $300\text{N} \times 4\text{m} = 1200\text{J}$

c. Give a reason for the answer in 33b. (2 marks)

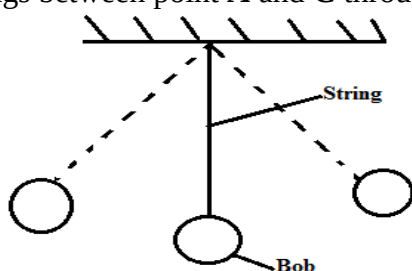
➤ The amount of work done on the load must be equal to the energy gained by the load.

2011-34.

a. Define “energy” (1 mark)

➤ The ability to do work.

b. Figure 8 is a diagram showing a pendulum. If the bob is pulled to point A and released, it swings between point A and C through the rest position, B.



(i) What form of energy will be maximum at point B? (1 mark)

➤ Kinetic energy

(ii) Give a reason for the answer in 34.b.(i). (1 mark)

➤ Because velocity of a pendulum is maximum

(iii) What energy changes take place as the bob moves from point A to C? (2 marks)

➤ Potential energy → Kinetic energy → Potential energy

2010-37.

a. State the law of conservation of energy. (1 mark)

➤ Energy cannot be created or destroyed, but changes from one form to another

b. Give the energy changes which take place in a dynamo. (1 mark)

➤ kinetic energy → electrical energy

2010-38.

Explain briefly why light energy is important to living organisms. (3 marks)

➤ Because, without light energy, plants cannot produce oxygen through photosynthesis.
As a result, animals cannot live since they depend on plants.

2005-33.

Figure 8 is a diagram showing positions of a ball after being released from position A and allowed to bounce from the ground to position C.

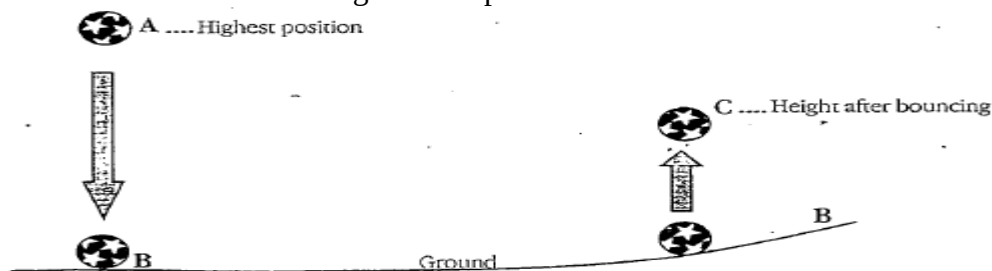


Figure 8

a. What type of energy was being gained by the ball as it dropped from position A to B?

(1 mark)

- Kinetic energy
- b. Write the energy changes that occur when the ball moves from position **A** to **C**. (2 marks)
 - The ball loses its kinetic energy while it gains gravitational energy.
- c. Why does the ball fail to reach the same height as position **A** on bouncing back? (1 mark)
 - It loses energy as heat and sound when it bounces

2004-39.

- a. Describe the energy changes that take place in a bicycle dynamo. (1 mark)
 - From kinetic energy to electrical energy.
- b. What name is given to devices that change energy from one form to another? (1 mark)
 - Transducer
- c.(i) A burning candle produced 10J of heat energy and 8J of light energy. How much chemical energy was used? (1 mark)
 - 18J
- (ii) Explain your answer to 39.c.(i). (1 mark)
 - The sum of all the energies is always constant, hence chemical energy = heat energy + light energy = 10J + 8J = 18J.

2007-43.

- a. State the energy changes that take place at a hydroelectric power station. (3 marks)
 - Potential energy → Kinetic energy → Electrical energy

MECHANICS

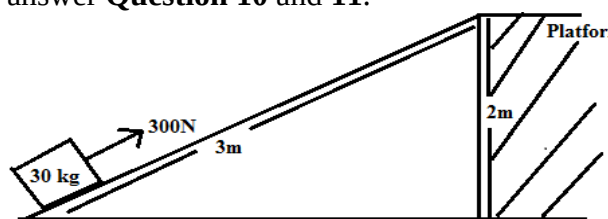
1. Power

What is the power dissipated by machine that lifts a block of 20 kg through a height of 2m in 5 seconds?

- A. 80 W
- B. 200 W
- C. 800 W
- D. 2000 W

[2011-11]

Figure 3 is a diagram showing a 30 kg box being pulled on the platform. Use it to answer **Question 10** and **11**.



2011-11.

What is the power if it takes 1 minute to pull the box on to the platform?

- A. 1 J/s
- B. 1.5 J/s
- C. 10 J/s
- D. 15 J/s

2008-16.

What is the power of a machine that does 36,000J of work in 10 minutes?

- A. 60W

- B. 3,600W
- C. 6,000W
- D. 36,000W

2005-27.

Calculate energy used by an electric bulb in 10 minutes if its power output is 3000W.

- A. 300J
- B. 3,000J
- C. 30,500J
- D. 1,800,000J

2005-29.

A machine with a mechanical advantage of 5 is used to lift a load of 50N. Calculate the effort applied.

- A. 0.1N
- B. 10N
- C. 55N
- D. 250N

2. Inclined plane

2011-9.

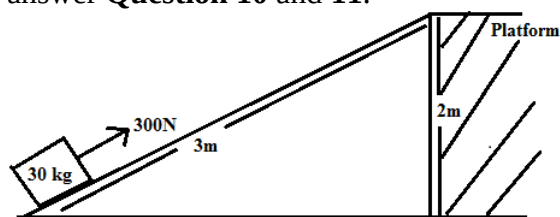
Which of the following will increase the mechanical advantage of an inclined plane?

1. using shorter planks
2. using longer planks

3. smoothening the planks
 4. widening the planks
- A. 1 and 3
 - B. 1 and 4
 - C. 2 and 3
 - D. 2 and 4

[2011-10]

Figure 3 is a diagram showing a 30 kg box being pulled on the platform. Use it to answer **Question 10** and **11**.



2011-10.

What is the potential energy gained by the box when raised on to the platform?

- A. 100 J
- B. 140 J
- C. 600 J
- D. 900 J

2009-19.

Which of the following will give a smaller mechanical advantage one inclined plane?

- A. short and rough surface
- B. long and rough surface
- C. short and smooth surface
- D. long and smooth surface

[2008-28,29]

Figure 4 is a diagram of an inclined plane being used to raise a 50kg box on to a platform. Use it to answer **Questions 28** and **29**.

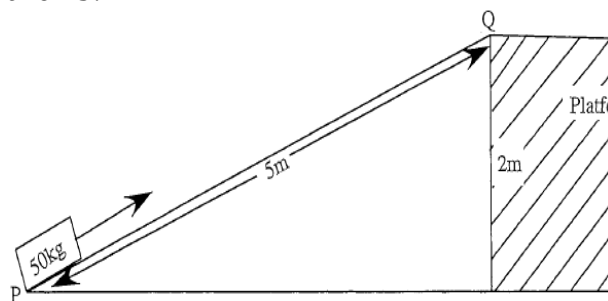


Figure 4

2008-28.

Calculate the work done in raising the box from point **P** to **Q**.

- A. 100J

- B. 250J
- C. 1,000J
- D. 2,500J

2008-29.

How much energy does the box gain on reaching point **Q**?

- A. 100J
- B. 250J
- C. 1,000J
- D. 2,500J

[2006-13,14]

Figure 2 is a diagram showing a box being pulled up along an inclined plane. Use it to answer **Questions 13** and **14**.

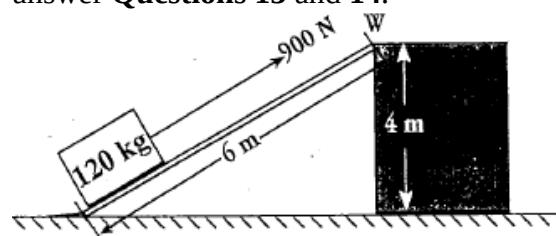


Figure 2

2006-13.

What potential energy is gained by the box when it reaches point **W**?

- A. 480J
- B. 720J
- C. 3600J
- D. 4800J

2006-14.

How much work is done against friction?

- A. 600J
- B. 720J
- C. 4800J
- D. 5400J

2004-2.

Which of the following does **not** increase the mechanical advantage of an inclined plane?

- A. using shorter planks
- B. using longer planks
- C. using smooth planks
- D. using rollers on planks

[2003-10,11,12]

Figure 3 shows an inclined plane being used to raise a 60N load on to a platform. Use it to answer **Questions 10 to 12**.

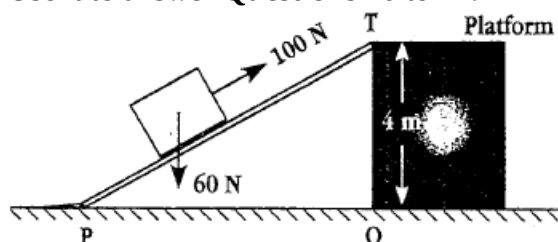


Figure 3

2003-10.

Calculate the length of the inclined plane if the work done in moving the load from point **P** to point **T** is 300J.

- A. 25m
- B. 15m
- C. 5m
- D. 3m

2003-11.

What is the potential energy of the load at position **T**?

- A. 6,000J
- B. 400J
- C. 240J
- D. 25J

2003-12.

How much energy is lost to overcome friction?

- A. 240J
- B. 60J
- C. 400J
- D. 300J

3. Pulley system

[2009-8,9]

Figure 2 is a diagram of a pulley system. Use it to answer **Questions 8 and 9**.

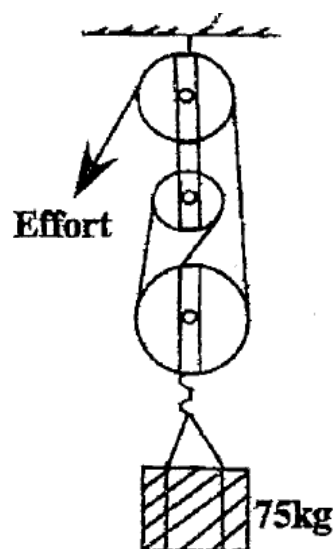


Figure 2

2009-8.

How much effort is needed to raise the load?

- A. 2250N
- B. 250N
- C. 225N
- D. 25N

2009-9.

How much energy is gained by the load after being raised through a distance of 2m?

- A. 37.5 J
- B. 150 J
- C. 750 J
- D. 1500 J

[2009-11]

Figure 3 is a diagram of a pulley system.

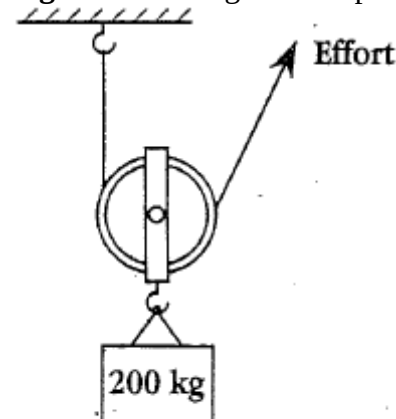


Figure 7

2003-25.

What is the mechanical advantage of the pulley?

- A. 0
- B. 1
- C. 2
- D. 3

2003-26.

Calculate the force applied to lift the load.

- A. 2,000N
- B. 1,000N
- C. 200N
- D. 100N

4. Lever

2021 – 5

Which of the following is an example of a third order lever?

- A. Pliers
- B. Tongs
- C. Bottle opener
- D. Nutcracker

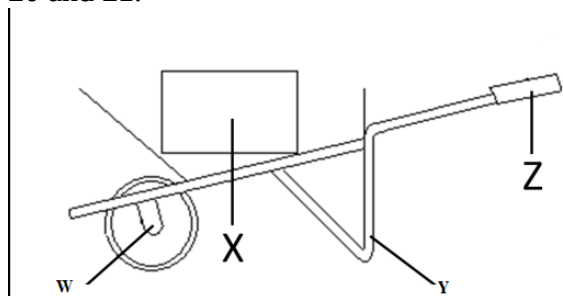
2010-23.

Which of the following is an example of second order levers?

- A. pliers
- B. wheel barrow
- C. stapler
- D. see-saw

[2009-20,21]

Figure 5 is a diagram of a box in a wheelbarrow. Use it to answer **Question 20** and **21**.



2009-20.

Which letter represents the fulcrum?

- A. Z
- B. Y
- C. X
- D. W

2009-21.

How can the effort applied be reduced?

- A. By applying oil to the wheel
- B. By moving the load closer to the wheel
- C. By moving the load away from the wheel
- D. By using a larger wheel

2003-7.

Figure 2 shows a lever system.

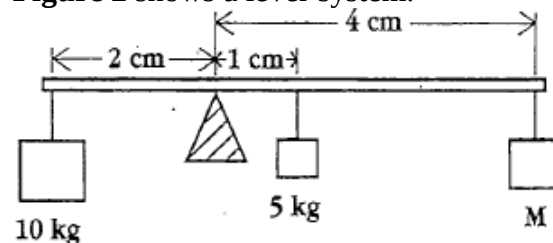


Figure 2

For the lever to balance, what should be the value of mass M?

- A. 37.5kg
- B. 10kg
- C. 5kg
- D. 3.75kg

ANSWERS TO QUESTIONS

1. Power

- 2011-11. C
- 2008-16. A
- 2005-27. D
- 2005-29. B

2. Inclined plane

- 2011-9. C

- 2011-10. C
- 2009-19. A
- 2008-28. C
- 2008-29. C
- 2006-13. D
- 2006-14. A
- 2004-2. A
- 2003-10. D

2003-11. C
2003-12. B

3. Pulley system

2009-8. B
2009-9. D
2009-11. C
2008-18. B
2008-19. B
2005-22. C

2005-23. B
2003-25. C
2003-26. B

4. Lever

2010-23. B
2009-20. D
2009-21. B
2003-7. D

SECTION B

1. Power

2011-35.

b. Calculate the power of a machine if it does 240 J of work in 30 seconds. (3 marks)

➤ $240\text{J} \div 30\text{second} = 8\text{J/s}$

2006-37.

a. Define “power”. (1 mark)

➤ Power is the quantity of work per a unit time.

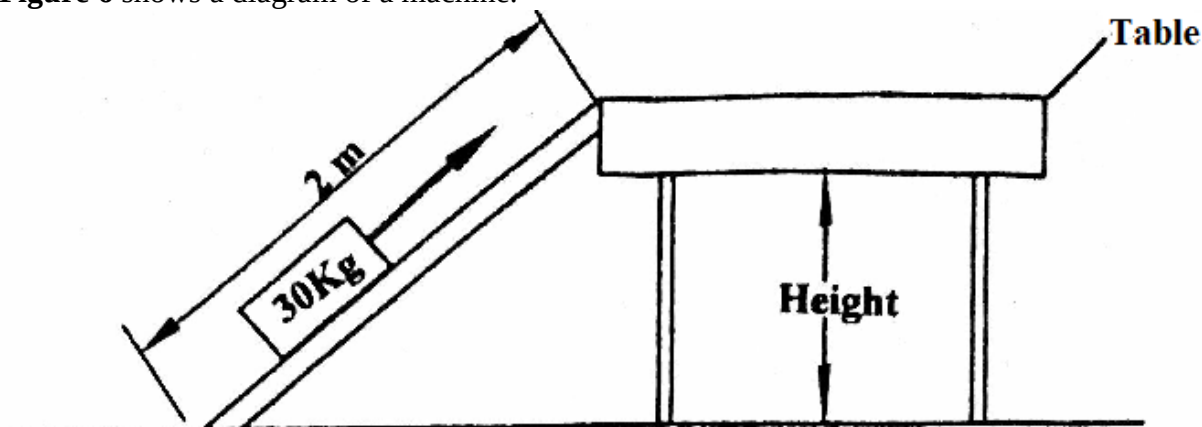
b. The power output of a heater is 2kW. How much energy does it use in 2 minutes? (3 marks)

➤ 240kJ (energy = power $\times$ time = $2 \times 2 \times 60 = 240$)

2. Inclined plane

2021 – 28

Figure 6 shows a diagram of a machine.



a. Name the machine shown in **Figure 6**

▪ Inclined plane

b. Calculate the amount of work done using the machine to move a 30 kg mass to the top of the table.

▪ $Work\ done = force \times perpendicular\ distance$

▪ $force = 30\text{kg} \times 10\text{N/kg} = 300\text{N}$

▪ $W = 300\text{N} \times 2\text{m} = 600\text{Nm} = 600\text{J}$

2009-35.

Explain how the use of rollers affect the mechanical advantage of an inclined plane. (3 marks)

➤ The use of rollers can make the surface area touching the plane smaller. Therefore, rollers can reduce frictional force hence increasing mechanical advantage of an incline plane

2021- 5 Sample paper

Give any **three** ways of increasing mechanical advantage of an inclined plane

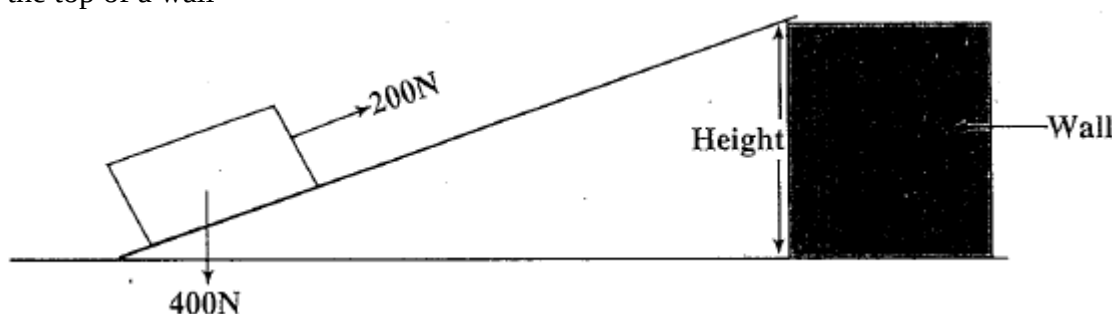
- Use of rollers
- Reducing length of a plank
- Increasing amount of load

2015 – 34

- Mention one advantage of using an inclined to lift heavy objects
 - Little effort is used to lift the heavy object
- Why would a person require more energy to lift an object using an inclined plane than lifting it vertically to the same height?
 - Some of the energy will be wasted to overcome static and dynamic frictional force using an inclined plane hence it needs more energy than lifting it vertically where effects of frictional force are not encountered

2006-36.

Figure 9 is a diagram showing an inclined plane being used to raise a box of weight 400N to the top of a wall



- Calculate the height of the wall if the box gains 2,000J of potential energy when raised to the top of the wall. (2 marks)
 - Height = Potential energy/weight
 - Height = 2000J/400N = 5m
- what is the length of the inclined plane if 400J of heat energy is produced on it when pulling the box to the top of the wall? (3 marks)
 - Work done = length × effort = (2000 + 400)J = Length × 200 = 12m

3. Pulley system

2010-39.

- Mention one way of increasing the mechanical advantage of a pulley system. (1 mark)
 - Increasing the number of pulleys.
- An effort of 500N is applied to raise a 140kg box through a height of 4m using a pulley system. Calculate the mechanical advantage of the pulley system. (3 marks)
 - load(Force) N = mass (kg) × acceleration (m/s^2) = 140 kg × $10m/s^2$ = 1400 N
 - Mechanical Advantage = load / effort = 1400 N / 500 N = 2.8

2007-35.

- Figure 7** is a diagram of a pulley system being used to lift a load.

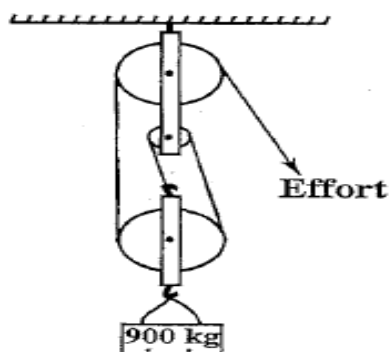


Figure 7

(i) What is the mechanical advantage of the pulley system? (1 mark)

➤ 2

(ii) Calculate the effort applied in lifting the load. (3 marks)

➤ Load = $900\text{kg} \times 10\text{m/s}^2 = 9000\text{N}$

➤ Effort = Load/Mechanical advantage = $9000\text{N}/2$

2006-35.

Figure 8 is a diagram showing two pulley systems, **A** and **B**.

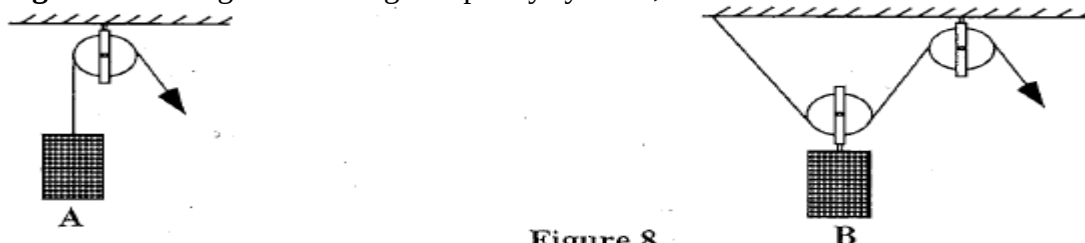


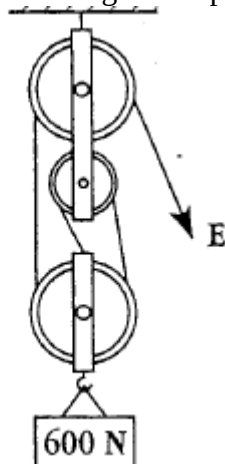
Figure 8

Explain why pulley system **B** is better than **A**. (3 marks)

➤ The mechanical advantage of B is 2, while that of A is 1. This means that less effort is needed in B.

2003-32.

Figure 9 is a diagram of pulley system.



a. Work out the effort required to lift the object. (2 marks)

➤ Effort = Load/Mechanical advantage = $600\text{N}/3 = 200\text{N}$

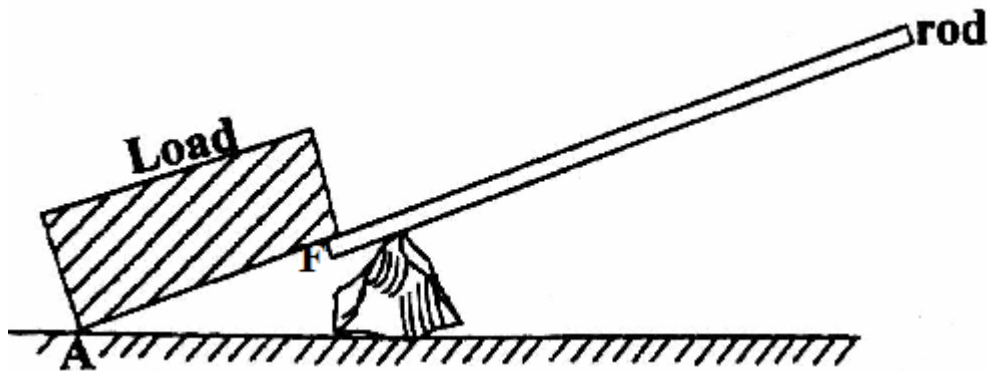
b. If the object is raised through a height of 3m above the ground, what length of rope has been pulled out? (2 marks)

➤ Length = mechanical advantage $\times$ height = $3\text{m} \times 3 = 9\text{m}$

4. Lever

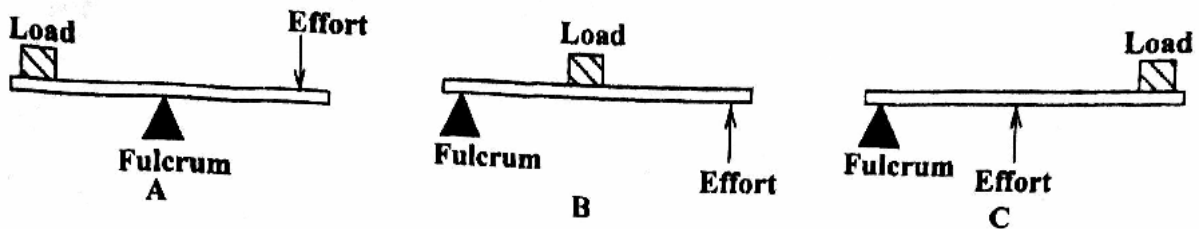
2021 – 30

Figure 7 is a diagram of a lever system.



- Indicate in the diagram point F of the fulcrum
- Describe the effect of moving the rod to A on the mechanical advantage of the system. (3 marks)
 - Mechanical advantage of the system will increase since moving rod to point A will make less effort to be used hence increasing mechanical advantage.

Figure 5 illustrates different types of lever systems.



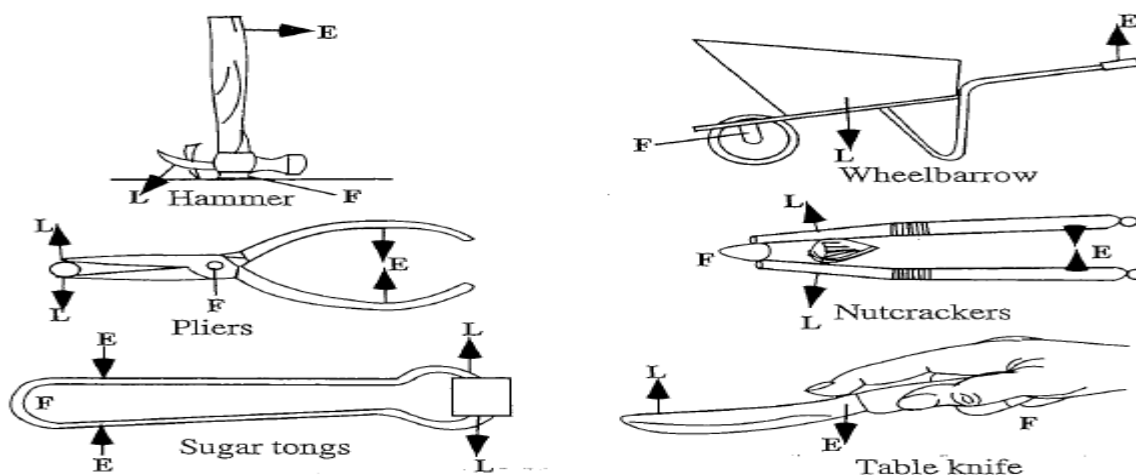
- Which letter represents the type of lever system as a wheelbarrow? (1 mark)
 - Letter B
- Identify the class of each of the two system of levers. (2 marks)
 - A is first class lever
 - B is second class lever
 - C is third class lever
- Give two examples of type A lever.
 - Scissors
 - Plier
 - Hammer

2011-35.

- Mention any **two** types of levers. (2 marks)
 - First class levers, second class levers, third class levers

2008-36.

Figure 8 is a diagram showing different levers.



Classify the levers as first, second and third order machines. (6 marks)

First order: Hammer, Pliers

Second order: Wheelbarrow, Nutcrackers

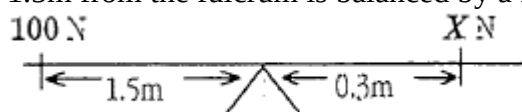
Third order: Sugar tongs, Table knife

2005-32.

a. State the principle of moments. (1 mark)

- The sum of each product of load and its distance from the fulcrum is equal to the sum of each product of effort and its distance from the fulcrum.

b. Figure 7 is a diagram showing a lever system in which a load of 100 Newtons placed at 1.5m from the fulcrum is balanced by a force of X Newtons exerted at 0.3m from the fulcrum



Find the value of X. (3 marks)

- $100 \times 1.5 = X \times 0.3$, hence $X = 500\text{N}$

2004-31.

a. Identify the order of the lever which has

(i) effort in between load and fulcrum. (1 mark)

- Third order

(ii) load between effort and fulcrum. (1 mark)

- Second order

b. Calculate the mechanical advantage of a pair of pliers which grips a nail with a force of 200N when a force of 40N is applied to the handles. (2 marks)

- Mechanical advantage = Load/Effort = $200\text{N}/40\text{N} = 5$

2014 – 41b

Explain the effect of increasing the length of a plank on the mechanical advantage of an inclined plane (4 marks)

- Increasing the length of a plank will require more effort to move a load from one position to another position of the same load hence mechanical advantage will decrease.

5 ELECTRICITY

2021 – 11

Identify from the following the electrical component used to maintain steady temperature in an oven.

A. Fuse

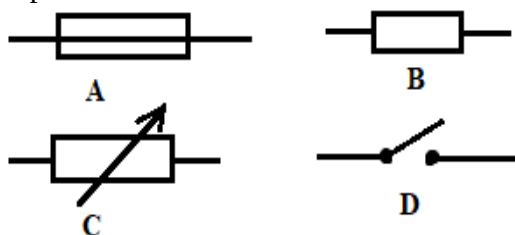
B. Thermostat

C. Switch

D. Resistor

2021 – 12

Which of the electric symbols in **figure 1** represent a variable resistor?



2021 – 14

Electric current is measured in

- A. Volts
- B. Joules
- C. Watts
- D. Amperes

2021 – 16

Metals allow electric current to flow through them easily because

- A. they have more atoms
- B. they have high densities
- C. they are good conductors
- D. they have free electrons

2021 – 4

Which of the following is true about two objects that have been charged by friction force?

- A. They take the charge
- B. They do not take any charge
- C. They take opposite charge
- D. One is charged and the other is not

Electric circuits Measuring of electric current and voltage

[2012-7,8]

Figure 2 is a diagram of an electric circuit. Use it to answer **Question 7** and **8**.

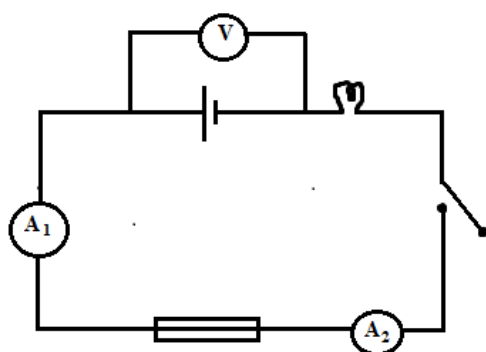


Figure 2

2012-7.

What is the name of the device labelled **Y**?

- A. resistor
- B. bulb

C. cell

D. fuse

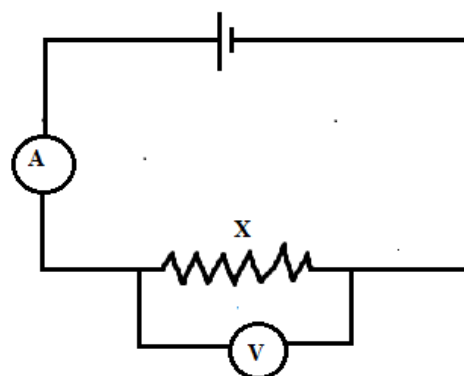
2012-8.

What is the reading of **A2** if **A1** reads **0.5A**?

- A. 0.25A
- B. 0.5A
- C. 1.0A
- D. 1.5A

[2011-22,23]

Figure 6 is a diagram of an electric circuit. Use it to answer **Question 22** and **23**.



2011-22.

Which symbol represent a resistor?

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

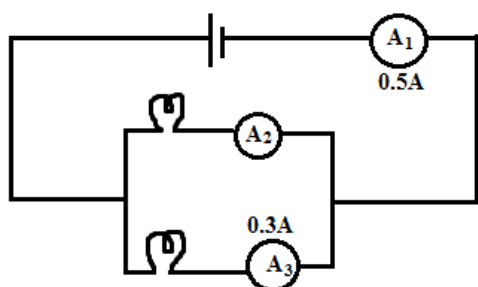
2011-23.

What happens to the reading of **V** when the length of **X** is increased?

- A. It increases.
- B. It decreases.
- C. It remains unchanged.
- D. It reads zero.

2010-12.

Figure 3 is a diagram of a circuit. **A1** reads **0.5A** and **A3** reads **0.3A**.

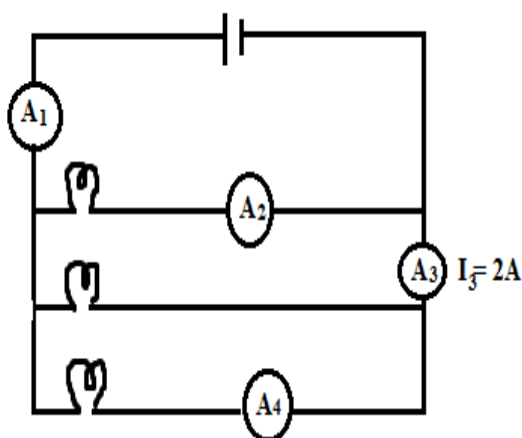


What is the reading of A2?

- A. 0.2 A
- B. 0.3 A
- C. 0.5 A
- D. 0.8 A

2009-25.

Figure 6 is a diagram of an electric circuit consisting of identical bulbs.



If A3 reads 2A, what will be the reading of A1?

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

[2008-4]

Figure 1 is a diagram of an electric circuit. Use it to answer **Question 4** and **5**.

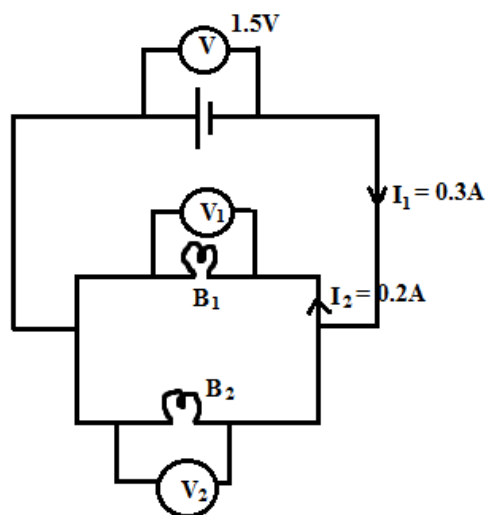


Figure 1

2008-4.

What is the reading of V2?

- A. 3.0V
- B. 1.5V
- C. 0.75V
- D. 0.5V

2007-9.

Figure 3 is a diagram of an electric circuit.

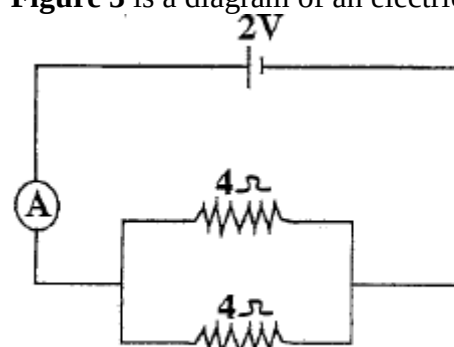


Figure 3

What is the reading of the ammeter?

- A. 0.25A
- B. 0.5A
- C. 1.0A
- D. 2.0A

2007-12.

Why do metals conduct electricity?

- A. They have protons.
- B. Their atoms are closely packed.
- C. They have small atoms.
- D. They have free electrons

2007-29.

Figure 4 shows an electric circuit

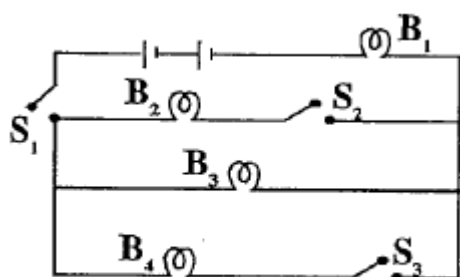


Figure 4

Which bulbs would give light if S1 is closed while S2 and S3 are opened?

- A. B1 and B2
- B. B2 and B4
- C. B1 and B3
- D. B3 and B4

2006-3.

What name is given to a force that is exerted by a charged object?

- A. magnetic
- B. frictional
- C. electrostatic
- D. gravitational

[2006-20,21]

Figure 4 is a diagram showing an electric circuit. Use it to answer Questions 20 and 21.

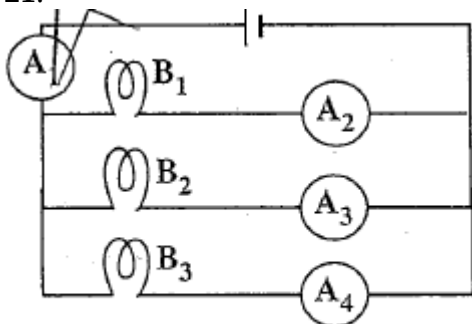


Figure 4

2006-20.

What would be the effect of adding another bulb in parallel?

- A. Total current would increase.
- B. Total current would decrease.
- C. Voltage would increase.
- D. Voltage would decrease.

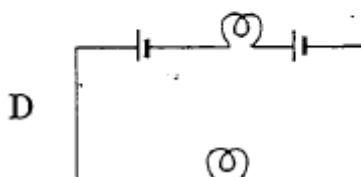
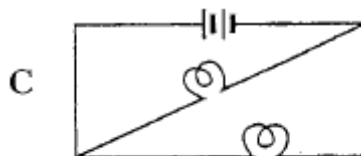
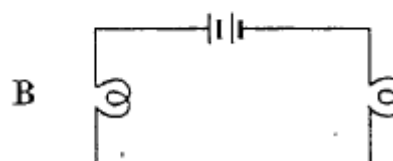
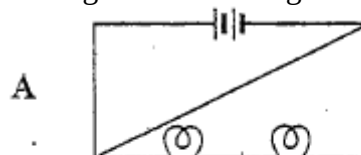
2006-21.

If B1, B2 and B3 were identical bulbs, and ammeter A2 read 0.3A, what was the reading of A1?

- A. 0.1A
- B. 0.3A
- C. 0.6A
- D. 0.9A

2005-16.

In which of the following arrangements would the bulbs give out more light?



[2005-25,26]

Figure 4 is a diagram showing an electric circuit. Use it to answer questions 25 and 26.

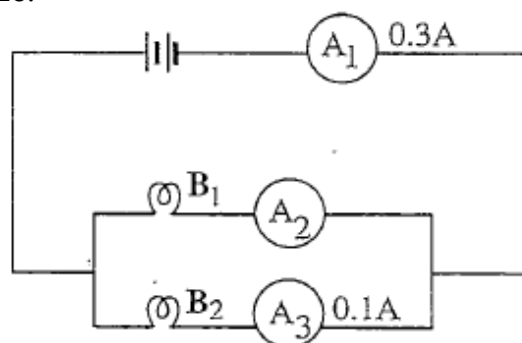


Figure 4

2005-25.

If A1 reads 0.3A, what will be the reading of A2?

- A. 0.4A
- B. 0.3A
- C. 0.2A
- D. 0.1A

2005-26.

When bulb B1 has blown off, A1 reads 0.4A. What would be the reading of A3?

- A. 0.0A
- B. 0.1A
- C. 0.2A
- D. 0.4A

2004-6.

Figure 1 is a diagram of an electric circuit.

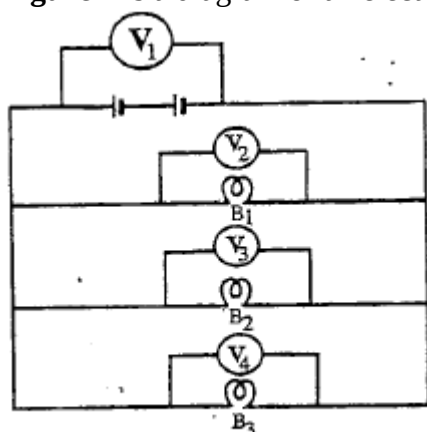


Figure 1

If V1 reads 6V, what is the reading of V4?

- A. 2V
- B. 3V
- C. 6V
- D. 18V

2004-14.

What instrument is used to measure electric current?

- A. voltmeter
- B. ohmmeter
- C. ammeter
- D. manometer

2004-28.

Figure 8 is a diagram of a voltmeter

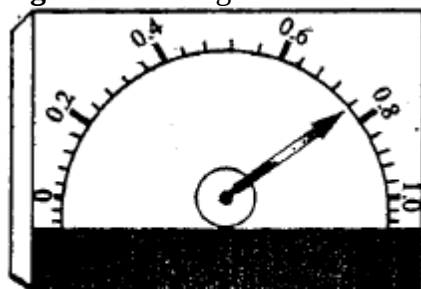


Figure 8

What is the voltmeter reading?

- A. 0.68V

B. 0.70V

C. 0.74V

D. 0.76V

[2003-29]

Figure 8 is a diagram of an electric circuit.

Use it to answer **Questions 28 and 29.**

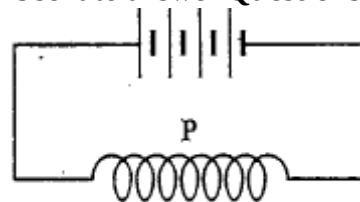


Figure 8

2003-29.

What is the total voltage in the circuit if the voltage across each cell is 1.5V?

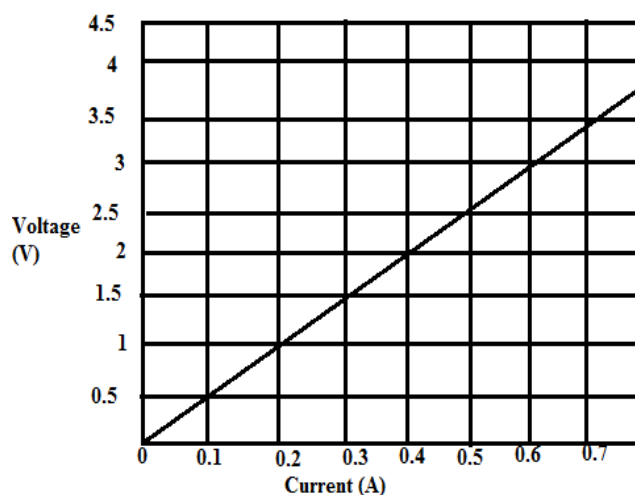
- A. 1.5V
- B. 3.0V
- C. 4.5V
- D. 6.0V

2. Electrical resistance

[2012-9,10]

Figure 3 is a graph of voltage against current for a wire. Use it to answer

Question 9 and 10



2012-9.

What is the resistance of the wire?

- A. 0.2 ☐
- B. 0.8 ☐
- C. 1.8 ☐
- D. 5.0 ☐

2012-10.

What is the relationship between voltage and current?

- A. Current increases as voltage decreases.
- B. Current increases as voltage remains the same.
- C. Voltage increases as current increases.
- D. Voltage increases as current decreases.

2010-17.

Which of the following factors does **not** affect the electrical resistance of a conductor?

- A. thickness
- B. length
- C. colour
- D. temperature

[2008-5]

Figure 1 is a diagram of an electric circuit. Use it to answer **Question 4** and **5**.

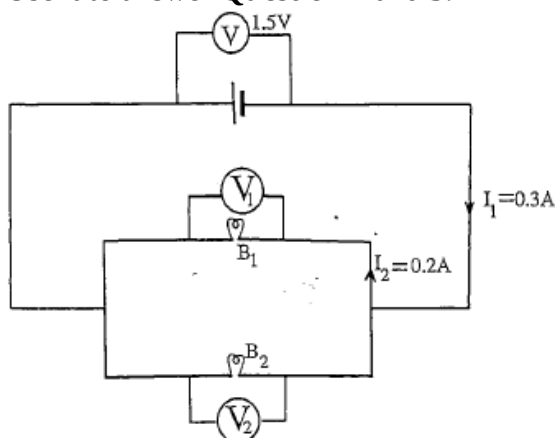


Figure 1

2008-5.

What is the resistance of B2?

- A. 3.0Ω
- B. 5.0Ω
- C. 7.5Ω
- D. 15.0Ω

2008-9.

Copper wire is used in electric power lines because

- A. it has a low resistance.
- B. it is light.
- C. it does not rust.
- D. it is a good conductor of heat.

2007-11.

Which of the following metals can be used as heating element of an electric iron?

- A. nichrome
- B. copper
- C. silver
- D. iron

2006-30.

Why is nichrome wire used as a heating element of an electric heater?

- A. It has very high resistance.
- B. It is a non-metal.
- C. It has low resistance.
- D. It has low melting point.

[2005-17,18]

Table 4 shows voltage measured across different wires of the same length and thickness and the current passing through them. Use it to answer **questions 17** and **18**.

Wire	Voltage (V)	Current (A)
P	12	3.0
Q	12	4.0
R	12	0.2
S	12	1.0

2005-17.

Which of the wires is suitable for making heating elements of electric kettles?

- A. P
- B. Q
- C. R
- D. S

2005-18.

Which of the wires has the lowest resistance?

- A. P
- B. Q
- C. R
- D. S

2005-19.

Calculate the resistance of a wire if current flowing through it is 3A and the voltage across its ends is 12V.

- A. 36Ω

- B. 15Ω
- C. 4Ω
- D. 0.25Ω

2005-30.

Figure 6 shows a graph of voltage against current

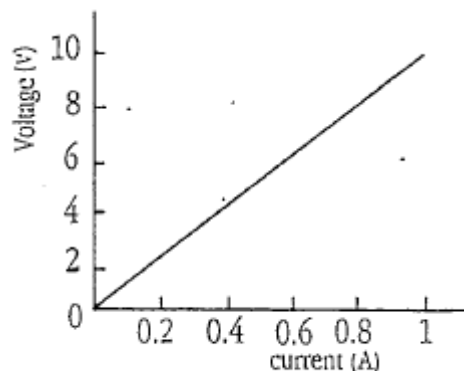


Figure 6

Which of the following factors were kept constant when collecting data used in the graph?

1. temperature of conducting wire
2. number of cells
3. length of the conducting wire
4. type of wire

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

2004-20.

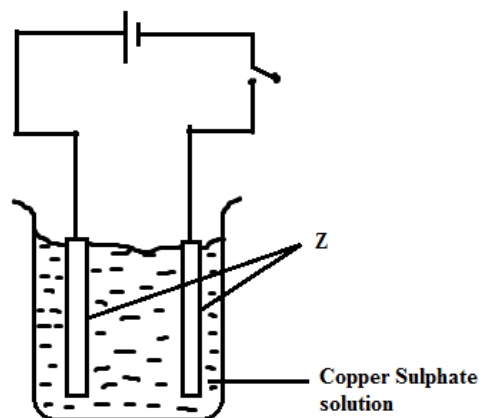
The resistance of a piece of wire does **not** depend on its

- A. length.
- B. temperature.
- C. thickness.
- D. density

3. Effects of electric current

[2012-11,12]

Figure 4 is a circuit diagram showing how a substance is coated with



2012-11.

What name is given to the parts labelled Z?

- A. electrodes
- B. cathodes
- C. anodes
- D. nails

2012-12.

What effect of current is demonstrated in **Figure 4**?

- A. heat effect
- B. chemical effect
- C. magnetic effect
- D. lighting effect

2007-7.

The strength of an electricity in an electric bell can be increased by

1. increasing number of cells
2. increasing number of turns of solenoid.
3. decreasing number of turns of solenoid.
4. decreasing number of cells.

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

2004-4.

Which of the following is used to control temperature?

- A. thermometer
- B. thermostat
- C. thermocouple
- D. thermoflask

[2003-28]

Figure 8 is a diagram of an electric circuit. Use it to answer **Questions 28** and **29**.

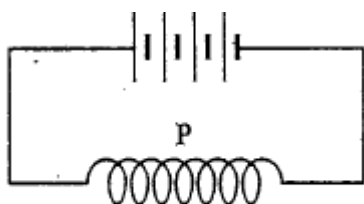


Figure 8

2003-28.

The part labelled **P** is

- A. solenoid.
- B. switch.
- C. thermocouple.
- D. bimetallic strip.

ANSWERS TO QUESTIONS

1. Electric circuits Measuring of electric current and voltage

2012-7. D
 2012-8. B
 2011-22. B
 2011-23. C
 2010-12. A
 2009-25. C
 2008-4. B
 2007-9. C
 2007-12. D
 2007-29. C
 2006-3. C
 2006-20. A
 2006-21. D
 2005-16. C
 2005-25. C
 2005-26. D
 2004-6. C
 2004-14. C
 2004-28. D
 2003-29. D

2. Electrical resistance

2012-9. D
 2012-10. C
 2010-17. C
 2008-5. D
 2008-9. A
 2007-11. A
 2006-30. A
 2005-17. C
 2005-18. B
 2005-19. C
 2005-30. D
2004-20. D

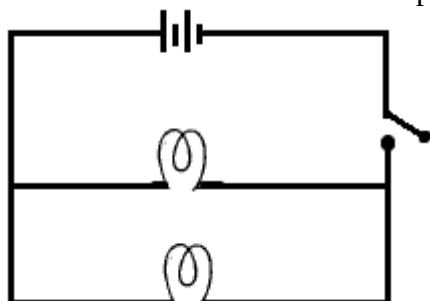
3. Effects of electric current

2012-11. A
 2012-12. B
 2007-7. A
 2004-4. B
 2003-28. A

SECTION B

2021 – 23

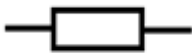
Draw a circuit diagram with 2 cells connected in series, 2 bulbs connected in parallel with each other and a switch which is open so that no bulb gives light. **(5 marks)**



2021 – 27a

Draw the symbol of the following electrical components.

Component	Symbol
Cell	

Resistor	
----------	--

2021 – 30c

Explain how distance affects electrostatic forces between charges

- Reducing distance between charges increases the electrostatic forces between objects

2021 – 22 sample paper

- Explain how temperature affects resistance of a wire (3 marks)
 - As temperature increases, there is high collisions between electric charges and ions hence electrical resistance increases
- Apart from temperature, name other factors that affect electrical resistance of a wire
 - Material made of the wire, thickness of the wire and length of wire.

2021-26 sample paper

Figure 3 is a circuit diagram in which bulbs B_1 , B_2 , and B_3 are identical

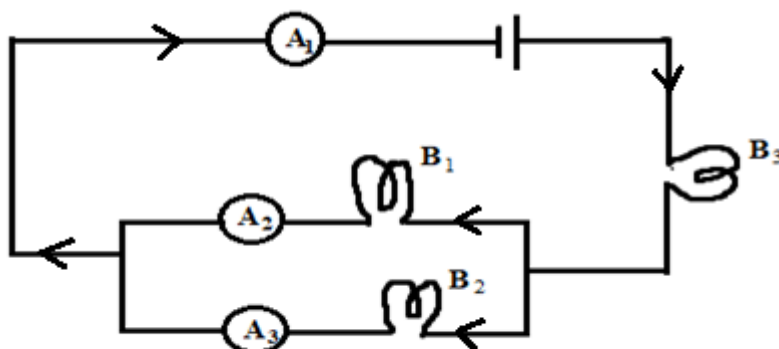
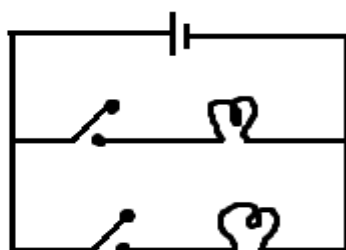


Figure 3

- Draw an arrow on the diagram showing the conventional direction of electric current (1 mark)
- If ammeter A_3 reads $0.2A$, what are the readings of ammeters A_1 and A_2 ?
 - $A_1 = 0.4A$, $A_2 = 0.2A$
- Give a reason for your answer to 26b
 - Because current shares equally between the components in parallel circuit

2014 – 34

Draw a parallel circuit of a cell, 2 switches and 2 identical bulbs such that each bulb can be controlled independently (3 marks)



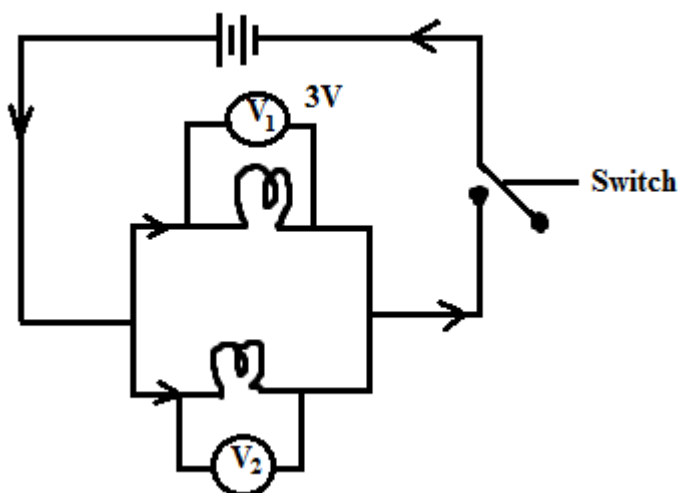
2014 – 41

In an experiment on electrical conductivity, a 30cm long copper wire was connected in a gap in a circuit and ammeter reads $2A$. The copper wire was then replaced by nichrome wire of the same length and thickness and ammeter read $0.1A$. Explain the difference in the ammeter readings.

- Copper wire offers low resistance to the flow of electric charges hence higher current reading while nichrome wire offers higher electrical resistance that is why there is lower current reading although the wires are of the same thickness and length.

2015 – 35

Figure 5 is a diagram of an electric circuit



- Identify the type of circuit in **Figure 5** (1 mark)
 - Parallel circuit
- What would be reading of V_2 when the switch is closed?
 - 3v
- Give a reason for the answer to **35b**.
 - Because voltage is the same at each and every point in parallel circuit
- Draw an arrow along the circuit in **Figure 5** to show the direction of movement of electrons when the switch is closed. (1 mark)

1. Electric circuits Measuring of electric current and voltage 2012-34.

Figure 9 is a diagram of an electric circuit

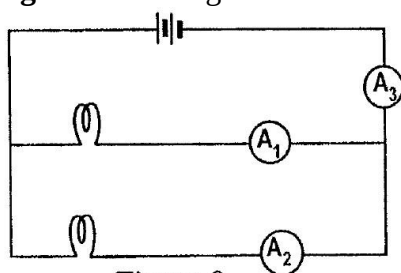
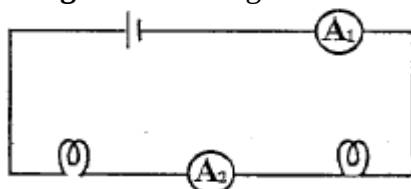


Figure 9

- If A_2 reads 0.2 A and A_3 reads 0.6 A, what will be the reading of A_1 ? (2 marks)
 - $0.2A + 0.6A = 0.8 A$
- Give a reason for the answer in **34a**. (1 mark)
 - $A_1 = A_2 + A_3$
- What will happen to the ammeter readings if one cell is added to the circuit? (1 mark)
 - The ammeter readings will increase.

2007-36.

- Figure 8** is a diagram of an electric circuit in which A_1 reads 0.2A.



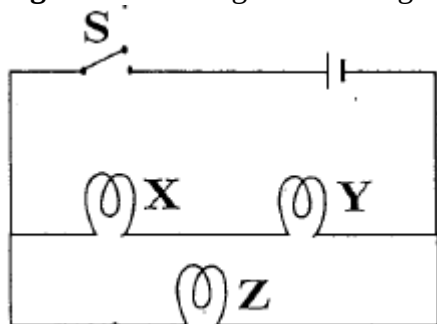
- What is the reading of A_2 ? (1 mark)
 - 0.2A
 - Give a reason for the answer to **36.a.(i)**. (1 mark)
 - In a series circuit, the electric current is the same at any points.
- (i) Define “voltage”. (1 mark)
 - Voltage is a measure of the ability of electrical energy to do work

(ii) Why should a voltmeter be connected in parallel with components? **(1 mark)**

- To measure the voltage across the components and it offers low resistance

2006-39.

Figure 10 is a diagram showing identical bulbs **X**, **Y** and **Z** in a circuit.



a. Which bulb(s) would light brightest when the switch **S** closed? **(1 mark)**

- Z

b. Give a reason for the answer to **39.a.** **(2 marks)**

- Bulbs X and Y are sharing the voltage of the cell

2004-32.

Table 1 shows the readings of electric current in bulbs **A**, **B** and **C** and the voltage readings across the bulbs in a circuit.

Bulb	Current (A)	Voltage (V)
A	0.3	1
B	0.1	2
C	0.2	2

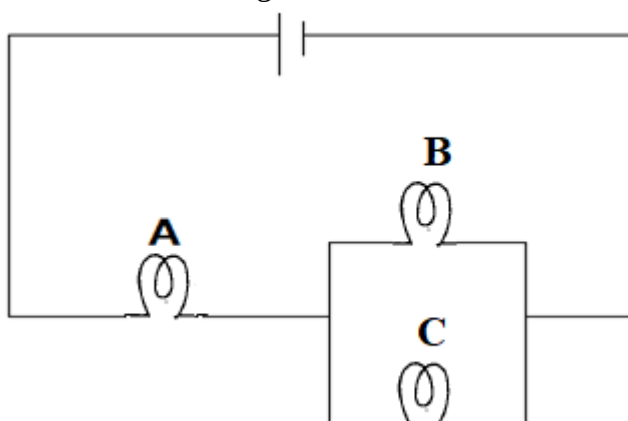
a. Which bulbs are connected in parallel? **(2 marks)**

- B and C

b. Give a reason for the answer to **32.a.** **(1 mark)**

- Voltages are equal in a parallel circuit.

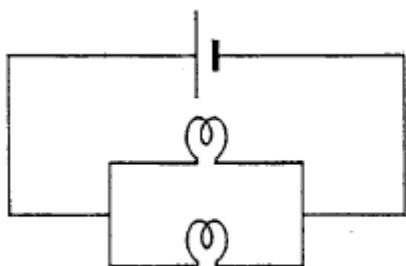
c. Draw a circuit diagram which shows how the bulbs **A**, **B** and **C** are connected. **(1 mark)**



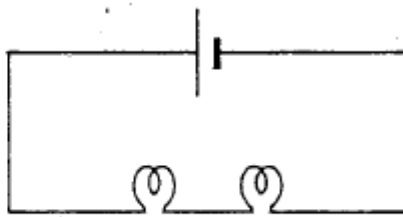
2003-33.

a. Name the type of electric circuit in which bulbs can be lit independent of each other. **(1 mark)**

b. **Figure 10** shows identical bulbs in circuits **X** and **Y**.



X



Y

- (i) In which circuit would the bulbs light more brightly? (1 mark)
- Circuit X
- (ii) Give a reason for your answer to **33.b.(i)**. (1 mark)
- Because the bulbs will receive the same voltage as of the cell which cannot happen in circuit Y
- (iii) Why would circuit **Y** **not** be suitable for wiring a house? (1 mark)
- If one of the bulbs in circuit Y breaks, electric current cannot flow.

2008-31.

a. State any **three** factors that affect the electrical resistance in a wire. (3 marks)

- Length of the wire
- Thickness of the wire
- Temperature, material made of the wire

3. Effects of electric current

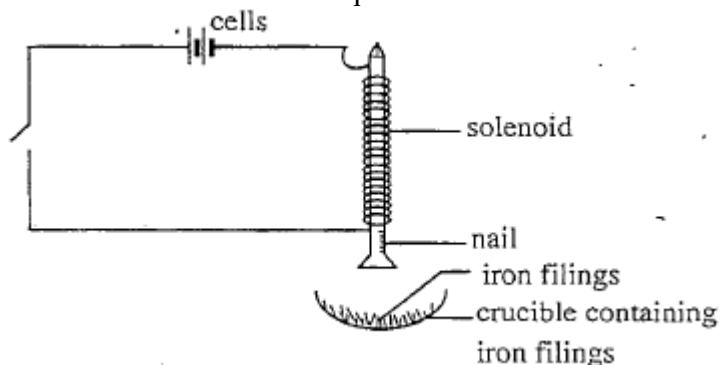
2008-31.

b. Mention any **two** effects of passing an electric current through an electrolyte. (2 marks)

- It brings about chemical change
- It reduces the concentration of the solution

2005-34.

Figure 9 is a diagram showing an electric circuit which has an iron nail inserted in a solenoid. Use it to answer questions that follow.

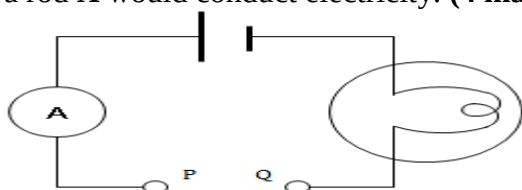


- a. Explain how iron filings would get attracted to the iron nail. (3 marks)
- When the current is switched on, the nail would get magnetized due to the magnetic field in the solenoid, hence it would attract iron fillings.
- b. What effect of electric current is being investigated in this circuit? (1 mark)
- Magnetic effect

1. Electric circuits Measuring of electric current and voltage

2006-41.

b. Describe with the aid of a diagram an experiment that could be done to determine whether a rod **X** would conduct electricity. (4 marks)



- Set up the apparatus as shown in the diagram above.
- Put the rod X across the gap PQ.
- Note if the bulb gives light or if the ammeter gives a reading.

Conclusion

If rod X is connected and the bulb gives light or the ammeter gives a reading then rod X conducts electricity. If rod X is connected and the bulb does not give light or ammeter does not give a reading, then rod X does not conduct electricity.

2. Electrical resistance

2021 – 31a

Explain how the change in temperature of a connecting wire affects its electrical resistance.

(5 marks)

- An increase in temperature of the connecting wire makes the electrons in the wires to gain kinetic energy. This brings collisions between electrons inside the connecting wires which bring higher opposition to the flow of electric current in the circuit. This increases electrical resistance of the connecting wires.

2021 – 29a

Define electrical resistance

- The opposition to the flow of electrical current in a circuit.

2021 – 29b

Give a reason why copper wire is the best metal for connecting wires in circuits

- Because it offers low resistance to the flow of electric current

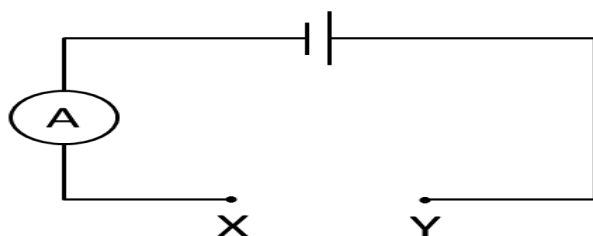
2021 – 29c

How much current will flow through a 6Ω resistor if voltage of 12V is applied across it?

$$I = \frac{V}{R} = \frac{12V}{6\Omega} = 2A$$

2011-43.

c. With the help of a diagram, describe an experiment that could be done to investigate the effect of thickness of a wire on electric current in a circuit. **(9 marks)**



- Set the apparatus as shown in the diagram above
- Connect 1.5cm diameter wire in the gap XY. Read and record ammeter readings
- Repeat step **b.** with 2.5cm, 3.5cm diameter wire and in each case read and record ammeter readings.
- Record the results in the table below.

Thickness of the wire (cm)	Current readings
1.5	
2.5	
3.5	

Observation

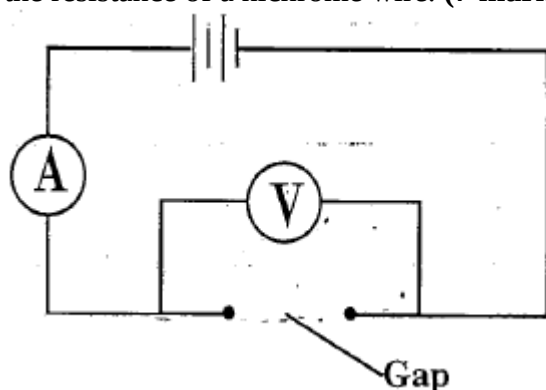
A thick wire shows a higher current reading but thin wire shows lower current reading.

Conclusion

As thickness increases, electric current passing through the circuit also increases. This is because the circuit offers low resistance to the current flow as thickness increases.

2008-41.

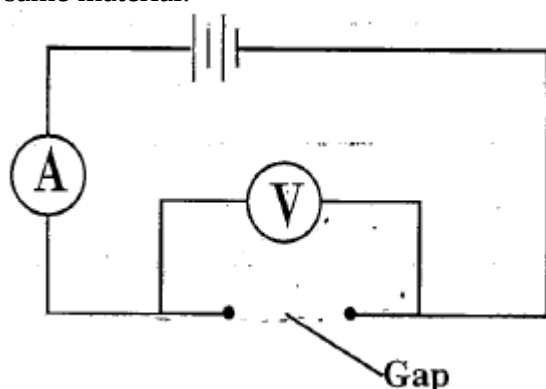
a. With the aid of a circuit diagram, describe an experiment that could be carried out to find the resistance of a nichrome wire. (7 marks)



- Set the apparatus as shown in the diagram above.
- Connect nichrome wire in the gap. Record voltmeter and ammeter reading.
- Calculate electrical resistance by dividing voltmeter reading with ammeter reading.

2007-43.

b. **Figure 11** is a diagram of an electric circuit. Explain how the circuit can be used to investigate the difference in resistance between a thin wire and a thick wire made from the same material.



- Cut two wires of the same length but of different thickness i.e. 1.5cm and 3.5cm diameter wires.
- Set the apparatus as shown in the diagram above
- Connect thin wire in the gap. Read and record voltmeter and ammeter reading.
- Calculate electrical resistance by dividing voltmeter reading with ammeter reading
- Repeat step c and d with a thick wire and record the results in the table below.

Thickness of wire	Ammeter reading (A)	Voltmeter reading (V)	Resistance (V/I)
Thin (1.5cm diameter)			
Thick (3.5cm diameter)			

Observation

Thick wires give low resistance while thin wires give higher resistance

Conclusion

As thickness of the wire increases, electrical resistance decreases. This is because in thick wires electric current receives lesser opposition to its flow than in thin wires.

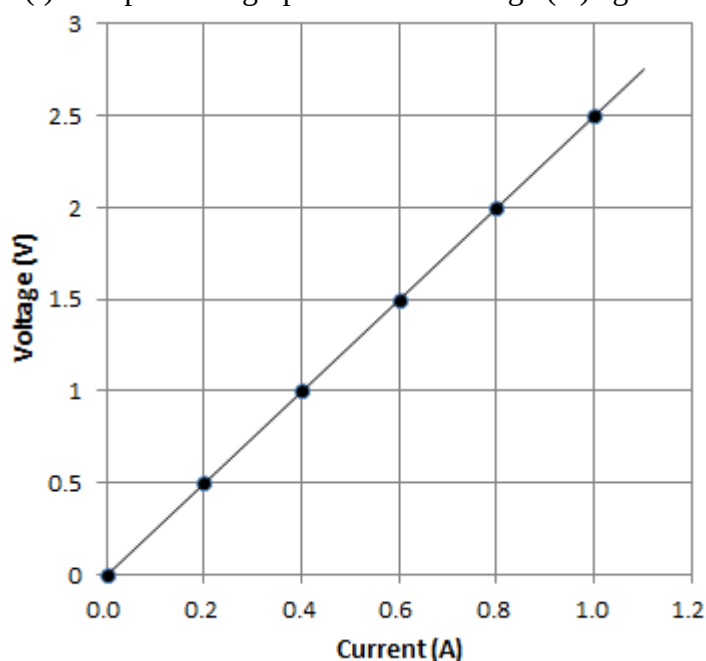
2004-43.

In an investigation a student changed the number of cells in the circuit and noted the current through the resistor wire. Results obtained are shown in **Table 3**.

Current (A)	Voltage (V)	V/A
0	0	0

0.2	0.5	2.5
0.4	1.0	2.5
0.6	1.5	2.5
0.8	2.0	2.5
1.0	0.5	2.5

- (i) State the aim of the investigation. (1 mark)
(ii) Name the independent variable. (1 mark)
(iii) Fill in the missing values in the **table**. (3 marks)
c.(i) Complete the graph below of voltage (V) against current (A). (3 marks)



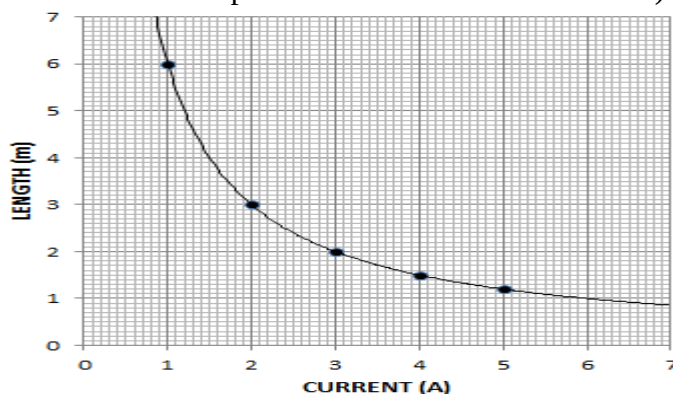
- (ii) From the graph state the relationship between current and voltage. (1 mark)
➤ Current is proportional to voltage.

2003-41.

Table 3 shows results of an experiment that was carried out to investigate the relationship between length of wire and current flowing it.

Length of wire (cm)	1	2	3	4	5
Current (A)	6	3	2	1.5	1.2

- a. Explain why the value of current decreases as the length of wire increases. (1 mark)
➤ The magnitude of resistance increases as the length of wire increases
b. Plot a graph of length of wire against current. (Scale: 2cm to represent 1m on the vertical axis and 2cm to represent 1A on the horizontal axis). (7 marks)



- c. Besides length, state **two** other factors that affect the resistance of a wire. (2 marks)
- Type of material, Thickness, Temperature

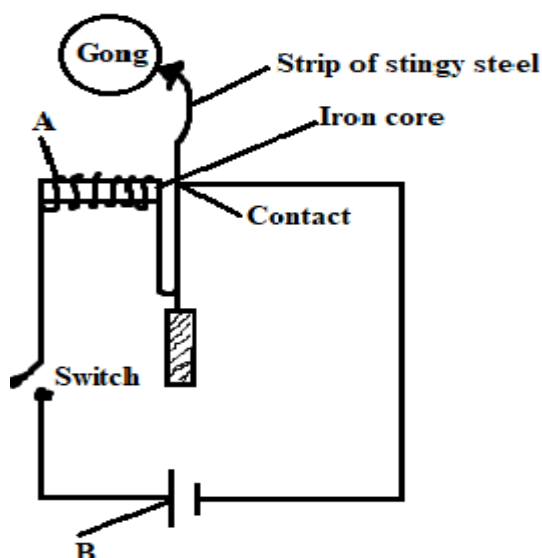
3. Effects of electric current

2011-43.

- a. What is the use of a fuse in an electrical appliance? (1 mark)
- If more current flow in the fuse wire, the fuse stops current flowing.
- b. Explain why nichrome wire is used in making heating elements of electric kettles. (3 marks)
- Nichrome wire has high resistance. Therefore, heat is produced when electrical current flows.

2010-43.

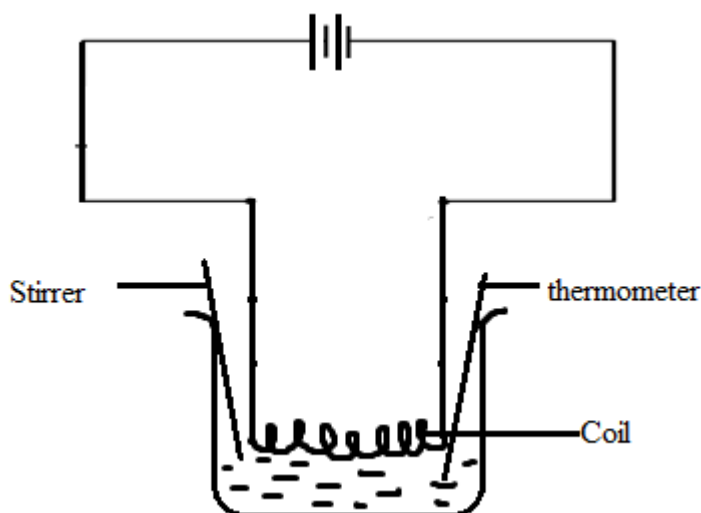
Figure 9 is a diagram of an electric bell.



- a. Name the parts labelled **A** and **B**. (2 marks)
- A: solenoid B: cell
- b. Explain how the electric bell works. (9 marks)
- Pressing switch closes the circuit, Strip of Springy steel is attracted by the electromagnet. A striker strikes a gong. The moving of the strip breaks the circuit. The electromagnet loses magnetism. The strip goes back to the previous position to close the switch. Then 2~6 will repeat until opening the switch.
- c. State any **two** changes that could be done to make the striker hit the gong harder. (2 marks)
- Increasing the number of turns of the solenoid.
 - Increasing the amount of current.

2009-41.

- a. Give any four ways in which the heating effect of an electric current is used in ever day Life. (4 mark)
- electric kettle, electric heater, electric cooker, electric iron
- b. With the aid of a diagram, design an experiment to find out if an electric has a heating effect. (6marks)



- Pour some water in the container until the coil is under the water level.
- Note the temperature of the water with the switch open
- Close the switch.
- Stir the water at regular intervals to spread the heat evenly, for example, every 30 seconds for 3 minutes. After 3 minutes, note the reading of the thermometer.

Observation

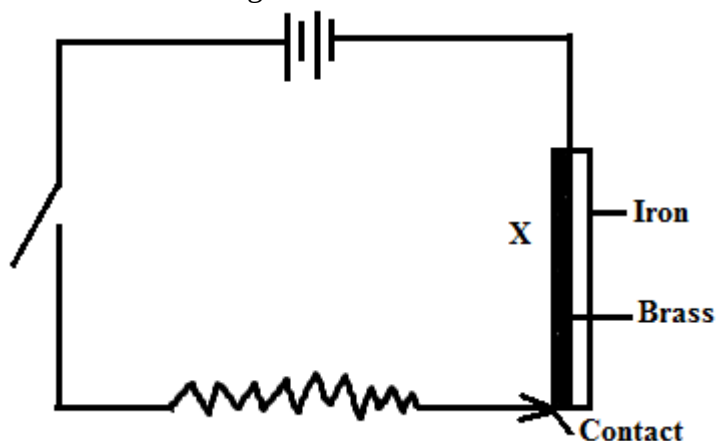
The thermometer reading is increasing as time goes hence there is rise in temperature.

Conclusion

Electric current has heating effect shown by increase in temperature as time goes hence the coiled wire is producing heat.

2009-43.

Figure 11 is a circuit diagram.



- Identify the device labelled X. (1 mark)
 - bimetallic strip
- Mention any one electrical appliance that uses device X. (1 mark)
 - dry electric iron
- Explain how the device labelled X works in an electrical appliance. (8 marks)
 - When the circuit has too much current, the device X is heated, brass expands more than iron and so the strip bends with brass on the outside because it is longer and break the circuit. The device X can protect the circuit from over-current.

6 MAGNETISM

2012-13.

What is the similarity between “magnetic force” and “gravitational force”?

A. The strengths depend on distance.

B. Their attractions depend on the type of material.

- C. They both attract any material.
D. They both attract metals only.

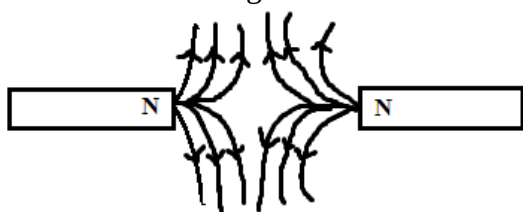
2011-24.

Which of the following is **not** a property of magnets?

- A. attracts pieces of paper
B. repels magnets
C. attracts magnetic substance
D. exerts a force

2010-13.

Figure 4 is a diagram showing magnetic field lines on two magnets



A magnetic material placed at point X would

- A. move up
B. move down
C. remain at the same position
D. move towards one magnet

2009-26.

Which of the following is **not** a property of magnets?

- A. Magnets attract magnetic substances.
B. Magnets used a compass needle.
C. Magnetic forces of a magnet pass through non-magnetic substances.
D. Strength of magnets is strength at the poles.

2008-6.

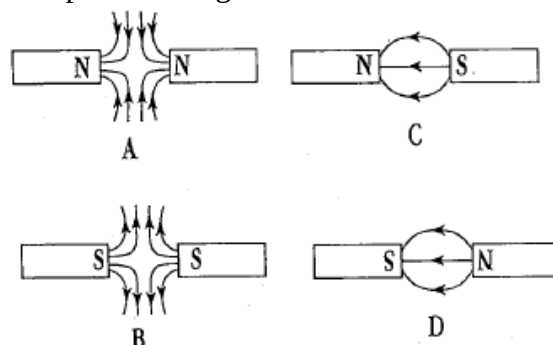
What is meant by magnetic field?

- A. A point on a magnet which exerts force on magnetic objects.

- B. The region around a magnet where magnetic force is experienced.
C. The lines of force of a magnet from the south pole to the north pole.
D. A point where any magnetic force can be experienced.

2006-12.

Which of the following correctly represents lines of magnetic force between two poles of magnets?



2015 -2

Which of the following lists consists of magnetic materials only?

- A. Iron nail, steel pin, plastic ruler
B. Steel pin, steel pot, paper
C. Iron nail, steel pin, steel pot
D. Copper wire, steel wire, copper coin

2015-3

What name is given to the region around magnet in which magnetic materials experience magnetic force?

- A. Magnetic field
B. Magnetic lines
C. Magnetic null point
D. Magnetic pole

ANSWERS TO QUESTIONS

2012-13. A

2011-24. A

2010-13. C

2009-26. C

2008-6. B

2006-12. D

2015-2. C

2015-3. A

SECTION B

2022 NED MOCK

Given an unmarked bar magnet, describe an experiment you would carry out in order to determine the poles of the magnet.

- Suspend a bar magnet using thin cotton thread by its centre. (1 mark) Make sure there is no steel or iron nearby.
- Displace the magnet slightly so it can swing in a horizontal plane. (1 mark)
- Note the direction in which it comes to rest. (1 mark)
- Repeat the above steps.

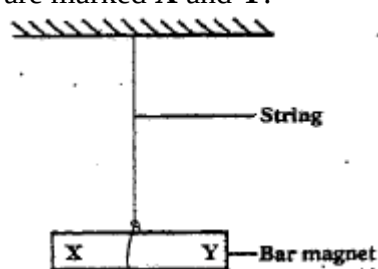
The bar magnet swings and upon resting it points North- south, (1 mark) label end pointing north(N) and end pointing south(S) (1 mark)

2021 – 27b Give any **three** ways of caring for magnets.

- Keep magnets using magnet keepers
- Keep magnets away from alternating current
- Keep magnets away from sources of heat
- Never drop or hammer magnets

2004-38.

Figure 9 shows a bar magnet which is suspended freely with a string. The ends of the magnet are marked X and Y.



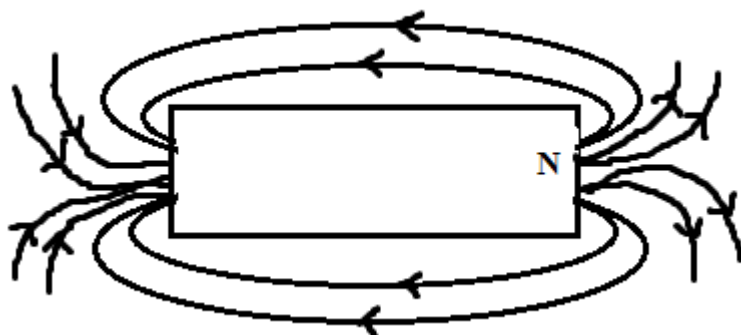
- A S-seeking pole of another magnet repels side X. In which direction is side X pointing? (1 mark)
 - South
- Give a reason for the answer to **38.a**. (3 marks)
 - X is the S-seeking pole because like poles repel each other. When a magnet is suspended, it changes the direction according to the Earth's magnetic field.

2012-41.

- Explain how the poles of a bar magnet could be identified. (5 marks)
 - Suspend the magnet. Push the magnet slightly so that it can swing. Wait until it stops swinging. Note the direction in which it comes to rest. The pole that points north is the N seeking pole and the pole that points south is the S-seeking pole.

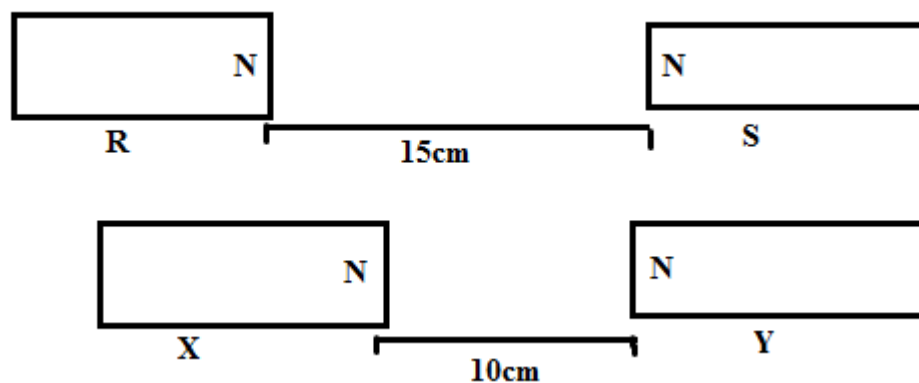
2016-39

- Figure 9 is a diagram showing magnetic field lines around a magnet



Label the north pole of the magnet **(1 mark)**

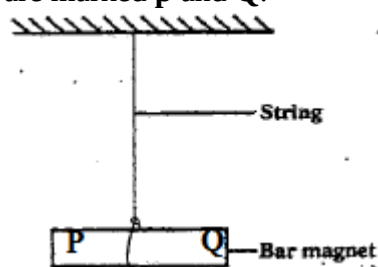
- Figure 10** is a diagram showing identical bar magnets R and S placed 15cm apart and bar magnets X and Y placed 10cm apart



- (i) Which pair of magnets will experience greater force of repulsion?
 ➤ **X and Y**
- (ii) Give a reason for the answer to 39.b.(i)
 ➤ Because distance between the magnets is short hence magnetic field is very large when magnets are close to each other.

2014-35.

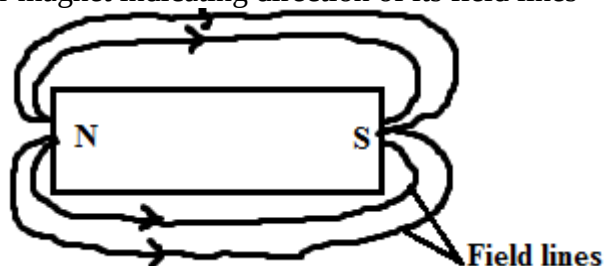
Figure 6 shows a bar magnet which is suspended freely with a string. The ends of the magnet are marked **p** and **Q**.



- a. If an N-seeking pole of another magnet repels side P, in which direction is P pointing?
 ➤ North pole
- b. Give a reason for your answer in 35.a

2014-36

Draw bar magnet indicating direction of its field lines



7 DENSITY

2021 – 9

A body has a density of 0.25g/cm^3 . If the mass is 120g, what is the volume?

- A. 0.02cm^3
- B. 480 cm^3
- C. 30 cm^3
- D. 2.08 cm^3

2021 – 13

A container with square base is filled with 75cm^3 of water to a height of 3cm. what is the base area?

- A. 20cm^2
- B. 225cm^2
- C. 25cm^2
- D. 200cm^2

2021 – 20

What is the relationship between density and temperature in the range of 0°C to 10°C ?

- A. as temperature decreases from 10°C to 4°C density decreases
- B. as temperature decreases from 10°C density increases
- C. as temperature decreases from 10°C to 4°C density remains the same
- D. as temperature decreases from 10°C to 4°C density is zero.

2012-30.

A ship floats on water because its

- A. mass is greater than that of water.
- B. average density is greater than that of water
- C. volume is less than that of water
- D. average density is less than that of water

2011-7.

What is the density of a 40 g cube with each side 2cm long.?

- A. 5 g/cm^3
- B. 10 g/cm^3
- C. 20 g/cm^3
- D. 80 g/cm^3

2010-9.

Find the density of a substance which has a mass of 120 g and volume of 15 cm^3 ?

- A. 8.0 g/cm^3
- B. 105 g/cm^3
- C. 135 g/cm^3
- D. 1800 g/cm^3

Substance	Volume (cm^3)	Mass (g)
R	20	25
S	30	15

2009-3.

What is the average density of the mixture of R and S?

- A. 0.80 g/cm^3
- B. 0.875 g/cm^3
- C. 1.25 g/cm^3
- D. 1.60 g/cm^3

2009-10.

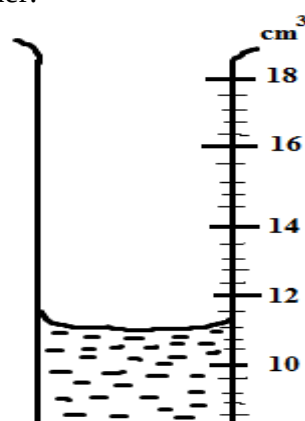
Why does a ship made of iron float on water?

- A. Its average density is less than the density of water.

- B. Its streamlined shape enables it to move easily
- C. The water exerts greater force than the ship.
- D. The density of iron is less than the density of water.

[2009-18]

Figure 4 shows part of a measuring cylinder.



2009-18. What is the volume of the liquid in the cylinder?

- A. 10.3 cm^3
- B. 10.7 cm^3
- C. 11.4 cm^3
- D. 11.8 cm^3

2008-14.

At what temperature is the density of pure water greatest?

- A. -14°C
- B. -4°C
- C. 0°C
- D. 4°C

2007-26.

Which of the following substances would float in a liquid of density 0.78 g/cm^3 ?

- A. wood of density 0.75 g/cm^3
- B. petrol of density 0.8 g/cm^3
- C. water of density 0.90 g/cm^3
- D. glass of density 2.6 g/cm^3

[2006-1,2]

Table 1 shows densities of different substances. Use it to answer Questions 1 and 2.

Substance	Density (g/cm^3)
P	0.78

Q	0.02
R	0.70
S	0.75
T	0.80

2006-1.

Which of the following substances would sink in **P**?

- A. Q
- B. R
- C. S
- D. T

2006-2.

What is the mass of 10cm³ of substance **Q**?

- A. 0.002g
- B. 0.2g
- C. 2.0g
- D. 20g

[2004-25,26]

Figure 7 is a graph of volume of water against temperature. Use it to answer questions 25 and 26.

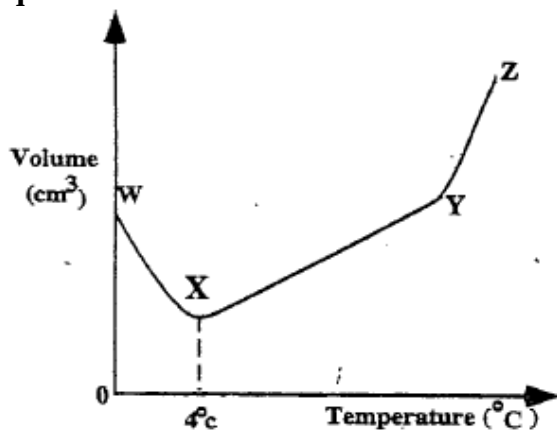


Figure 7

- 2012-30. D
- 2011-7. A
- 2010-9. A
- 2009-3. A
- 2009-10. A
- 2009-18. C
- 2008-14. D

2004-25.

Which statement is true about the density of water from point **W** to point **X**?

- A. The density of water is increasing because volume, of water decreases between 0°C and 4°C.
- B. The density of water is increasing because volume of water increases between 0°C and 4°C.
- C. The density of water is decreasing because volume of water decreases between 0°C and 4°C.
- D. The density of water is decreasing because volume of water increases between 0°C and 4°C

2004-26.

At which point will the density of water be lowest?

- A. W
- B. X
- C. Y
- D. Z

2003-16.

Table 1 shows densities of different substances.

Table 1

Substance	Density (g/cm ³)
W	19.3
X	8.9
Y	2.7
Z	1.6

If equal masses of each substance are compared, which one will have the greatest volume?

- A. Z
- B. Y
- C. X
- D. W

ANSWERS TO QUESTIONS

- 2007-26. A
- 2006-1. D
- 2006-2. B
- 2004-25. A
- 2004-26. D
- 2003-16. A

SECTION B

2021 – 22a

Calculate mass of a cuboid of sides 5cm each and density of 8g/cm^3 . (4 marks)

$$\text{Volume} = 5\text{cm} \times 5\text{cm} \times 5\text{cm} = 125\text{cm}^3$$

$$d = 8\text{g/cm}^3$$

$$m = d \times v = \frac{8\text{g}}{\text{cm}^3} \times 125\text{cm}^3 = 1000\text{g} = 1\text{kg}$$

2021 – 24b

Describe how temperature affects the density of a liquid. (3 marks)

- When a liquid is heated, distance between the particles increases. This increases the volume of the substance hence decreasing density of the liquid.

2021 – 33a

Describe how one would determine the density of a liquid using a cylindrical container of a uniform cross sectional area and a mass balance.

- Measure the mass of a uniform cross sectional area cylinder using a mass balance and record the readings.
- Pour in the liquid into the cylindrical container and note the volume reached.
- Weigh the mass of the cylindrical container with liquid in it using a mass balance
- Subtract the mass of the cylindrical container from the mass of the cylindrical container with liquid in it to find the mass of the liquid only.
- Calculate the density of the liquid by dividing the mass of the liquid with volume of the liquid.

2019 MSCE sample – 7

Calculate the average density of the mixture when 20cm^3 of paraffin whose density is 0.7g/cm^3 is mixed with 10cm^3 of petrol whose density is 0.9g/cm^3 .

• Solution

Mass of paraffin	=	density of paraffin $\times$ volume of paraffin
	=	$0.7\text{g/cm}^3 \times 20\text{cm}^3$
	=	14g
Mass of petrol	=	density of petrol $\times$ volume of petrol
	=	$0.9\text{g/cm}^3 \times 10\text{cm}^3$
	=	9g
Total mass of mixture	=	14g + 9g
	=	23g
Total volume of mixture	=	$20\text{cm}^3 + 10\text{cm}^3$
	=	30cm^3
Average density	=	$\frac{23\text{g}}{30\text{cm}^3}$
	=	0.8g/cm^3

2019 -7a

Define average density

- The ratio of total mass to total volume of a substance

2003-40.

10g of cement, volume 2.5cm^3 and 30g of sand, volume 17.5cm^3 are mixed, calculate the average density of the mixture. (3 marks)

- 2g/cm^3 (Total mass = $10\text{g} + 30\text{g} = 40\text{g}$, Total volume = $2.5\text{cm}^3 + 17.5\text{cm}^3 = 20\text{cm}^3$, hence average density = $40\text{g}/20\text{cm}^3 = 2\text{g/cm}^3$)

2012-43.

- Explain why an inflated tube floats on water. (2 marks)



- The average density of inflated tube is smaller than the density of water.
- b. Explain why the air on land rises during a sea breeze. (3 marks)
 - The land warms faster than the water in the sea. The air on land expands, become less dense, and therefore it rises.

2010-41.

Describe how the density of an object with an irregular shape but known mass could be found. (7 marks)

- Record the known mass of the regular object
- Pour water into the measuring cylinder and note its volume as (V_1)
- Put in an irregular solid into the measuring cylinder and note the new volume as (V_2)
- Calculate the volume of irregular solid by subtracting V_1 from V_2
- Calculate density by dividing the known mass with the calculated volume

2007-42.

- b. Explain why the density of a substance decreases when the substance is heated. (6 marks)
 - When a substance is heated, it gains kinetic energy. Intermolecular force between particles weakens hence distance between particles increases. This increases volume of particles while mass remains constant hence density decreases

2005-41.

a. Define “density”. (1 mark)

- Density is the mass of a substance per unit volume

b. Why does ice float on water? (1 mark)

- Ice is less dense than water.

c. Describe an experiment that can be done to determine the density of a regular metal block. (8 marks)

- Measure the mass of a regular metal block using a beam balance
- Measure the length, width and height of a regular metal block using a metre ruler
- Calculate the volume of the regular metal block by multiplying the length, width and the height
- Calculate the density of the regular metal block by dividing its mass with the calculated volume

2014 – 43a

Why a small grain of sand sink in water while a big ship floats? (3 marks)

- The average density of a small grain of sand is greater than that of water hence it sinks while the average density of a big ship is lower than the average density of water hence it floats.

8 SPECIFIC HEAT CAPACITY

2011-26.

How much heat is supplies to 20 g of water if its temperature is raised from 30°C to 50°C? (specific heat capacity of water is 4.2 J/g°C)

- A. 95.2 J
- B. 1680 J
- C. 2520 J
- D. 4200 J

2010-5.

How much heat is needed to raise the temperature of 0.2kg of paraffin from 25°C to 40°C? (Specific heat

capacity of paraffin is 2200 J/kg°C)

- A. 29.3 J
- B. 6,600 J
- C. 33,000 J
- D. 165,000 J

2007-19.

How much heat energy is produced when the temperature of 100g of water is raised from 30°C to 40°C? (Specific heat capacity of water is 4,200J/kg°C)

- A. 420J
- B. 4,200J



- C. 42,000J
D. 420,000J

[2005-6,7]

Table 1 shows specific heat capacities for some liquids. Use it to answer **questions 6 and 7**.

Table 1

Substance	Specific Heat Capacity (J/kg°C)
Pure water	4,200
Sea water	3,900
Paraffin	2,200
Methylated Spirit	2,500

2005-6.

Calculate the mass of paraffin that gains 8,800 J when its temperature rises from 38°C to 40°C.

- A. 0.5kg
B. 2.0kg

- C. 4.0kg
D. 8.0kg

2005-7.

Which substance would have the lowest temperature rise if they were all supplied with equal amount of heat?

- A. pure water
B. paraffin
C. methylated spirit
D. sea water

2003-15.

How much heat energy will be needed to raise the temperature of 3kg of water from 23°C to 25°C? (Specific heat capacity of water is 4,200J/kg°C)

- A. 25.2kJ
B. 8.4kJ
C. 6.3kJ
D. 2.8kJ

ANSWERS TO QUESTIONS

2011-26. B

2010-5. B

2007-19. B

2005-6. B

2005-7. A

2003-15. A

SECTION B

2004-41.

a. Define the term “specific heat capacity” of a substance. **(1 mark)**

- Specific heat capacity of a substance is the amount of heat energy needed to raise the temperature of 1kg of the substance by 1 Kelvin

Table 2 shows changes in temperature when equal masses of water, methylated spirit and paraffin were heated equally.

Table 2

Liquid	Mass (g)	Initial Temp. (°C)	Final Temp. (°C)	Temp. Change (°C)
Water	200	26.0	33.0	7
Methylated spirit	200	26.1	42.1	16
Paraffin	200	26.3	47.3	

(i) Calculate the temperature change for paraffin. **(2 marks)**

- $(47.3 - 26.3) ^\circ\text{C} = 21^\circ\text{C}$

(ii) Which of the liquids has the highest specific heat capacity? **(1 mark)**

- Water

(iii) Give a reason for your answer in **41.b.(ii)**. **(3 marks)**

- The temperature change of water was the smallest, hence water has the highest heat capacity.

(iv) Suppose the 200g of paraffin gained 10,500 Joules of heat. Calculate its specific heat capacity. **(3 marks)**

- $c = \frac{Q}{m\Delta T} = \frac{10500\text{J}}{0.2\text{kg} \times 21^\circ\text{C}} = 2.5\text{J/g}^\circ\text{C}$



2015 – 37

State any **three** applications of specific heat capacity in everyday life

- Materials with high specific heat capacity are suitable for making handles of heating devices like kettles, pans and oven covers
- Some substances can be used to make cooking utensils because with low specific heat capacity i.e. flying pans, pots and kettles.
- Substances with low specific heat capacity can be used to make cooking utensils i.e. flying pans, pots and kettles.

9 HEAT TRANSFER

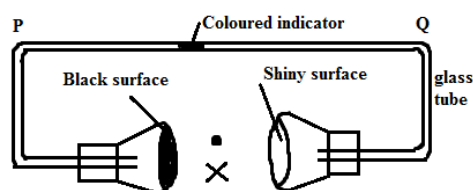
2010-21.

Heat energy is transferred in a vacuum through

- A. radiation only.
- B. conduction only.
- C. convection and conduction.
- D. convection and radiation.

2010-26.

Figure 6 is a diagram showing a setup of an experimental on heat transfer.



What will happen to the coloured indicator if a heat source is placed at point X?

- A. It will move towards Q.
- B. It will move towards P.
- C. It will contract.
- D. It will split into two parts.

2009-5.

Why is the glass in a thermos flask painted silver?

- A. To prevent heat loss by radiation.
- B. To prevent heat loss by conduction.
- C. To prevent heat loss by convection.
- D. To keep the surface shiny.

2009-14.

ANSWERS TO QUESTIONS

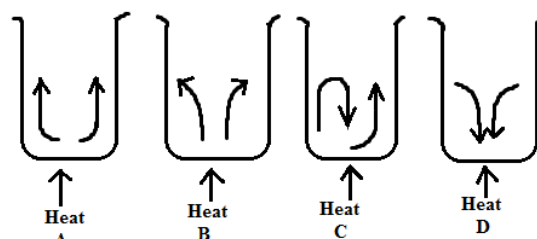
2010-21. A

2010-26. A

2009-5. A

2009-14. B

Which of the following represents a convection current?



2008-2.

When heat is applied to a beaker containing water, the transfer of heat in the water is through

- A. convection and radiation
- B. conduction
- C. radiation and conduction
- D. convection

2006-28.

How does heat loss occur in a thermos flask?

- A. by convection only
- B. by conduction only
- C. by convection and radiation
- D. by conduction and radiation

2005-5.

In which of the following is heat transferred by radiation?

- A. liquids
- B. gases
- C. solids
- D. vacuum

SECTION B

2022 NED MOCK – 33b

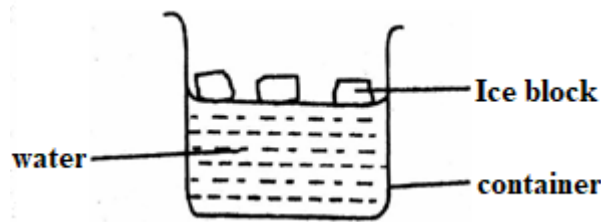
Explain why the air on land rises during a sea breeze.



- Air get heated since soil has low specific heat capacity. (1 mark) air expands (1 mark) and become less dense so it rises (1 mark)

2021 – 31b

Figure 8 is a diagram of water in a container with ice blocks floating on top.



Explain how the water in a container gets cooler.

- Particles of water around ice blocks are cooled. Then the cooled particles of water sink because they get denser due to contraction, while less dense particles at the bottom goes on top to float. Thus convection current is produced and the water is cooled equally

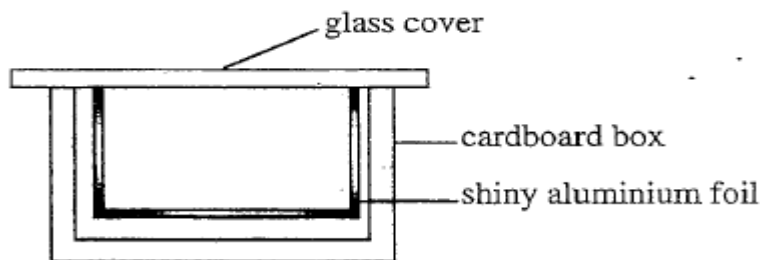
2011-39.

Explain the effect of too much heat in water bodies on aquatic life. **(3 marks)**

- The high water temperatures reduce the amount of oxygen dissolved in water. The reduced oxygen content is harmful to aquatic life and they die due to lack of oxygen.

2005-39.

Figure 12 is a diagram showing a simple solar heater. Use it to answer the questions that follow.



a. State **two** functions of glass cover. **(2 marks)**

- To let light enter through it.
- To prevent the heat from going outside.

b. Explain why the inside of the heater is covered with a shiny aluminium foil. **(2 marks)**

- To reflect the heat so that the heat will not be absorbed in the cardboard box.

2011-41.

a. State any two ways in which heat is transferred. **(2 marks)**

- convection, radiation

b. Explain how heat transfer in liquids could be demonstrated using potassium permanganate crystals and water. **(3 marks)**

- The colour moves up when the water near the crystal is heated. Because the warm water started rising. After that the colour moves downwards because the water was cooled.

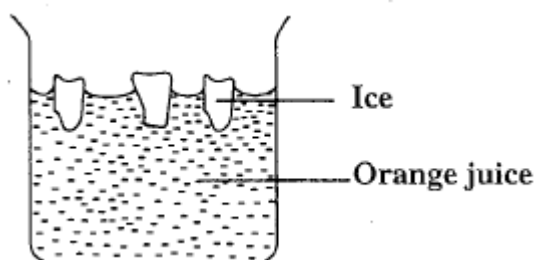
2008-42.

a. Describe an experiment that could be carried out to show the effect of heat on the solubility of salt in water. **(5 marks)**

- Prepare a table salt, cold water, hot water and beaker. Add the same amount of hot water and cool water in two beakers. Add the same amount of salt into the two beakers and dissolve it. If there is difference between solubility of salt, then it is due to the effect of heat.

2006-41.

a. **Figure 11** is a diagram showing ice cubes floating in orange juice.



Explain in detail how the orange juice in the whole container eventually becomes cooler. (6 marks)

- Particles of juice around ice are cooled. Then the cooled particles sink because they get denser due to contraction, while less dense particles around the bottom float. Thus convection current is produced and the juice is cooled equally

10 LIGHT

1. General property (eclipse)

2012-29.

A solar eclipse happens when the

- A. moon comes between the sun and the earth
- B. earth comes between the moon and the sun
- C. sun comes between the earth and the moon.
- D. sun is at its furthest distance from the earth

2011-20.

Which of the following is a set of luminous sources of light?

- A. sun, moon, stars
- B. sun, torch, moon
- C. moon, stars, torch
- D. sun, lamp, torch

2009-15.

Which of the following are examples of luminous structure of light?

- A. sun, fire, lamp
- B. sun, moon, torch
- C. star, lamp, planet
- D. fire, candle, moon

2008-13.

Materials that allow light to pass through them are said to be

- A. translucent.
- B. opaque.
- C. transparent.
- D. luminous.

[2007-5,6]

Figure 2 is a diagram of an object placed between a lamp and a screen. Use it to answer Questions 5 and 6.

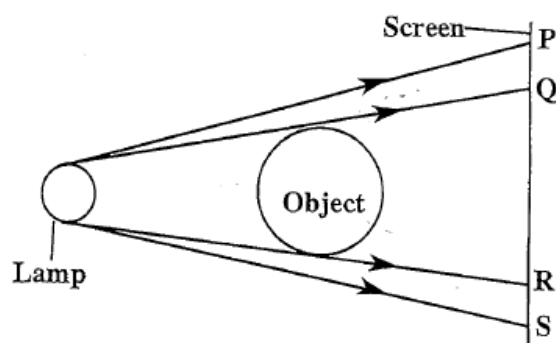


Figure 2

2007-5.

Which of the following regions on the screen represents umbra?

- A. PQ
- B. PR
- C. QR
- D. QS

2007-6.

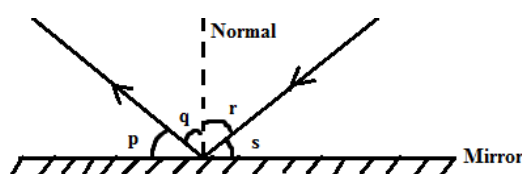
What would be the effect of moving the object closer to the lamp?

- A. PQ will get wider
- B. QR will get wider
- C. QR will get narrower
- D. RS will get wider

2. Reflection

2011-12.

Figure 4 is a diagram showing a ray of light reflected by a plane mirror.



Which of the following represents the angle of incidence?

- A. p
- B. q
- C. r
- D. s

2011-30.

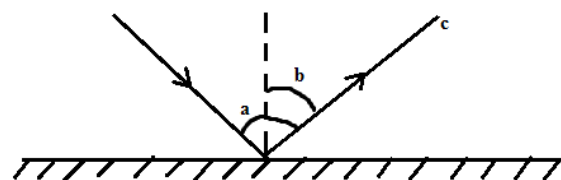
The image of an object placed in front of a plane mirror is formed

- A. on the surface of the mirror.
- B. on the same side as the object.
- C. inside the mirror.
- D. on the other side of the mirror.

[2010-15,16]

Figure 5 is a diagram showing reflection of light.

Use it to answer **Question 15** and **16**.



2010-15.

What is the value of angle b if angle a is 60° ?

- A. 120°
- B. 90°
- C. 60°
- D. 30°

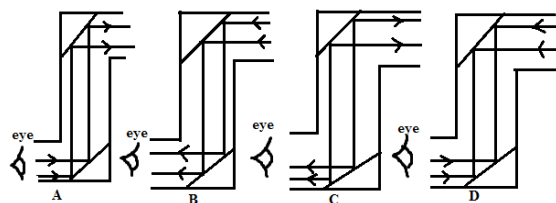
2010-16.

Which of the following does **C** represent?

- A. incident ray
- B. dispersed ray
- C. reflected ray
- D. refracted ray

2009-16.

Which of the following diagrams correctly shows the path taken by light rays in a periscope?



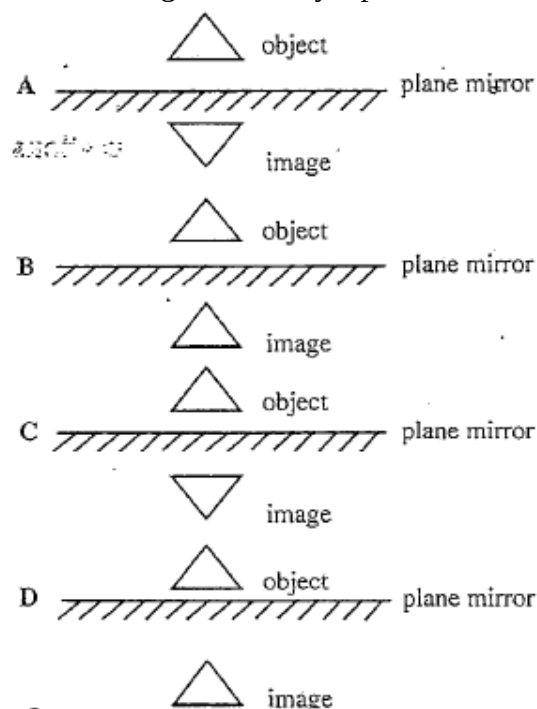
2008-3.

Which of the following is a correct statement on reflection of light?

- A. The angle of incidence is equal to the angle of reflection.
- B. The angle of incidence is larger than the angle of reflection.
- C. The normal and the reflected ray lie in different planes.
- D. The angle between the incident ray and the reflected ray is 90° .

2005-9.

Which of the following diagrams is correct about an image formed by a plane mirror?



[2004-10,11]

Figure 3 is a diagram of ray of light reflected from a plain mirror. Use it to answer **questions 10** and **11**.

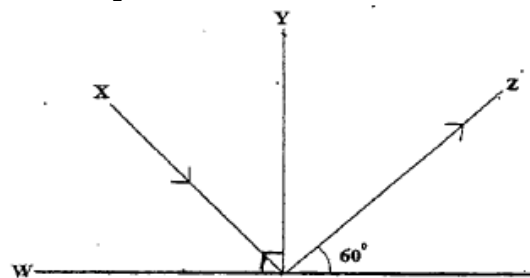


Figure 3

2004-10.

What is the value of the angle of incidence?

- A. 30°
- B. 60°
- C. 90°
- D. 180°

2004-11.

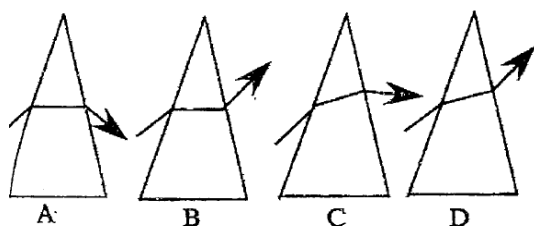
Which is the correct order of the parts labelled **W, X, Y** and **Z** respectively?

- A. reflecting surface, reflected ray, normal, incident ray
- B. normal, incident ray, reflected ray, reflecting surface
- C. reflecting surface, incident ray, normal, reflected ray
- D. incident ray, reflected ray, normal, reflecting surface

3. Refraction (dispersion)

2009-22.

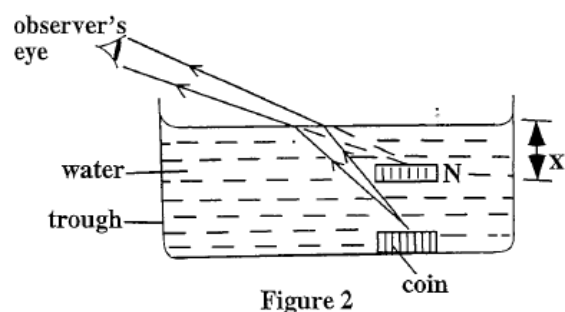
Which of the following correctly represents a path of a ray of light through a prism?



- B. air is denser than glass.
- C. some of the light has been reflected.
- D. the normal attracts the incident ray.

[2008-11,12]

Figure 2 is a diagram showing a coin immersed in water and its image seen at position **N**. Use it to answer **Questions 11** and **12**.



2008-11.

The observer is able to see the coin at position **N** because of the

- A. reflection of light.
- B. dispersion of light.
- C. diffraction of light.
- D. refraction of light.

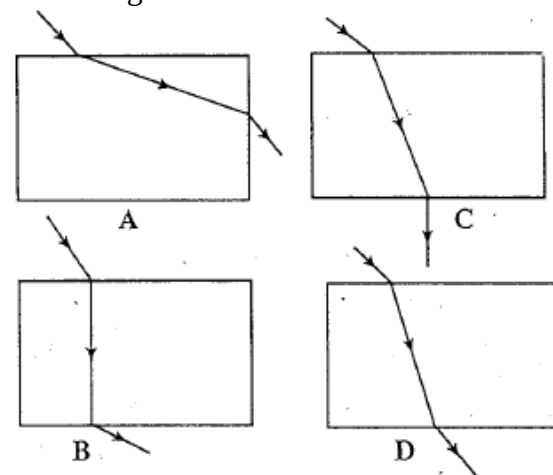
2008-12.

What does the part labelled **x** represent?

- A. actual depth
- B. diffracted depth
- C. apparent depth
- D. refracted depth

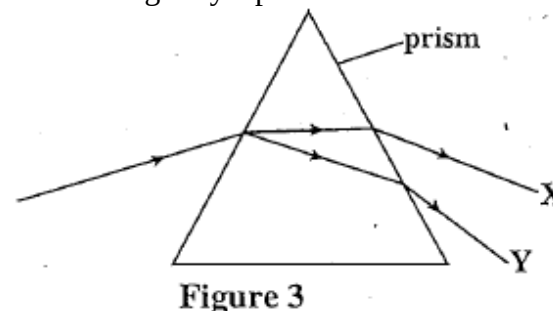
2006-17.

Which of the following diagrams correctly represents a path of a ray of light through a block of glass?



2006-18.

Figure 3 is a diagram showing dispersion of white light by a prism.



- What colours are represented by **X** and **Y**?
- A. red and yellow
 - B. red and violet
 - C. yellow and green
 - D. green and violet

ANSWERS TO QUESTIONS

1. General property (eclipse)

2012-29. A

2011-20. D
2009-15. A
2008-13. C
2007-5. C
2007-6. B

2. Reflection

2011-12. C
2011-30. D
2010-15. D
2010-16. C
2009-16. B

2008-3. A
2005-9. A
2004-10. A
2004-11. C

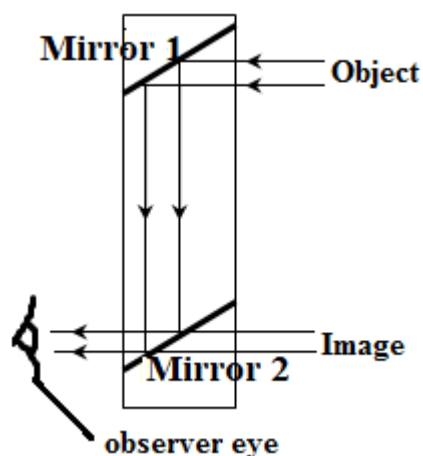
3. Refraction (dispersion)

2009-22. A
2008-7. A
2008-11. D
2008-12. C
2006-17. D
2006-18. B

SECTION B

2022 NED MOCK – 31a

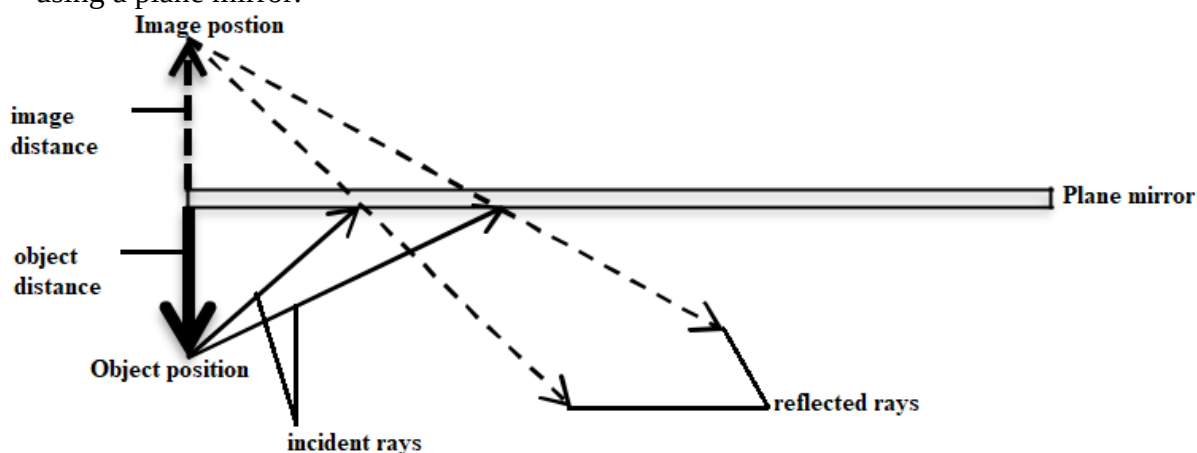
With the aid of a well labelled diagram explain how a periscope works.



Light rays from the object is reflected by Mirror 1 1 mark. Mirror 1 reflect light rays into mirror 2 (1 mark). Mirror 2 reflects light rays into the eye (1 mark)

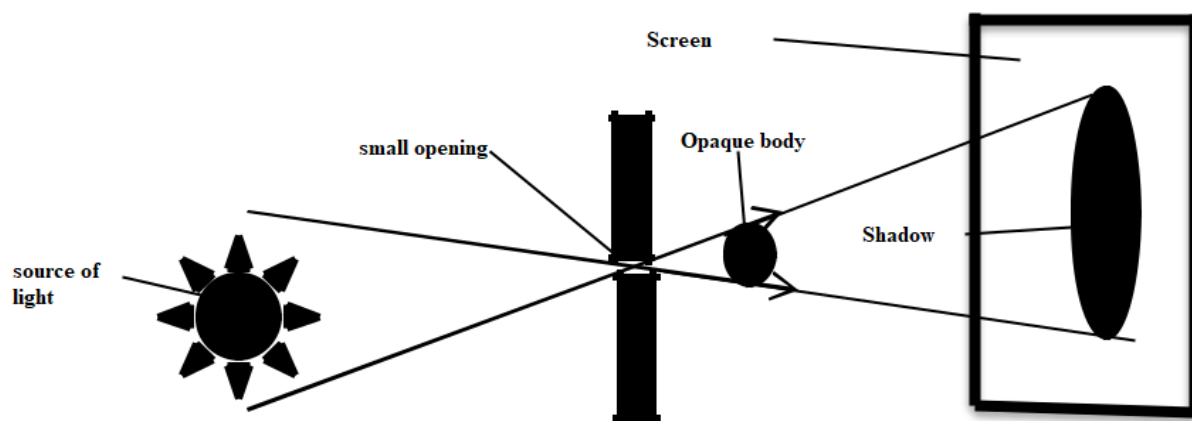
2021 – 33

b. Draw a well labelled diagram to show the position of an image formed by a point object using a plane mirror.



2021 – 32a

With the aid of a well labelled diagram, describe how shadows are formed with a point source of light. (5 marks)

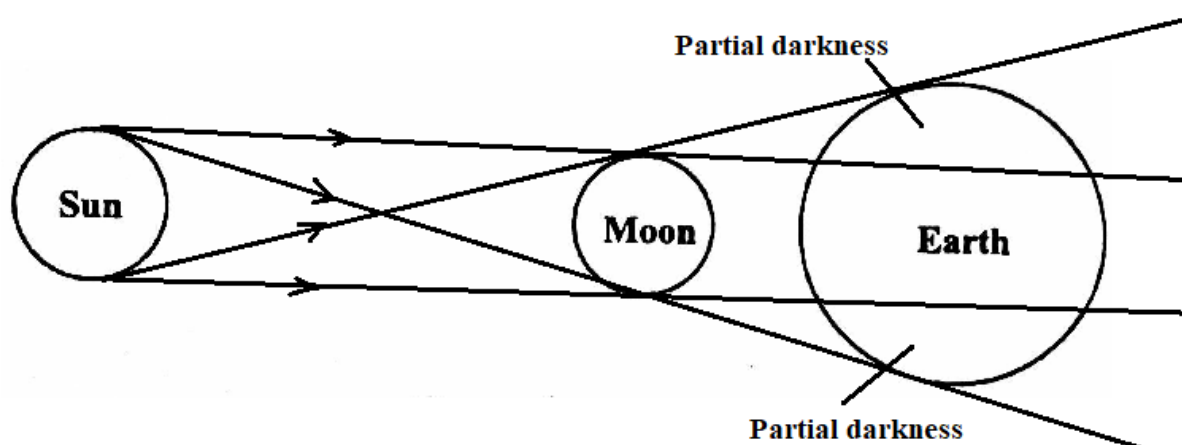


Light rays pass through small opening. The light rays are blocked by the opaque body. The shadow of the opaque body is casted on the screen with only an area of total darkness called umbra.

1. General property (eclipse)

2021 - 25

Figure 4 is a diagram of the respective positions of the sun, moon and the earth during an eclipse.



- Name the type of eclipse that occurs when the sun, moon and earth are positioned as in **Figure 4**
 - Solar eclipse
- Draw in the same diagram to show the part of the earth that would experience a partial eclipse. **(3 marks)**
- State the property of light that causes an eclipse to occur.
 - Reflection of light

2012-36.

Explain how a shadow of an object is formed. **(2 marks)**

- The shadows are formed as a result of light travelling in straight line. Light falling on the subject is either absorbed or sent back, hence a shadow is formed on the side where light fails to come out.

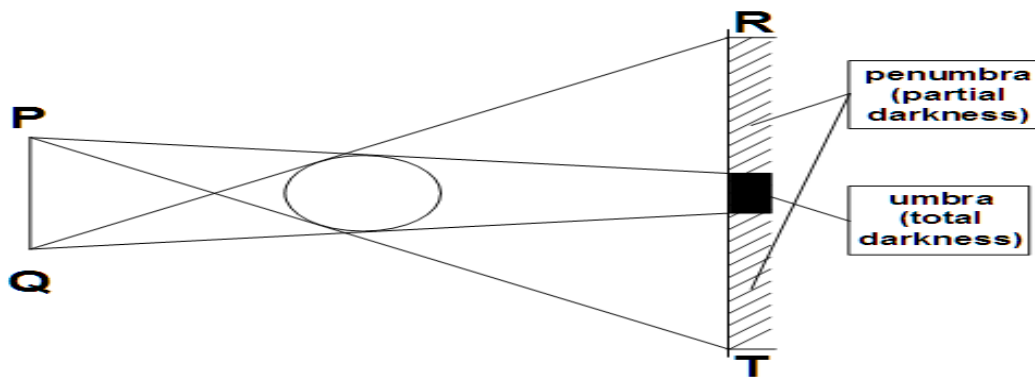
2012-37.

Explain the difference between “umbra” and “penumbra” **(4 marks)**

- Umbra is an area of total darkness while penumbra is an area of partial darkness

2009-37.

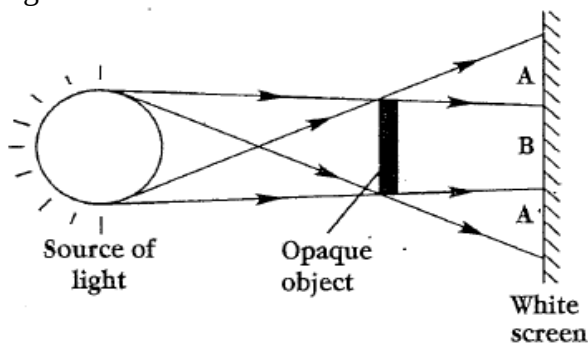
Figure 9 is a diagram showing an opaque material placed between a source of light, **PQ** and a screen, **RT**



- Complete the diagram by drawing two rays from **P** and two rays from **Q** to show how the shadow of the opaque material will be formed on the screen. **(2 marks)**
- On the diagram completed in 37.1, label the regions of: **(3 marks)**
 - total darkness and
 - partial darkness

2003-36.

- Give any **two** examples where reflection of light is used in everyday life. **(2 marks)**
 - Car mirrors
 - Periscopes
- Figure 12** shows dark regions **A** and **B** formed when an opaque object blocks the path of light.



Name the dark regions labelled **A** and **B**. **(2 marks)**

- A: penumbra, B: umbra

2. Reflection

2007-31.

Figure 5 is a diagram of an optical device.

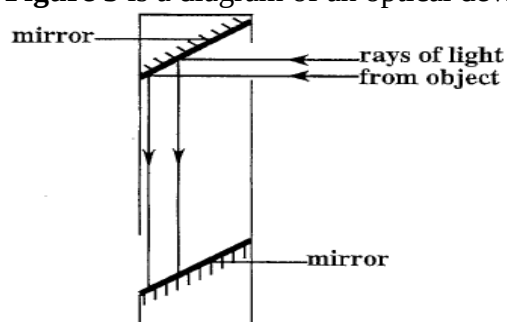
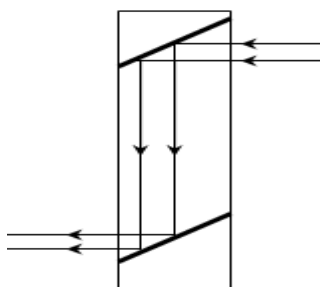


Figure 5

- Name the device. **(1 mark)**
 - Periscope
- Complete the diagram to show rays of light coming out of the device. **(2 marks)**



c. State **two** uses of the device. (2 marks)

- To enable people to see around or over obstacles
- To see below water from above surface

2005-38.

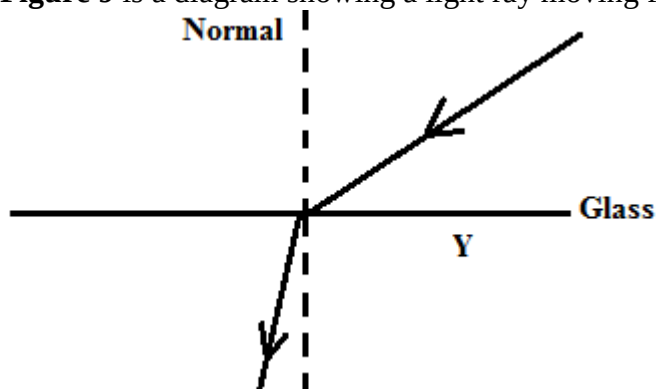
b. Give **two** instruments that use reflection of light. (2 marks)

- Periscopes, Convex mirrors, Concave mirrors, Car mirrors, Cameras

3. Refraction (dispersion)

2011-36.

Figure 9 is a diagram showing a light ray moving from glass to substance Y.



a. Which medium is denser between “glass” and “Y”? (1 mark)

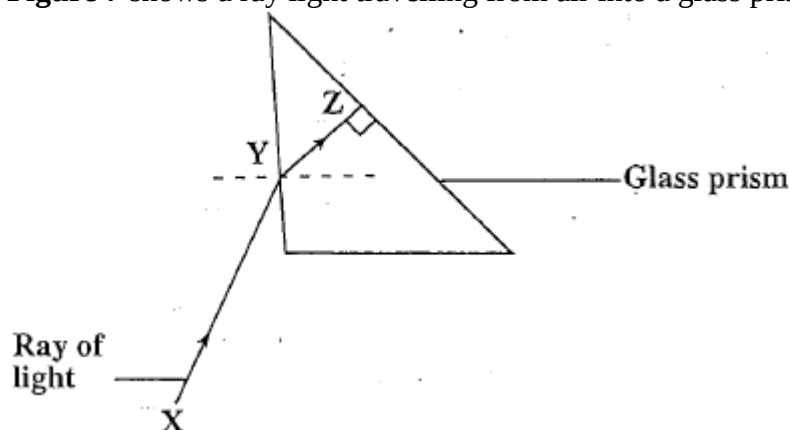
- Y

b. Give a reason for the answer in 36.a. (3 mark)

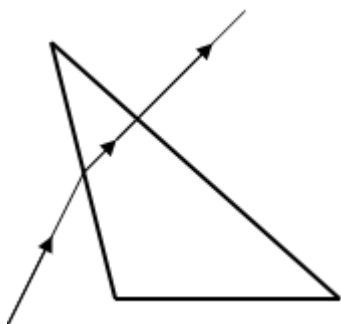
- Because the angle of refracted light ray is larger than the angle of incident light ray.

2006-33.

Figure 7 shows a ray light travelling from air into a glass prism.



a. Complete the diagram by drawing the ray of light emerging from the prism at point Z into the air. (1 mark)



b. Explain the reasoning for completing the diagram in the way done in **33.a.** (2 marks)

- When light travels across a border at a right angle, it does not refract.

2005-38.

a. **Figure 11** is a diagram showing a light ray striking a glass block.

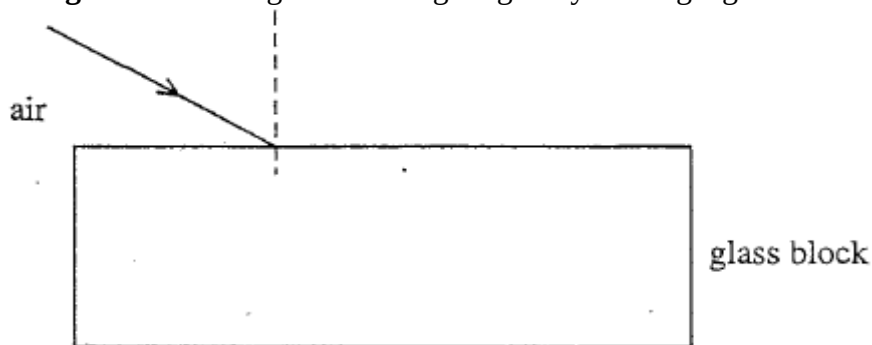
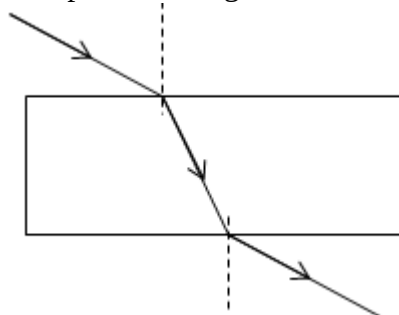


Figure 11

Complete the diagram to show the path the light takes to get out of the glass block. (2marks)



1. General property (eclipse)

2004-42.

a. Give **one** example for each of the following luminous sources of light: **(2 marks)**

- (i) point source: A small bulb, a star in the long distance, the small fire of a match
- (ii) extended source: the sun, a big torch

b. Explain how the following eclipses are produced:

(i) Solar eclipse: **(3 marks)**

- A solar eclipse occurs when the moon lies between the sun and the earth. The moon prevents the sunlight from reaching the earth totally or partially. The shadow of the moon is casted on the earth.

(ii) Lunar eclipse: **(3 marks)**

- A lunar eclipse occurs when the earth lies between the sun and the moon. The earth prevents the sunlight from reaching the moon totally or partially. The shadow of the earth is casted on the moon

c. Mention any things that happen to light when it strikes a surface. **(2 marks)**

- Reflection, Refraction, dispersion

2. Reflection

2006-43.

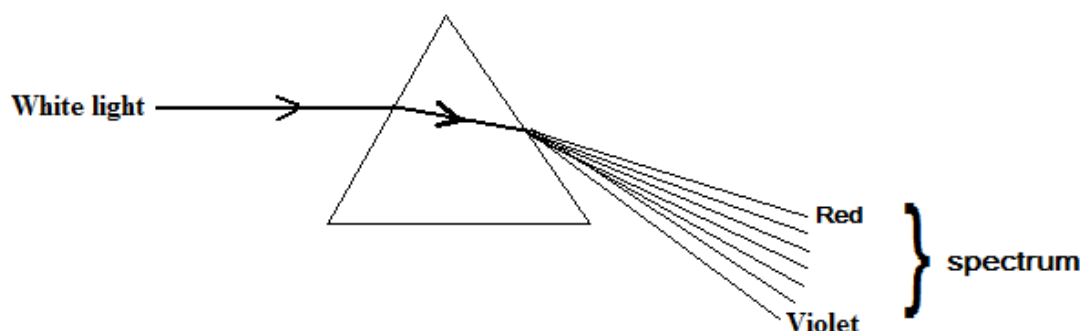
a. State any **three** properties of an image formed by a plane mirror. **(3 marks)**

- It is upright
- Image size is same as object size
- It is virtual

3. Refraction (dispersion)

2010-42.

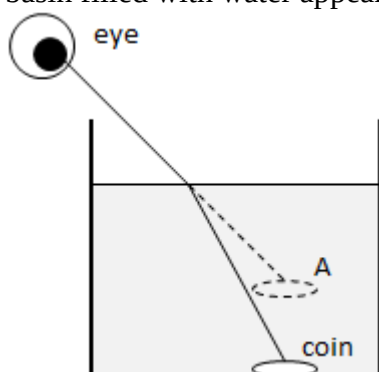
a. With the help of a labelled diagram, describe how white light can be split into various colours using a prism. **(5 marks)**



- White light from the source enters the prism. It bends away from the normal line then it splits into different colours forming a band of colours called a spectrum.

2006-43.

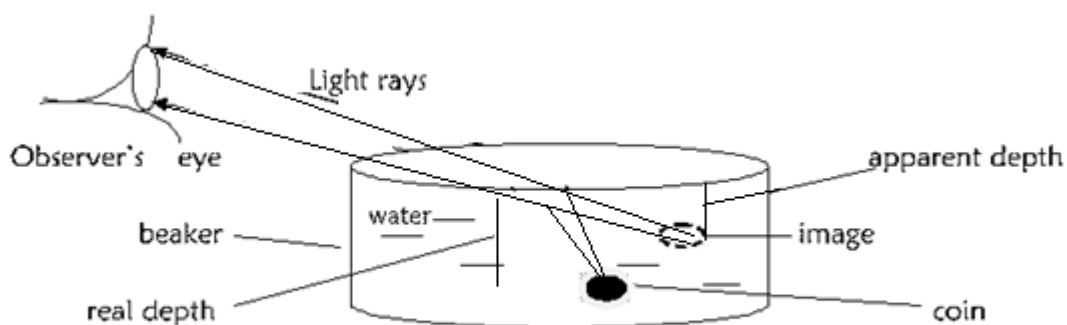
b. With the aid of a diagram, explain why apparent depth of a coin placed at the bottom of a basin filled with water appears to be higher than the actual depth. **(7 marks)**



The light from the coin is refracted at the surface of water and comes to our eyes. Since light apparently comes straightforward to our eyes, we think as if the coin were at the point A which is higher than where the coin actually is.

2022 NEED MOCK – 33a

With the aid of a well labelled diagram, explain why apparent depth of a coin placed at the bottom of a basin filled with water appears to be shallower than the actual depth.



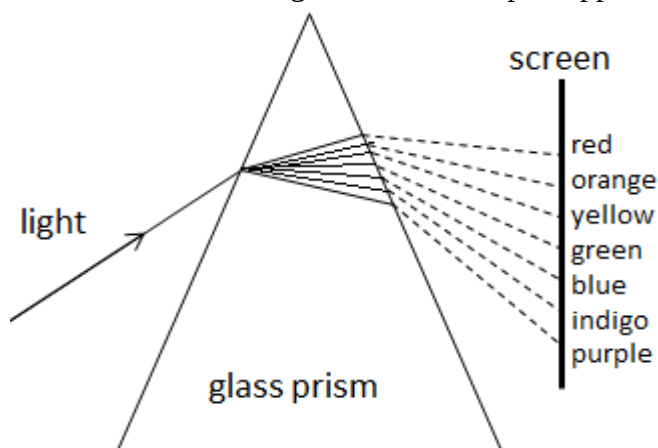
correct diagram(1 mark)

Light rays from the coin travels through water (1 mark), upon reaching the boundary between water and air it bends away from the normal to reach the eye. (1 mark) Since light travels in a straight line, the observer sees the image as the coin. (1 mark)

2003-42.

A student set up an experiment to demonstrate the dispersion of white light.

a. Draw a labelled diagram of the set-up of apparatus the student may have used. **(4 marks)**



b. What name is given to the band of colours produced when white light is dispersed? **(1 mark)**

➤ Spectrum

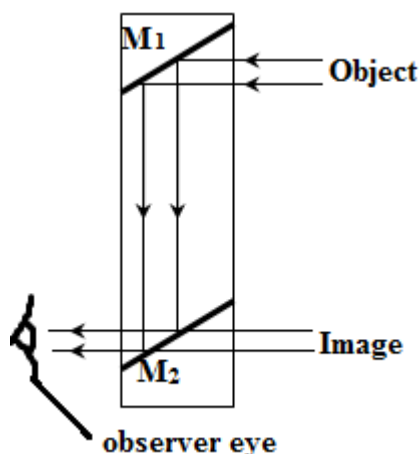
2015 – 42 e

Describe the nature of image formed when object is placed in front of a converging lens at distance between the lens and focal point

- The image is upright, magnified and virtual

2015- 43

With the aid of a diagram, explain how a periscope works



Incident rays from the object are directed to M_1 . The mirror reflects the incident rays perpendicularly to M_2 which is downwards. The reflected rays from M_2 are reflected to the observer's eye and the image of the object is seen and casted opposite the observer eye. The image will look as if it is behind M_2 . The observer will see whatever is happening on top and surrounding his building.

11 PROPERTIES OF MATTER

2021 – 8

Which of the following terms means heat energy needed by a substance to change state?

- A. Heat of vaporization
- B. Melting
- C. Internal energy
- D. Latent heat

2021 – 18, 19

Figure 2 is a diagram showing particles of water changing from a solid into liquid form. Use it to answer questions 18 and 19

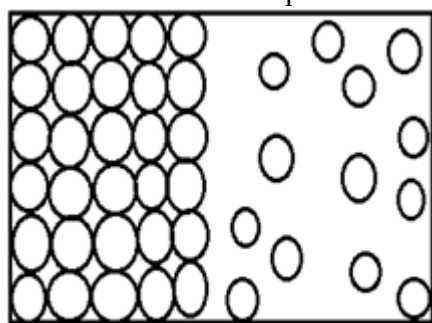


Figure 2

2021 – 18

What process is represented by the arrangement?

- A. Freezing
- B. Deposition
- C. Melting
- D. Evaporation

2021 – 19

1. At what temperature does water undergo the process represented in the diagram?

- A. 100°C
- B. 30°C
- C. -10°C
- D. 0°C

2011-25.

Which of the following is a physical change?

- A. burning of sugar
- B. melting of ice
- C. formation of precipitates
- D. rusting of iron

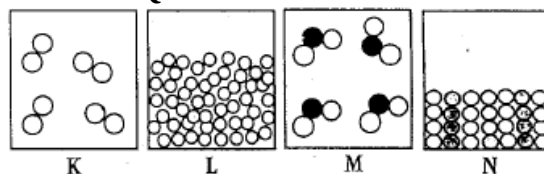
2011-29.

A gas can easily be compressed because its molecules are

- A. small in size
- B. far apart
- C. moving randomly
- D. able to slide over each other

[2006-6,7]

Figure 1 is a diagram showing boxes K, L, M and N containing substances. Use it to answer Questions 6 and 7.



2006-6.

Which box contains a gaseous compound?

- A. *K*
- B. *L*
- C. *M*
- D. *N*

2006-7.

Which box contains a liquid?

- A. *K*
- B. *L*
- C. *M*
- D. *N*

[2006-23,24]

Figure 5 is a diagram showing a summary of heating and cooling processes at sea level. Use it to answer **Questions 23 and 24**.

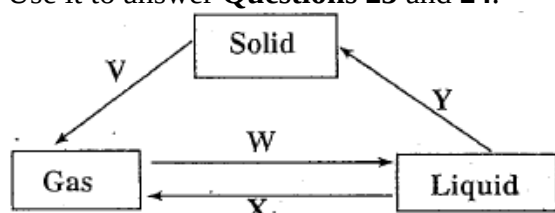


Figure 5

2006-23.

What processes are represented by the letters **V, W, X** and **Y** respectively?

- A. *melting, condensation, evaporation and sublimation*
- B. *sublimation, condensation, evaporation and freezing*
- C. *evaporation, sublimation, melting and condensation*
- D. *condensation, evaporation, sublimation and melting*

2006-24.

At what temperature does water start undergoing process **Y**?

- A. 0°C
- B. 4°C
- C. 25°C
- D. 100°C

[2004-15,16]

Figure 5 is a diagram showing changes of state of matter. Use it to answer **questions 15 and 16**.

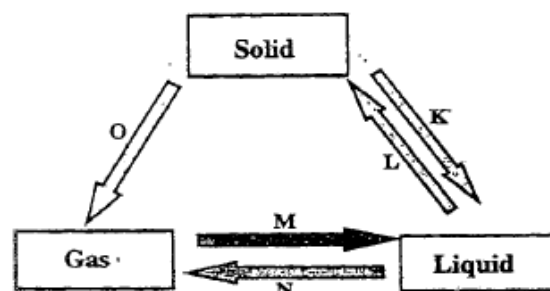


Figure 5

2004-15.

What process is represented by letter **O**?

- A. *melting*
- B. *boiling*
- C. *sublimation*
- D. *evaporation*

2004-16.

Which of the following substances undergoes the process represented by the letter **O**?

- A. *copper*
- B. *mercury*
- C. *iron*
- D. *iodine*

2003-2.

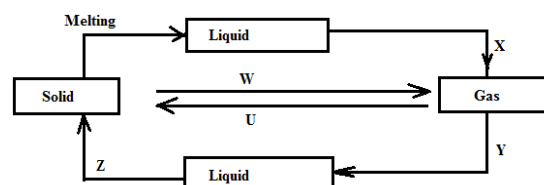
Which of the properties listed below is true for both gases and liquids?

- A. *They can flow.*
- B. *They have definite shape.*
- C. *They have a definite volume.*
- D. *They can easily be compressed.*

2. Thermal properties (molecular motion, MP, BP, pressure)

[2012-14,15]

Figure 5 is a diagram showing the processes that take place as a substance changes from one state to another. Use it to answer **Question 14 and 15**



2012-14.

Which letter represents sublimation?

- A. *U*
- B. *W*
- C. *X*

D. Z

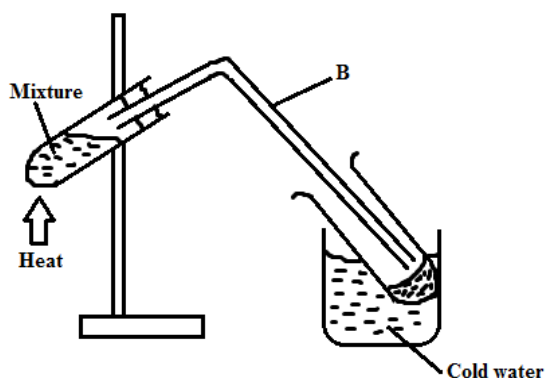
2012-15.

Identify the process marked Y.

- A. evaporating
- B. depositing
- C. freezing
- D. condensing

[2012-23,24]

Figure 7 is a diagram of a distillation apparatus. Use it to answer Question 23 and 24



2012-23.

Name the part labelled B.

- A. boiling tube
- B. delivery tube
- C. receiving tube
- D. capillary tube

2012-24.

What happens if the cold water is replaced by hot water?

- A. Distillate will contain impurities.
- B. More distillate will be produced.
- C. Amount of distillate will be the same.
- D. Less distillate will be collected.

2011-3.

Heating of water causes increase in the

- A. number of its molecules.
- B. mass of its molecules.
- C. density of its molecules.
- D. distance between its molecules.

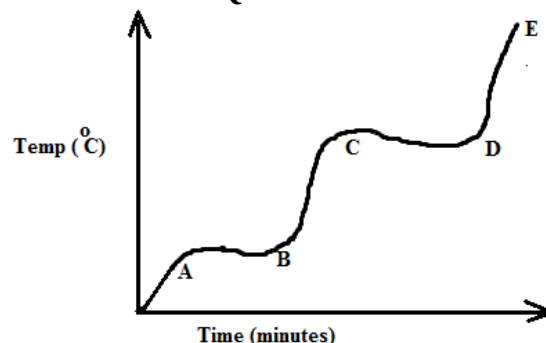
2011-6.

What the altitude of a place at which pure water boil at 96°C ?

- A. 96 m
- B. 104 m
- C. 300 m
- D. 1200 m

[2010-7,8]

Figure 2 is a graph of temperature against time for candle wax that was being heated. Use it to answer Question 7 and 8.



2010-7.

In which state of matter was the candle wax between point B and C?

- A. solid
- B. liquid
- C. gas
- D. liquid and gas

2010-8.

Why does temperature remain constant between point A and B?

- A. Heat supplied is constant at that temperature.
- B. It is a maximum temperature a substance can reach.
- C. Heat supplied is used to create new bonds.
- D. Heat supplied is used to arrange the molecules into another state.

2010-22.

Which of the following factors affect the boiling point of water?

- 1. pressure
 - 2. altitude
 - 3. impurities
 - 4. volume
- A. 1, 2 and 3
 - B. 1, 2 and 4
 - C. 1, 3 and 4
 - D. 2, 3 and 4

2009-30.

The boiling point of water decreases with increase in altitude because _____.

- A. air pressure decreases with increase in altitude
- B. heat energy increases with increase in altitude

- C. density increases with increase in altitude
D. surface tension decrease with increase in altitude

2008-20.

The temperature of a liquid remains constant at its boiling point because the additional heat

- A. is changed into other forms of energy.
B. is not used by the liquid.
C. is absorbed by the surrounding air.
D. is used to change state.

2008-24.

Which of the following affects the boiling point of substances?

- A. pressure and impurities
B. pressure and amount of substance
C. density and impurities
D. density and amount of substance

2008-25.

Which of the following is the boiling point of pure water at an altitude of 900m above the sea level?

- A. 97°C
B. 100°C
C. 103°C
D. 300°C

2007-13.

What would be the boiling point of water at a place 1,800m above sea level?

- A. 100°C
B. 94°C
C. 6°C
D. 0°C

[2007-27,28]

Table 3 shows the melting and boiling points of different substances. Use it to answer **Questions 27 and 28.**

Table 3

Substance	Melting point (°C)	Boiling point (°C)
Nitrogen	-210	196
Ammonia	-78	-34
Bromine	-7	59
Phosphorus	44	280

2007-27.

Which element is a solid at 20°C?

- A. Nitrogen

- B. Phosphorus
C. Bromine
D. Ammonia

2007-28.

Which substance has the lowest melting point?

- A. Bromine
B. Ammonia
C. Phosphorus
D. Nitrogen

2007-30.

Which of the following is a property of a gas?

- A. compressibility
B. inability to flow
C. definite shape
D. definite volume

[2005-14,15]

Figure 1 is a graph showing changes of temperature when a solid substance is heated

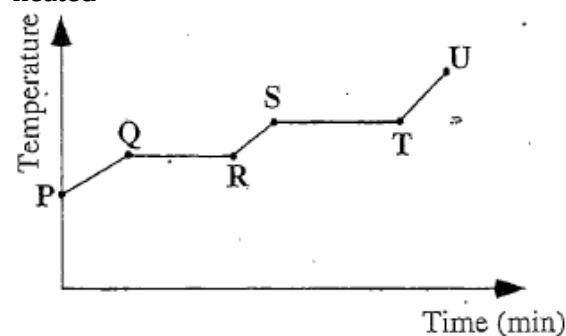


Figure 1

2005-14.

Which region of the graph shows that the substance is boiling?

- A. RS
B. QR
C. TU
D. ST

2005-15.

How does atmospheric pressure affect the boiling point of a substance?

- A. As pressure decreases, boiling point decreases.
B. As pressure increases, boiling point decreases.
C. As pressure changes, boiling point remains the same.
D. As pressure decreases, boiling point increases.

2004-5.

Gases can be easily compressed because their particles

- A. move in all directions.
- B. take the shape of a container.
- C. are far apart.
- D. are not in fixed position.

3. Expansions and Contractions

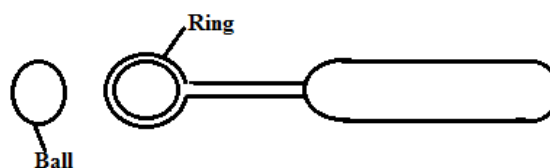
2012-16.

Why is it difficult to compress a stone but easy to compress air?

- A. Molecules of air are strongly held together as compared to those of a stone.
- B. Molecules of a stone are strongly held together as compared to those of air.
- C. Molecules of air are weaker as compared to those of a stone.
- D. Intermolecular forces are stronger in air than in a stone.

2011-8.

Figure 2 is a diagram showing a ball and ring apparatus in which the ball can just pass through the ring.



When the ball is heated it would not pass through the ring because in the ball

- A. mass of the particles increases.
- B. spaces between the particles increase
- C. particles increase in size.
- D. number of particles increases.

2015-4

Which of the following is a property of a solid?

- A. No fixed volume
- B. Easy to compress
- C. No define shape
- D. Difficult to compress

2015-20

A change from solid to gas is called

- A. Sublimation
- B. Evaporation
- C. Freezing
- D. Melting

ANSWERS TO QUESTIONS

1. The particulate nature of matter

2011-25. B

2011-29. B

2006-6. C

2006-7. B

2006-23. B

2006-24. A

2004-15. C

2004-16. D

2003-2. A

2. Thermal properties (molecular motion, MP, BP, pressure)

2012-14. B

2012-15. D

2012-23. B

2012-24. D

2011-3. D

2011-6. B

2010-7. B

2010-8. D

2010-22. A

2009-30. A

2008-20. D

2008-24. A

2008-25. A

2007-13. B

2007-27. B

2007-28. D

2007-30. A

2005-14. D

2005-15. A

2004-5. C

3. Expansions and Contractions

2012-16. B

2011-8. D

SECTION B

2022 NED MOCK – 32. a.

Explain how a pressure cooker works.

Pressure cooker has a lid with a gasket that traps vapour inside. (1 mark)



High pressure is built up inside the pot (1 mark) which increases the boiling point to about 120°C. (1 mark). It has a loaded pin valve which releases excess pressure to prevent it from exploding. (1 mark). Pressure cooker cooks food faster (1 mark).

2022 NED MOCK – 32b

b. Describe an experiment that can be conducted to show that matter is made up of tiny particles using potassium permanganate, water, beaker and tube.

- pour water in a beaker (1 mark) using a tube lower potassium permanganate into one corner of a beaker. (1 mark)
- observe for about 10 minutes. (1 mark)

It is observed that purple colour spreads through water (1 mark) representing movement of molecules. (1 mark)

2021 – 21

Figure 3 shows a scale reading of pure water at sea level

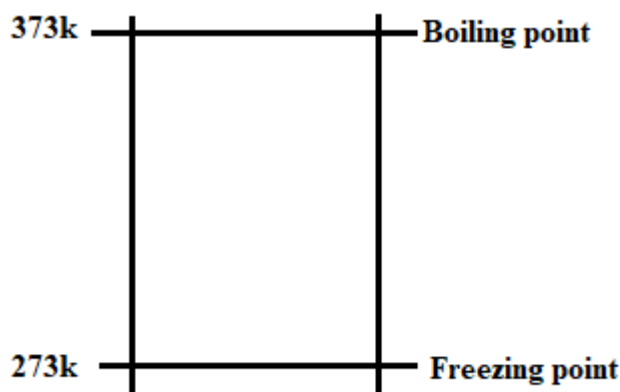


Figure 3

- Name the type of scale illustrated in figure 1
 - Kelvin scale
- What name is given to the reverse process at boiling point when water changes from gas to liquid?
 - Condensation
- Calculate the reading of 130°C on the scale used in **Figure 3**.

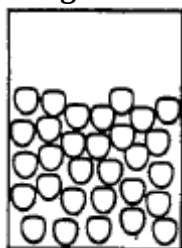
$$T = (\theta + 273)K = (130 + 273)K = 403K$$

2011-31.

- Define “matter”. (2 marks)
 - Everything around us that has mass and occupies space.
- Mention any two properties of liquids. (2 marks)
 - They have medium density
 - They have medium intermolecular force
 - They are viscous
 - They take the shape of a container

2007-32.

c. **Figure 6** shows the structure of a substance

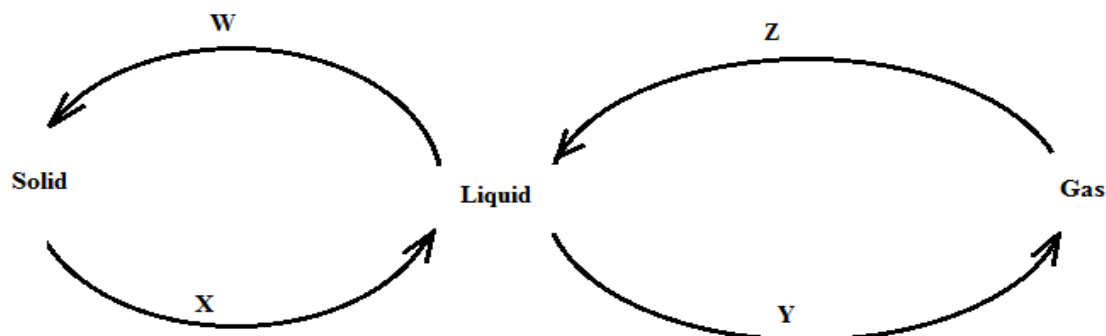


- In what state is the substance? (1 mark)
 - Liquid
- Give a reason for the answer to 32.c.(i). (2 marks)
 - The molecules are close to each other and are not arranged in a regular pattern.

2. Thermal properties (molecular motion, MP, BP, pressure)

2009-33.

b. **Figure 8** shows physical changes which occur in substances.



(i) Name the processes marked **W** and **Y**. (2 marks)

➤ W: Freezing, Y: Evaporation

(ii) At what temperature of water at sea-level does change **X** occur? (1 mark)

➤ 0°C

2007-32.

b. What term is given to the process in which a solid change straight to gas? (1 mark)

➤ Sublimation

3. Expansions and Contractions

2010-33.

a. Why are gases easy to compress? (1 mark)

➤ Because the molecules of a gas are relatively far from one another with large spaces between them.

b. State any **three** negative effects of expansion in our everyday life. (3 marks)

➤ bursting tyres
➤ cracks in buildings
➤ bending of steel railway lines

2008-33.

Figure 6 shows a setup of an investigation.

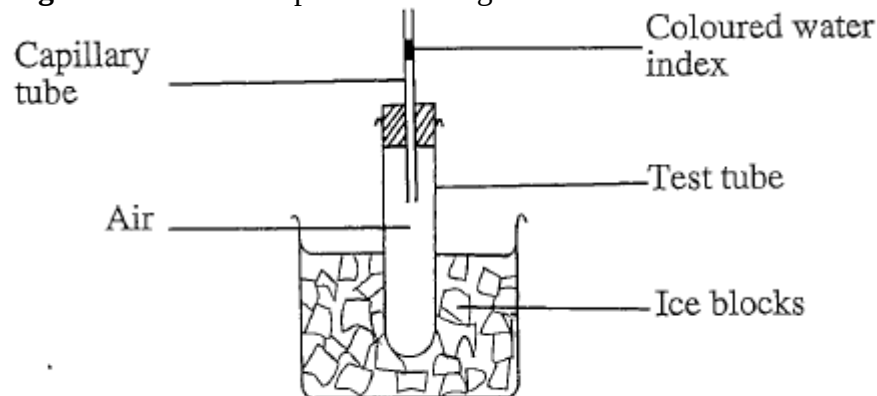


Figure 6

a. What was the aim of the investigation? (1 mark)

➤ To investigate whether air expands or contracts when cooled.

b. What would happen to the water index after some time? (1 mark)

➤ It would drop as the test tube cooled.

c. Give a reason for the answer in **33.b**. (2 marks)

➤ When air is cooled, it will contract. Air changes into water. A degree of movement of particles is less in liquids than in gases.

2007-32.

a. Why are solids difficult to compress? (1 mark)

➤ The molecules are arranged in a regular pattern and are very close to each other.

3. Expansions and Contractions

2015 - 41

Explain each of the following observations

a. Temperature remains constant as ice changes to liquid

- The heat energy supplied is used to weaken intermolecular force and increase distance between the particles hence temperature is hidden that's why it remains constant
- b. Boiling point of water decreases as altitude increases
 - As altitude increases, particles are not densely populated and temperatures are low hence temperature at which a liquid changes to gas decreases.
- c. Density of substance increases as temperature decreases
 - Reducing temperature, increases the intermolecular force holding particles of a substance hence distance between the particles gets reduced. This reduces volume of the substance but mass remains the same hence density increases.

NUCLEAR PHYSICS

SECTION A

2021 – 10

Which of the following describes the nucleus of $^{14}_6\text{C}$ atom?

- 14 protons, 6 protons
- 6 neutrons, 8 protons
- 6 protons, 8 neutrons
- 6 protons, 14 neutrons

SECTION B

2021 – 24a

Give two examples of radio- active elements.

- Uranium
- Nitrogen
- Carbon

2021 Sample paper

- What are isotopes **(1 mark)**
 - Atoms of the same element with the same atomic number but different mass number due to different number of neutrons
- Name **two** sub-atomic particles found inside the nucleus of an atom
 - Protons
 - Neutrons
- State any **two** uses of nuclear radiations **(2 marks)**
 - Radioactivity is used in packaging industries
 - Generation of atomic energy
 - They are used to trace fertilizer uptake in plants
 - Detecting of oil leaks in pipe lines

2012-6.

- (i) Name two types of radioactivity. **(2marks)**
 - Natural radioactivity
 - Artificial Radioactivity
- (iii) Mention any three properties of an alpha particle. **(3marks)**
 - It has higher ionisation ability
 - It has less penetration ability of all particles
 - It has positive charge
 - It is much heavier than other radioactivity

2012-8

Explain any two uses of nuclear radiation. **(4marks)**

- The measurement of amount of remaining radioisotope of carbon can tell the date at which the plant or animal last stopped taking in the carbon and therefore the date when it existed, science animals and plants stop taking carbon when they die.
- The heat energy which is produced by nuclear fusion is used to boil water to make steam at high pressure and its energy are converted to electrical energy in nuclear power plant.

2011-7.

Thorium ($^{232}_{90}\text{Th}$) decays by alpha emission to radium ($^{228}_{88}\text{Ra}$)



(i) What do the numbers 228 and 88 represent in ($^{228}_{88}\text{Ra}$)

- 228 represents mass number
- 88 represent atomic number

2010-5.

a.(i) Name two particles found in the nucleus of an atom. **(2 marks)**

- Neutrons and protons

(ii) State two characteristics of a radioactive substance. **(2 marks)**

- They undergo a radioactive decay
- They have an unstable ratio of protons to neutrons

(iii) State any two uses of nuclear radiation. **(2 marks)**

- Archaeological dating
- Power generation

2009-3.

a. Define “radioactivity”. **(2marks)**

- The spontaneous disintegration of unstable nucleus to release either rays or particles

b. Name three types of radiation. **(3marks)**

- alpha decay
- beta decay
- gamma rays

d. State any three safety precautions that must be followed when handling radioactive substances.

(3 marks)

- We never hold it near the eyes.
- They must be kept in the boxes when not in use.
- Handle with long tongs and transported in thick lead containers.

2007-8.

Describe the following radioactive processes: alpha decay, beta decay and gamma emission. In the description include atomic numbers, penetration power, ionizing ability and behaviour in magnetic and electric fields.

Alpha decay: **(5marks)**

- Each alpha particle has 2 protons (atomic number is 2) and 2 neutrons and it is identical to Helium -4 nucleus with a charge of +2. Alpha particles have strong ionising effect, that is to say, alpha particles have a better ability to remove electrons from shells of other atoms. Alpha particles are not very penetrating; they are easily stopped by thick sheet of paper or by skin, or a few centimetres of air. Alpha particles are deflected by magnetic and electric fields (to the negative side/charge).

Beta decay: **(5marks)**

- The beta particle is an electron and it has a relative charge of -1 since they are smaller than alpha particles. Beta particles have weak ionising effect. Beta particles are more penetrating than alpha particles, but can be stopped by a few millimetres of aluminium or any other metals. Beta particles are deflected by magnetic and electric fields (to the positive side/charge). The beta particles have higher speed than alpha particles, i.e. an average speed of light.

Gamma emission: **(4marks)**

- When a gamma radiation occurs, high energy electromagnetic waves are emitted from the atomic nucleus. Gamma rays have a very weak ionising effect, that is, gamma rays have a very little ability to remove electrons from their paths in the atoms. Gamma rays are very penetrating; never completely blocked or stopped, though lead and concrete can reduce the intensity of penetrating. Gamma rays are not deflected by magnetic or electric fields since they have no charge.

(ii) Why is it important to use radioisotopes with a short half-life as tracers in Agriculture? **(2 marks)**



- The short life-time radioisotopes decay into stable substance rapidly in the plants. As a result, use of short life-time radioisotope can only affect minimum damage for plant cells.

(iii) Explain why fission is a useful process in industry. **(3marks)**

- Useful in the production of nuclear energy.

2004-6.

a. State any two safety precautions to be taken when handling radioactive substances. **(2 marks)**

- Wear protectors
- Use forceps
- Enclose the waste in steel containers which are taken buried in concrete bunkers

(ii) Explain why gamma radiation is used in sterilization of medical equipment. **(3 marks)**

- Because gamma rays cuts DNA and kills cells of bacteria and virus

2003- 2

a. What are isotopes? **(2marks)**

- atoms of the same element which have the same atomic numbers but the different mass numbers.

b. Chlorine has two isotopes $^{35}_{17}\text{Cl}$ and $^{37}_{17}\text{Cl}$ Give the number of neutrons in the nucleus of $^{35}_{17}\text{Cl}$

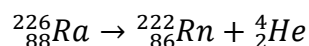
(1mark)

- $35 - 17 = 18$

d.(i) What is radioactivity? **(2marks)**

- It is a random spontaneous disintegration of certain atomic nucleus with the emission of three different types of radiation such as alpha, beta and gamma rays.

(ii) When the nucleus of radium emits an alpha particle it decays to radon according to the equation:



Besides radon, what other particle is produced when radium decays? **(1mark)**

- Helium

How does the mass of the decaying atom compare with the masses of the Products? **(1mark)**

- The sum of the masses of products is the same to the mass of reactants.

Name the alpha particle in this equation? **(1mark)**

- Helium

e. Explain how gamma rays are emitted. **(4marks)**

- Gamma rays can be emitted by decaying of heavy atoms such as cobalt.

f. Give one use of gamma rays. **(1mark)**

- Treatment for cancer (killing cancer cells)

