Physics Checkpoint Notes and Topical Past Papers

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1. Measuring Tools:

Pictures of different measuring tools are given in Fig 1.1. Analog (with needle) Voltmeter is not given in the list, however, it looks the same as Analog Ammeter.

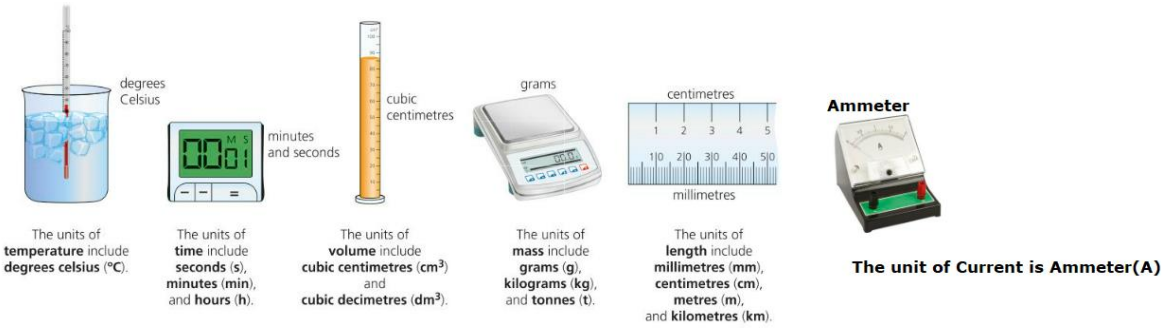
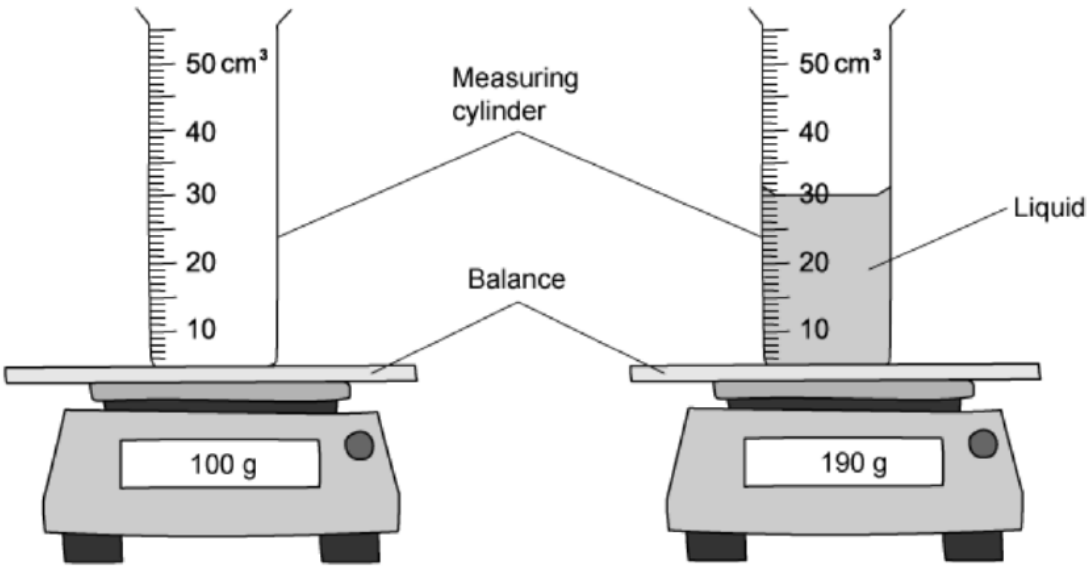


Fig 1.1

Description of tools:

i) Thermometer is used to measure temperature.
ii) Stopwatch is used to measure time.
iii) Measuring Cylinder is used to measure the volume of a liquid or solid object
iv) Mass balance is used to measure the mass of the object.
v) Ruler is used to measure the length of an object. You can also measure the height or width of an object if the object is big enough.
vi) Ammeter is used to measure the current in a circuit.
vii) Voltmeter is used to measure the voltage across any component.

Exam tip:
Many a times a measuring tool is showing a reading even before you have put anything on it. In that case you would have to **subtract** the initial reading from the final reading.
For example, you want to measure the mass of the liquid by using a digital balance. Look at the picture below and find the mass of the liquid.



Answer_____

Watchout for the unmarked divisions on the tool:

Look at the picture of ammeter given below. Big divisions are marked with Amperes(0A, 4A, 8A and 10A). Unlike bigger divisions, smaller divisions are not marked.

What is the value of one small division? Is it 1? No.

How would you find the value of the smallest division? Here is the formula.

Value of smallest division=$\frac{Difference\ between\ two\ consecutive\ big\ divisions}{number\ of\ small\ divisions\ between\ two\ consecutive\ big\ divisions}$

$$= \frac{8-6}{10} = \frac{2}{10} = 0.2$$

Therefore, every small division is equal to 0.2A

2. Fair Experiments:

In a fair test, the scientists change one variable to find out what effect it has, and they are careful to keep all other variables the same.
The quantity that you change is **independent variable**. A quantity that changes as a result is called **dependent variable**.
In a fair test, you change the independent variable, measure the dependent variable, and keep all other variables the same. The other variables are called **control variables.**

Example:

A student wants to investigate this question: "How does the loudness of sound changes with the distance from a speaker"?

i) Write down the independent variable.

_____

ii) Write down the dependent variable.

_____

iii) Write down one control variable.

3. Making the results more accurate:

If you perform an experiment, how can you make the results more accurate?

i) Repeat the experiment at least three times and take the average of the results.
ii) If there is an anomalous result (that is not fitting with the rest of the results), repeat that experiment again.

4. Risk Assessment:

When you are performing an experiment, you must do the risk assessment. Risk assessment means that how can you reduce the chances of

i) Damage to equipment
ii) Injury to people

How can you reduce the chances of damage to equipment?

By reducing the probability of something going wrong (e.g. keeping glass objects away from the edge of the desk.

How can you reduce the chances of injury to the people?

By reducing the consequences if something goes wrong (e.g wearing the safety goggles)

5. Plotting graphs and finding the values:

In Checkpoint Exams, Examiner could ask you to plot a graph. Therefore, you must be prepared for this. When you plot a graph, you can find the outliers/anomalous data easily.

6. Forces (Density):

Density:
Mass over volume is called Density.

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

Unit of density:

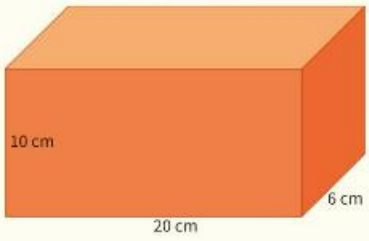
$$\frac{kg}{m^3}$$

Tips for the exam:

1. You must be able to rearrange the formula to get any quantity. They might give you the density and volume and ask you to find mass. You must be able to rearrange to find the mass from the equation given above.
2. You must be watchful of the units given for the quantities. If the mass is given in grams instead of kilograms and volume in m^3, the unit of the density would become $\frac{g}{m^3}$
3. In a dense material, the atoms are closer to each other than a material with less density.
4. To compare two densities, both of the densities must have same units.
5. Do not ever decide whether something would float, or sink based on your assumption. Always compares the **density** values and then decide.
6. If they give you the volume and density of two different objects, and ask you to compare the masses of both, use point 1
7. If they ask you to **describe** how you will measure the density, you must state that you would use a balance to measure mass, a measuring cylinder to measure the volume or a ruler(if the object is too big to fit in a measuring cylinder). Then you would divide mass by volume.
8. Watchout for meniscus. You must measure the volume of a liquid from the bottom of meniscus. Meniscus is the **curved part** of the liquid at the top.

Textbook problems and Past Paper questions

1. A student wants to find the density of a brick. He measures the sides of the brick.



a. Calculate the volume of the brick. **[2]**

b. He measures the mass of the brick and finds that it is 2.4 kg. Calculate the density of the brick. **[2]**

c. Water has a density of 1 g/cm³. Explain why the brick does *not* float on water. **[1]**

2. The table below lists the densities of some materials.

Material	Density in g/cm³
Air	0.001
Ice	0.9
Iron	7.9
Plastic	1.4
Wood	0.7
Water	1.0

a. Write down which of these statements is true.

i. 10 cm³ of iron has a smaller mass than 10 cm³ of wood. **[1]**

ii. 2 cm³ of ice has a bigger mass than 1 cm³ of water. **[1]**

iii. 1 cm³ of plastic has a bigger mass than 100 cm³ of air. **[1]**

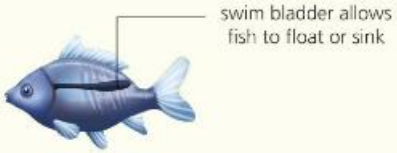
iv. 5 cm³ of plastic has a smaller mass than 1 cm³ of iron. **[1]**

b. Explain which solid materials would float in:

i. water **[1]**

ii. mercury, which has a density of 13.6 g/cm³. **[1]**

3. A fish can move up and down in the water. It has a sac inside it called a swim bladder. If the fish fills the sac with oxygen from its gills it will float upwards. Explain why. **[2]**



5. Mercury is a liquid metal with a density of 13.6 g/cm³. Water has a density of 1.0 g/cm³.

a. Gold has a density of 19.3 g/cm³.

i. Will it float or sink in mercury?

ii. In water? **[1]**

b. Silver has a density of 10.5 g/cm³.

i. Will it float or sink in mercury?

ii. In water? **[1]**

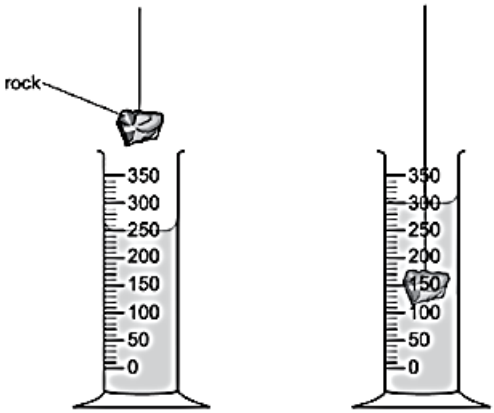
c. Wood has a density of 0.8 g/cm³

i. Will it float or sink in mercury?

ii. In water? **[1]**

1) Measuring cylinders are used to measure volume.

Look at the diagram.



What is the volume of the piece of rock?

..... cm^3 [1]

2) Carlos calculates the density of an object.

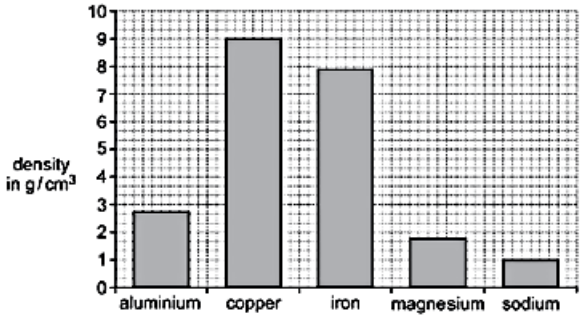
(a) The object has a mass of 450 g.

The object has a volume of 50 cm^3.

Calculate the density of the object.

density ..... g/cm^3 [3]

(b) Carlos knows the densities of different metals.



Carlos has a piece of each of the five metals.

Each piece of metal has the same volume.

Which piece of metal has the greatest mass?

Circle the correct answer.

aluminium

copper

iron

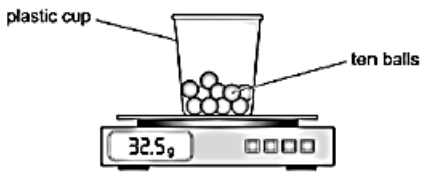
magnesium

sodium

[1]

3) Safia wants to find the density of a small ball.

(a) She measures the mass of a plastic cup containing ten identical balls.



(I) The plastic cup has a mass of 2.5g.

What is the mass of one ball?

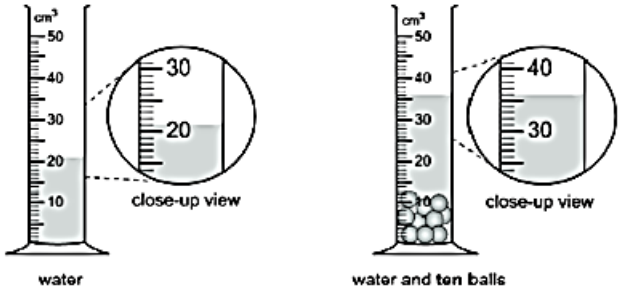
.....g [1]

(II) Why does Safia use ten identical balls?

.....

..... [1]

3) (b) Safia measures the volume of the ten identical balls.



Complete the measurements to find the volume of one ball.

The volume of water in the measuring cylinder is ..... cm^3.

The volume of the water and ten balls in the measuring cylinder is ..... cm^3.

The difference in volume between these two readings is ..... cm^3.

The volume of one ball is ..... cm^3.

[2]

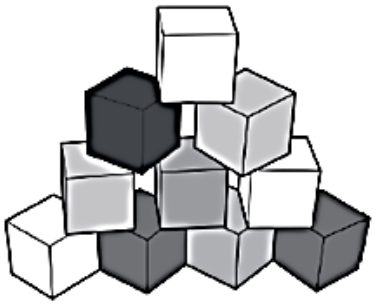
(c) Calculate the density of a ball.

Use your answers for mass in part (a) and volume in part (b) to calculate the density.

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

The density of the ball is ..... g/cm^3 [1]

4) Blessy has some cubes of material.



She wants to calculate the density of one of these cubes.

Blessy needs to measure **two** physical quantities.

One of these is the mass of the cube.

(a) Describe how she finds the **mass** of the cube.

.....

..... [1]

(b) (i) What is the other physical quantity that Blessy needs to measure?

..... [1]

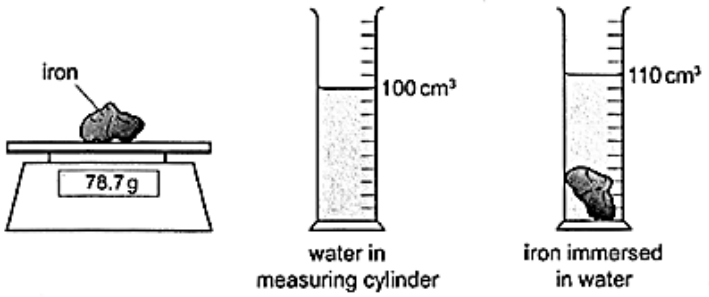
(ii) How does she find this physical quantity?

.....

.....

..... [2]

5) This apparatus is used to find the density of an irregular shaped piece of iron.
The results are shown in the diagrams.



(a) What is the name of the apparatus used to measure the mass of the piece of iron?

..... [1]

(b) What is the mass of the piece of iron? ..... [1]

(c) What is the volume of the piece of iron? ..... cm^3 [1]

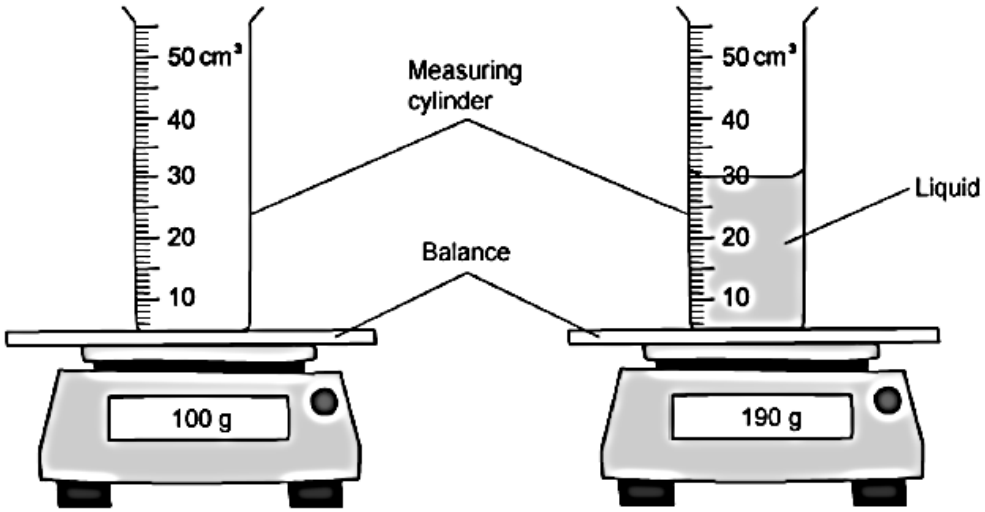
(d) Calculate the density of the piece of iron.

Show your working, and give the correct unit with your answer.

..... [3]

Question 6

The diagram shows a measuring cylinder containing a liquid, and that same measuring cylinder when it is empty.



What is the density of the liquid?

A 6.30 g/cm³

B 3.00 g/cm³

C 0.33 g/cm³

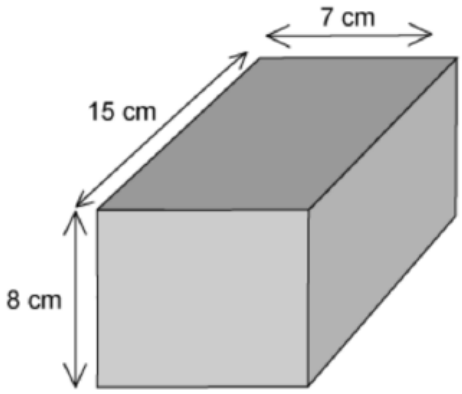
D 0.16 g/cm³

[1 mark]

Question 7

A block of an unknown material is shown in the diagram.

It's mass is 500 g.



What is the density of the block?

A $\frac{7 \times 15 \times 7}{500} \text{g/cm}^3$

B $\frac{7 \times 15}{500 \times 8} \text{g/cm}^3$

C $\frac{500}{7 \times 15 \times 8} \text{g/cm}^3$

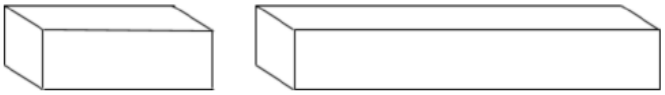
D $\frac{500 \times 7}{8 \times 15} \text{g/cm}^3$

[1 mark]

Question 8

Two beams have the same rectangular cross section, but one is longer than the other.

Both beams are made from the same material.



Which quantity is the same in both beams?

A The volume

B The weight

C The mass

D The density

[1 mark]

Question 9

Some unknown liquid in a beaker has a mass of 200 g and a volume of 230 cm^3.

The density of water is 1.0 g/cm^3

How does the density of the unknown liquid compare with the density of water?

A Its density is greater than the density of water

B Its density is less than the density of water

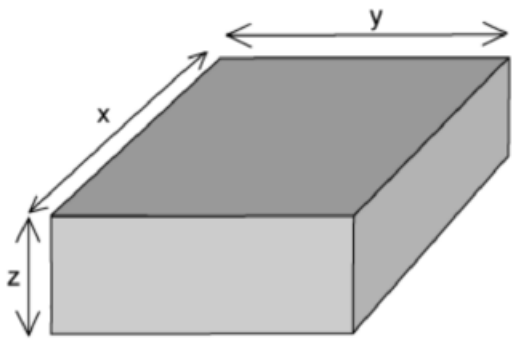
C Its density is the same as the density of water

D With the information given, it is impossible to tell.

[1 mark]

Question 10

A block is shown in the diagram. It has a mass of *m*.



Which expression, below, could be used to calculate the density of the block?

A $m \times x \times y \times z$

B $x \times z \times y$

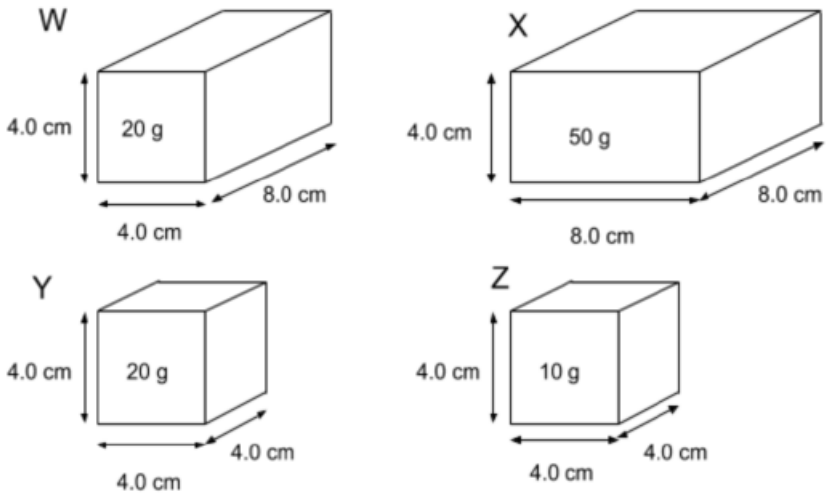
C $\frac{x \times y \times z}{m}$

D $\frac{m}{x \times y \times z}$

[1 mark]

Question 11

Four blocks, **W**, **X**, **Y** and **Z** are shown below.



Which of the two blocks have the same density?

A W and X

B W and Y

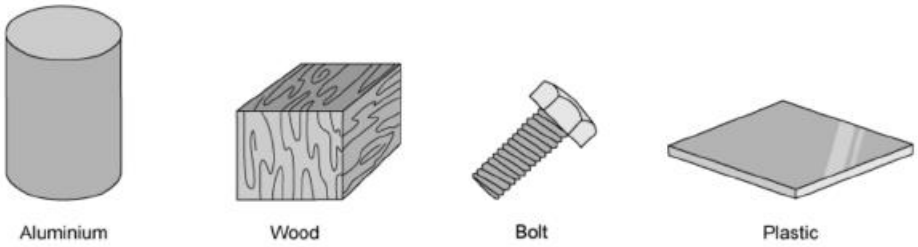
C Y and Z

D W and Z

[1 mark]

Question 12

A student is given four objects, a mass balance and a metre ruler.



Which of the objects can he determine the density of, using only the metre ruler and the mass balance?

A Steel, aluminium and plastic

B Wood, steel and plastic

C Aluminium, wood and plastic

D Aluminium, wood and steel

[1 mark]

7. Energy:

Difference between Heat, Thermal Energy and Temperature:

	Temperature	**Heat**	**Internal Energy**
1	Average Kinetic Energy of particles is called Temperature	The energy that flows away or towards the body	The total energy inside the body is called or Internal energy
2	Temperature is measured in Celsius	Heat is measured in Joules	Internal energy is measured in Joules
3	Temperature does not depend on the number of particles in an object	Heat does not depend on the number of particles, rather it depends on the difference of temperature between objects	Internal energy depends on number of particles in an object. More particles mean more internal energy

Types of Energy Transfer:

a) Conduction
b) Convection
c) Radiation

a) Conduction:

Whenever the heat transfers because of vibration of atoms or electrons, the energy transfer is called conduction. In conduction, the object must be touching each other. In conduction the atoms/particles do not leave their place. Metals are good conductors of heat. Conduction is not possible in vacuum.

b) Convection:

When the hot particles move from one place to another, this kind of heat transfer is called convection. Convection takes place in liquids and gases. Convection is not possible in vacuum.

c) Radiation:

The heat transfer due to Infrared Radiation is called Radiation. Radiation does not need particles. Radiation can pass through the vacuum.

Evaporation:

When high energy molecules leave the surface, this process is called evaporation. Evaporation causes cooling.

Exam Tips:

→ All objects absorb Infrared
→ All objects radiate infrared
→ Black surfaces absorb and radiate infrared quickly
→ Shiny surfaces absorb and radiate infrared slowly
→ Trapped Air is insulator
→ Because of convection, the hot air goes **upwards** not **downwards**

Review 12.7

1. Copy and complete these sentences.
   a. You measure _____ in degrees Celsius. [1]
   b. You measure _____ in joules. [1]
   c. A bath will have _____ energy than a cup of warm water at the same temperature. [1]

2. The amount of energy that you need to raise the temperature of something does *not* just depend on the size of the temperature rise.
   a. Name two other things the temperature rise depends on. [1]
   b. Put these in order from the smallest to the largest amount of energy required. [1]
      A The energy needed to raise the temperature of 1 kg of water by 20 °C
      B The energy needed to raise the temperature of 2 kg of water by 20 °C
      C The energy needed to raise the temperature of 1 kg of water by 10 °C

3. Explain why:
   a. Saucepans are usually made of metal. [1]
   b. Black clothes dry quicker than white clothes if they are drying in the Sun. [1]
   c. A hot air balloon rises. [1]
   d. A bird fluffs up its feathers if it is cold. [1]

4. Copy and complete the sentences below, choosing the correct bold words.
   The law of conservation of energy says that energy cannot be **created/dissipated** or **destroyed/transferred**.
   When you burn coal, you transfer energy from a **chemical/thermal** store to a **chemical/thermal** store. [4]

5. A student puts two thermometers on the desk underneath a lamp. She covers the bulb of one thermometer with black paper and the other with aluminium foil.
   a. Write down which thermometer will show the higher temperature after half an hour. [1]
   b. Explain why. [1]

6. There is a hot drink on the table.

   a. Explain how conduction changes the temperature of the tea. [1]
   b. Explain how convection changes the temperature of the tea. [1]
   c. Explain how radiation changes the temperature of the tea. [1]
   d. Explain why putting a lid on top of the cup would keep the tea hotter for longer. [1]

7. You are cooking a pizza. You place your pizza on a metal tray at room temperature and put it in the oven. When the pizza is cooked you remove the tray from the oven. Eventually it reaches room temperature again.
   Describe and explain in detail what happens to the motion of the particles in the metal tray. [6]

8. A student has left his drink outside in the Sun.

a. Explain why the can of soft drink is warmer than it would be if it was inside the house. **[1]**

The student decides to use the Sun to cool down a can of drink on a hot day. He covers the can of drink with a clay pot and pours water over the pot. He keeps pouring water over it for a few minutes. When he takes the can out it is cooler than before.

b. Explain why the can is cooler. **[2]**

c. Explain why he has to keep pouring water over the pot. **[1]**

9. Explain why:

a. Houses are painted white in hot countries. **[1]**

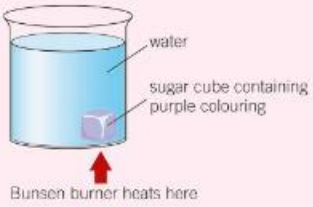
b. You can't find people in burning buildings with a thermal imaging camera. **[2]**

10. Some double-glazing systems trap air between two panes of glass.

a. Explain how energy is transferred through a double-glazed window from a hot room to the cold air outside. **[3]**

b. State and explain how the rate of energy transfer would change if you removed the air from the gap. **[3]**

11. Here is an experiment to demonstrate convection.



a. Describe what will happen to the purple colour during heating. **[3]**

b. Explain why the purple colour forms a convection current. **[3]**

c. Describe where convection currents are formed in everyday life. **[1]**

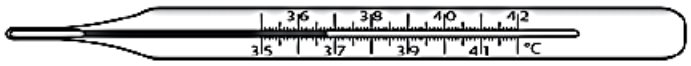
12. a. Explain why there are no convection currents in solids. **[1]**

b. If you stand near a fire on a cold night you feel warm even though the air is cold. Explain why. **[1]**

c. Write down one similarity between light and infrared radiation. **[1]**

1) A class of 20 students measure their body temperatures.

The thermometer shows the body temperature of student number 20.



(a) The table shows the results for 19 of the students.

The result for student 20 is missing.

What is the body temperature of this student?

Write your answer in the table.

student	1	2	3	4	5	6	7	8	9	10
temperature in °C	36.9	37.1	37.0	37.1	36.9	37.0	37.1	37.0	37.2	37.1

student	11	12	13	14	15	16	17	18	19	20
temperature in °C	37.0	36.9	37.0	37.2	36.9	37.0	37.1	37.3	37.0	.....

[1]

2) Birds can live in cold places.

They trap air between their feathers.

Why does this help to keep the birds warm?

Circle the correct answer.

trapped air is a good conductor

trapped air is a good convector

trapped air is a good insulator

trapped air is a good radiator

[1]

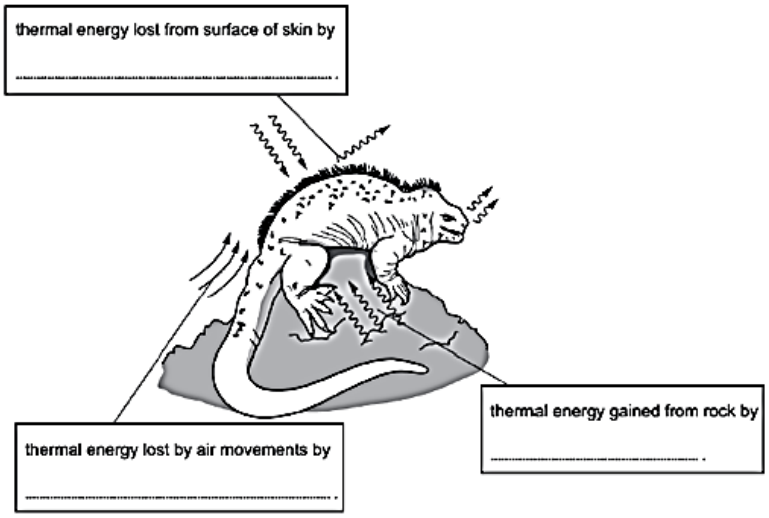
3) The lizard loses thermal (heat) energy and gains thermal (heat) energy.

Complete the labels to show the energy transfers taking place.

Choose from the following words.

conduction **convection** **radiation**

[2]



13 Metal carbonates react with acids.

A salt and two other chemicals are made.

Name the two other chemicals made.

..... and ..... . [2]

4) Youssef puts a small amount of water into a flat dish.

He then leaves the dish outside in the warm sunshine.

After a while the water disappears.

Explain what happens to the water particles.

.....

.....

..... [2]

5) Angelique investigates heat transfer.

She heats a metal rod.

The metal rod has a pin attached with wax.

When the end of the metal rod is hot, the wax melts and the pin falls.

(a) What type of heat transfer is Angelique investigating?

..... [1]

(b) Angelique repeats the investigation with rods made of different metals.

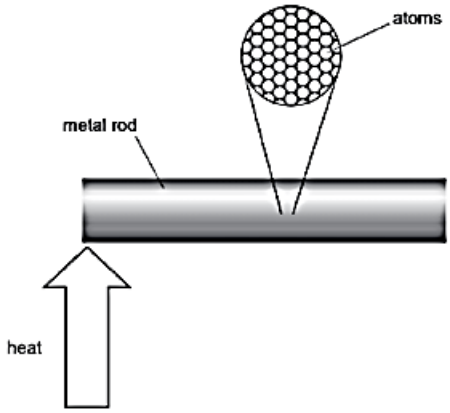
The pins fall after different amounts of time.

Why do the pins fall after different amounts of time?

.....

..... [1]

6) Angelique draws a picture of the atoms inside one of the metal rods.



Describe how the heat is transferred to the end of the metal rod.

Use Angelique's drawing to help you.

.....

.....

..... [2]

7 Complete the sentences and answer the question about thermal (heat) energy.

Choose from the following words.

conduction
conductor
convection
evaporation
insulation
insulator
radiation

(a) The main form of thermal (heat) energy transfer in liquids and gases is called ..... . [1]

(b) Thermal (heat) energy is transferred through a solid by ..... . [1]

(c) Iron is a metal so it is a good ..... . [1]

(d) What is the term for a poor conductor? ..... . [1]

Question 8

Which of the following statements about energy transfer is correct?

A Metals conduct thermal energy well because their electrons are not free to move.

B Infrared radiation cannot travel through a vacuum.

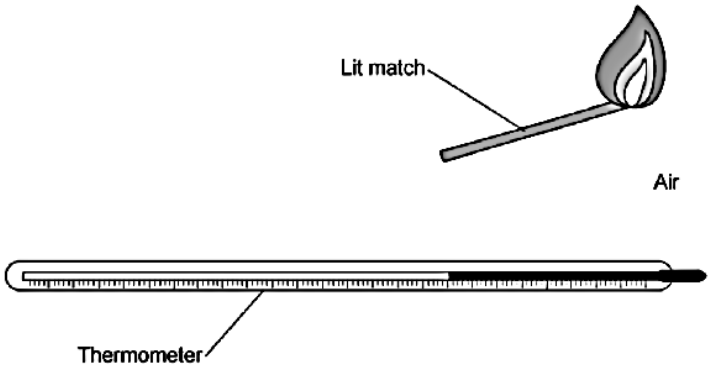
C Warm fluids rise because their particles move further apart.

D Convection only occurs in gases.

[1 mark]

Question 9

A lit match is placed above a thermometer.



Which row in the table shows how the thermal energy from the lit match reaches the thermometer?

	convection	conduction	radiation
A	yes	yes	yes
B	yes	yes	no
C	no	yes	yes
D	no	no	yes

Question 10

Which of the following statements about thermal radiation is correct?

A It is electromagnetic radiation.

B It can only happen in a vacuum.

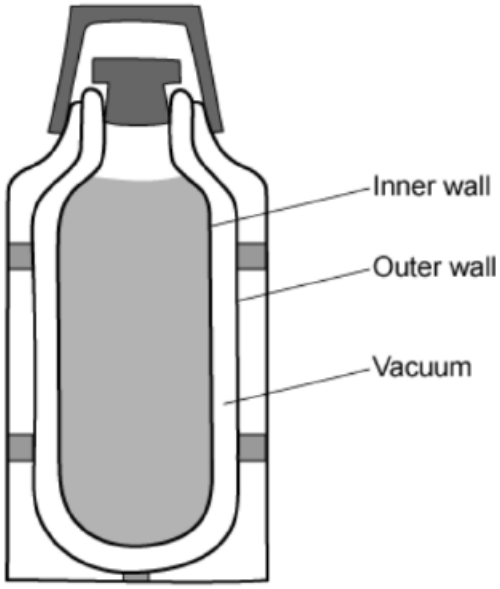
C It involves movement of molecules due to changes in density.

D It involves transfer of electrons through a material.

[1 mark]

Question 11

The walls of a vacuum flask contain two layers of glass, separated by a vacuum.



Which method(s) of thermal energy transfer are prevented by the vacuum?

A Radiation

B Conduction and radiation

C Convection and radiation

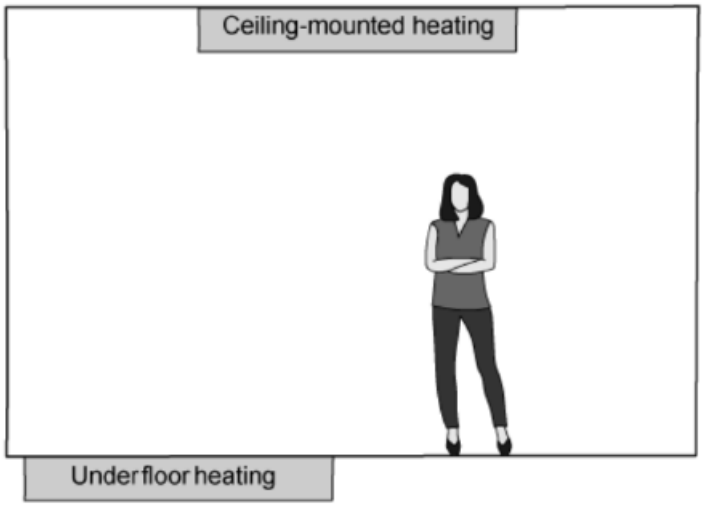
D Conduction and convection

[1 mark]

Question 12

In modern housing, it is convenient to locate heaters so they are not on the walls, taking up valuable wall space for furniture.

Other than wall-mounted radiators, two other options would be viable: ceiling heaters or underfloor heaters.



Which of the two options would heat the room more effectively and why?

	option	explanation
A	ceiling-mounted	hot air is more dense and falls
B	ceiling-mounted	hot air is less dense and falls
C	underfloor	hot air is less dense and rises
D	underfloor	hot air is more dense and rises

[1 mark]

Question 13

When a family wants to embark on a picnic, they tend to want to take food which is best served chilled, like sandwiches and lemonade.

In order to achieve this, ice packs are packed with the picnic food in a hamper. Two are recommended.

Where does physics dictate both ice packs should be placed in order to keep the food as cool as possible?

A Both at the top of the hamper

B One at the top of the hamper and one at the bottom

C Both at the bottom of the hamper

D On either side of the hamper

[1 mark]

Question 14

The Sun is the source of the majority of the energy on Earth.

How does thermal energy from the Sun travel to the Earth?

A By conduction, convection and radiation

B By conduction and convection only

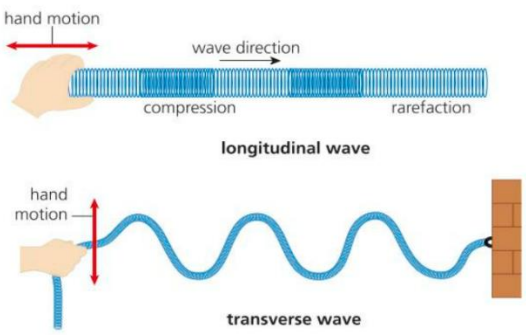
C By convection and radiation only

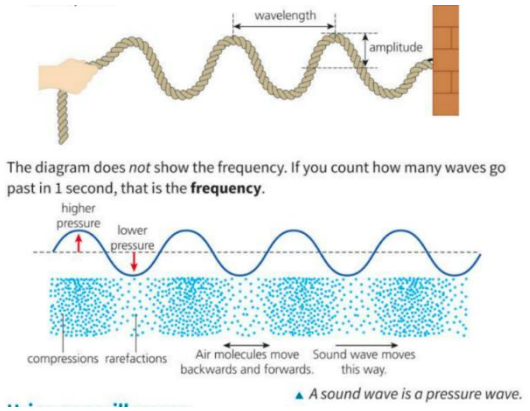
D By radiation only

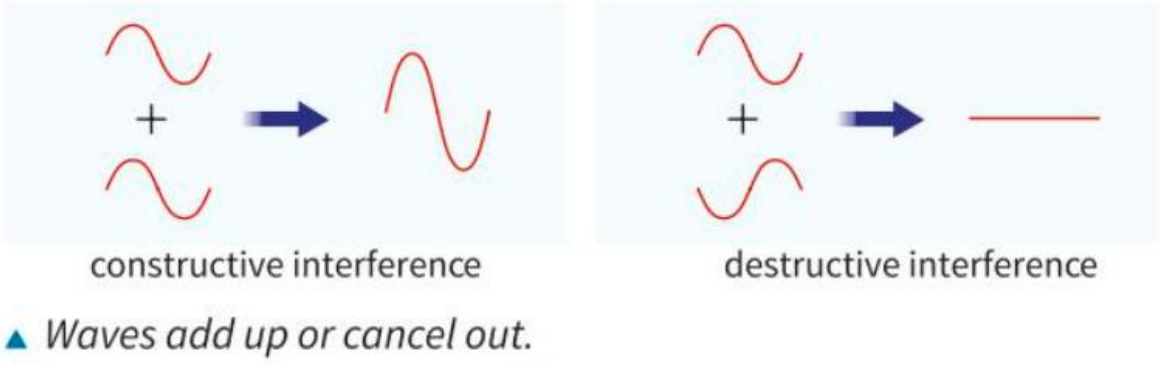
[1 mark]

8. Sound:

→ Sound travels in the form of vibrations.
→ Sound travels in the form of compressions and rarefactions.
→ Compression represents a crest.
→ Rarefaction represents a trough.
→ The distance between two consecutive crests is called wavelength
→ The distance between two consecutive troughs is also called wavelength
→ The distance between two consecutive compressions is also called wavelength
→ The distance between two consecutive rarefactions is also called wavelength
→ Amplitude is the vertical height of a wave from the centre/equilibrium line of the wave
→ Frequency is the number of waves passing in 1 second.
→ An Oscilloscope is used to visualize the sound by plotting the air pressure on the screen
→ High amplitude means loud sound
→ Low amplitude means quite sound
→ If the crests are closer to each other, it means the wave has more frequency and pitch
→ Sound is longitudinal wave
→ Amplitude and Wavelength, both are distances hence they are measured in meter
→ Relative intensity of sound tells us about the loudness of sound and measured in decibels
→ Sound waves can interfere with each other constructively or destructively







Review 13.5

1. For each of the quantities listed below write the letter of the definition and the unit. You need to use one letter twice.

a. The wavelength of a wave

b. The frequency of a wave

c. The amplitude of a wave

A The number of waves per second.

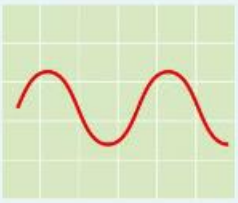
B The distance from the middle to the top of a wave.

C The distance from the top of one wave to the next.

D hertz

E metres **[3]**

2. A tuning fork produces this wave on an oscilloscope screen.



a. Draw the wave you would see if the sound was louder. **[1]**

b. Draw the wave you would see if the sound had a higher pitch. **[1]**

3. a. A note has a frequency of 400 Hz. State how many sound waves pass a point per second. **[1]**

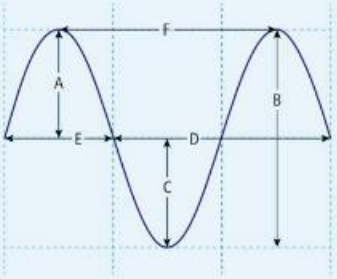
b. Another wave has a frequency that is half that of the wave in part **a**. Choose the number of waves per second for this wave.

4. a. Write down the audible range of a human. **[1]**

b. Complete this sentence by choosing the correct word in bold:

All animals have **different/the same** audible ranges. **[1]**

5. Look at the arrows on the diagram below. Copy the table and tick the correct columns to show whether each arrow shows the wavelength, the amplitude, or neither.



Arrow	Wavelength	Amplitude	Neither
A			
B			
C			
D			
E			
F			

[6]

6. A boy is whistling a note that has a frequency of 1500 Hz.

a. Explain what 'a frequency of 1500 Hz' means. **[1]**

b. Describe what would change about the sound he would hear if he whistled at 2000 Hz. **[1]**

7. Rani used a sound-level meter to survey the noise at different places and times during the day. Here are her results.

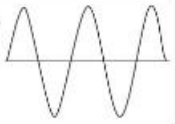
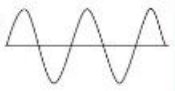
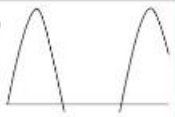
Place	Noise level (dB)
by the road on the way to school	70
sitting in a classroom	50
playing with friends	60
traffic on the way home	80
reading a book	40

a. Describe what 'dB' means. **[1]**

b. Write down which sound is loudest. **[1]**

c. Rani's brother likes to listen to very loud music on his headphones. Describe two things that he could he do to reduce the risk of damaging his hearing. **[2]**

8. A teacher uses an oscilloscope to display some sound waves. The sounds shown are either loud or soft, and either high or low pitched. Match each number to a letter in the pictures below.

1 a low-pitched loud sound	**A** 
2 a high-pitched soft sound	**B** 
3 a low-pitched soft sound	**C** 
4 a high-pitched loud sound	**D** 

[4]

9. For each statement about ultrasound, write 'true' or 'false'.

a. Ultrasound can be used to see an unborn baby. **[1]**

b. Ultrasound is sound with a frequency greater than 2000 Hz. **[1]**

c. Ultrasound is very-high-frequency sound. **[1]**

d. Ultrasound cannot be heard by humans. **[1]**

10.a. Describe what is necessary for two waves to:

i. add up **[1]**

ii. cancel out. **[1]**

b. A microwave oven has a turntable to rotate the food through places where microwaves superpose. Suggest what will happen if the turntable breaks. **[2]**

11. A singer produces sounds that vary in pitch and loudness. Suggest and explain in detail what her vocal chords do to produce different types of sound wave. **[3]**

12. A student wants to investigate this question: 'How does the loudness of a sound change with the distance from a speaker?'

TWS

a. Write down the independent variable. **[1]**

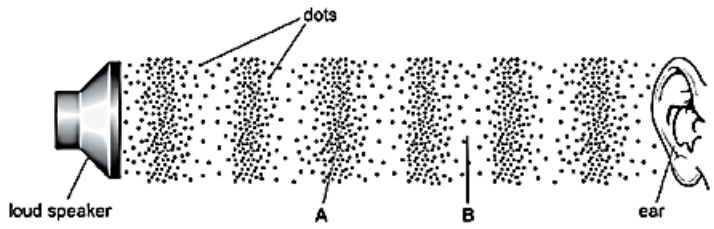
b. Write down the dependent variable. **[1]**

c. Write down one control variable. **[1]**

d. Suggest why it might be difficult for the student to carry out this investigation. **[1]**

TWS

1) The properties of sound can be explained using a diagram.



Complete the sentences.

The first sentence has been done for you.

Choose words from

air	close together	compression	density	far apart
mass	pressure	rarefaction	solid	sound

The dots on the diagram are .....air..... particles.

In area A the dots are ..... .

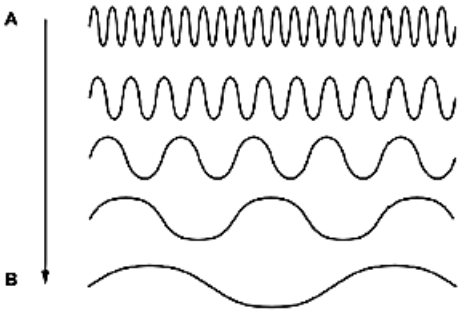
This area is called a ..... .

In area B the dots are ..... .

This area is called a ..... .

[4]

2) Chen looks at different sound traces with an oscilloscope.



Describe what is happening to the sound from A to B.

Choose words from

decreases	increases	stays the same

The pitch of the sound ..... .

The frequency of the sound ..... .

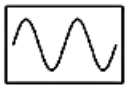
The volume of the sound ..... .

The amplitude of the sound ..... .

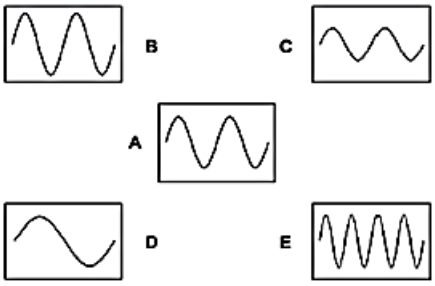
[4]

3 Gabriella makes a sound.

She looks at the trace it makes on an oscilloscope.

A 

She makes four different sounds and looks at their traces.



Complete the sentences.

Choose from the following letters.

B C D E

The sound with a higher pitch than A is .....

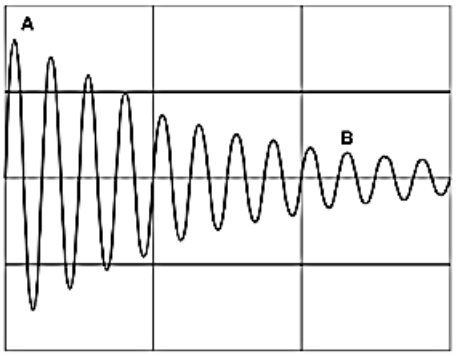
The sound with a larger volume (louder) than A is .....

The sound with a smaller frequency than A is .....

The sound with a smaller amplitude than A is .....

[4]

4) Sound waves can be shown on an oscilloscope.



Complete the sentences.

Choose words from the list.

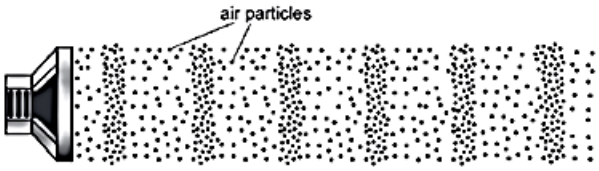
amplitude frequency noise particle size

At A the wave has the highest .....

At A and B the wave has the same .....

[2]

5) Yuri draws a picture to show the air particles in front of a loudspeaker.



Write the letter **C** on the diagram where there is a **compression** of air particles.

Write the letter **R** on the diagram where there is a **rarefaction** of air particles.

[2]

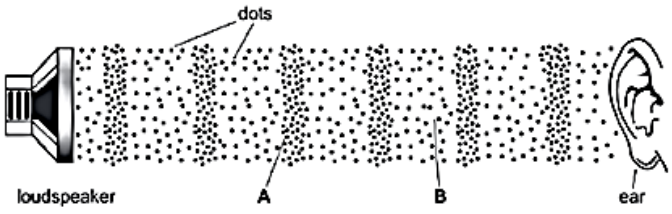
6) This question is about sound.

Tick (✓) the correct sentence about the pitch of sound.

A high pitched sound is always loud.	☐
A high pitched sound always has a high frequency.	☐
A high pitched sound always has a large amplitude.	☐
A high pitched sound always has a low frequency.	☐
A high pitched sound must have a large wavelength.	☐

[1]

7) The properties of sound can be explained using a diagram.



(a) What do the dots represent?

Circle the correct answer.

air particles

heat particles

light particles

solid particles

sound particles

[1]

(b) Complete the sentences.

The particles in the diagram move.

Area **A** is called a compression because the particles are .....

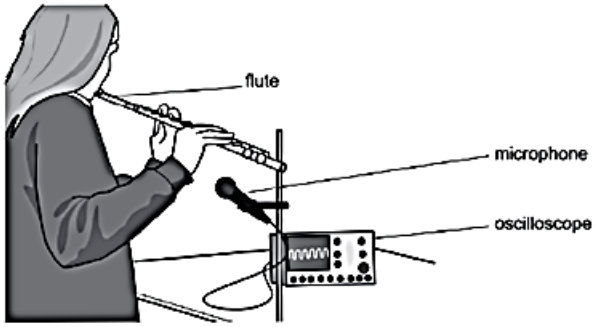
.....

Area **B** is called a rarefaction because the particles are .....

.....

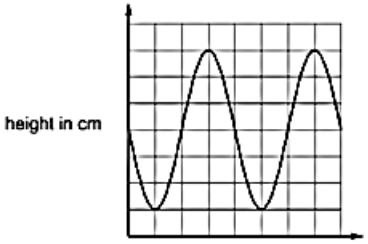
[2]

8) Mia plays her flute.



The oscilloscope shows the sounds the flute makes.

Here is an oscilloscope picture.



(a) There are two complete waves in the picture.

This wave has a frequency of 2 units.

The frequency of the wave increases to 6 units.

The amplitude stays the same.

(i) What is the number of complete waves that are now seen in the oscilloscope picture?

..... [1]

(b) Mia moves further away from the microphone.

She plays the flute in exactly the same way.

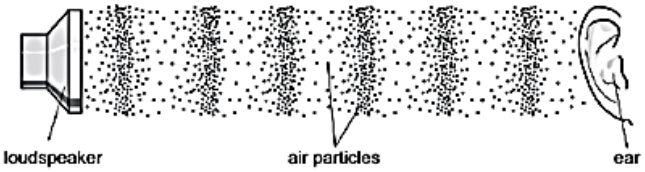
Explain what happens to the oscilloscope picture.

.....

.....

..... [2]

9) Sound is made by a loudspeaker.



The air particles move.

(a) What does the loudspeaker do to make sound?

Complete the sentence.

Choose the best word from the list.

turns **twists** **vibrates** **waves**

The loudspeaker ..... [1]

(b) The air particles move.

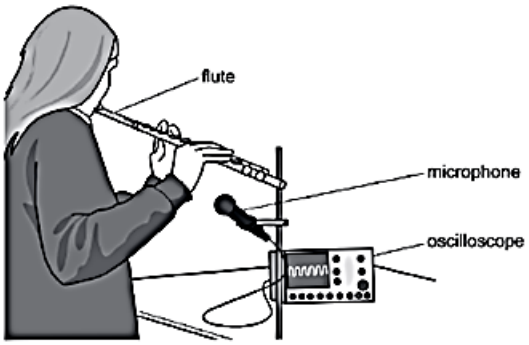
Complete the sentence.

Choose the best word from the list.

compression **reflection** **refraction** **vibration**

When air particles are close together it is called a ..... [1]

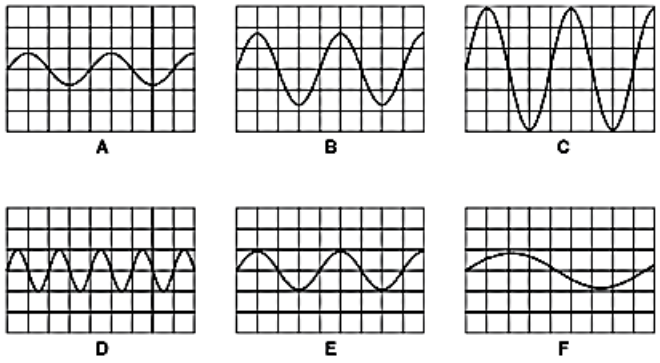
10) Safia plays her flute.



The oscilloscope shows the sounds the flute makes.

Safia plays six different notes on her flute.

Here are six oscilloscope pictures.



(a) Which sound is the **loudest**?

Circle the correct answer.

A B C D E F

[1]

(b) Which sound has the **greatest amplitude**?

Circle the correct answer.

A B C D E F

[1]

(c) Which sound has the **highest pitch**?

Circle the correct answer.

A B C D E F

[1]

(d) Which sound has the **highest frequency**?

Circle the correct answer.

A B C D E F

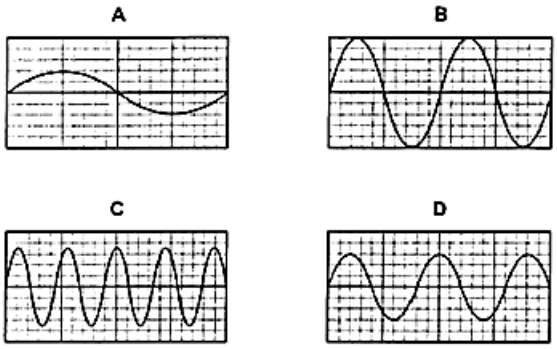
[1]

11) Blessy works in a recording studio.

She uses an oscilloscope to study sounds.

The oscilloscope shows the trace of a sound wave.

The diagrams show the traces made by four sounds.



(a) Tick (✓) the two correct sentences.

Sound A is louder than sound C.	☐
Sound A has a lower pitch than sound B.	☐
Sound B has a higher pitch than sound D.	☐
Sound D is louder than sound A.	☐

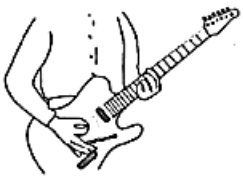
[2]

(b) Complete these sentences. Choose from **A**, **B**, **C** or **D**.

The sound with the largest amplitude is .....

The sound with the highest frequency is ..... [2]

12)



Sound waves travel from a vibrating guitar string to the ear of a listener by moving air particles.

(a) In what way are the air particles moving?

..... [2]

(b) How does this movement change if the guitar string is plucked harder?

..... [1]

(c) What does the listener notice about the sound heard when this happens?

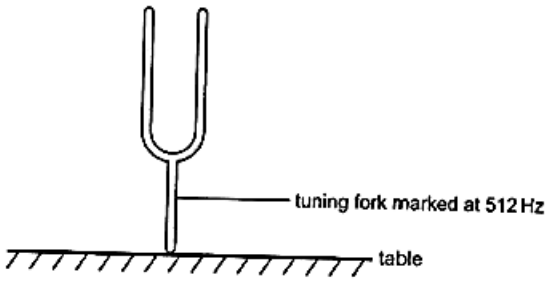
..... [1]

(d) What is the effect heard if the frequency of vibration of the string increases?

..... [1]

13) The diagram shows a tuning fork which emits a single tone when it is sounded.

The tuning fork was sounded by banging the prongs and then putting the base on a table top as shown.



(a) What does the tuning fork do to produce a sound wave in the air near the fork?

..... [1]

(b) Complete the following sentences by using words from the list.

amplitude frequency loudness pitch

The fork has a .....of 512 Hz and the tone produced has a ..... of C.

When the fork is hit harder this increases the ..... of the wave produced and increases the ..... of the sound. [4]

Question 14

Sound wave W has amplitude, *A*, and frequency, *f*.

Sound wave X is louder and lower in pitch than sound wave W.

What can be said about the amplitude and frequency of sound wave X?

	amplitude	frequency
A	higher than *A*	higher than *f*
B	higher than *A*	lower than *f*
C	lower than *A*	higher than *f*
D	lower than *A*	lower than *f*

[1 mark]

Question 15

A tuba player plays a loud note on her tuba.

She then plays a quiet note of the same pitch.

Which property of the sound wave she produced has changed?

A Frequency

B Wavelength

C Amplitude

D Speed

[1 mark]

Question 16

A high frequency note is played on a violin.

The violinist then reduces the frequency of the note.

What change in the note do the audience hear?

A Pitch increases

B Pitch decreases

C Volume increases

D Volume decreases

[1 mark]

Question 17

When objects vibrate, they produce sound waves.

An object in a room vibrates. However, a person in that same room does not hear anything. Why not?

A The room contains no air.

B The sound waves are travelling too fast.

C The amplitude of the sound waves is too great.

D The frequency of the sound waves is too great.

[1 mark]

Question 18

After a lockdown drill at a school, the management team notes that the lockdown siren is too quiet, and its pitch is too low to be heard at a distance.

They call the company that supplied the siren and ask them to make the alarm louder, and to give it a higher pitch.

What effect does the change have on the resulting sound wave produced by the siren?

A It has a larger amplitude and a lower frequency.

B It has a larger frequency and a lower amplitude.

C It has a smaller frequency and a larger amplitude.

D It has a larger frequency and a larger amplitude.

[1 mark]

Question 19

A teacher uses a piece of lab equipment called a signal generator, which he connects to a speaker.

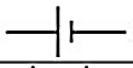
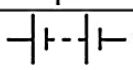
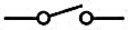
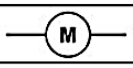
This apparatus can be used to make a particularly irritating noise.

The teacher makes four sounds of different frequencies with the signal generator. Which one can be heard by the student?

A 10 Hz **B** 30 kHz **C** 440 Hz **D** 120 kHz

[1 mark]

9. Electrical symbols and Circuits:

Component	Symbol
wire	
cell	
battery of cells	
lamp	
open switch	
closed switch	
buzzer	
motor	

Electric Current:
It is the flow of charges in one second. Unit of electric current is Ampere(A). In a circuit, the current is measured by using Ammeter.

Voltage:
The energy provided to one charge to move in the circuit is called Voltage. Unit of Voltage is Volt. In a circuit, voltage is measured using Voltmeter.

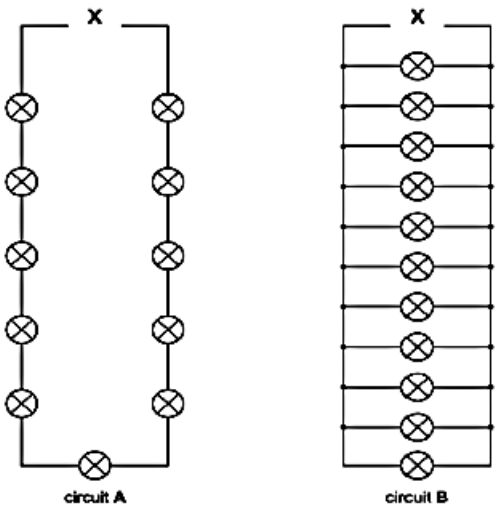
Series Circuit:
It is a circuit in which there is only one path for electricity.

Parallel Circuit:
It is a circuit in which there is more than one path for electricity. Every path is called a branch and every branch is independent of the other branches.

Exam Tips:

- → In a given Series circuit, the total current remains the same at every point of the circuit.
- → In a given Series circuit, of you add one more bulb, the total current decreases.
- → In a Series circuit, the voltage is divided among the components.
- → In a Parallel circuit, the total current of the battery is divided among branches
- → In a Parallel circuit, the voltage is same across every branch of the circuit.
- → Ammeter is connected in series with the component.
- → Voltmeter is connected across a component.

1) Blessy compares **two** electrical circuits.



(a) Which electrical component must be in position **X** to make the lamps work?

The name of this electrical component is .....

Draw the electrical circuit symbol for this component.

[2]

(b) All of the lamps are working in both circuits.

Blessy removes **one** lamp from circuit **A** and **one** lamp from circuit **B**.

Explain what happens to the **other** lamps in the circuits.

In circuit **A** the other lamps .....

This is because .....

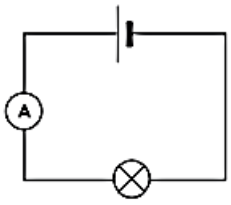
In circuit **B** the other lamps .....

This is because .....

[2]

2) Aiko wants to measure different quantities in electrical circuits.

(a) She connects this electrical circuit.



Complete the sentences.

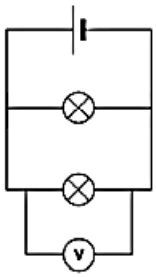
The circuit diagram shows a ..... circuit.

The component shown by (A) is ..... .

This component measures ..... .

[2]

(b) She connects this electrical circuit.



Complete the sentences.

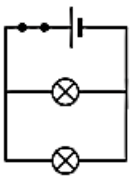
The circuit diagram shows a ..... circuit.

The component shown by (V) is ..... .

This component measures the ..... across the lamp.

[2]

3) Priya connects an electrical circuit.



(a) What type of circuit is shown in the diagram?

Circle the correct answer.

parallel circuit with closed switch

series circuit with closed switch

parallel circuit with open switch

parallel and series circuit with open switch

series circuit with open switch

[1]

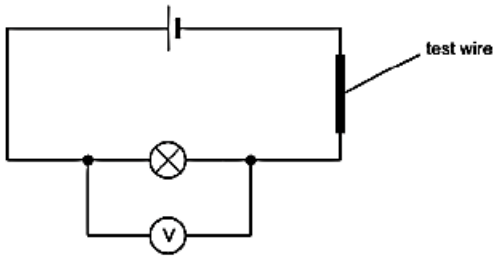
(b) Priya wants to measure the current in the circuit.

What is the name of the meter she uses to measure the current?

..... [1]

4) Safia investigates electrical circuits.

She measures the voltage across a lamp.

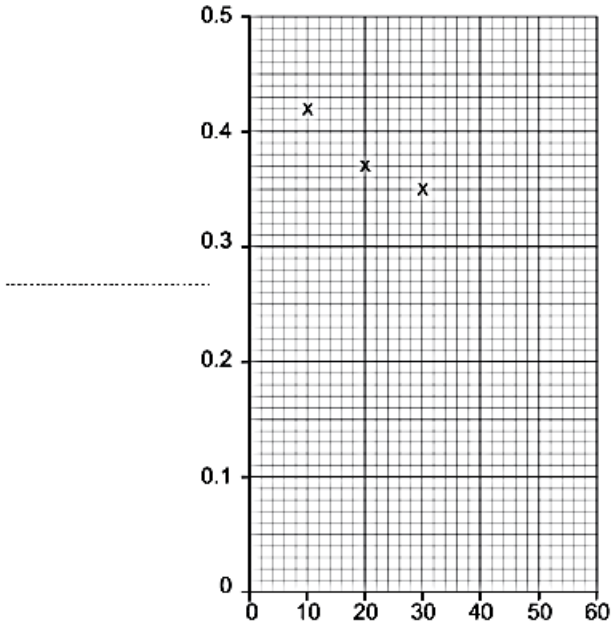


Safia writes her results in a table.

length of test wire in cm	voltage in V
10	0.42
20	0.37
30	0.35
40	0.28
50	0.22

(a) Complete the graph of Safia's results by

- adding labels to both of the axes
- plotting the points (the first three have been done for you).



.....

.....

[2]

(b) One of the results does not fit the pattern.

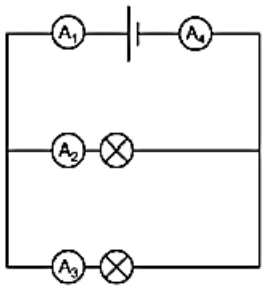
Which result is anomalous and what should Safia do to check this result?

anomalous result .....

she should .....

[2]

5) Gabriella connects an electrical circuit.



There are two lamps and four ammeters in the circuit.

The lamps are identical.

The reading on A_1 is 0.8A.

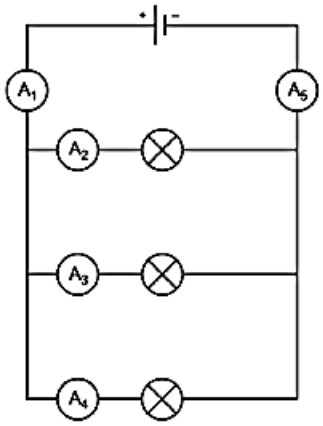
What are the readings on the other ammeters?

A_2 is ..... A.

A_3 is ..... A.

A_4 is ..... A. [2]

6) Mia connects an electrical circuit.



(a) What type of electrical circuit has Mia made?

..... [1]

(b) There are five components in the circuit with the letter A in a circle.

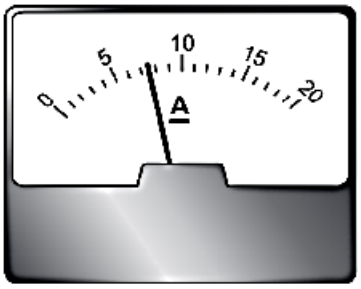
(i) Write down the name of this component.

..... [1]

(ii) What do these components measure?

..... [1]

(c) Here is a picture of component A_1.



What is the reading on component A_1?

..... [1]

(d) Predict the reading on component A_5.

..... [1]

7) Class 9 have a quiz about current and voltage.

Their teacher gives them four questions.

Answer the questions on the quiz.

Quiz

1. What equipment is used to measure current?

   .....

2. What equipment is used to measure voltage?

   .....

3. What is the unit of current?

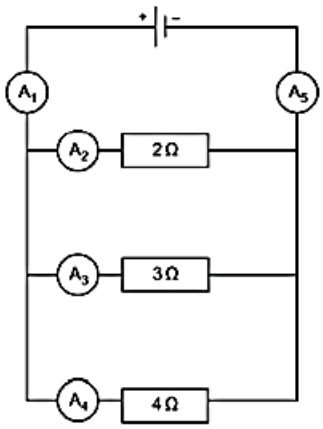
   .....

4. What is the unit of voltage?

   .....

[4]

8) Piriya connects an electrical circuit.



The 2Ω, 3Ω and 4Ω components are resistors.

Complete the readings on the ammeters.

A_1 = 1.8 amps

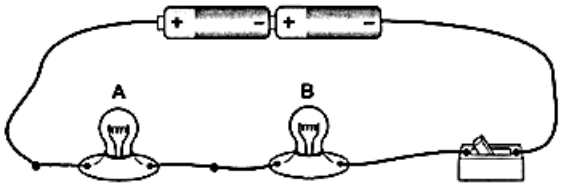
A_2 = 0.8 amps

A_3 = 0.6 amps

A_4 ..... amps

A_5 ..... amps [2]

9) The diagram shows an electric circuit. Both lamps are alight.



(a) Another cell is added in series with the original two cells.

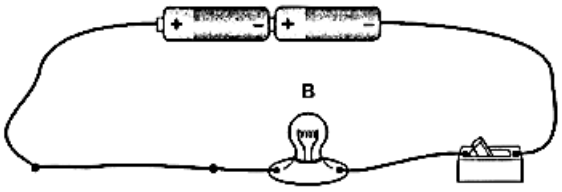
What would happen to the brightness of the lamps?

Tick (✓) the correct box.

stay the same brightness	☐
dimmer	☐
brighter	☐

[1]

(b) Lamp **A** is removed as shown in the diagram.

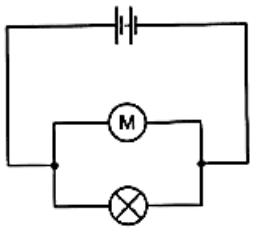


How would lamp **B** be affected?

.....

[1]

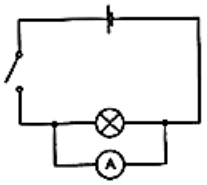
10) (a) Draw an ammeter symbol (A) on this circuit diagram where it would measure the current through the electric motor (M).



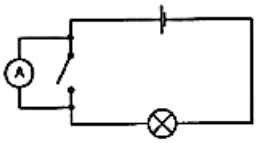
[1]

(b) Which circuit diagram below shows the correct position of the ammeter to measure the current in the circuit when the switch is closed?

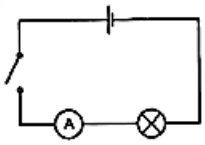
Tick the correct answer.



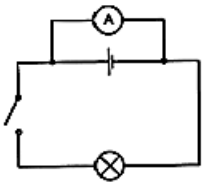
A ☐



B ☐



C ☐



D ☐

10. Earth and Beyond:

Definitions:

Planet:
Planet means wanderer. Planets orbit around stars.
Stars:
A fixed luminous (light producing) object in space.
Moon:
It is an object which orbits around a planet. It is also called a natural satellite.
Asteroid:
It is an object, smaller than planet, orbiting the sun. Most of the asteroids lie in asteroid belt between mars and Jupiter.
Comet:
An Icy object found at the edge of solar system.

Exam Tips:

- → You must remember the order of distance of planets from Sun.
- → You must be able to interpret any data given in table form in exam.
- → Earth`s axis of rotation is tilted by 23.5 degrees.
- → Earth has seasons because of the tilt of the earth.
- → Stars produce their own light.
- → Planets and Moons do not produce their own, rather they reflect the light

1) There are stars, planets and other objects in space.

name	type of object
Mars	planet
Moon	natural satellite
Polaris	star
Sirius	star

(a) Use the table to write down the names of two light sources in space.

1 .....

2 .....

[1]

(b) Humans can see Mars from Earth.

(i) Describe why we can see Mars in the night sky.

.....

..... [1]

(ii) Describe why we **cannot** see details on the surface of Mars.

..... [1]

(c) Humans can see the star Polaris from Earth.

It **appears** to move during different times of the year.

Explain why Polaris appears to move.

.....

..... [1]

2 (a) Class 9 have a quiz about our solar system.

Complete the answers.

Solar System Quiz

1. Mercury, Earth and Mars are three of the inner planets of our solar system.

   What is the name of the other inner planet?

   .....

2. The most distant planet from Earth was Pluto.

   Pluto has now been classified as a dwarf planet instead of a planet.

   What is the name of the most distant planet from Earth?

   .....

3. What is the name of the object that all the planets in our solar system orbit?

   .....

[2]

(b) Class 9 look at a photograph of the night sky.

A camera normally lets light into it for a second.

The camera that took this photograph let light into it for 30 minutes.

What objects in the night sky make the lines on the photograph?

.....

Explain why they look like lines.

.....

[2]

3) There are many objects in space.

(a) Which object is a source of light?

Circle the correct answer.

asteroid

Earth

Moon

planet

star

[1]

(b) Comets are **not** sources of light.

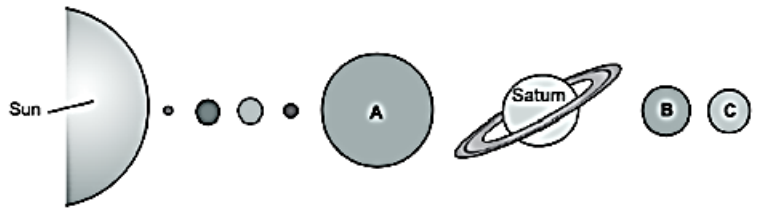
Explain how we can see a comet even though it is not a source of light.

.....

.....

..... [2]

4) Planets orbit the Sun.



Write down the names of planets **A**, **B** and **C**.

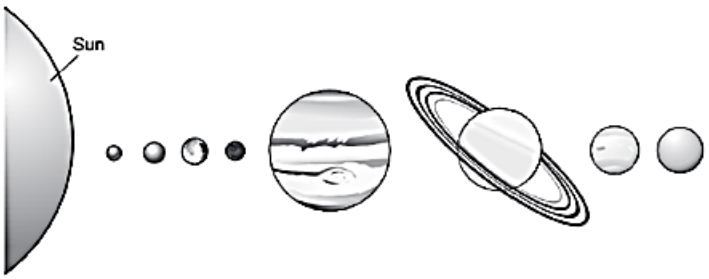
A .....

B .....

C .....

[1]

5) Jamila draws a picture of the Sun and the planets in the solar system.



She has labelled the Sun.

(a) Write down the names of the two planets **nearest** to the Sun.

..... and ..... [1]

(b) We see the Sun because it is a source of light.

Explain why we see the planets.

.....

..... [1]

6) Rajiv draws pictures of the stars in the night sky from his bedroom window.

He draws a picture in January.

He draws a picture in June.

(a) Write down one **difference** between the two pictures.

..... [1]

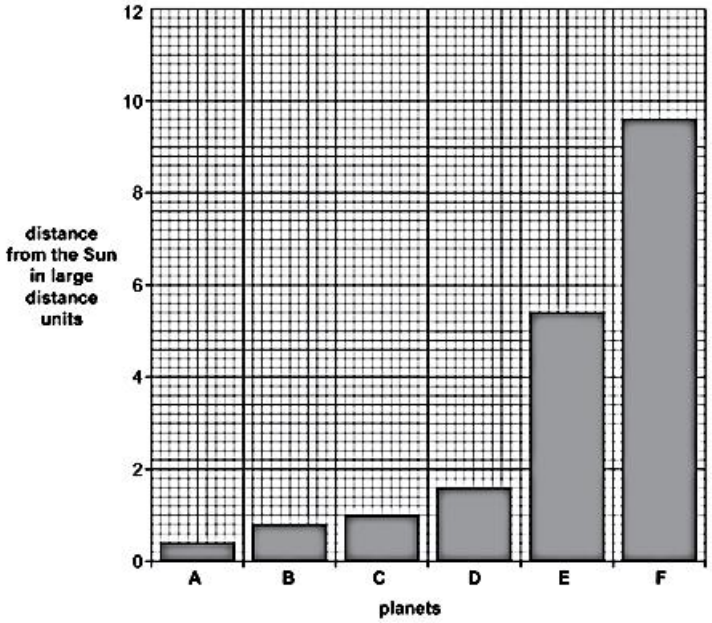
(b) Rajiv draws another picture in January of the next year.

Describe what the picture will look like.

.....

..... [1]

7 Aiko draws a bar chart to show the mean (average) distance of planets from the Sun.



(a) Planet C is the Earth.

What are the names of planets A and B?

Planet A .....

Planet B ..... [1]

(b) What planet is between 8 and 12 large distance units from the Sun?

Choose from A, B, C, D, E or F.

..... [1]

(c) How many planets are less than 8.2 large distance units from the Sun?

Circle the correct answer.

3 4 5 6 7

[1]

8) Look at the pictures of stars seen from the same position on the surface of the Earth.

One of the pictures is from June and the other is from December.

June December

(a) Why are the patterns of the stars different?

..... [1]

(b) A picture of stars is taken in October.

It is taken from the same position on the Earth.

What pattern will the stars have in the month of October?

Circle the correct answer.

same as the pattern in June

same as the pattern in December

a different pattern

[1]

9) Mike and Oliver find information about some planets.

name of planet	time to orbit the Sun in (Earth) years
Earth	1.0
Jupiter	11.9
Mars	1.9
Mercury	0.2
Venus	0.7

(a) Which two of these planets take more time than the Earth to orbit the Sun?

..... and ..... [1]

(b) Oliver finds some information about the planets Saturn and Uranus.

name of planet	time to orbit the Sun in (Earth) years
Saturn	84.0
Uranus	29.5

Mike says the information is incorrect.

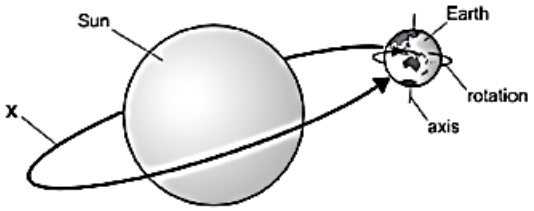
What is wrong with this information?

Explain your answer.

.....

..... [1]

10) Look at the diagram of the Sun and the Earth.



(a) Write down the name of path X.

..... [1]

(b) The Earth turns on its own axis.

How many hours does it take the Earth to complete one rotation?

..... hours [1]

(c) Complete the sentence.

Choose the best answer from the list.

an absorber of light

a reflector of light

a refractor of light

a source of light

The Sun is ..... . [1]

SS

(d) Complete the sentence.

Choose the best answer from the list.

absorbed by its surface

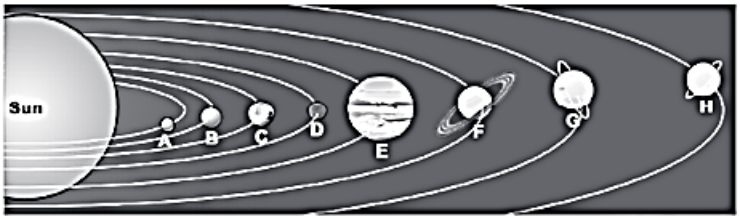
emitted by its surface

reflected by its surface

refracted by its surface

A planet is seen because light is ..... . [1]

11) Look at the diagram of the Sun and eight planets.



NOT TO SCALE

(a) Planet C is the Earth.

There are two planets with a smaller orbit than the Earth.

Write down the letters of these two planets.

..... and ..... [1]

(b) What are the names of planets A, D and F?

A .....

D .....

F ..... [1]

(c) Complete the sentence.

Choose the letter from the list.

A B C D E F G H

The planet that takes the shortest time to orbit the Sun is ..... . [1]

12) (a) Here is some information about objects in the universe.

name	type of object	Is it a source of light?
Sirius	star	.....
Earth	planet	.....
Venus	planet	.....
Pallas	asteroid	.....
Canopus	star	.....

Complete the table by writing yes or no. [2]

(b) We can see the Moon.

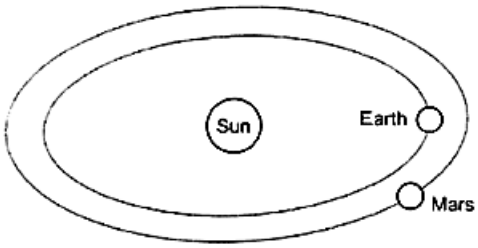
Complete the sentence.

The Moon can be seen from the Earth because light from the Sun is

..... . [1]

13) Earth and Mars are planets in the Solar System.

Look at the diagram that shows the orbits of these planets around the Sun.



(a) Write the name of a planet that is

(i) closer to the Sun than Earth

.....

(ii) further away from the Sun than Mars.

[1]

.....

[1]

(b) How long does it take Mars to orbit the Sun?

Put a tick (✓) in the correct box.

less time than an Earth year	
the same time as an Earth year	
more time than an Earth year	

[1]

(c) Mars is not a light source but we can still see it in the night sky.

Explain how it is possible to see Mars in the night sky.

..... [1]

SSS SS