NOTES

DATE:

SEPTEMBER HOLIDAY REVISION

SEC 1 SCIENCE

Instructions:
Please complete your Mock Exam Paper under timed conditions and bring it for class.

CONTENT PAGE

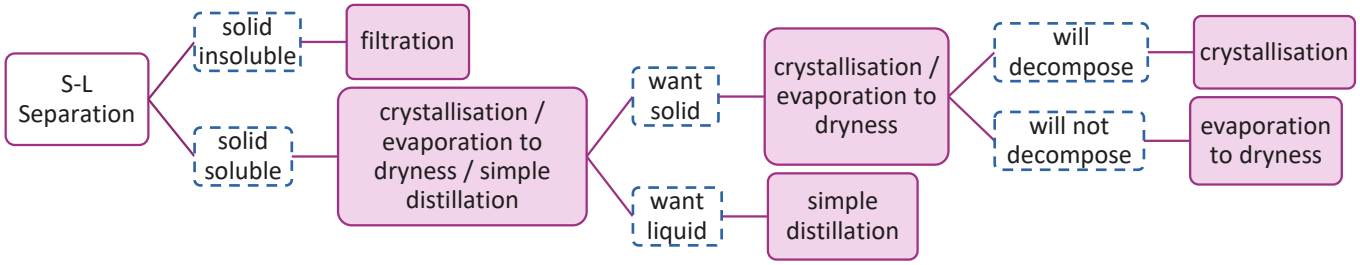
CHAPTER 4: SEPARATION TECHNIQUES

SOLID-SOLID SEPARATION

MAGNETIC SEPARATION

Examples:
Magnetic materials - Iron, Steel, Nickel, Cobalt

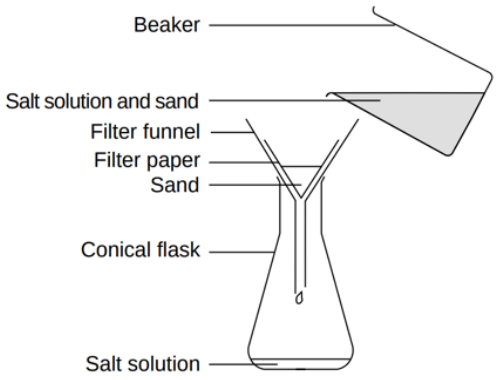
SOLID-LIQUID SEPARATION



FILTRATION

Method
1. [Optional – depends on question] Dissolve the mixture in *water* *(to change accordingly)*.
2. Pour the mixture through a filter funnel lined with filter paper into a beaker.
3. Collect the filtrate of _____ solution in a beaker.
4. Collect the residue of _____ that remains on the filter paper. Rinse the _____ with small amounts of distilled water and dry the powder between sheets of filter paper.

How residue is collected in the filter paper
Size of the particle is greater than the pore size of the filter paper, therefore it cannot pass through.



SIMPLE DISTILLATION

Method

1. Heat the mixture in a distillation/distilling flask in a set-up
2. When the thermometer first shows a reading of ___°C, _____ boils off. _____ vapour passes through the condenser, cools and condenses to produce liquid _____, which is collected in the conical flask as the distillate.

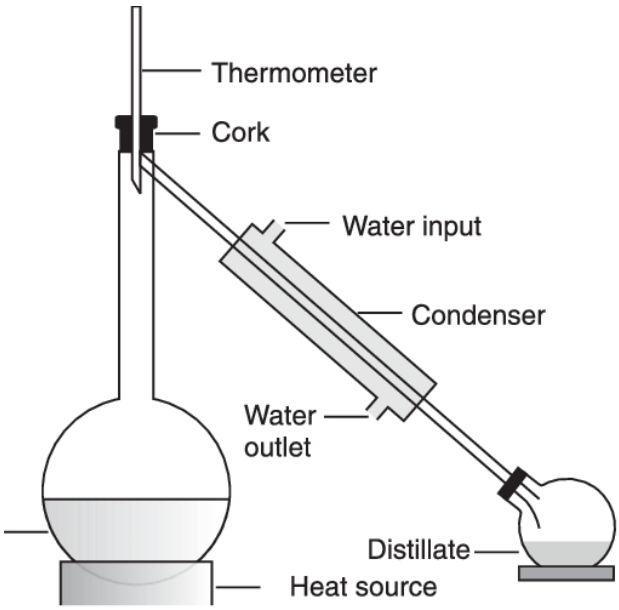
Apparatus function:

Apparatus	Function
Condenser	The condenser cools the vapours so that they can condense to form a liquid and can be collected as the distillate.
Boiling chips	To ensure smooth boiling.
Thermometer	To measure the temperature of the vapour before it enters the condenser.

Precautions

Water must enter condenser from the bottom and exit from the top, instead of the other way around

➔ To maximize the cooling of the vapour passing through the condenser as the condenser would be filled entirely with cold water.



CRYSTALLISATION

Method

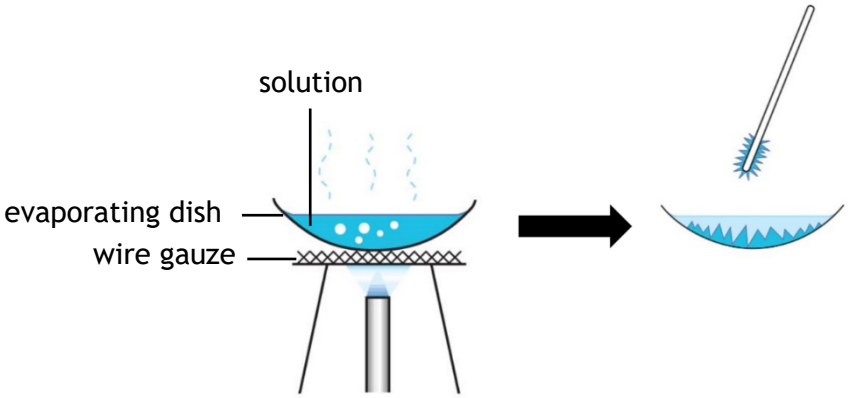
1. Heat the solution until a hot saturated solution is obtained.
2. Cool the solution and filter to collect the crystals as the residue.
3. Dry the crystals between sheets of filter paper.

Explanation on how crystals are collected

As temperature decreases, the solubility of _____ in the solution decreases. Hence, any _____ that can no longer remain dissolved at a lower temperature will start to form crystals.

Explanation on why Solid X is not suitable to be obtained by evaporation to dryness

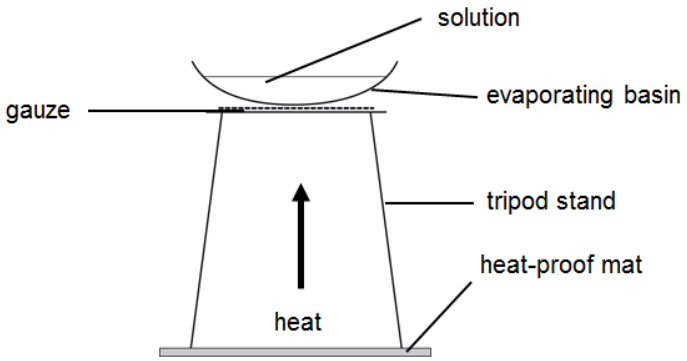
Solid X would decompose when heated over a Bunsen burner.



EVAPORATION TO DRYNESS

Method

1. The solution can be heated until all water has evaporated to obtain _____.



LIQUID-LIQUID SEPARATION

FRACTIONAL DISTILLATION

Method

1. Heat the mixture in a round bottom flask.
2. When the temperature reaches ___°C, collect the distillate of _____ in a conical flask.
3. Change the conical flask when the temperature rises to collect the next distillate, _____.

Apparatus function

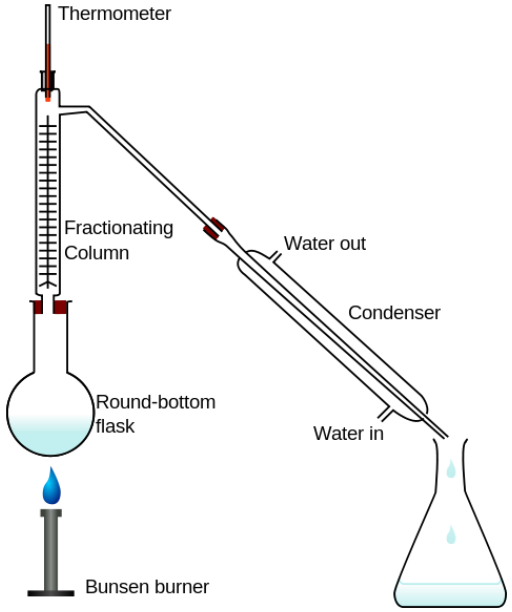
Apparatus	Function
Condenser	The condenser cools the hot vapours so that they can condense to form a liquid and can be collected as the distillate.
Boiling chips	To ensure smooth boiling
Fractionating column	The fractionating column provides a surface for vapours of substances which have not reached their boiling point to condense and return to the round-bottomed flask. Only substances that have reached their boiling point pass through the condenser.
Thermometer	To measure the temperature of the vapour before it enters the condenser. (Temperature = Boiling point of distillate)

Precautions

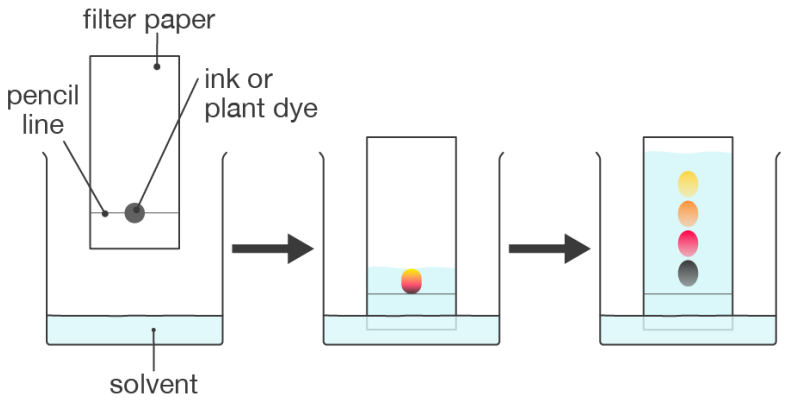
- If distillate obtained is not entirely pure → Use a longer fractionating column
- If boiling points of distillate is too close → Distillate cannot be separated effectively

Property of Substance X, Y and Z that allow them to be collected by fractional distillation

The substances were collected in increasing order of their boiling points. Substance X which has the lowest boiling point will be first to boil, condense and be collected as first distillate, followed by Substance Y then Substance Z with the highest boiling point.



CHROMATOGRAPHY



Retention factor R_f = distance travelled by substance ÷ distance travelled by solvent

Highest solubility substance → travel further up the chromatography paper → larger R_f value

Lowest solubility substance → travel a shorter distance up the chromatography paper → smaller R_f value

Method

He should compare the chromatogram to another chromatogram of known substances. If the R_f value of his spots match the R_f values of known substances, he would be able to identify his spots.

Precautions

Starting line of chromatography paper cannot be submerged in the solvent

➔ The spots of the ink/dyes/chemicals would dissolve in the solvent and will not travel up the chromatography paper.

Starting line to be drawn in pencil and not to be drawn in pen

➔ Pen ink dissolves in most solvents while pencil does not. Hence, using a pencil will not affect the results of the chromatogram.

Advantages of chromatography

Only small amount of each sample is required for analysis.

Suggestion for greater separation of spots obtained in the chromatogram

Use a larger piece of filter paper / change the solvent used

Locating agent

For colourless substances, we need to use a locating agent to make the colourless solution visible. Locating agents react with the spots on the chromatogram to produce a coloured product. Hence, the spots on the chromatogram can be seen.

REVERSE OSMOSIS

(FOR G3 and IP ONLY)

High pressure is applied
This would force the water molecules through the partially permeable membrane.

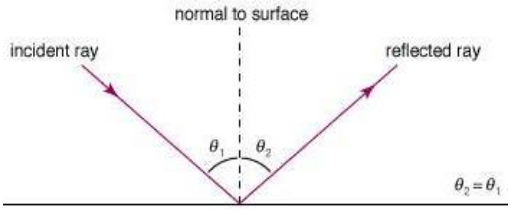
Presence of partially permeable membrane
It allows only liquid (water) molecules to pass through while retaining larger solid (solute) particles. Pure water is thus separated from the impurities.

CHAPTER 5: RAY MODEL OF LIGHT

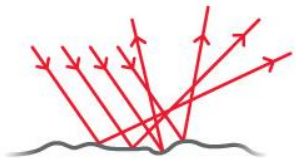
REFLECTION

Law of reflection

1) The incident ray, the reflected ray, and the normal at the point of incidence all lie on the same plane.
2) The angle of incidence, i, is equal to the angle of reflection, r.



Regular vs diffuse reflection

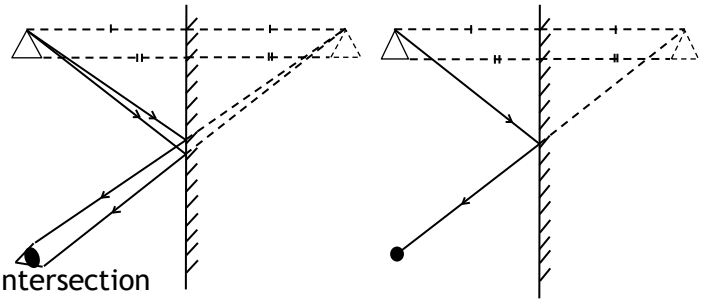
Regular reflection	Diffuse reflection
Smooth surface	Rough surface
	

Ray diagram

Step 1: Draw image

Step 2: Connect from image to eye

Step 3: Connect from object to point of intersection



Characteristics of images in mirrors

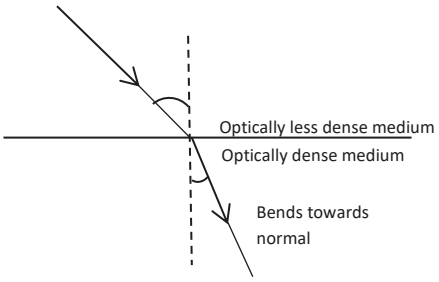
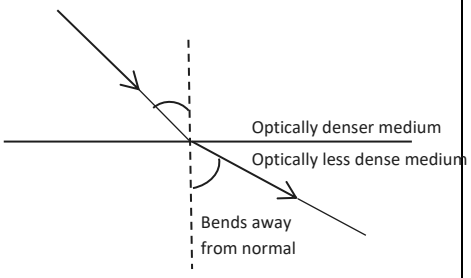
Plane mirror	Convex mirror	Concave mirror
- **Virtual** - **Upright** - **Same size** - **Laterally inverted** - Image will be **same distance** from mirror as object is from mirror	- **Virtual** - **Upright** - **Smaller/diminished** - **Wider field of vision** (more objects can be seen)	- **Virtual** - **Magnified** image for close objects
	Eg. Installed at corner of shops and road blind spots, rear-view and side mirrors of vehicle	Eg. Torchlight, car headlights, shaving and dental mirror

REFRACTION

Refraction is the bending of light as light enters at an angle at the boundary between two mediums of different optical density.

Law of refraction

1) The incident ray, the refracted ray and the normal at the point of incidence all lie in the same plane.
2) For light passing through any two mediums, the ratio of **sin i / sin r** is a constant (refractive index).

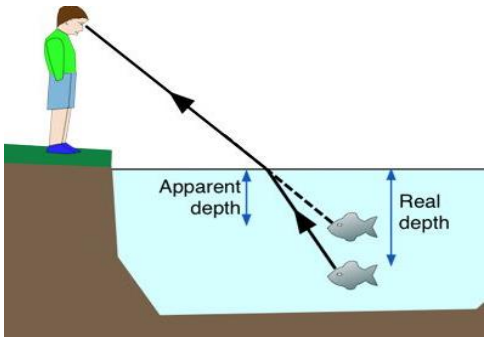
	Less dense to denser medium	**Denser to less dense medium**
Speed of light	Decreases	Increases
Refraction	Towards normal	Away from normal
Diagram		

Ray diagram

Step 1: Draw image

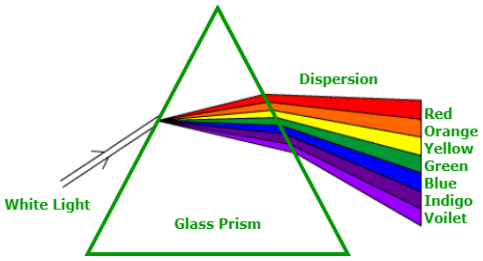
Step 2: Connect from image to eye

Step 3: Connect from object to point of intersection



Dispersion of light

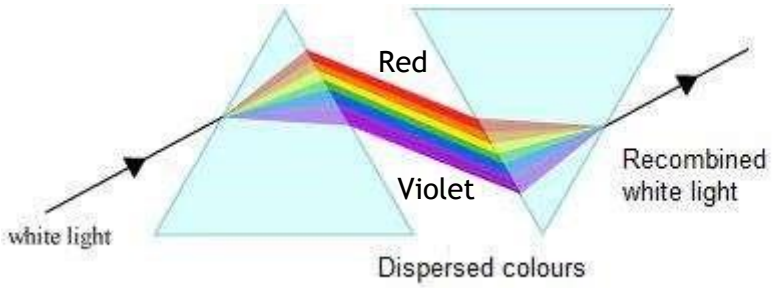
Definition:
The separation of white light into its spectrum of colours by passing white light through a glass prism.



Red light:
Longest wavelength (700 nm)
Greatest speed (fastest)
Refracts the least

Violet:
Shortest wavelength (400 nm)
Lowest speed (slowest)
Refracts the most

An inverted glass prism placed in the path of dispersed light can recombine dispersed light to form white light.



ELECTROMAGNETIC (EM) RADIATION

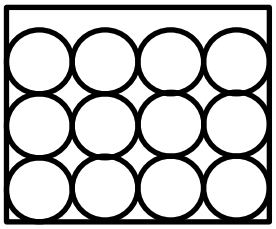
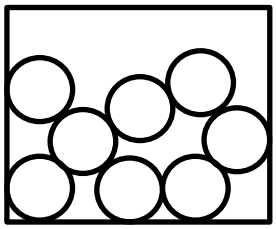
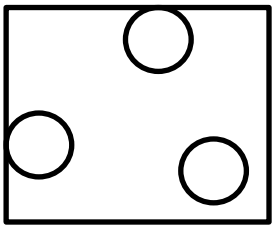
EM radiation is a form of energy that is all around us.

Type of EM radiation	Application	Harmful effects
Infrared radiation	• **Thermal imaging cameras** • **Electrical appliances** • Cables and remote controls	• **Easily absorbed by our skin,** can cause skin burns • Cause the temperature on Earth to rise and lead to **climate change**
Ultraviolet (UV) radiation	• Helps our body **produce Vitamin D** • **Water treatment plants**	• **Damage our eyes and skin**,
Visible light	• Visible lights aids in **navigation**, • **Photosynthesis** • Source of **renewable energy**	• **Light pollution,** affect nocturnal animals that depend on natural light to guide their life cycles

CHAPTER 7: THE PARTICULATE NATURE OF MATTER

KINETIC PARTICLE THEORY

Particles in matter have kinetic energy and are in constant random motion.

Property	Solid	Liquid	Gas
Volume	Fixed volume	Fixed volume	No fixed volume
Shape	Fixed shape	No fixed shape	No fixed shape
Compressibility	Cannot be compressed	Cannot be compressed	Can be compressed
Ability to flow	Does not flow	Flows easily	Can flow in all directions
Forces of attraction between particles	Very strong	Strong (but weaker than that between particles in a solid)	Very weak
Arrangement of particles	Packed very closely together in an orderly arrangement	Packed closely together in a disorderly arrangement	Far apart from each other in a random arrangement
Movement of particles	Vibrate about fixed positions	Free to move throughout the liquid by sliding past each other	Free to move in any direction at high speeds
Energy of particles	Low	Mid	High
Particulate model of matter	 - At least 2 rows of circles - Must touch bottom - Regular arrangement - Circles cannot overlap	 - Must touch bottom and sides - Circles cannot overlap - Irregular arrangement	 - At least 3 circles - Far apart and some near walls - Circles cannot overlap

DIFFUSION

Diffusion is the **net movement** of particles from a region of **higher concentration** to a region of **lower concentration**, until an equilibrium is reached.

Answering technique: There is a **net movement** of particles from _____ which is a region of **higher concentration** to _____ which is a region of **lower concentration**.

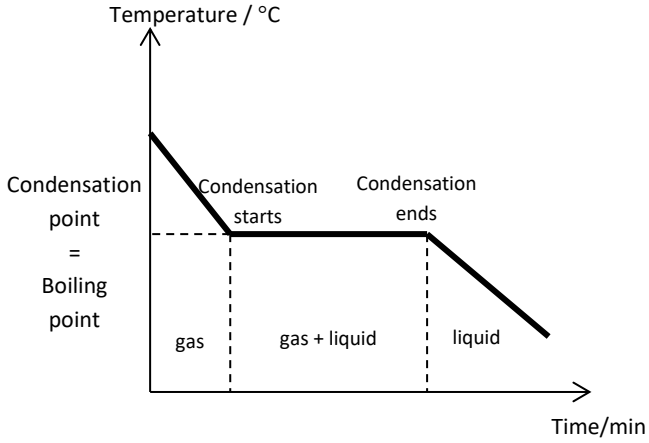
<u>Factors affecting rate of diffusion</u>

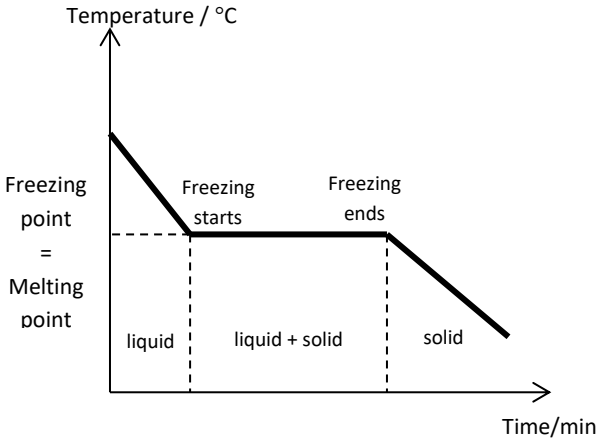
- **Relative molecular mass of particles**
  Relative molecular mass of particles ↑ → rate of diffusion ↓
  Answering technique: _____ have a higher relative molecular mass than _____. Hence, _____ will diffuse slower and _____.
  (answer the question)

- **Temperature**
  Temperature ↑ → rate of diffusion ↑
  Definition: Temperature is the measure of the average kinetic energy of the particles in a substance.
  Answering technique: As temperature increases, the average kinetic energy of _____ increases and the particles of _____ move more quickly. Hence, the rate of diffusion increases.

CHANGES IN STATE

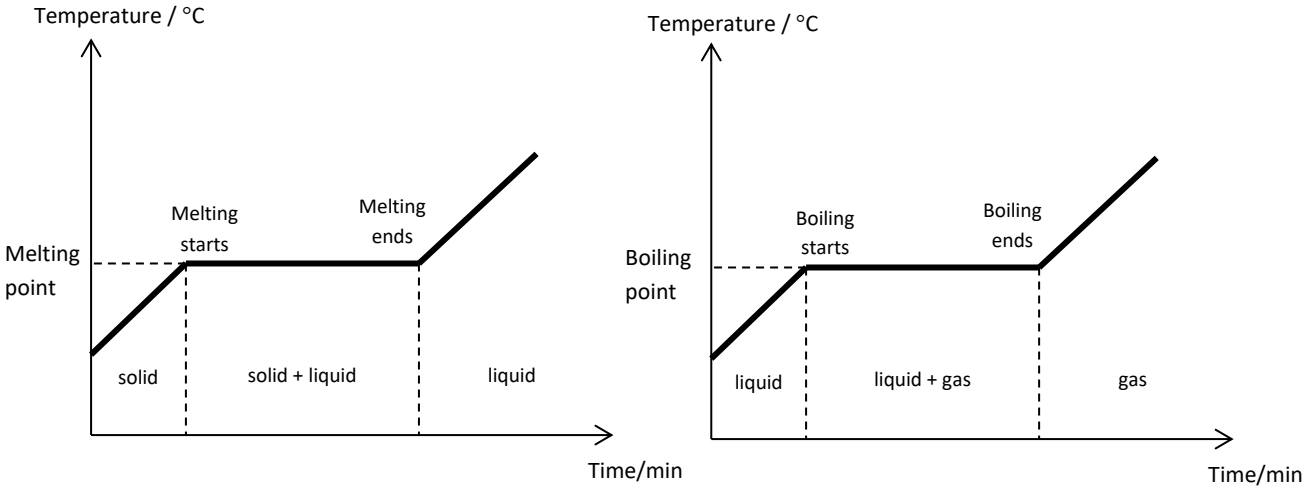
Condensation & Freezing





Heat lost to	↓ Temperature	Temperature remains constant. Substance is undergoing a change in state so heat lost is used to increase the strength of forces of attraction between particles.	↓ Temperature
Arrangement of particles	(Refer to KPT table)	Particles move closer to each other and start to take on a disorderly (L) / orderly (S) arrangement	(Refer to KPT table)
Movement of particles	Free to move in any direction at <u>lower</u> speeds (G) / Free to move throughout the liquid by sliding past each other <u>slower</u> (L)	Change from free to move in any direction to become free to move throughout the liquid by sliding past each other (G → L) / Change from free to move throughout the liquid by sliding past each other to vibrate about fixed positions (L → S)	Free to move throughout the liquid by sliding past each other <u>slower</u> (L) / Vibrate about fixed positions <u>slower</u> (S)

Melting & Boiling



Heat gain to	↑ Temperature	Temperature remains constant. Substance is undergoing a change in state so heat gained by particles is used to overcome the forces of attraction between particles.	↑ Temperature
Arrangement of particles	(Refer to KPT table)	Particles move further apart and start to take on a disorderly (S → L) / random (L → G) arrangement	(Refer to KPT table)
Movement of particles	Vibrate about fixed positions <u>more quickly</u> (S) / Free to move throughout the liquid by sliding past each other more quickly (L)	Change from vibrate about fixed positions to free to move throughout the liquid by sliding past each other (S → L) / Change from free to move throughout the liquid by sliding past each other to free to move in any direction at higher speeds (L → G)	Free to move throughout the liquid by sliding past each other <u>more quickly</u> (L)/ Free to move in any direction at <u>higher</u> speeds (G)

Evaporation vs Boiling

Evaporation is a process where a substance changes from liquid to a gaseous state at a temperature between its melting point and boiling point.

Evaporation	Boiling
Occurs at any temperature between its melting point and boiling point	Occurs at a fixed temperature
Relatively slow process	Relatively fast process
Occurs only at the surface of a liquid	Occurs throughout the liquid

Explanation for evaporation using particulate model of matter

Answering technique: Particles of water have sufficient kinetic energy/speed to overcome the forces of attraction between them and leave the surface of liquid water to form water vapour.

Impact of impurities on boiling point (and melting point)

To test whether a substance is pure or not:

Method - Check boiling point (and melting point)

Explanation - Impurities increases boiling point (and decreases melting point) / causes the substance to boil (and melt) over a range of temperature

END OF YEAR MOCK EXAMINATION
SECONDARY ONE
BASED ON 2024 SEAB SYLLABUS

SCIENCE **G2/G3**

Paper 1

September 2024
1 hour

READ THESE INSTRUCTIONS FIRST

Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions in the spaces provided.

The number of marks is given in brackets [ ] at the end of each question or part question.

The use of an approved scientific calculator is expected, where appropriate.

SCORE

Paper 1		20
Paper 2		30
TOTAL		50

Shade the corresponding lozenge.

Total score: _____

1	A ▭	B ▭	C ▭	D ▭
2	A ▭	B ▭	C ▭	D ▭
3	A ▭	B ▭	C ▭	D ▭
4	A ▭	B ▭	C ▭	D ▭
5	A ▭	B ▭	C ▭	D ▭
6	A ▭	B ▭	C ▭	D ▭
7	A ▭	B ▭	C ▭	D ▭
8	A ▭	B ▭	C ▭	D ▭
9	A ▭	B ▭	C ▭	D ▭
10	A ▭	B ▭	C ▭	D ▭
11	A ▭	B ▭	C ▭	D ▭
12	A ▭	B ▭	C ▭	D ▭
13	A ▭	B ▭	C ▭	D ▭
14	A ▭	B ▭	C ▭	D ▭
15	A ▭	B ▭	C ▭	D ▭
16	A ▭	B ▭	C ▭	D ▭
17	A ▭	B ▭	C ▭	D ▭
18	A ▭	B ▭	C ▭	D ▭
19	A ▭	B ▭	C ▭	D ▭
20	A ▭	B ▭	C ▭	D ▭

Question 1 [BEATTY 2021 S1 EOY P1 | Q1]

The two hazard symbols and the 'no smoking' sign shown, are commonly seen at petrol stations.

Figure 1

Which statement best describes why smoking is prohibited at petrol stations?

(A) Smoking is prohibited as it releases oxygen which can cause a fire or an explosion.

(B) Smoking is prohibited as petrol is highly corrosive.

(C) Smoking is prohibited as the smoke from cigarette is harmful to the health of the drivers.

(D) Smoking is prohibited as the sparks from the cigarette may ignite the petrol.

Question 2 [FHSS 2021 S1 EOY P1 | Q5]

Cindy noticed some of her T-shirts shrank in size after washing in hot water. She took the following steps in a scientific investigation.

I Cindy predicted that the temperature of the water used to wash the T-shirts affects whether they would shrink in size after washing.

II Cindy chose two T-shirts made of the same material and washed them in cold water and hot water respectively.

III Cindy measured the size of the T-shirts before and after the wash and recorded them in a table.

IV Cindy concluded that T-shirts washed in hot water resulted in greater shrinkage.

Which of the following match the steps to the scientific investigation correctly?

	carrying out experiment	**collecting data**	**formulating hypothesis**	**interpret data**
(A)	I	II	III	IV
(B)	II	III	I	IV
(C)	III	IV	I	II
(D)	II	III	IV	I

Question 3 [ASSUMPTION ENGLISH 2019 S1 SA2 P1 | Q9]

An Overmugged student finds the volume of the cork using a measuring cylinder. The cork floats, so he uses a stone to keep it under the water. He then measures the volume of the stone. The results for each stage of the experiment are shown.

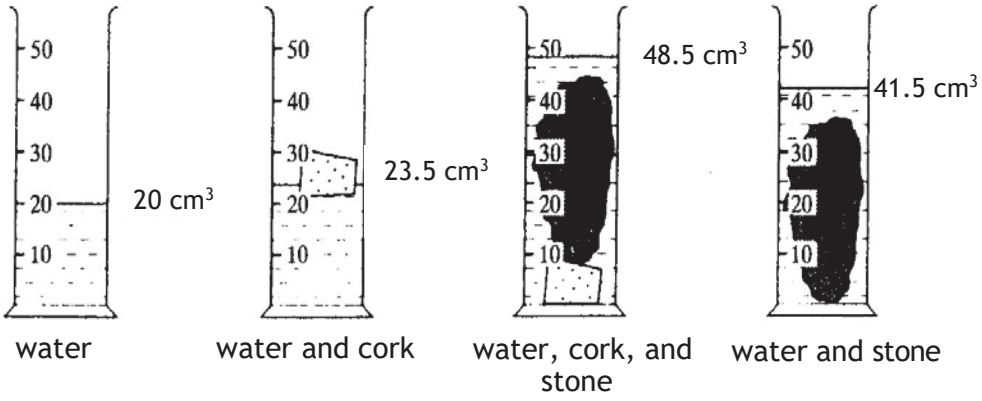


Figure 3

What is the volume of the cork?

(A) 3.5 cm^3 (B) 7.0 cm^3

(C) 18.0 cm^3 (D) 21.5 cm^3

Question 4 [HOUGANG 2019 S1 SA2 P1 | Q10]

A cuboid of 5 cm by 2 cm by 1 cm has a mass of 17.6 g.

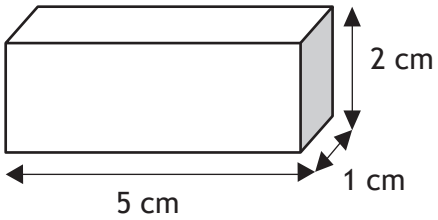


Figure 4

Which of the following is the density of the object?

(A) 0.568 g/cm^3 (B) 0.568 kg/m^3

(C) 1.76 g/cm^3 (D) 1.76 kg/m^3

Question 5 [EAST SPRING 2019 S1 SA2 P1 | Q19]

An object is placed on a beam balance and on a compression spring balance on earth. The same experiment is then repeated on moon.

Which set of observations is true about the beam balance and the spring balance readings?

	Beam balance	Compression spring balance
(A)	Reads less on moon than on earth	Reads less on moon than on earth
(B)	Reads less on moon than on earth	Reads the same on moon and earth
(C)	Reads the same on moon and earth	Reads less on moon than on earth
(D)	Reads the same on moon and earth	Reads the same on moon and earth

Question 6 [BARTLEY 2019 S1 SA2 P1 | Q4]

Which diagram shows a mixture of two different elements?

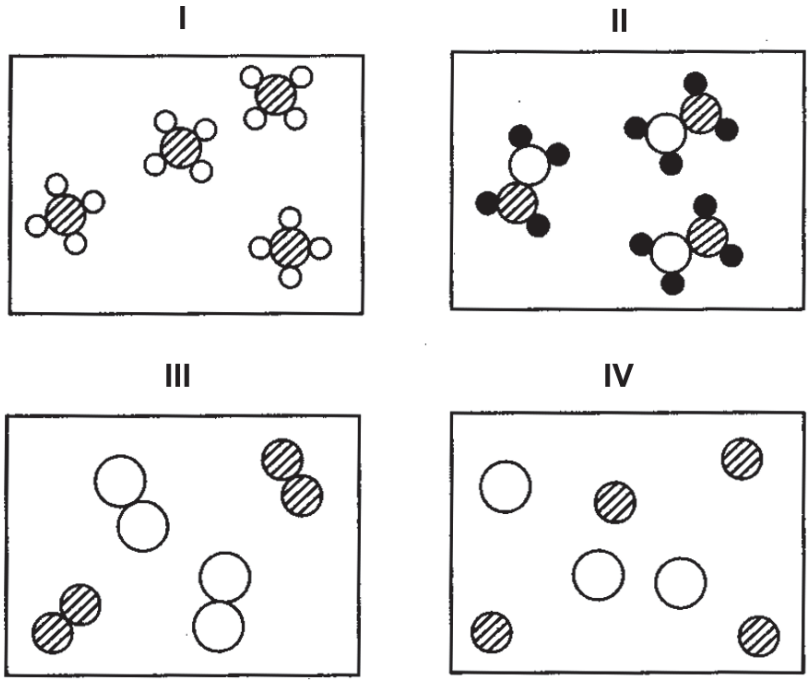


Figure 6

(A) I only
(B) I and II only
(C) III and IV only
(D) All of the above

Question 7 [HIHS 2021 S1 EOY P1 | Q15]

The solubility of different substances in water varies with temperature, as shown in the graph below.

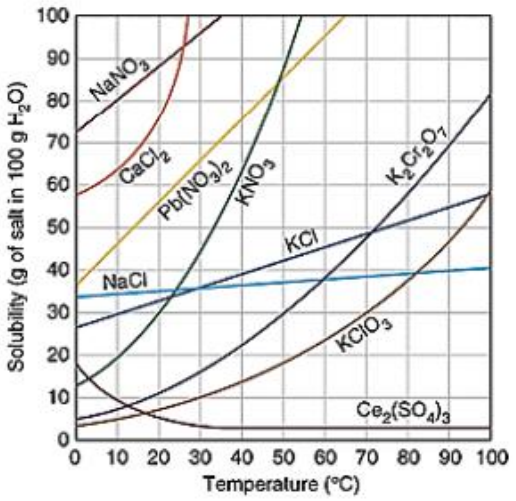


Figure 7

Three statements on solubility are also shown.

I Between 0 °C to 50 °C, the solubility of KNO_3 is always higher than that of $K_2Cr_2O_7$.

II Less $Ce_2(SO4)_3$ would be able to dissolve at 100 °C as compared with 10 °C.

III If a saturated solution of $KClO_3$ were to be cooled from 70 °C to 30 °C, 10 g of solid would be formed.

Which of these statements is correct?

(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

Question 8 [ASSUMPTION ENGLISH 2019 S2 SA2 P1 | Q1]

Which separation techniques involve a change in state of matter?

I Distillation

II Evaporation to dryness

III Filtration

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

Question 9 [BARTLEY 2019 S1 SA2 P1 | Q9]

A swimmer is suspected to have consumed a banned drug to improve his performance in a swimming competition. His urine sample was taken and sent for testing in the laboratory using paper chromatography.

The chromatograms of the pure drug and his urine sample are tested with two different solvents, alcohol and water and are shown below.

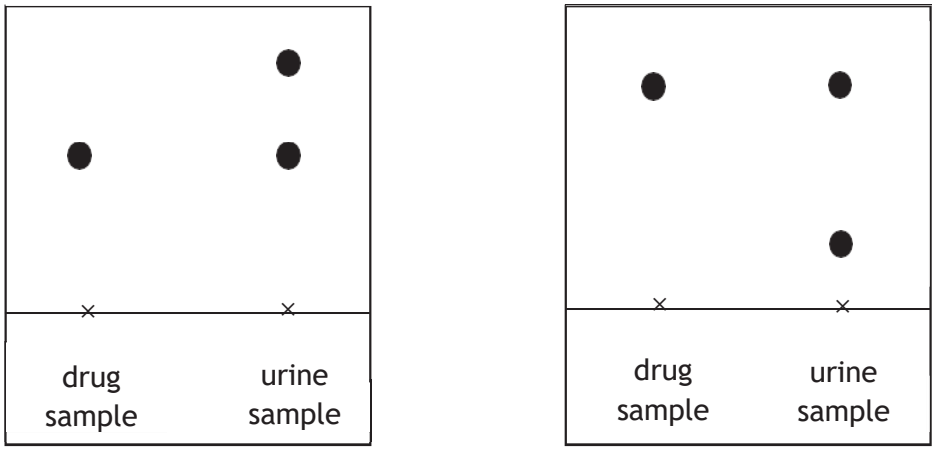


Figure 9

Which statement about the results is true?

(A) Both tests show that he consumed the banned drug.

(B) Both tests show that he did not consume the banned drug.

(C) The test using alcohol as solvent shows that he consumed the banned drug, but not the test using water as solvent.

(D) The test using water as solvent shows that he consumed the banned drug, but not the test using alcohol as solvent.

Question 10 [ACS(B) 2021 S1 EOY P1 | Q15]

The setup below is used to obtain water from salt solution.

At which position is the temperature exactly 100°C?

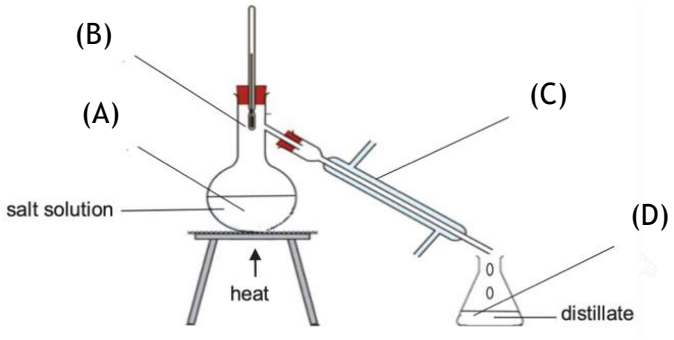


Figure 10

(A) A (B) B

(C) C (D) D

Question 11 [PLMGS 2021 S1 EOY P1 | Q16]

The diagram shows a plane mirror surface being tilted by 25º from its original position.

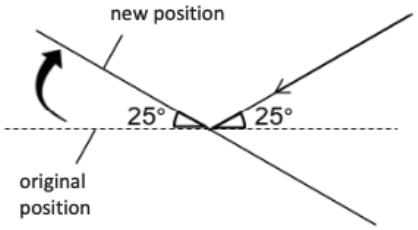


Figure 11

What is the new angle of reflection?

(A) 25° (B) 40°

(C) 70° (D) 95°

Question 12 [FUCHUN 2021 S2 EOY P1 | Q14]

The ray diagram shows the path of light as it travels through three media P, Q and R.

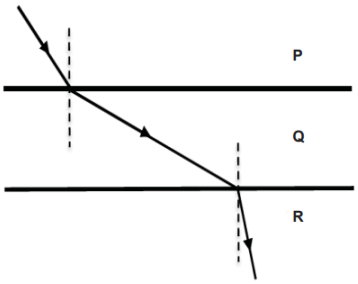


Figure 12

Which statement correctly describe about the optical densities of the three media?

(A) Q is denser than P.

(B) R is less dense than Q.

(C) R has the largest density.

(D) P has the lowest density.

Question 13 [BEATTY 2021 S1 EOY P1 | Q23]

The diagram shows a ray of light passing through a prism.

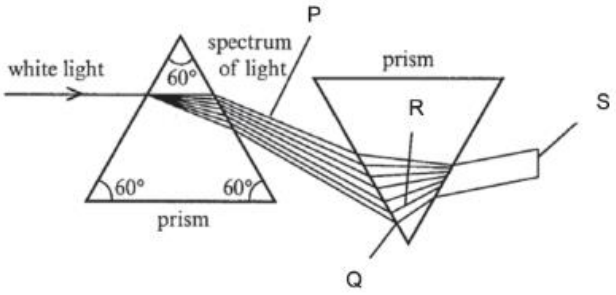


Figure 13

What are the colours of P, Q, R and S?

	P	Q	R	S
(A)	green	yellow	blue	Indigo
(B)	red	orange	blue	white
(C)	red	violet	indigo	white
(D)	violet	indigo	orange	white

Question 14 [ESSS 2021 S1 SA2 P1 | Q20]

A student collected some water from the reservoir. He placed a drop of reservoir water on a microscope slide and observed it under the microscope. He saw an organism swimming in the drop of water. The diagram below shows the organism.

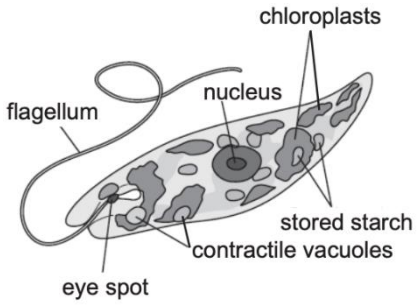


Figure 14

Which of the following statements can be deduced based on his observations?

(A) It may be an animal-like organism because it contains starch.

(B) It may be an animal-like organism because it contains a nucleus.

(C) It may be a plant-like organism because it contains vacuoles.

(D) It may be a plant-like organism because it contains chloroplasts.

Question 15 [CCH(M) 2021 S1 EOY P1 | Q27]

Which statements about division of labour are correct?

I Division of labour only exists in animals.

II Different types of cells have different functions.

III It allows organisms to carry out more complex tasks.

IV Division of labour only exists in animals.

(A) I and IV only
(B) II and III only
(C) II, III and IV only
(D) All of the above

Question 16 [ACS(B) 2021 S2 EOY P1 | Q7]

The diagram below shows the arrangement of particles in a substance at 100 °C and 140 °C.

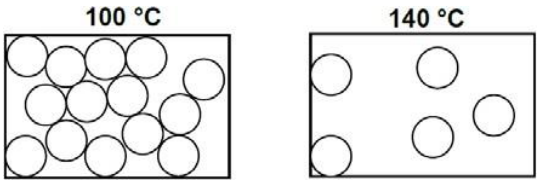


Figure 16

What could be the melting point and boiling point of the substance shown?

	melting point / °C	boiling point / °C
(A)	-120	-80
(B)	-20	40
(C)	40	125
(D)	120	180

Question 17 [BBS 2021 S1 SA2 P1 | Q25]

Which of the following change occurs when a gas is compressed?

(A) change in the distance between particles

(B) change in the mass of particles

(C) change in the arrangement of particles

(D) change in the arrangement of particles

Question 18 [FHSS 2021 S1 EOY P1 | Q12]

Two gas jars containing colourless oxygen gas and reddish-brown bromine gas were separated by a cover plate. The cover plate was removed and after several hours, the colour of the gas was the same in both jars.

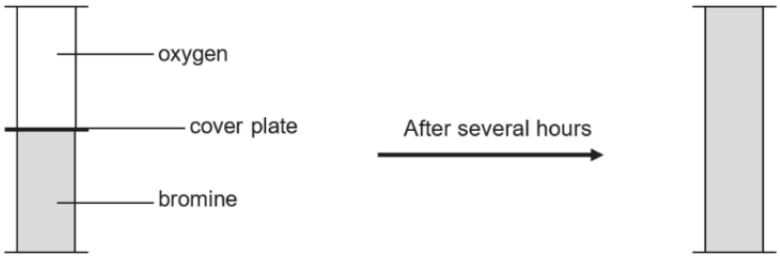


Figure 18

Which of the following statements explains this change?

(A) Oxygen and bromine gases have the same density.

(B) Oxygen and bromine molecules are in constant random motion.

(C) Oxygen and bromine molecules reacted and produced a new substance.

(D) Oxygen molecules diffuse faster than bromine molecules.

Question 19 [BDS 2021 S2 EOY P1 | Q26]

Six elements and their proton numbers are listed below. The letters are not their chemical symbols.

element	P	Q	R	S	T	U
proton number	7	9	11	13	14	19

Figure 19

Which two of these elements would have similar chemical properties?

(A) P and Q

(B) Q and U

(C) R and U

(D) S and T

Question 20 [EHSS 2021 S2 SA2 P1 | Q13]

Four atoms have the following chemical symbols.

$^{36}_{16}S$ $^{37}_{17}Cl$ $^{38}_{18}Ar$ $^{39}_{19}K$

Figure 20

What can you conclude about the following atoms?

(A) They have the same atomic masses.

(B) They have the same number of neutrons.

(C) They have the same number of electron shells.

(D) They have the same total number of electrons, protons and neutrons.

Write your answers in the spaces below.

Question 21 [BGPHS 2021 S1 EOY P2 | Q2]

Four boards made of different materials were tested to compare the maximum weight they can hold before breaking.

The set-up is shown in Fig. 21.1 (the figure is not drawn to scale).

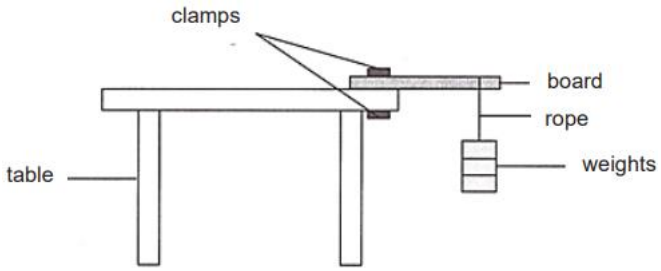


Figure 21.1

The four materials being tested are wood, plastic, ceramic and glass.

Suggest one variable that should be kept constant and one dependent variable for this experiment. [2]

Question 22 [BGPHS 2021 S1 EOY P2 | Q4]

(a) Fig. 22.1 shows 6 diagrams (A – F) of particles in different substances.

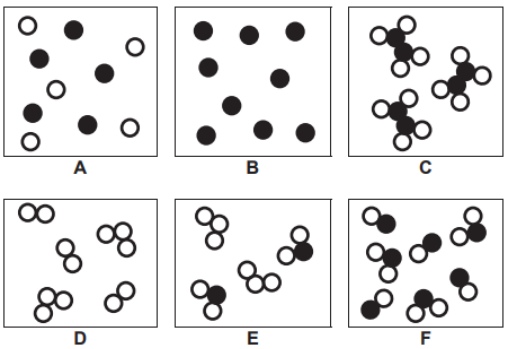


Figure 22.1

Each letter may be used once, more than once, or not at all.

List down the letter(s) which best represents [2]

(i) a pure compound: _____

(ii) a mixture of element and compound: _____

(b) When making cakes, we often beat eggs with granulated sugar instead of coarse-grained sugar. Explain why. [1]

_____

_____

(c) State one difference between a mixture and a compound. [1]

_____

_____

Question 23 [DAMAI 2021 S1 EOY P2 | Q4]

An officer from the organising committee of the Olympic Games suspects that Amy, Tom and Ash used illegal drugs to help them boost their performance.

Paper chromatography was used to analyse the athletes' urine samples. The chromatogram is shown in the diagram below. The urine test results of the athletes were compared against some known illegal performance-enhancing drugs, P, Q, R, S and T.

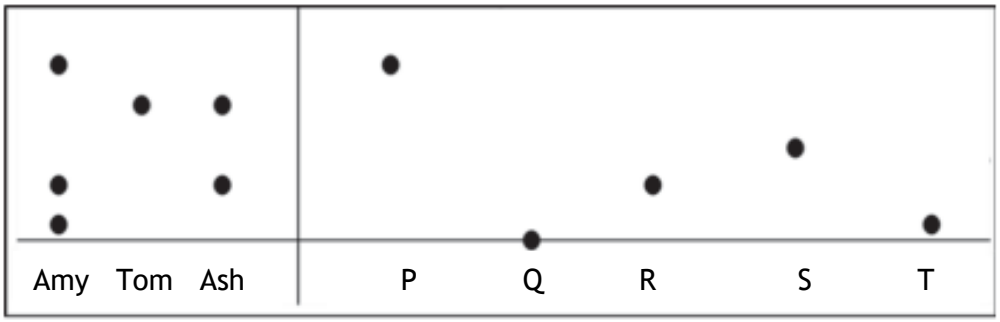


Figure 23.1

(a) (i) State which athlete(s) took performance-enhancing drugs. [1]

_____

(ii) Based on your answer in (i), identify the drug(s) that each athlete took. [2]

_____

_____

(b) Suggest why the drug samples P and T are found at different positions on the chromatogram. [1]

_____

_____

(c) Explain why drug sample Q is still found on the start line of the chromatogram, even after chromatography is completed. [1]

_____

_____

Question 24 [ESSS 2021 S2 SA2 P2 | Q5]

A student observed that an image is formed when an object is placed in front of a plane mirror as shown in Fig. 24.1.

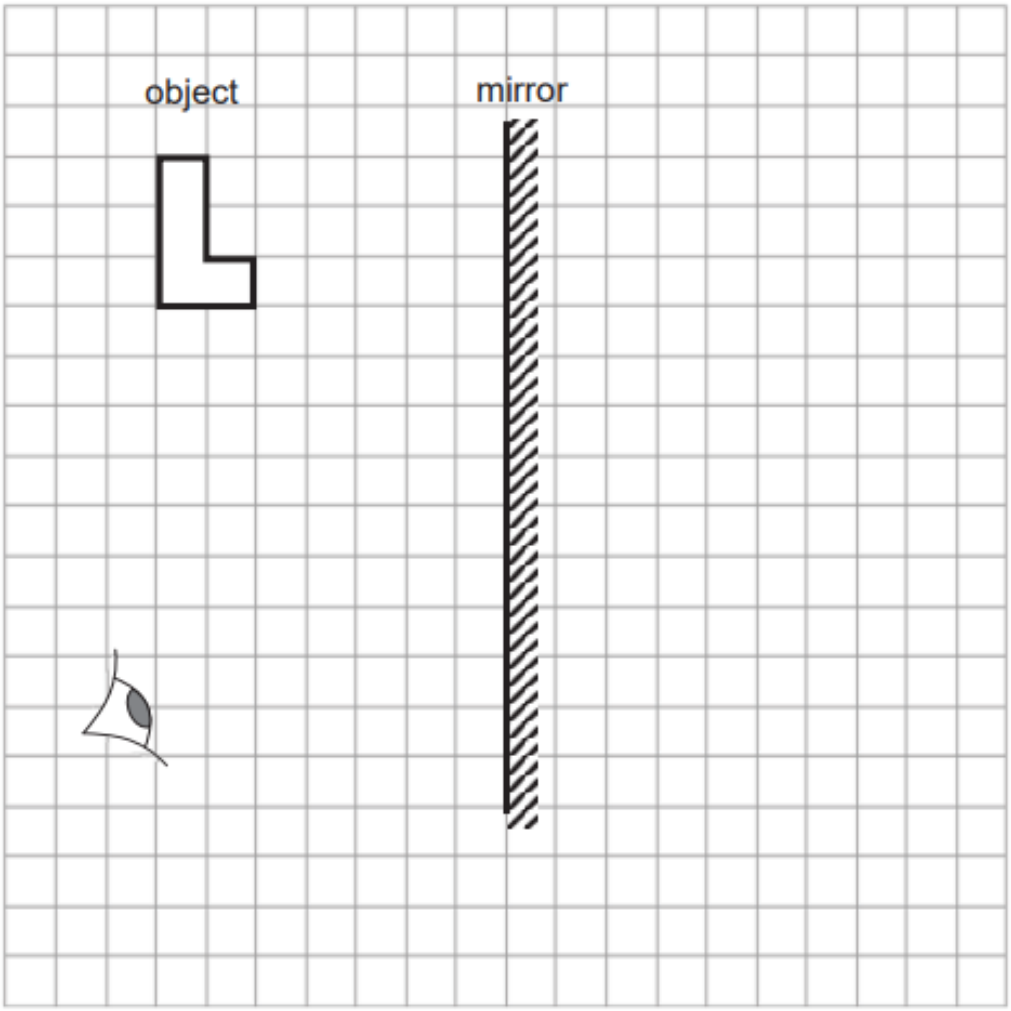


Figure 24.1

(a) (i) Draw the image of object formed by the plane mirror on Fig. 24.1 and label it as image. [1]

(ii) Draw light rays on Fig. 24.1 to show how the observer sees the image of the object. [2]

(b) State two characteristics of the image formed by a plane mirror. [1]

_____

_____

Question 25 [CCHS(M) 2021 S1 EOY P2 | Q9]

Two men were stranded on an island and decided to fish using a self-made spear.

One of them looked into the sea as shown below, aimed and threw his spear at the fish. However, he was always unsuccessful as the actual position of the fish is different from its image.

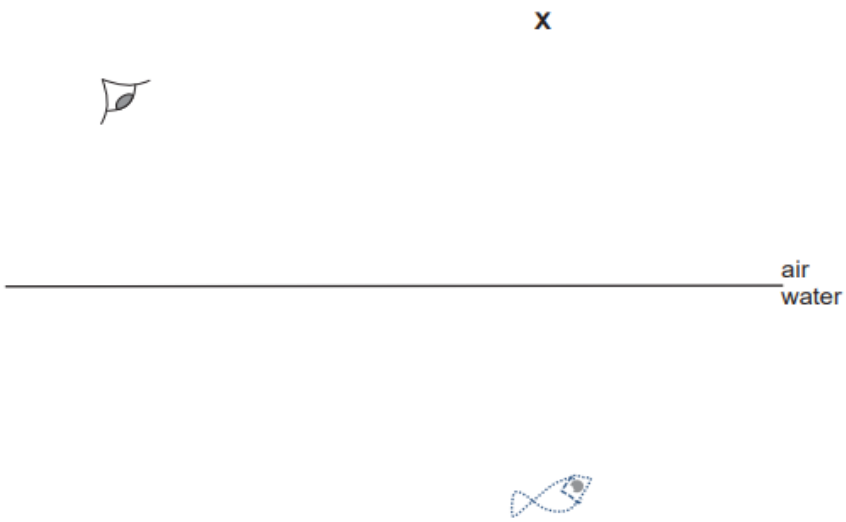


Figure 25.1

(a) Fig. 25.1 shows the image of the fish. Draw the actual position of the fish. [1]

(b) Draw two light rays from the tail of the fish to show how the man sees its image. [2]

(b) His companion advised him to place his eye at position X in Fig. 6.1 when aiming at the fish. Do you agree with his suggestion? Explain your answer. [2]

Question 26 [SJI 2021 S2 MYE P2 | Q3]

Fig. 26.1 is a diagram of a palisade mesophyll cell. Fig. 26.2 shows the same palisade mesophyll cell after it has been placed in a concentrated sugar solution for twenty minutes.

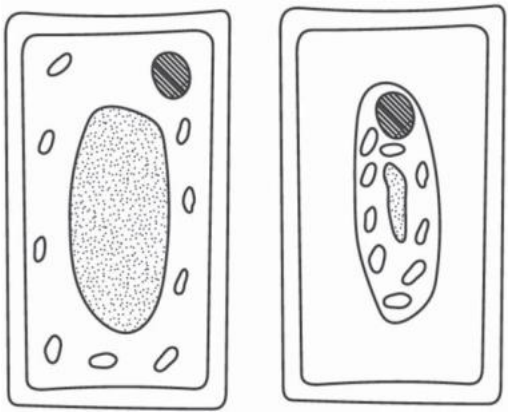


Figure 26.1 *Figure 26.2*

Describe one change that had taken place in the cell between Fig. 26.1 and Fig. 26.2. [2]

Question 27 [BEATTY 2021 S1 EOY P2 | Q2]

Fig. 27.1 shows the heating curve of substance X as it is heated from an initial temperature of -120 °C.

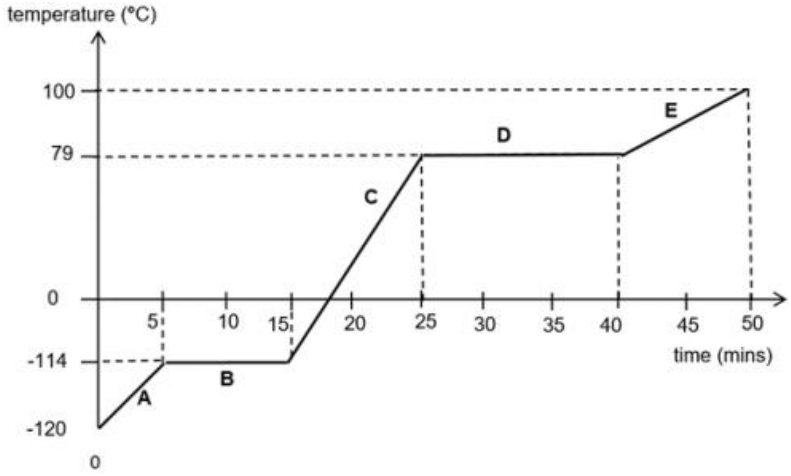


Figure 27.1

(a) Explain why the temperature remains constant in region D. [1]

(b) Substance X is used commercially for the manufacture of perfumes.

Suggest a reason and explain why. [1]

(b) Using your knowledge on the Particulate Nature of Matter, describe what happens to the particles in the substance as it is heated up in the first 25 minutes as represented by regions A, B and C. [3]

Question 28 [FUCHUN 2021 S2 EOY P2 | Q3]

Fig. 28.1 represents the nuclei of five different atoms F, G, H, J and K. The letters do not represent the actual symbols of the elements.

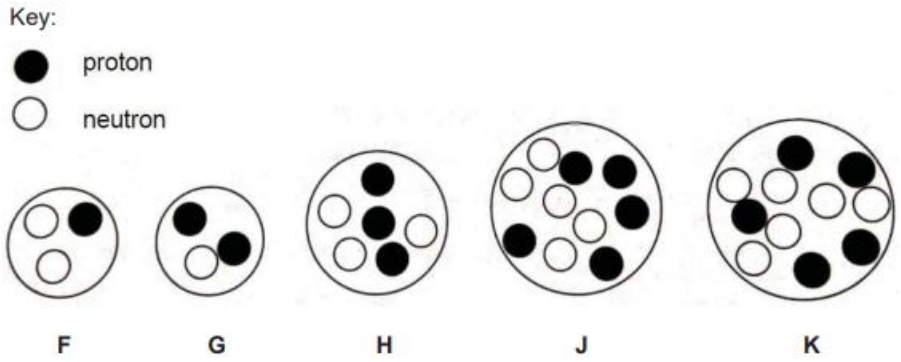


Figure 28.1

Choose the letter(s) which represent [2]

(a) two atoms which represent the same element, _____

(b) an atom which has 2 electrons, _____

(c) The protons in the atom carry positive charges.

Explain why an atom has no overall charge. [1]

_____

_____

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