

Strand I: Mixtures, elements and compounds

I.1: Elements and compounds

Section A

1. B
2. B
3. C
4. B
5. B
6. C
7. B
8. C
9. C
10. B

Section B

1.
 - (a) Atoms, molecules, compounds
 - (b) C
 - (c) An atom is the smallest particle of an element that can take part in a chemical change. A molecule is a group of two or more atoms held together by chemical bonds. A compound is a pure substance made up of two or more elements that are chemically combined and can be broken down by simpler means.
2.
 - (a) It is a good conductor of electricity. It is ductile, so it can be drawn into thin wires without breaking.
 - (b) Aluminium is used in the construction of buildings, bridges, roofing materials, doors and window frames.
 - (c) Iron is used to make nails, roofing sheets, farm tools and machinery.
3.
 - (a) Expiry/best-before date. Ingredients – shows what substances are present and helps identify possible allergens. Nutritional information – shows the amounts of nutrients such as carbohydrates, protein, fat and salt. Storage instructions – indicate how the food should be stored safely.
 - (b) Nutritional information is important because it helps consumers know the nutrients contained in the food and choose foods that meet their dietary needs.
 - (c) Expiry dates should be checked to ensure that the food is within its safe period for consumption and to reduce the risk of food poisoning or illness from spoiled food.
4.
 - (a)

- i. Carbon + oxygen $\rightarrow$ carbon (IV) oxide
- ii. Magnesium + oxygen $\rightarrow$ magnesium oxide
- iii. Hydrogen + chlorine $\rightarrow$ hydrogen chloride

- (b) Reactants are on the left, products on the right.
- (c) The arrow ($\rightarrow$) means “reacts to form” or “produces.”

5.

- (a) A- neon; B- Graphite; C – Copper; D – Gold
- (b) Neon glows brightly when an electric current passes through it. Graphite is soft and leaves a mark on paper. Copper is a good conductor of electricity. Gold does not corrode easily.

6.

- (a) Iron is needed for the formation of haemoglobin, which carries oxygen in the blood. Calcium is needed for the formation and strengthening of bones and teeth. Iodine is needed for the production of thyroid hormones, which regulate body growth.
- (b) Iron: Liver; Calcium: Milk; Iodine: Iodised salt
- (c) So that consumers can choose foods that provide the minerals their bodies need and maintain a balanced diet.

7.

Element	Symbol
Gold	Au
Silver	Ag
Mercury	Hg
Oxygen	O
Lead	Pb
Copper	Cu
Chlorine	Cl

8.

Compounds	Elements
Water	Chlorine
Carbon (IV) oxide	Oxygen
Sodium chloride	Copper
	Mercury
	Nitrogen

9.

- (a) Copper oxide: Copper and oxygen; Sodium chloride: Sodium and chlorine; Aluminium chloride: Aluminium and chlorine; Carbon (IV) oxide: Carbon and oxygen; Water: Hydrogen and oxygen
- (b) Because the elements chemically combine in fixed proportions to form a new substance with new properties.

10.

- (a) Hydrogen + oxygen $\rightarrow$ water
- (b) Aluminium + nitrogen $\rightarrow$ aluminium nitride
- (c) Copper + chlorine $\rightarrow$ copper chloride

I.2: Physical and chemical changes

Section A

- 1. D
- 2. C
- 3. C
- 4. B
- 5. B
- 6. C
- 7. B
- 8. B
- 9. C

Section B

- 1.
 - (a) Because it lowers the melting point of ice, causing the ice to melt even when the temperature is below 0°C .
 - (b) Melting point of ice: Impurities lower the melting point.
Boiling point of water: Impurities raise the boiling point.
 - (c) Adding salt to ice lowers its melting point, which is useful when making ice cream.
Impure substances, such as candle wax, melt over a range of temperatures.
 - (d) Lowering the melting point of ice helps clear the roads and makes them safer for vehicles and pedestrians.
- 2.
 - (a) Melting candle wax – Physical change; Rusting of iron – Chemical change; Burning charcoal – Chemical change; Freezing water – Physical change
 - (b) No new substance is formed. The change is usually reversible. No change in mass.
There is no change in heat.
 - (c) It forms ash therefore the change is irreversible. New substance is formed. There is a change in mass.
- 3.
 - (a) Refrigeration preserves food by lowering its temperature, which slows down the growth and reproduction of microorganisms and slows chemical reactions that cause food to spoilage.
 - (b) Freezing (liquid $\rightarrow$ solid).

- (c) Dry ice is suitable because it sublimates directly from a solid to a gas without leaving liquid water and keeps the food at a very low temperature, helping to prevent spoilage during transport.
- (d) Drying clothes – water changes from liquid to gas through evaporation. Making ice cubes – water changes from liquid to solid through freezing.

4.

- (a) A reversible chemical change.
- (b) The blue hydrated copper (II) sulphate crystals turned white when heated. The white powder turned blue when water was added.
- (c) Because the white anhydrous copper (II) sulphate reacts with water to form blue hydrated copper (II) sulphate again.
- (d) A new substance is formed, but the change can be reversed to form the original substance. There is change in mass. There is change in heat.

5.

- (a) Ice – Solid to Water – Liquid to Steam – Gas
- (b) In ice, particles are closely packed in a fixed arrangement and vibrate in fixed positions. In liquid water, particles are less closely packed and can move past one another. In steam, particles are far apart and move freely and rapidly in all directions.

6.

- (a) BC - In this section, the substance undergoes a change of state from solid to liquid, a process known as melting. During this process, the temperature remains constant at the melting point. DE - In this section, the substance changes state from liquid to gas, a process known as vaporisation. During vaporisation, the temperature remains constant at the boiling point.
- (b) This is because the heat energy supplied is used to weaken the forces of attraction between the particles rather than increasing their kinetic energy.
- (c) BC - solid to liquid; DE - liquid to gas
- (d) Heating continues during BC and DE because the heat supplied is used as latent heat to overcome the forces of attraction between particles and change the state of the substance, rather than increasing its temperature.

7.

- (a) Physical change.
- (b) No new substance is formed. The metal only changes its shape and possibly its state temporarily when heated. It can be shaped into another form while retaining its chemical composition.
- (c) Chemical change, specifically rusting/corrosion of the metal.
- (d) Physical change: No new substance is formed and the change is reversible.
Chemical change: A new substance with different properties is formed and the change is irreversible.

8.

- (a) Sign A indicates the fire assembly point. It shows where people should gather after evacuating the building during a fire emergency.
- (b) Sign B indicates a fire exit. It shows the designated route or doorway to use when evacuating the building during a fire emergency.

- (c) The learner should go to the fire assembly point.
- (d) Fire exits should be kept clear to allow people to evacuate quickly and safely without obstruction.
- (e) They should remain there so that everyone can be accounted for and so that they do not return to the building while it may still be dangerous.
- (f) To know the quickest and safest route out during an emergency.

9.

- (a) The learner should raise the alarm immediately and alert the teacher or other people nearby.
- (b) The class/type of fire, to ensure the extinguisher is suitable. Whether it is safe to use the extinguisher, with a clear escape route available.
- (c) A rapidly spreading fire can quickly become uncontrollable and expose the learner to flames and smoke. A blocked escape route means the learner may be unable to escape safely if the situation worsens.
- (d) Leave calmly using the designated emergency exit. Go directly to the fire assembly point and remain there.

10.

- (a) Wet chemical fire extinguisher.
- (b) Class F fires, involving cooking oils and fats.
- (c) Dry powder fire extinguisher. Class A fires; Class D; Class E

11. A – wood, papers, plastics, textiles; B – petrol, diesel, kerosene, ethanol; C – cooking gas; D – flammable metals such as sodium and potassium

1.3: Classes of fire

Section A

- 1. B
- 2. B
- 3. C
- 4. B
- 5. B
- 6. D
- 7. B
- 8. B
- 9. C
- 10. B

Section B

- 1.
 - (a) Clearing the dry grass removes the fuel needed by the fire. This creates a gap that prevents the flames from spreading easily to unburnt vegetation.
 - (b) Water cools the burning material below its ignition temperature, reducing the heat needed to sustain the fire.
 - (c) Natural causes: Lightning strikes – can ignite dry grass and vegetation. Extreme heat and dry conditions.

Human causes: Unattended or poorly extinguished fires. Burning vegetation or rubbish. Carelessly discarded cigarette butts. Arson (deliberately setting fires). Sparks from machinery or electrical equipment

2.

- (a) Class F/K
- (b) Because water sinks below the hot oil and rapidly turns into steam. The expanding steam can cause the burning oil to splash and spread the fire.
- (c) A fire blanket cuts off the supply of oxygen to the fire.
- (d) Never leave cooking oil unattended while heating. Keep flammable materials away from the cooker. Avoiding overheating cooking oil.

3.

- (a) **P**ull the pin on the handle; **A**im the nozzle at the base of the fire; **S**queeze the lever slowly; **S**weep from side to side
- (b) The nozzle should be aimed at the base of the fire because this is where the burning material (fuel) is located. Applying the extinguishing agent to the base removes or reduces the heat and interrupts combustion, helping to put out the fire.
- (c) Check that the extinguisher is suitable for the class of fire. Check that the extinguisher is in good working condition. Read the instructions and warnings on its label. Check for a clogged nozzle, broken seal, pressure on the pressure gauge or any damage.

4.

- (a) Class E.
- (b) The electricity supply should be switched off to remove the source of electrical energy and prevent electric shock. It also helps prevent further sparks that could continue or spread the fire.
- (c) Carbon (IV) oxide fire extinguisher.
- (d) Have electrical wiring regularly inspected and maintained by a qualified electrician. Replace damaged or faulty wires and electrical equipment promptly. Avoid overloading electrical sockets and circuits. Keep flammable materials away from electrical equipment and sources of sparks.

5.

- (a) To warn consumers about the hazards of the product. To provide instructions for safe handling, transportation and storage. To explain what to do in case of an accident, fire or exposure.
- (b) Keep the paint away from flames, sparks and other sources of heat. Keep the container tightly closed and transport/store it in a cool, well-ventilated place.
- (c) Consumers have a right to access information about flammable substances because it enables them to make informed and safe choices and take appropriate precautions when handling, transporting and storing the substances, reducing the risk of fires, injuries and other accidents.

6.

- (a) Learners should stop what they are doing and evacuate the building calmly using the designated emergency exit. They should not stop to collect their bags.
- (b) Lifts should not be used because power may fail during a fire, causing people to become trapped. Smoke and heat may also enter the lift shaft, putting people at risk.

- (c) To teach learners and staff how to evacuate safely and quickly during a real fire. To identify weaknesses in the school's emergency procedures and improve preparedness.
- (d) Smoke can cause breathing difficulties or suffocation. Smoke can reduce visibility, making it difficult for people to escape safely.

7.

- (a) Leaving cooking equipment unattended while cooking. Burning rubbish or dry vegetation carelessly. Not putting out camp fires. Carelessly throwing lit cigarette ends. Faulty or overloaded electrical wiring
- (b) They destroy vegetation and habitats, leading to loss of biodiversity. They pollute the air with smoke and gases and may contribute to climate change.
- (c) Educate community members about fire prevention and safe handling of flammable materials. Ensure electrical systems and equipment are regularly inspected and faulty ones repaired.