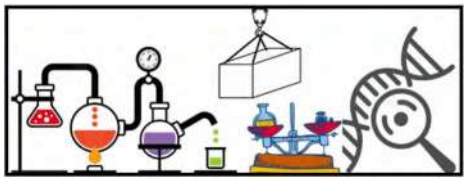
education

Department of Education
FREE STATE PROVINCE

NATURAL SCIENCES

GRADE 8

CONTENT MANUAL
BASIC CONCEPTS WITH ACTIVITIES



MEMORANDUM

Strand: Life and Living (Term 1) **MEMORANDUM**

ACTIVITY 1: Photosynthesis

1.1.1 Sun✓
1.1.2 Chlorophyll✓
1.1.3 Radiant energy✓
1.1.4 Interdependence✓
1.1.5 Chemical reaction✓
1.1.6 Potential energy✓
1.1.7 Water✓
1.1.8 Carbon dioxide✓
1.1.9 Photosynthesis✓
1.1.10 Glucose✓
1.1.11 Oxygen✓ (1 x 11 = 11)

1.2 A - Sunlight✓
B - Carbon dioxide✓
C - Water✓
D - Oxygen or Glucose✓
E - Glucose or Oxygen✓ (1 x 5 = 5)

1.3

Requirements for photosynthesis in green plants (what is needed)	**Products of photosynthesis (what we get from photosynthesis)**
1. Chlorophyll✓	1. Glucose✓
2. Sunlight light / Radiant energy✓	2. Oxygen✓
3. Carbon dioxide✓	
4. Water✓	

(6)

1.4 Carbon dioxide✓ + Water✓ $\xrightarrow[\text{Sunlight}\checkmark]{\text{Chlorophyll}\checkmark}$ Glucose✓ + Oxygen✓ (6)

1.5 Starch - Food for humans and animals (source of energy). ✓
Cellulose - Part of the cell walls of plant cells and help to keep the plant stiff and upright / provide support to the plant. ✓ (2)

1.6 Radiant energy / Light energy✓ → Chemical potential energy✓ (2)
[32]

ACTIVITY 2: Scientific Investigation Process

2.1.1 Temperature✓ (1)

2.1.2 Rate at which sugar dissolves✓ (1)

2.1.3 Volume of water (100 mℓ in each beaker) ✓
Amount of sugar (one spoonful in each case) ✓
Amount of stirring (one stir in each case) ✓ (3)

2.1.4 B✓ (The higher the temperature, the quicker the sugar will dissolve.) (1)

2.2.1 Amount of stirring / How many times the water is stirred✓ (1)

2.2.2 Rate at which sugar dissolves✓ (1)

2.2.3 Volume of water (100 mℓ in each beaker) ✓
Amount of sugar (one spoonful in each case) ✓
Temperature of the water✓ (3)

2.3.1 Type of fertilizer✓ (1)

2.3.2 Rate of plant growth / How fast the plants grow✓ (1)

2.3.3 Identical plants✓ (type, height, condition/health)
Same amount of the fertilizer used✓
Growth environment of plants (same amount of sunlight, same amount of water, same pot size, same soil, wind, etc.) ✓ (**ANY TWO**) (2)

[15]

ACTIVITY 3: Test for starch in foods

3.1 Iodine solution✓ (1)

3.2

	Type of food	Contains starch (✓)	Does not contain starch (X)
3.2.1	Onion		X
3.2.2	Bread	✓	
3.2.3	Rice	✓	
3.2.4	Banana	Unripe banana ✓	Ripe banana X
3.2.5	Orange		X
3.2.6	Milk		X
3.2.7	Cereal	✓	

One mark for the correct answer for each of the 7 foods tested. (7)

3.3 Iodine solution turns blue- black / purple. ✓ (1)

3.4 Iodine solution remains yellowish-brown. ✓ (1)

[10]

ACTIVITY 4: Respiration

4.1.1 Chemical potential energy✓
4.1.2 Cells✓
4.1.3 Respiration✓
4.1.4 Oxygen✓
4.1.5 Clear lime water✓
4.1.6 Glucose✓
4.1.7 Energy✓
4.1.8 CO_2 and H_2O✓ (8)

4.2

Requirements for respiration	Products of respiration
1. Glucose✓	1. Energy✓
2. Oxygen✓	2. Carbon dioxide (CO_2)✓
	3. Water (H_2O)✓

(5)

4.3 Glucose✓ + Oxygen✓ → Energy✓ + Carbon dioxide✓ + Water✓ (5)

4.4.1 Clear lime water✓ (1)

4.4.2 Clear lime water turns milky (cloudy).✓ (1)

4.4.3 The clear lime water turns milky.✓ (1)

4.4.4 That carbon dioxide is exhaled.✓ (1)

4.4.5 Respiration✓ (1)

4.4.6 Respiration is the process in cells by which glucose is broken down✓ and energy is released.✓ (2)
[25]

ACTIVITY 5: Comparing Photosynthesis with Respiration

5.1

	PHOTOSYNTHESIS	RESPIRATION
Type of cell where the process takes place	Plant cells✓ (In the cells of green plants which contain chlorophyll.)	Plant and animal cells✓
When it takes place (what role does sunlight play in the process?)	During the day✓ (In the presence of sunlight)	All the time✓
Requirements (Reactants and other things needed)	Sunlight Chlorophyll Carbon dioxide Water✓ (for all four)	Glucose Oxygen✓ (for both)
Products	Glucose Oxygen✓ (for both)	Energy Carbon dioxide Water✓ (for all three)
Energy conversion that takes place	Radiant (light) energy to chemical potential energy✓	Chemical potential energy to kinetic energy, heat energy, etc. All types of energy a living organism needs for the life processes.✓

(10)

5.2.1 Photosynthesis✓
5.2.2 Photosynthesis✓
5.2.3 Respiration✓
5.2.4 Photosynthesis✓
5.2.5 Respiration✓ (5)

[15]

ACTIVITY 6: Introduction to Ecology and Ecosystems

6.1.1 Ecosystem✓
6.1.2 Biotic factors✓
6.1.3 Habitat✓
6.1.4 Abiotic factors✓
6.1.5 Biosphere✓
6.1.6 Species✓
6.1.7 Interdependence✓ (7)

6.2.1 E✓
6.2.2 A✓
6.2.3 B✓
6.2.4 D✓
6.2.5 C✓ (5)

6.3 Individual; Population; Community; Ecosystem; Biosphere

✓ Individual
✓ Population; Community; Ecosystem; all three in the correct order
✓ Biosphere

ALSO ACCEPTABLE:
Individual; Population; Community; Ecosystem; Biome; Biosphere (3)
[15]

ACTIVITY 7: Biotic and Abiotic Factors

Please note:
Question 7.1 to 7.5 are open-ended questions. Also consider other answers based on scientific facts.

7.1 Tree, shrubs, birds, tadpoles, flies, water weeds, snail, fish, frog, eggs (if they are fertilised) (**SEVEN OR MORE**) (7)

7.2 Sun, clouds, rocks, soil, log, water, air, temperature, minerals in soil, nest (**FIVE OR MORE**) (5)

7.3 (a) **Trees:**
-provide shelter,
-provide a nesting habitat,
-are a direct or indirect source of food.✓ (**ANY ONE**)

Birds:
-help trees by foraging on (eating the) leaf-eating insects,
-dispersing seeds,
-pollinate flowers.✓ (**ANY ONE**) (2)

(b) -Frogs depend on water for reproduction; frogs lay their eggs in water / eggs hatch in the water. ✓
-Frogs feed on water insects, tadpoles, etc. in the water. ✓
-The skin of a frog must be moist to allow gases to pass through, helping the frog to breathe. ✓ (**ANY TWO**) (2)

7.4 -The pond can dry up, leaving the water weeds, snail, tadpoles, frog, and other organisms without a habitat. ✓
-Less / no water available for the survival of animals / plants. ✓
-If some organisms die because the drought / heat, other organisms might suffer from a shortage of food. ✓
-Some animals, like the birds might need to move (migrate) to other places for food and water. This will have a negative impact on the biodiversity of the ecosystem. ✓ (**ANY TWO**) (2)

7.5 Littering can pollute the pond and the area around the pond which can have a negative effect on the plants and animals living in and around the pond. ✓
Noise, due to loud music or talking, might scare the animals away. ✓
Swimming / boats in the pond can pollute the water and disrupt the plant and animal life. ✓
Some people might remove some of the plants / animals from the area (poaching). ✓
Breaking off branches, making fires, destroying the vegetation, etc.✓
(**ANY TWO**) (2)
[20]

ACTIVITY 8: Feeding relationships - Terminology

8.1 C
8.2 D
8.3 A
8.4 J
8.5 H
8.6 B
8.7 F
8.8 E
8.9 G
8.10 I **[10]**

ACTIVITY 9: Feeding relationships

This is a general indication of the feeding relationships of each organism, although there might be some exceptions.

	Organism	Producer	Consumer	Herbivore	Carnivore	Omnivore	Predator	Scavenger	Insectivore	Decomposer
A	Cheetah		✓		✓		✓			
B	Vulture		✓		✓			✓		
C	Giraffe		✓	✓						
D	Hyena		✓		✓			✓		
E	Aardvark		✓						✓	
F	Frog		✓		✓		✓		✓	
G	Baboon		✓			✓		(✓)		
H	Cow		✓	✓						
I	Earthworms		✓							✓
J	Trees	✓								
K	Mushrooms		✓							✓
L	Pig		✓			✓		(✓)		
M	Shark		✓		✓		✓			
N	Spider		✓		✓		✓		✓	
O	Water lilies	✓								
P	Snail		✓	✓						

[1 mark per organism for all ticks correctly indicated; 16 x 1 = 16]

ACTIVITY 10: Food chains, food webs and the balance in an ecosystem

10.1 C
10.2 B
10.3 D
10.4 B
10.5 C
10.6 C
10.7 C
10.8 D
10.9 C
10.10 D **[10]**

ACTIVITY 11: Food chains, food webs and the balance in an ecosystem

NOTE to the teachers: It is advisable to do this activity in TWO PARTS; 11.1 to 11.5 and then 11.6 and 11.7

11.1 Food web✓ (1)

11.2 (a) Shrub
(b) Butterfly / Caterpillar / Sparrow / Squirrel
(c) Frog / Snake / Fox / Sparrow
(d) Eagle / Fox
(e) Eagle / Fox / Snake / Frog
(f) Frog
(g) Butterfly / Caterpillar / Squirrel
(h) Sparrow (1 x 8 = 8)

11.3 **FOOD CHAIN** that starts with a plant,✓ then a plant eater,✓ followed by a meat eater✓ and a secondary meat eater✓ for 4 marks.

Deduct 1 mark if arrows are absent or pointing in the wrong direction.

Shrub → Caterpillar → Frog → Eagle

Shrub → Butterfly → Frog → Eagle

Shrub → Sparrow → Snake → Eagle

Shrub → Squirrel → Snake → Eagle

(Any TWO food chains, 4 marks each) (2 x 4 = 8)

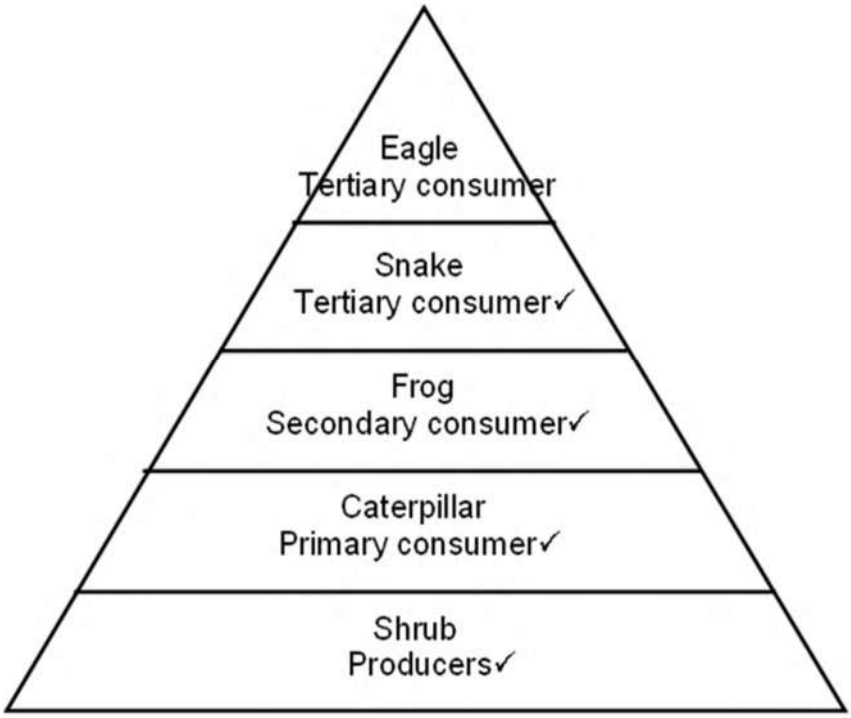
11.4 The arrows represent the flow of energy✓ from one organism to another.✓ (2)

11.5 Predator hunts live prey for food. ✓
Scavenger lives off dead animals (or plants). ✓ (2)

11.6 *Open-ended question; any other answer based on scientific facts can be considered.*

If the caterpillars die:
-there will be more of the shrubs for the butterflies, sparrows, and squirrels to eat; thus, they will thrive, and numbers might increase;✓ now there will be more food for the fox / eagle and their numbers might increase.
-the frogs and sparrows will have less food and their numbers might decrease;✓ this will cause the eagles and snakes to have less food and their numbers might decrease. (**ANY TWO**) (2)

11.7 (a)



NOTE: ✓producer; ✓primary consumer; ✓secondary consumer; ✓any of the tertiary consumers (4)

(b) Energy transferred = 10% of 800 000 kJ

$$= \frac{10}{100} \times 800\,000\checkmark$$

= 80 000 kJ✓

(**NOTE:** 720 000 kJ were used by the shrubs for their own life processes.) (2)

(c) 80 kJ✓ (1)
[30]

ACTIVITY 12: Adaptation

12.1

Animal	Adaptation	Purpose
Elephant	Big ears Tusks Long trunk ✓	To keep them cool. To protect themselves. To feed.✓
Zebra	Stripes on hide Powerful legs Strong teeth ✓	To melt in with the group for camouflage. For running fast. To feed on grass.✓
Spoonbill	Flat spoon-shaped bill✓	Swinging through water to catch fish.✓

(✓ per adaptation; ✓ per corresponding purpose) (6)

12.2 (a) Camouflage✓ The praying mantis uses shapes and colours to look like things in the environment (a twig).✓ (2)

(b) Mimicry✓ The butterfly uses colours, patterns and shapes to look like another animal (owl). ✓ (2)

[10]

ACTIVITY 13: Adaptation

Open-ended; other correct adaptation, with its purpose can also be considered.

13.1 Cheetah:

	Adaptation	Function
1	Has very muscular and long legs.	To run very fast.
2	Has an extremely long tail.	For support and balance when chasing prey.
3	Canine teeth are very long and sharp.	To tear meat.
4	Yellowish-brown fur is covered with black spots.	For camouflage to hunt their prey effectively.

(✓ per adaptation; ✓ per corresponding function) (8)

13.2 Shark:

	Adaptation	Function
1	Body is streamlined and is shaped like a torpedo.	To move very fast in water.
2	Has a strong tailfin.	To keep the body upright and level.
3	Teeth are very sharp and are continuously replaced.	To bite prey and tear meat.
4	Snout is covered with sensory organs.	To locate potential prey.

(✓ per adaptation; ✓ per corresponding function) (8)

[16]

ACTIVITY 14: Conservation of the ecosystem

Teacher to compile own marking guidelines, based on the article / case study.

ACTIVITY 15: Micro-organisms

15.1

(a) **Causes**

It is a respiratory virus✓ that is spread by droplets when an infected person coughs or sneezes.✓

OR

It is a virus infection✓ attacking the lungs and/or respiratory system.✓ (2)

(b) **Effects on body / Symptoms**

Sore throat and/or cough✓
Fever✓
Headache✓
Body pains ✓
Loss of taste and/or smell✓
Pneumonia - illness of the lungs and respiratory system. ✓
Clotting of blood in the body. ✓ (**ANY THREE**) (3)

(c) **Treatment**

Drink vitamins e.g., Vit. C and D✓
Zink supplements✓
Medication prescribed by doctor✓
Bed rest✓
Drink plenty water✓ (**ANY TWO**) (2)

(d) **Prevention**

COVID vaccine✓
Wear a facemask✓
Social distancing✓
Wash hands✓
Sanitize with at least 70% alcohol sanitizers✓ (**ANY THREE**) (3)

(e)

COMMON FLU	**COVID-19**
Show symptoms within 1 to 4 days, even sooner.	Symptoms develop between 1 to 10 days.
Shortness of breath sometimes occurs.	Shortness of breath is common and severe.
Not always deadly / fatal.	Deadly – mortality rate higher.
More info available on flu.	Research in early stages.

Consider other answers as well. (**ANY THREE**) (3)

15.2

(a) Sugar / starch / nutrients✓
Moisture / water✓
Oxygen✓
Moderate temperature✓ (4)

(**NOTE:** For **growth**, yeast needs oxygen.
Fermentation of sugar to alcohol and CO_2 takes place in the **absence of O_2**.)

(b) Carbon dioxide✓ and alcohol✓ (in some cases, acids) (2)

(c) Brewing beer or ginger beer✓
Making wine / vinegar✓
Baking bread✓
Pickling food✓ (fermented food)
Amasi / Buttermilk✓
Cheese and yoghurt✓ (**ANY TWO**) (2)

15.3

(a) Fungi, like mushrooms, is a source of food/protein.✓
Used in the production of antibiotics, like penicillin.✓
Mushrooms and other fungi species act as decomposers in nature and recycle nutrients in the soil.✓
Other correct answers must also be considered. (**ANY TWO**) (2)

(b) Bacteria in the intestines (gut) of humans and animal assist with the processing of food.
Production of food, like yoghurt, cheese, pickles, vinegar, etc.
Making vaccines.
Pest control.
Cleaning up oil spills and break down sewage. (**ANY TWO**) (2)
[25]

OPTIONAL: ACTIVITY 16 - Informal practical activity (scientific process)

Teacher should compile the marking guidelines, based on the investigation done.

Strand: Matter and Material (Term 2) **MEMORANDUM**

Topic: Atoms

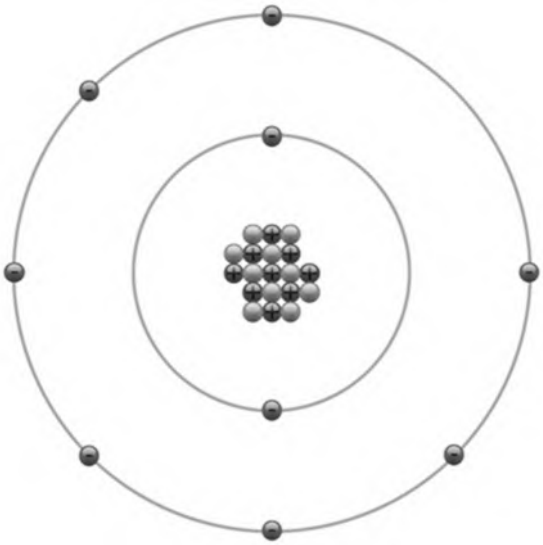
Activity 1 - Atoms and sub-atomic particles

1.1.1 Atoms✓
1.1.2 Element✓
1.1.3 Periodic Table✓
1.1.4 Element✓
1.1.5 Sub-atomic particles✓ (5)

1.2 a and b

Protons✓ - positive✓
Electrons✓ - negative✓
Neutrons✓ - neutral✓ (6)

1.3

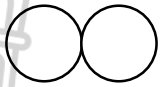


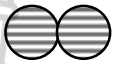
✓ protons and neutrons in the nucleus
✓ 9 protons
✓ 10 neutrons
✓ 9 electrons around the nucleus

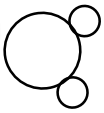
(4)
[15]

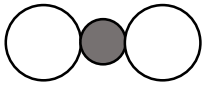
Activity 2 - Pure substances (Elements and Compounds); Mixtures

2.1.1 H_2  ✓

2.1.2 O_2  ✓

2.1.3 N_2  ✓

2.1.4 H_2O  ✓

2.1.5 CO_2  ✓ (5)

2.2 A - Element✓
B - Mixture✓ (of two elements, one mono-atomic, the other diatomic)
C - Mixture ✓ (of a diatomic element and a compound)
D - Compound✓
E - Mixture✓ (of two compounds)
F - Compound✓
G - (Diatomic) Element✓
H - Mixture✓ (of two elements and a compound)
I - Mixture✓ (of two elements) (9)

2.3.1 (a) NaCℓ✓
(b) H_2O✓
(c) CO_2✓
(d) H_2SO_4✓

2.3.2 1:1:3✓ (5)

2.4.1 (a) P, ✓ Q✓ and R✓ (3)
(b) Q✓ (1)
(c) P✓ (1)
(d) S✓ (1)
(e) R✓ (1)

2.4.2 (a) R✓ (1)
(b) P✓ (1)
(c) Q✓ (1)

2.4.3 A✓ (1)

2.5.1 4✓ (1)
2.5.2 5✓ (1)
2.5.3 2✓ (1)
2.5.4 20✓ (1)
2.5.5 CH_4✓ (1)
[35]

Activity 3 - Particle model of matter; Diffusion

3.1

	SOLID	LIQUID	GAS
Diagram of the state of matter	 ✓	 ✓	 ✓
Arrangement of the particles	Closely packed in a regular arrangement. ✓	Loosely arranged but still quite close together. ✓	No particular arrangement. ✓
Movement of the particles	Do not move around but vibrate in one position. ✓	Move fast and slide past each other. ✓	Move very fast. ✓
Forces between the particles	Strong forces holding particles together. ✓	Weaker forces holding particles together. ✓	Extremely weak forces between particles. ✓
Spacing between the particles	Very small spaces between them. ✓	Bigger spaces between them. ✓	Very big spaces between them. ✓

(15)

3.2.1 Diffusion is a process in which particles in liquids and gases move✓ (separate and spread) from a highly concentrated area to an area with a lower concentration✓ of those particles. (2)

3.2.2 In a gas, the particles move faster✓ and have bigger spaces between them than in a liquid.✓
Therefore, it is much easier for gas particles to move from a higher to a lower concentration.✓ (3)
[20]

Activity 4 - Change of state

4.1.1 Melting✓ (1)
4.1.2 Evaporation✓ (1)
4.1.3 Condensation✓ (1)
4.1.4 Freezing / Solidification✓ (1)

4.2 Melting✓ and evaporation✓ (2)

4.3 Condensation✓ and freezing/solidification✓ (2)

4.4.1 The solid candle wax will melt / change into a liquid.✓ (1)

4.4.2 The liquid candle wax will solidify / change into a solid/✓ (1)
[10]

Activity 5 - Density

5.1.1 Brick✓ (1)

5.1.2 The brick particles are tightly packed, and more clay particles fit into the same space (volume).✓
The spaces between the sponge particles are bigger so, less particles fit into the same space (volume).✓ Therefore, brick feels heavier.
OR
Because the density of the brick is greater✓ than the density of the sponge,✓ the brick feels heavier. (2)

5.1.3 Volume = ℓ x b x h ✓
= 20 cm x 10 cm x 15 cm ✓
= 3 000 cm^3 ✓ (3)

5.1.4 Density of brick = $\frac{mass\ (g)}{volume\ (cm^3)}$✓

= $\frac{2\ 000\ g}{3\ 000\ cm^3}$✓

= 0,67g/cm^3✓ (3)

5.1.5 Density of sponge = $\frac{mass\ (g)}{volume\ (cm^3)}$

= $\frac{200\ g}{3\ 000\ cm^3}$✓

= 0,067g/cm^3✓ (2)

5.1.6 Density is the amount of mass✓ in a given volume✓ of the material. (2)

5.2.1 B✓ Helium is less dense than air and the balloon will float in the air.✓ (2)

5.2.2 A✓ Carbon dioxide is denser that air and the balloon will drop to the ground. ✓ (2)

5.2.3 (a) Density of helium = 0,164 kg/m^3✓
(b) Density of air = 1,23 kg/m^3✓
(c) Density of carbon dioxide = 1,98 kg/m^3✓ (3)

5.3.1 The oil and water separate,✓ with the oil floating on top of the water.✓ (2)

5.3.2 Oil is less dense✓ than water. ✓ (2)

5.3.3 The pebble is denser than water. ✓ (1)
[25]

Activity 6 - Expansion and contraction

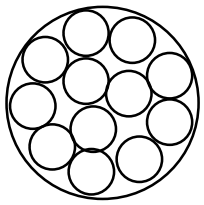
6.1.1 Expansion✓ (1)

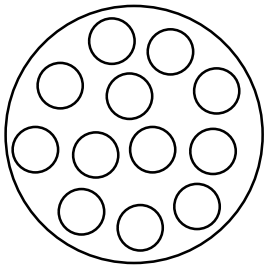
6.1.2 It will contract✓ (1)

6.1.3 When the wire cools down, the particles move slower✓ and come closer together, ✓ causing the wire to contract (get shorter). ✓ (3)

6.2.1 It expands✓ (1)

6.2.2 Ball before heating Ball after heating





Before heating:
Smaller ball✓ with particles close to each other.✓

After heating:
Bigger ball with particles further apart.✓
Particles are the same size and number as before heating.✓

(4)
[10]

Activity 7 - Pressure

7.1.1 D✓ (1)

7.1.2 B✓ (1)

7.2.1 A gas exerts a pressure because of the collisions of the particles with each other✓ and against the sides of the container.✓ (2)

7.2.2 Cylinder 2 contains more gas particles.✓
More collisions take place in cylinder 2.✓ (2)
[6]

Practising of Process Skills **Informal assessment**

KNOWLEDGE STRAND: Matter and Material **TOPIC: DENSITY**

1.1 25 cm^3 1.2 9 cm^3

1.3 40 cm^3 1.4 20 cm^3 (4)

2.1

Object	Volume of water and object	Volume of water only	Volume of object	Mass of object	Density of object
Battery	22 cm^3✓	17 cm^3✓	22 - 17 = 5 cm^3✓	25,2 g	5,04 g/cm^3✓
Nail	18 cm^3✓	17 cm^3	1 cm^3✓	7,9 g	7,9 g/cm^3✓
Button	19 cm^3✓	17 cm^3	2 cm^3✓	13,1 g	6,55 g/cm^3✓
Key	20 cm^3✓	17 cm^3	3 cm^3✓	26,2 g	8,73 g/cm^3✓

(13)

2.2 The densities of all the objects are greater✓ than that of water.✓ (2)

3.1 Density = $\frac{Mass}{Volume}$ ✓

= $\frac{0,75\ g}{2,5\ cm^3}$ ✓ ✓

= 0,3 g/cm^3 ✓ (4)

3.2 The density of (the) cork (stopper) is less✓ than that of water.✓ (2)

4.1 **ANY ONE** OF:

How does temperature affect the density of water?
What is the effect of temperature on the density of water?
What is the relationship between the temperature of water and the density of water?

Marking criteria	Marks
Both variables are mentioned.	✓
The question is about the relationship between the variables.	✓

(2)

4.2 Not accepted / Rejected ✓ (1)

4.3.1 1 g/cm^3 ✓ (1)
4.3.2 0,97 g/cm^3 ✓ (1)

4.4 If the temperature of the water increases, the density of the water **decreases**.✓
OR
If the temperature of the water **decreases**,✓ the density of the water increases.(1)

4.5.1 Density of water✓ (1)
4.5.2 Temperature✓ (1)

4.6.1 Increases✓ (1)
4.6.2 Increases✓ (1)
4.6.3 Remains the same✓ (1)
4.6.4 Increases✓ (1)
4.6.5 Decreases✓(Same number of particles in a bigger space / volume.) (1)

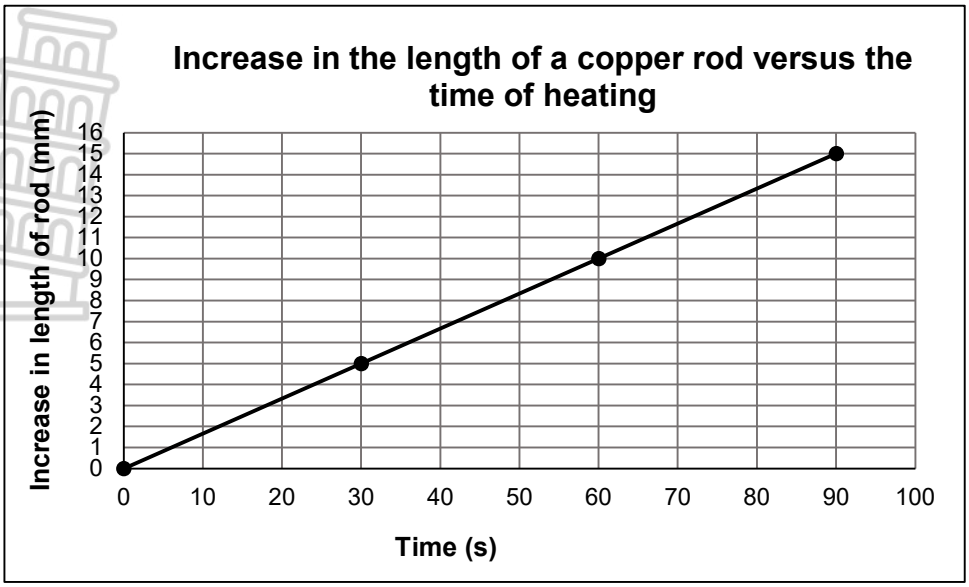
5.1 Independent variable: Time✓ of heating
Dependent variable: Length of the rod / Increase in length of the rod✓ (2)

5.2 ✓Table drawn with correct headings

Time (s)	Length of rod (mm)	Increase in length of rod (mm)
0	100	0✓
30	105	5✓ (105 - 100)
60	110	10✓ (110 - 105)
90	115	15✓ (115 - 110)
✓ for 4 values	✓ for 4 values	

(7)

5.3



Marking criteria	Marks
Heading, containing both variables	✓
Label on x-axis, with unit	✓
Label on y-axis, with unit	✓
Correct scale on x-axis	✓
Correct scale on y-axis	✓
2 points plotted correctly	✓
2 other points plotted correctly	✓
Straight line through all points	✓

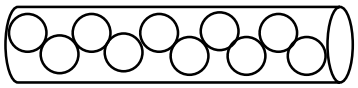
(8)

5.4 **ANY ONE** OF:
The longer a copper rod is heated, the greater the length of the rod.
The length of a copper rod increases, the longer it is heated.

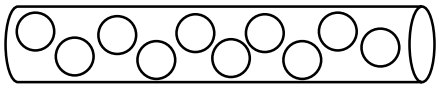
Marking criteria	Marks
Both variables are mentioned.	✓
The relationship between the variables is indicated.	✓

(2)

5.5 **Rod A:** atoms / particles are close to each other.



Rod C: rod has EXPANDED, and the SAME number of atoms / particles are FURTHER apart, ✓ with the size of the atoms still the same as before. ✓



(2)

NOTE:
TOTAL OF "PRACTISING PROCESS SKILLS" DEPENDS ON WHICH QUESTIONS ARE SELECTED TO BE DONE BY THE LEARNERS.

Strand: Energy and Change (Term 3) **MEMORANDUM**

INFORMAL ACTIVITY 1 – FRICTION AND STATIC ELECTRICITY

1.1 Hands will get warm. / Heat will develop.✓ (1)

1.2 Friction between the hands produce heat.✓ (1)

2. Electrons✓
Electrons move freely around the nucleus✓ and are not tightly bond in the nucleus like protons and neutrons. (In general, only a small amount of energy is required to remove one or more electrons from metal atoms.) (2)

3.1

	Number of p^+ on the balloon	Number of e^- on the balloon	Charge of the balloon (+ or - or neutral)	Number of p^+ on the hand	Number of e^- on the hand	Charge of the hand (+ or - or neutral)
BEFORE RUBBING	5	5	neutral	8✓	8✓	neutral✓
AFTER RUBBING	5✓	9✓	- or negative✓	8✓	4✓	+ or positive✓

(9)

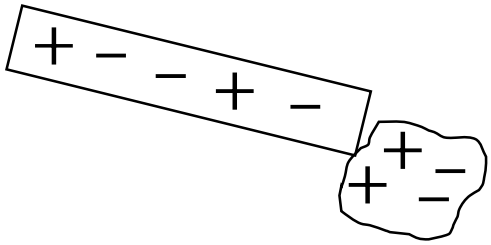
3.2 (**Electrons**✓ / Protons) were transferred FROM the (balloon / **hand**✓) TO the (**balloon**✓ / hand) (over a distance / **through friction**✓). (4)

4.1 Unlike charges✓ attract.✓
OR
The positively charged (surface of the) wall attracts✓ the negatively charged (surface of the) balloon. (2)

4.2 Like charges repel.✓
OR
The positively charged (surface of) balloon 1 repels the positively charged (surface of) balloon 2.✓ (1)

5.1 The piece of tissue paper will be attracted towards the ruler / stick to the ruler.✓ (1)

5.2



Marking criteria:
✓Negatively charged ruler / Ruler drawn as is.
✓Negative charges in the tissue paper are pushed away / repelled by the negatively charged ruler to the opposite side of the piece of tissue paper.
✓The side of the piece of tissue paper closest to the ruler becomes positively charged (due to a shortage of negative charges on that side of the piece of tissue paper is) and is attracted to the ruler.

(3)

6.1 During a discharge, electrons move from one object to another.✓
This can cause a spark✓ that can cause an explosion of the petrol fumes. (2)

6.2.1 Type of cloth/fabric/material. ✓ (1)

6.2.2 Number of pieces of paper. ✓ (1)

6.2.3 Size/weight of the pieces of paper. ✓
OR
How many times the balloon is rubbed against the cloth. ✓ (1)

6.3.1 29✓ (Accept: 28 – 29) (1)

6.3.2 33✓ (Accept: 33 – 34) (1)

6.3.3 Silk✓ because it picked up the highest number/most pieces of paper. ✓ (2)

6.3.4 Polyester. ✓
When the balloon is rubbed against polyester, it picks up the smallest number of pieces of paper. The electrostatic build up on polyester is the smallest and the chance of a spark during electrostatic discharge is the smallest. ✓ (2)
[35]

INFORMAL ACTIVITY 2 – CIRCUITS AND CURRENT ELECTRICITY; COMPONENTS OF A CIRCUIT

1.1.1 A: Battery / Cell✓  ✓ Symbol of one or more cells (2)

1.1.2 B: Bulb✓  ✓ (2)

1.2.1 

✓

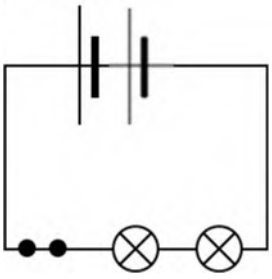
1.2.2 

✓ (2)

1.3 No.✓ The circuit is not complete/broken/there is a gap in the circuit. ✓ (2)

1.4 Close the gap with a connecting wire✓/bulb✓/resistor✓/closed switch.✓
(**ANY TWO**) (2)

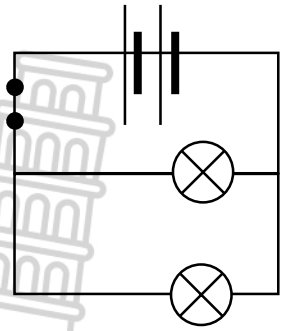
2. C✓ E✓ F✓ K✓
The wire must be connected to two contact points. The one end to the screw part (casing) and the other end to the solder knob at the bottom of the bulb. (4)

3.1 

Marking criteria:
✓Two cells in series
✓Two bulbs
✓ Bulbs in series
✓ Open **OR** closed switch

(4)

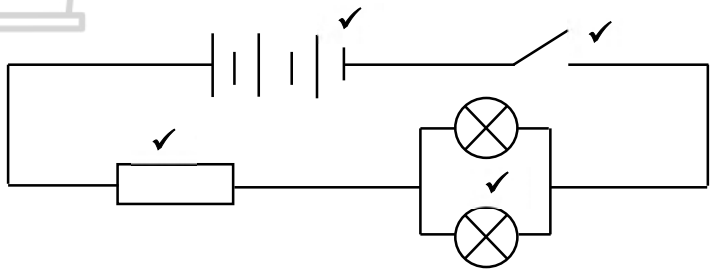
3.2



Marking criteria:
✓One or more cells in series (battery)
✓Two bulbs
✓ Bulbs in parallel
✓ CLOSED switch

(4)

4.1



(4)

4.2.1 A resistor controls the amount of current✓ that flows in a circuit. (1)

4.2.2 A switch breaks or completes a circuit.✓ (1)

4.3 Chemical energy✓ is converted to electrical energy. ✓ (2)
[30]

INFORMAL ACTIVITY 3 – EFFECTS OF AN ELECTRIC CURRENT

1.1 They heat up. / Element inside heats up.✓ (1)
1.2 Electrical energy✓ transformed to heat (thermal) energy.✓ (2)
1.3 (Heating) element.✓ (1)

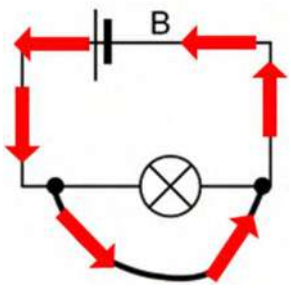
2.1.1 D✓ (1)
2.1.2 B✓ (1)
2.1.3 C✓ (1)
2.1.4 A✓ (1)

2.2 The fuse will heat up, melt off✓ and break the circuit. (1)

2.3 A fuse is a safety device to protect the components in an electric circuit✓ from getting damaged by a too strong current.✓
OR
If the current through the fuse/circuit is too great,✓ the wire heats up, melts off and breaks the circuit to protect the other components from getting damaged.✓ (2)

3.1 B✓ (1)

3.2



✓ Current flows from + to - through the short circuit, not the bulb.
(Current flows through the wire providing an alternative path / path of least resistance.)

(1)

3.3 Short circuit✓ (1)

4.1 Temporary✓ magnet (1)

4.2 Closed✓ (1)

4.3 The nail will only be able to attract the pins while the current is flowing.✓ (1)

4.4.1 current✓
4.4.2 magnetic field✓
4.4.3 magnetised✓
4.4.4 wire turns✓
4.4.5 headphones✓ (5)

5.1 Electrolysis✓ (1)

5.2 Copper chloride → Copper + chlorine✓ (1)

5.3.1 D✓ (1)
5.3.2 A✓ (1)
5.3.3 C✓ (1)
5.3.4 B✓ (1)
5.3.5 C✓ (1)
5.3.6 B✓ (1)
5.3.7 C✓ (1)
5.3.8 A✓ (1)

5.4 By its characteristic smell.✓
OR
Yellowish-green colour in the electrolyte around the positive electrode.✓ (1)

5.5 Reddish-brown layer around the negative electrode.✓ (1)

5.6 Without the torch battery/cell no energy is provided for the chemical reaction to take place.✓ (1)
[35]

INFORMAL ACTIVITY 4 – SERIES AND PARALLEL CIRCUITS

1.1 Three✓ (1)

1.2 Series✓ (1)

1.3 There is only one pathway for the current to pass through.✓ (1)

1.4

Circuit	Number of bulbs	Brightness of bulbs
A	1	Bright✓
B	2	Less bright / Dimmer✓
C	3	Least bright / Dimmest✓

✓Number of bulbs in table indicated as 1, 2 and 3. (4)

1.5 How does the number of bulbs in series affect the brightness of the bulbs?

Marking criteria	Marks
Both variables are mentioned. Number of bulbs; Brightness of bulbs	✓
A question about the relationship between the variables is asked.	✓

(2)

1.6 A, B, C✓ (1)

1.7 C, B, A✓ (1)

1.8 The more bulbs in series, the dimmer they glow.
OR
As the number of bulbs in series increases, the brightness of the bulbs decreases.

Marking criteria	Marks
Both variables are mentioned. Number of bulbs; Brightness of bulbs	✓
The relationship between the variables is indicated.	✓

(2)

2.1 All bulbs glow with the same brightness.✓ (1)
2.2 Three✓ (1)
2.3 Parallel✓ (1)
2.4 There are two or more pathways for the current to pass through. ✓ (1)
2.5 C, B, A✓ (1)
2.6 A, B, C✓ (1)

2.7 The more bulbs in parallel, the lower the total resistance.
OR
As the number of bulbs in parallel increases, the total resistance decreases.

Marking criteria	Marks
Both variables are mentioned. Number of bulbs; Total resistance	✓
The relationship between the variables is indicated.	✓

(2)

2.8 ✓Circuit C redrawn; 2 cells, 3 bulbs in parallel, anyone of the switches closed.
✓ Any TWO of the three switches must be open (for only ONE bulb to glow). (2)

3.1 Nichrome✓
The higher the total resistance✓ in a circuit, the smaller the current✓ that flows through the bulb, the dimmer the bulb✓ glows. (4)

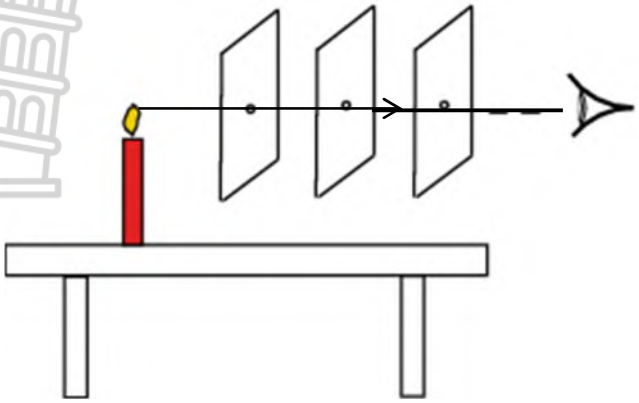
3.2.1 Length and thickness of wire✓ (1)
3.2.2 Brightness of the bulb✓ (1)
3.2.3 Type of wire✓ (1)
[30]

INFORMAL ACTIVITY 5 – SEEING OF LIGHT / COLOUR

1.1 Red✓ (1)
1.2 Blue✓ (1)
1.3 Only blue shorts/surfaces✓ can reflect blue light.✓ (2)
1.4 White light✓ (1)
1.5 Black✓ (1)
2.1 The red shell/surface can reflect✓ red light✓ which can be observed by the eye. (2)
2.2 The black spots/black surfaces absorb all colours/frequencies of light✓ so that no light is reflected.✓ Therefore, the spots appear black. (2)
[10]

INFORMAL ACTIVITY 6 – VISIBLE LIGHT

1.1



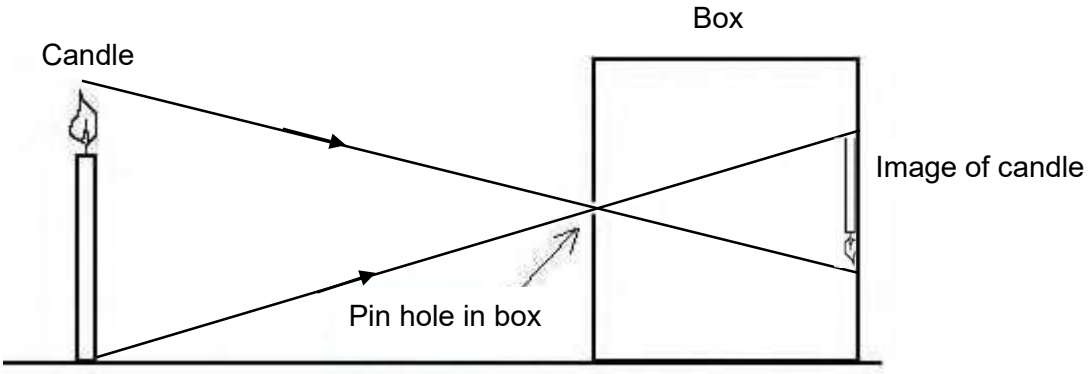
Straight line from the candle to the eye through the 3 holes✓

Arrow indicating the direction of the ray of light✓

(2)

(a) Light only travels in straight lines.✓ (1)

1.2

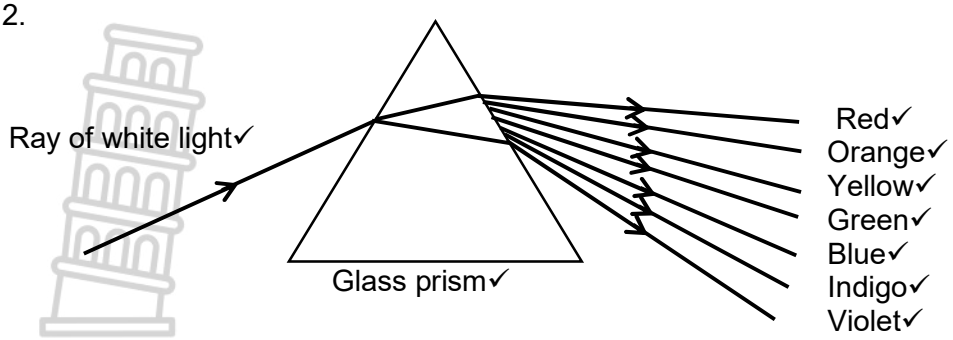


Straight line from top of candle, through pinhole to opposite side of the inside of the box✓
Straight line from bottom of candle, through pinhole to opposite side of the inside of the box✓
Arrows indicating the direction of the rays of light, from candle to image✓
Diminished, upside down image of the candle✓ (4)

(a) Pinhole-camera✓ (1)

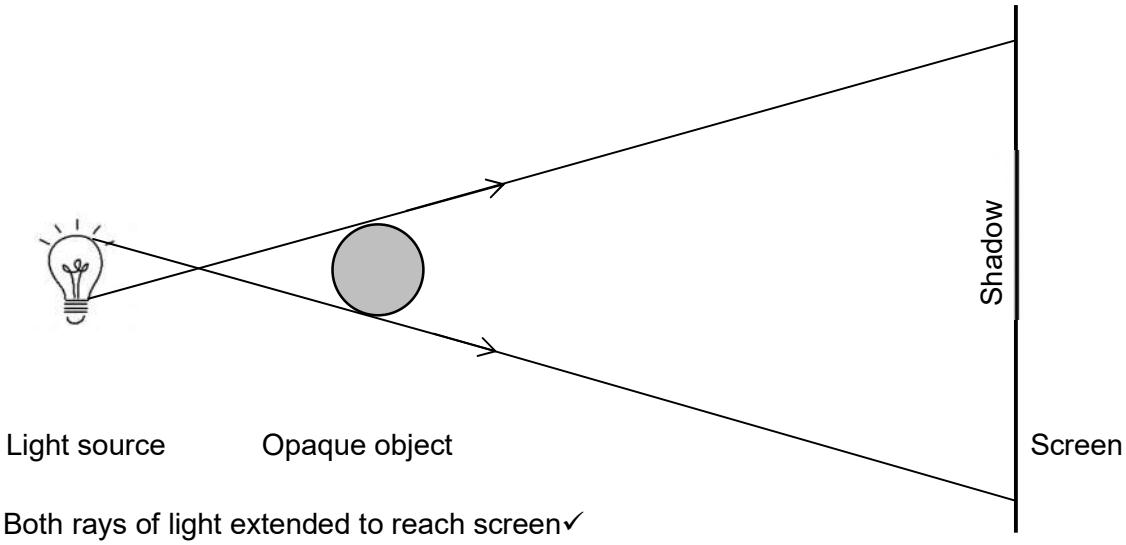
(b) Upside down✓ straight✓ (2)

2.



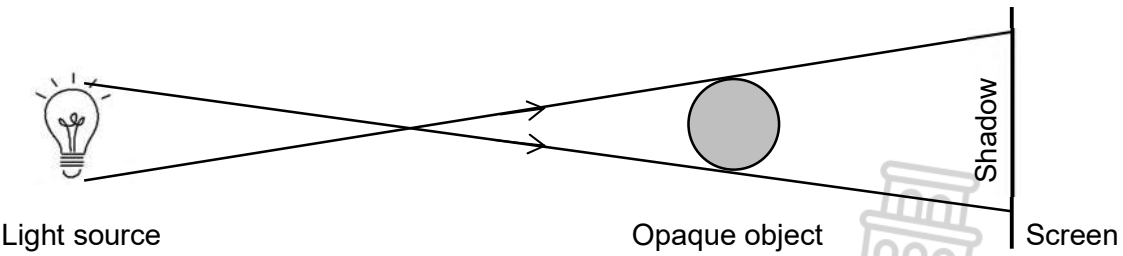
✓For each ray of light with correct colour (9)

3.1



Both rays of light extended to reach screen✓
Position of shadow indicated✓ (2)

3.2

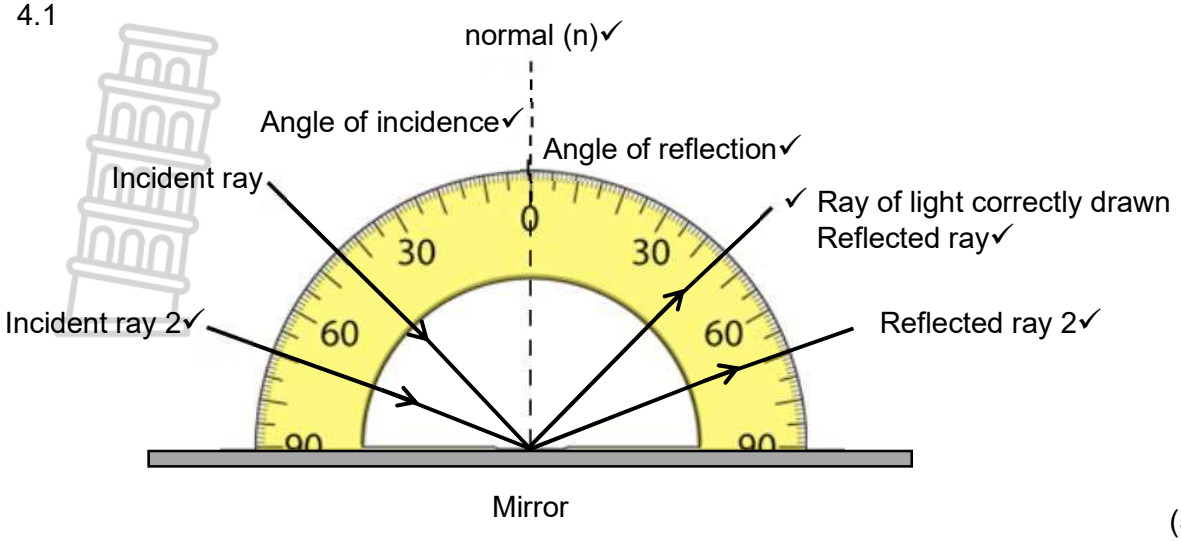


Both rays of light drawn correctly✓
Arrows indicating the direction of the ray of light✓
Position of shadow indicated✓ (3)

(a) Bigger✓ (1)

(b) Smaller✓ (1)

4.1



(5)

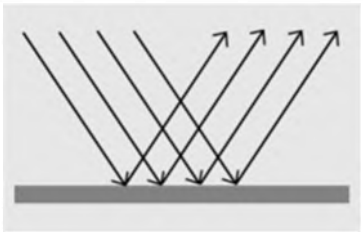
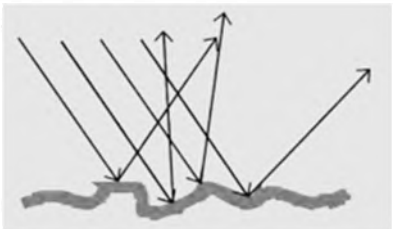
(a) 45°✓ (1)

(b) 45°✓ (1)

(c) The angle of incidence is equal to✓ the angle of reflection. ✓ (2)

(d) **On diagram:**
Incident ray 2, with angle of incidence of 70°✓
Reflected ray 2, with angle of reflection of 70°✓ (2)

4.2

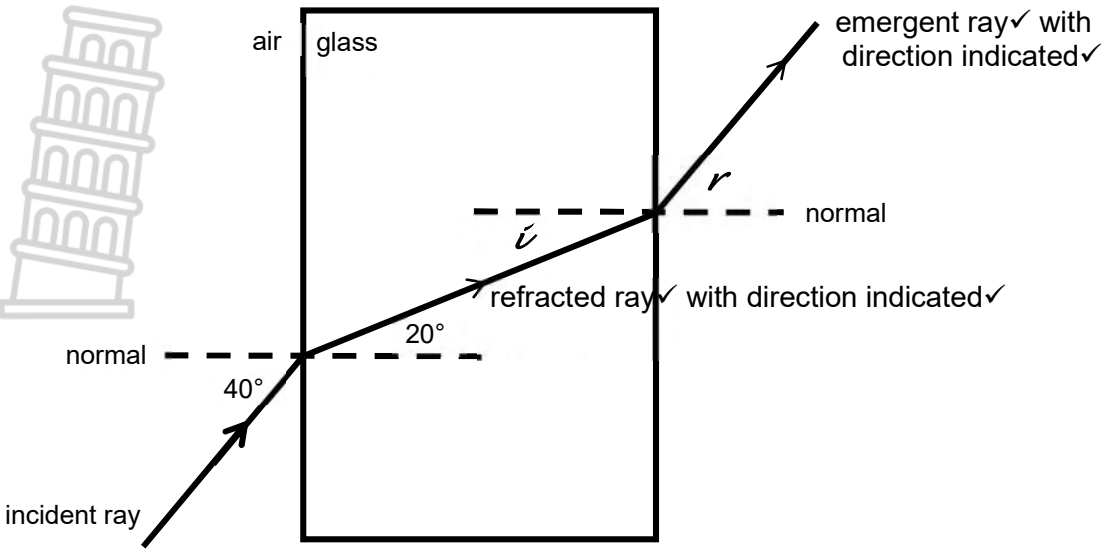
Reflection of light of a smooth surface	Reflection of light of a rough surface
 Mirror	 Crumpled aluminium foil
✓Parallel rays of light reflected ✓Direction of rays indicated	✓Rays of light reflected in different directions ✓Direction of rays of light indicated

(4)

(a) reflected in the same direction✓ (1)

(b) scattered✓ (1)

5.1



(4)

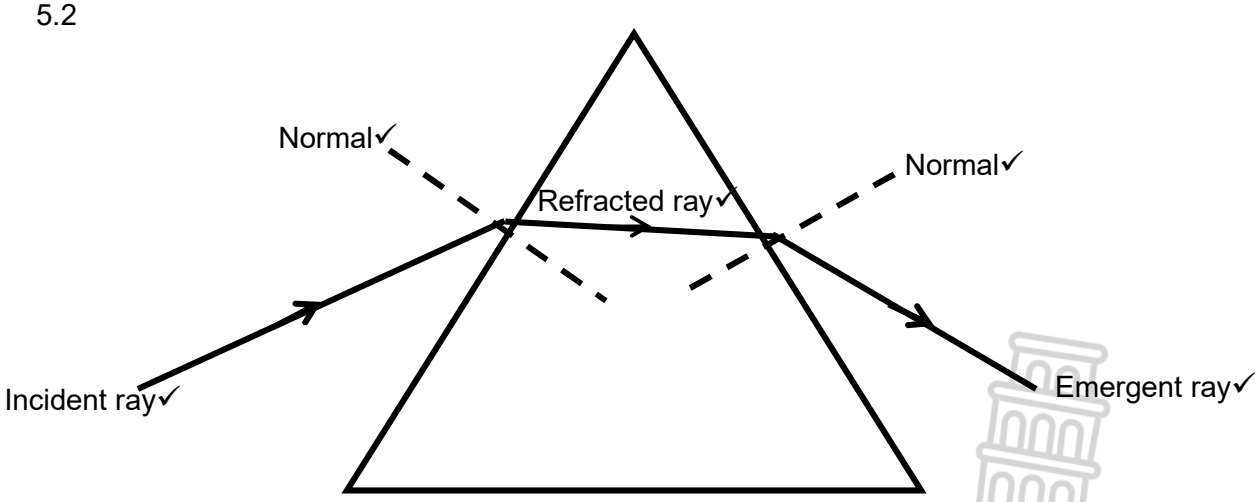
(a) $i = 20°$✓ (1)

(b) $r = 40°$✓ (1)

(c) towards✓ (1)

(d) away from✓ (1)

5.2



Refracted ray drawn correctly with **direction** indicated✓
Emergent ray drawn correctly with **direction** indicated✓ (7)

(a) towards✓
away✓ (2)

[60]