STAGE 4 SCIENCE
Remote Learning

Thursday, July 29, 2021

Dear Student & Parent/Carer,

The following VALID Past Paper is designed to be skills and stimulus-based revision for independent study at home. Completing the paper with the assistance of your Science book and the internet will ensure that you are revision all Stage 4 content in preparation for the Year 8 VALID test later this year.

Additionally, students can be working on their assessment task 'Student Research Project'.

Task notifications are available under the 'For Parents' tab within the school website:

https://manilla-c.schools.nsw.gov.au/

Please do not hesitate to contact your class teacher for assistance:

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Regards,

Mrs Lawrence & Mr Hyles

Read the following article then complete items 14 to 19.

Frog glue to the rescue!

Australia's Holy Cross Frog (*Notaden bennetti*) survives dry conditions by living one metre underground and only coming out after heavy rain to find food and a mate.

To defend itself, the frog releases a sticky liquid that secures predators, such as ants, to the frog's skin. Each week the frog sheds and eats its sticky skin, gaining nutrients from the trapped would-be predators.

Professor Mike Tyler, a herpetologist, stumbled upon this interesting 'glue' on a field trip when he got some on his hands. He could not wash it off with soap, water or petrol and had to cut it off with a knife.

Laboratory tests showed the glue breaks down slowly and sticks almost anything including bone and skin. Frog glue was even tested by repairing damaged knee tissue in sheep.

Later, Professor Tyler started working with doctors to investigate using the glue to repair human knee and shoulder tissues. CSIRO scientists are working on a synthetic version of the glue to avoid using living frogs.

14 Why does the frog make sticky liquid?

- ⬭ to let the frog lose its skin
- ⬭ to keep the frog's skin moist
- ⬭ to provide some food for the frog
- ⬭ to protect the frog when attacked

15 Choose from:

Investigate properties of the glue.
Develop a synthetic version of the glue.
Observe the sticky secretion of the frog.
Develop ideas for using the glue in surgery.

to put the steps in the scientific discovery of frog glue into the correct order in the table.

Step 1	
Step 2	
Step 3	
Step 4	

16 Bones and muscles are part of a human's

- skeletal system
- nervous system
- digestive system
- circulatory system

17 The scientists worked with surgeons to test the glue on damaged knee tissue in sheep.

The most important consideration in such investigations is

- booking an operating theatre
- meeting safety and ethical guidelines
- obtaining permission from the farmer
- researching current surgical procedures

18 Why would the scientist test the glue on sheep?

- Human bones were too difficult to obtain
- To test if the glue was poisonous to humans
- Hospitals would not let frogs into an operating theatre
- To see how the glue would cope when the sheep walked around

19 How would scientists from different fields of research contribute to developing a synthetic version of the glue?

Draw lines to match each type of scientist with their contribution.

Biologists	Formulate the composition of the synthetic glue
Chemists	Design tests to measure the properties of the glue
Physicists	Identify other types of frogs that secrete sticky liquids

Read the following article then complete items 22 to 26.

A mind for matter

John Dalton (1766-1844) was an English scientist. He is best known for developing a theory about matter.

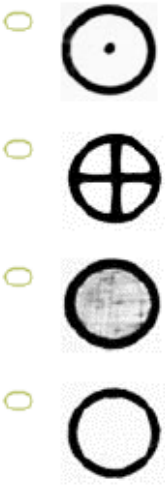
Dalton's model of matter

Dalton stated:

- elements consist of tiny particles
- particles of a particular element are identical and have the same mass
- particles of different elements have different masses from each other
- compounds consist of particles of different elements combined.

Dalton was the first to use symbols to represent the elements. His symbols are shown in the table.

22 Which of Dalton's symbols represents carbon?



23 Look at Dalton's table of elements.

Show how the mass of iron compares to the mass of magnesia by drawing a line through the incorrect options in each box.

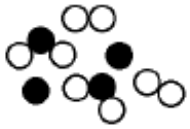
Iron is [1.5/2.5/7.5/30] times [heavier/lighter] than magnesia.

24 Dalton's model has changed since it was developed.

Why has the model changed?

- ⬭ Scientists often change their minds.
- ⬭ New evidence doesn't fit the old model.
- ⬭ Famous scientists make up new models.
- ⬭ The scientist that made up the old model had died.

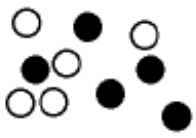
25 Classify each substance as either a compound, an element or a mixture, by drawing a line through the incorrect options in each box.



a compound/
an element/
a mixture

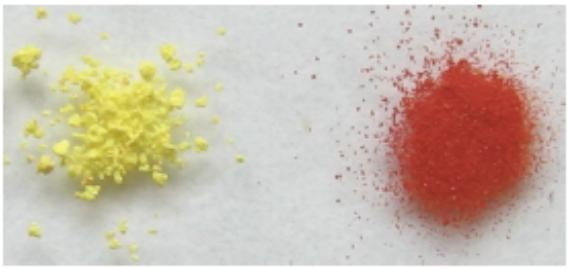
a compound/
an element/
a mixture

a compound/
an element/
a mixture



a compound/
an element/
a mixture

26 John Dalton made many observations.



If yellow litharge is heated in a fire, it changes colour to a deep red that lasts even after it is cooled down.
This happens because?

- ⬭ a physical change has taken place
- ⬭ a chemical change has taken place
- ⬭ powders turn red when they are heated

Read the following article then complete items 42 to 46.

Lighten up

At night, people lived in the dark until we learnt to make fire.

The first lamps burnt animal fats to produce light. Later, wicks made from plant fibres were added to the lamps. Their flames were dangerous and produced smoke and soot (powdered carbon).

People then started using candles instead of lamps. They were safer and easier to carry.

When Davy connected platinum wire to electricity it glowed. This inspired other scientists, like Swan and Edison to experiment. Their work led to the development of the light bulb.

Eventually light bulbs with a tungsten wire filament were filled with argon gas. When the electricity was on, the wire would glow without melting or burning. However, these light bulbs were found to waste a lot of energy.

Advances in technology have led to more efficient lighting with many applications.

42

A lighting technology timeline

Early history	Humans learn to make fire.
	Lamps burn animal fats.
	Candles are invented.
1801	Platinum conducts electricity to make light.
1876	Pumps remove oxygen from light bulbs to prevent burning.
1882	440 electric bulbs light up 82 homes for 150 hours.
1900	45 million tungsten filament light bulbs are sold.
1981	Energy efficient light bulbs are introduced.

When was electricity first used to create light?

- ⬭ 1801
- ⬭ 1876
- ⬭ 1882
- ⬭ 1900

43 A chemical reaction occurs when a simple lamp is used.

Which of the following is evidence of this?

- ⬭ Animal fat is used.
- ⬭ Fat melts in the lamp.
- ⬭ Smoke and soot are produced.
- ⬭ Wicks made from plant material are used.

44 The candle flame causes wax to melt and then evaporates.

Choose from gas, solid and liquid to write in the boxes to show the sequence representing this change.

[ ] ➡ [ ] ➡ [ ]

45 Choose yes or no for each substance to identify which are metals.

	Yes	No
argon	⬭	⬭
carbon	⬭	⬭
platinum	⬭	⬭
tungsten	⬭	⬭

46

Light bulbs are not 100% efficient. Tungsten filament light bulbs waste 90% of the energy they use.

Most energy used by tungsten filament light bulbs is wasted as

- ⬭ heat
- ⬭ light
- ⬭ movement
- ⬭ sound

Read the following article then complete items 64 to 69.

'Snot' what you think it is

This drone isn't whale watching... it's collecting whale mucus.

The Macquarie University led project has allowed researchers to collect whale mucus in a non-invasive way ... rather than collecting from beached whales or trying to get close with a boat.

The modified drone is equipped with a sterile petri dish and a novel lid to secure the blow spray.

Mucus samples can be used to assess the health of individual whales or populations. The drone was designed by engineer Alastair Smith and PhD candidate Vanessa Pirotta.

In the marine environment, drones are revolutionising the way we study marine species.

Due to their small size, the fact that they cause minimal disturbance to wildlife and offer improved safety for both operators and animals, drones are an attractive option for studying marine wildlife.

Image courtesy of Fairfax Media

64 The aim of the project is to

- collect material from beached whales
- replace human researchers with drones
- assess whale health by investigating their mucus
- develop technology to collect samples from marine animals

65 Complete the sentence by crossing out the incorrect options in the box.

Phytoplankton are microscopic organisms that photosynthesise using the

nucleus/ cytoplasm/ chloroplasts/ cell membrane

in their cells.

66 Phytoplankton are mainly unicellular organisms.

Complete the food chain below by drawing a line through the incorrect options in each box.

Humpback whale/ Krill/ Phytoplankton

↓

Humpback whale/ Krill/ Phytoplankton

↓

Humpback whale/ Krill/ Phytoplankton

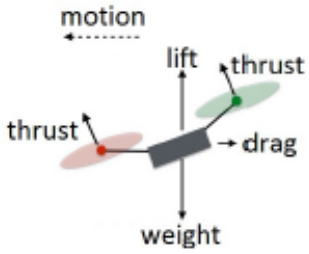
67 Use the checkboxes to show the advantages and disadvantages of capturing whale snot remotely with a drone.

	Advantage	Disadvantage
It frightens the seabirds away.	⬭	⬭
It avoids interference/contact with each whale.	⬭	⬭
It keeps researchers a safe distance from the whales.	⬭	⬭
It requires highly skilled pilots to control the operation.	⬭	⬭

68 Which part of the drone provides its energy?

- ⬭ battery
- ⬭ camera
- ⬭ computer
- ⬭ remote control

69 The diagram shows the forces acting on a drone in flight towards the whale



Which force acts as a frictional force to slow the forward motion?

- ⬭ lift
- ⬭ drag
- ⬭ thrust
- ⬭ weight

Read the following article then complete items 66 to 75.

Best served cold

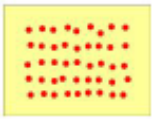
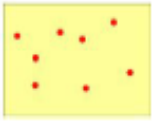
Jack left an ice cold can of soft drink on the table.

When he returned half an hour later he discovered that the soft drink was now warm.

There was also a puddle of water on the table under the drink can.

Jack thought about what happened to his soft drink. He wondered if he could learn more in the lab at school.

66 Which image represents the particles in a liquid soft drink?

- ⬭ 
- ⬭ 
- ⬭ 

67 As soft drink warms up, the water particles are

- ⬭ losing matter
- ⬭ losing energy
- ⬭ gaining matter
- ⬭ gaining energy

68 As water vapour cools on a cold surface, the particles

- ⬭ stop moving
- ⬭ move more slowly
- ⬭ start to move more quickly
- ⬭ keep moving at the same speed

69 Which process also involves condensation?

- ⬭ melting iceblocks
- ⬭ clothes drying on the clothesline
- ⬭ water boiling in the electric kettle
- ⬭ a mirror fogging up during a warm shower

70 When liquid water changes to ice the process is called

- ⬭ melting
- ⬭ freezing
- ⬭ evaporation
- ⬭ condensation

71 In the laboratory we would use this equipment to measure the temperature of ice water.

What is the name of the glass container?

- flask
- beaker
- Bunsen jar
- measuring cylinder

72 Which unit is used in the measurement of temperature?

- kilowatts
- kilojoules
- millimetres
- degrees Celsius

73 Look at the diagram in question 71, left.

When measuring the temperature of the ice water in the laboratory, we hold the bulb of the thermometer above the bottom of the container.
This is because the thermometer's bulb

- must be surrounded by the ice and water
- must not touch the container or it will break
- has to be held against the ice to measure its temperature
- has to be raised so it can be used to stir the ice and water

74 Look at the diagram in question 71, above.

Which of the following would be the easiest way to separate the water from the ice?

- distillation
- decantation
- evaporation
- crystallisation

75 Cross out the incorrect words to complete the answer to the question below:
Why does ice float in water?

Ice | weighs less/weighs more/ is less dense/is more dense | than water.

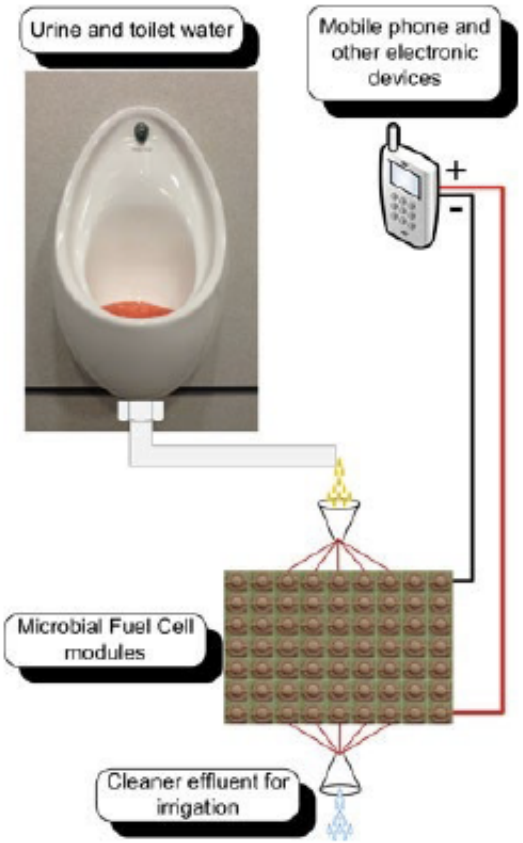
Read the following article then complete items 61 to 67.

Wee-powered phones

People could soon charge their mobile phones using their own urine.

Scientists have developed a way to charge a mobile phone using urine. The process uses microbial fuel cells. Microbial fuel cells use bacteria to convert the chemicals found in urine into electricity. The small amount of electrical charge can be stored for short periods of time in a battery.

The scientists think that with improvements in this technology it could be installed into domestic toilets in the future to collect urine to produce enough electricity to power shavers and perhaps lights.



61 Which energy transformation occurs to charge the battery of a mobile phone using urine?

- chemical energy → sound energy
- sound energy → electrical energy
- chemical energy → electrical energy
- electrical energy → sound energy

62 What is an advantage of charging a mobile phone using urine compared to regular methods?

- A small current is produced.
- It uses an energy transformation.
- Bacteria are used to produce energy.
- A waste product is used to produce energy.

63 Which body system produces urine?

- digestive
- excretory
- respiratory
- circulatory

64 The human body has many different systems. Each system is made up of organs, cells and tissues.

Show the order of the structures from simplest, 1 to most complex, 4, by drawing a line through the incorrect options in the boxes.

Simplest

1	cells/ organs/ tissues/ systems
2	cells/ organs/ tissues/ systems
3	cells/ organs/ tissues/ systems
4	cells/ organs/ tissues/ systems

Most complex

65 Urine is made up of urea dissolved in water. Classify the three substances as either a solute, a solvent or a solution by drawing a line through the incorrect options in each box.

urea	solute/ solvent/ solution
urine	solute/ solvent/ solution
water	solute/ solvent/ solution

66 Urine is a substance that contains water and urea $CO(NH_2)_2$.

Classify the three substances as either an element, a compound or a mixture by drawing a line through the incorrect options in each box.

urea	element/ compound/ mixture
urine	element/ compound/ mixture
water	element/ compound/ mixture

67 Urea has the chemical formula $CO(NH_2)_2$.

Show the elements that are present in urea by drawing a line through the incorrect options in each box.

carbon/ copper	osmium/ oxygen	nickel/ nitrogen	helium/ hydrogen

Read the following article then complete items 66 to 72.

All the glitters (is a glow worm)

Glow worms are insects, not worms. Glow worms are often found in caves with high humidity in Australia.

The worm-like larvae have tails that glow to attract small flying insects. The hungrier the glow worms are the more brightly their tails glow. The insects get caught in traps made from long sticky silk threads hanging from the tube where the glow worm lives.

When glow worms are making the blue-green light, they use a lot of oxygen for the chemical reaction.

66 Glow worms appear very bright inside a cave because

- the cave is very dark
- the cave is very quiet
- there are many flying insects
- they have eaten a lot of insects

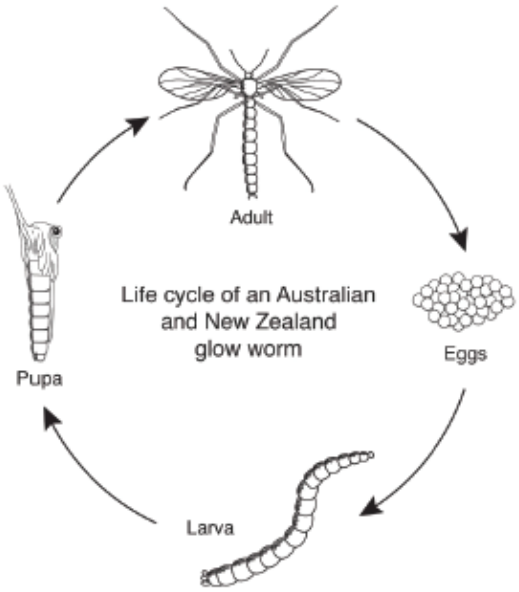
67 What will happen to a glow worm's tail after it has been eating?

- The tail will glow less.
- The tail will glow more.
- The tail will not change.

68 What would scientists use to classify glow worms?

- They live in caves.
- They have glowing tails.
- They use a lot of oxygen.
- They are found in Australia.

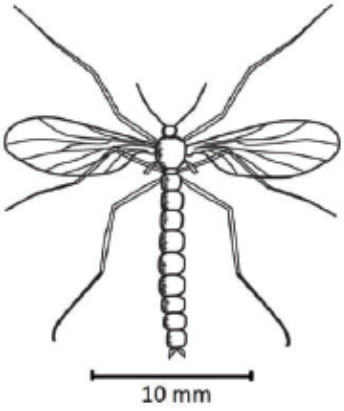
69



The correct order of the glow worm's life cycle is

- ⬭ pupa → adults → larva → eggs
- ⬭ adults → eggs → pupa → larva
- ⬭ eggs → larva → pupa → adults
- ⬭ larva → pupa → eggs → adults

70 Use the scale provided to estimate the wingspan of this insect.



- ⬭ 14 mm
- ⬭ 14 cm
- ⬭ 22 mm
- ⬭ 22 cm

71 Choose yes or no for each answer to the following question.

Is it one of the glow worm's adaptations?

	Yes	No
They are worms.	⬭	⬭
They live in caves.	⬭	⬭
They are found in Australia.	⬭	⬭
They make sticky hanging threads.	⬭	⬭
They use light to attract insects.	⬭	⬭

72 A glow worm is a multicellular organism.

Use the words cells, organs, systems, tissues to show the order of cellular structures from least complex, 1, to most complex, 5, the organism, which has been done for you.

Write each word in the space beside the corresponding number.

Least complex

1	
2	
3	
4	
5	organism

Most complex

A burning question

Who invented the Bunsen burner?

In 1855, Bunsen designed a heating device that mixed coal gas with air at the bottom of a tube called a barrel. This mixture travelled up the barrel to the top where the coal gas was burnt.
Bunsen's assistant developed the collar that we rotate to change the safety flame to a heating flame.

Faraday invented an earlier burner without an air hole. The flame was like a safety flame because it flickered, was sooty and was not very hot. Faraday used his burner to heat gases such as chlorine and carbon dioxide. He believed they would turn to liquids if he heated them. Instead, he discovered some of them exploded, so he tried cooling them instead and succeeded in making liquid chlorine.

Being a scientist in those days was not a safe occupation. Bunsen lost sight in one eye in a chemical explosion and Davy, another chemist, damaged his eyesight in an accident with nitrogen trichloride.

70 What is the advantage of the safety flame?

- ⬭ It flickers.
- ⬭ It is sooty.
- ⬭ It is yellow.
- ⬭ It is not very hot.

71 The resource describes two accidents that caused injuries to Bunsen and Davy.

Which safety equipment would have prevented their injuries?

- ⬭ 
- ⬭ 
- ⬭ 
- ⬭ 

72 Many chemists in the 1800s had serious accidents.

The most likely reason is

- they had a lot of bad luck
- they used faulty equipment
- they were not very good scientists
- they did completely new experiments

73 Which chemical named in the resource could have the formula NCl_3?

- coal gas.
- chlorine
- carbon dioxide
- nitrogen trichloride

74 Which problem-solving strategy did Faraday use to make liquid chlorine?

- working with other scientists
- researching background information
- experimenting and learning from mistakes
- performing the same investigation as another scientist

75 What is the main difference between chlorine and carbon dioxide?

- Chlorine is a gas but carbon dioxide is a liquid.
- Chlorine is a metal but carbon dioxide is a non-metal.
- Chlorine is a compound but carbon dioxide is a mixture.
- Chlorine is an element but carbon dioxide is a compound.