

*Students are **not permitted** to write on or mark the exam paper.*

MATHEMATICS

Question 1

(i) In this part, use the fact that 1 light year = 9.46×10^{15} metres.

The distance of the star Sirius from the Sun is 8.6 light years.

Calculate the distance, in kilometres, of Sirius from the Sun.

Give your answer in standard form.

[2]

(ii) The distance of the star Proxima Centauri from the Sun is 3.97×10^{13} km.

A space probe travels at 60 000 km/h.

Calculate the time taken for the probe to travel from the Sun to Proxima Centauri.

Give your answer in years, correct to three significant figures.

[3]

[N12/II/4(c)]

Question 2

(a) One day Amit works from 08 00 until 17 00.

The time he spends on filing, computing, writing and having lunch is in the ratio

Filing: Computing: Writing: Lunch = 2: 5 : 4 : 1.

Calculate the time he spends

(i) writing,

[1]

(ii) having lunch, giving this answer in minutes.

[1]

(b) The amount earned by Amit, Bernard and Chris is in the ratio 2 : 5 : 3.

Bernard earns \$855 per week.

Calculate how much

(i) Amit earns each week,

[1]

(ii) Chris earns each week.

[1]

(c) After 52 weeks Bernard has saved \$2964.

What fraction of his earnings has he saved?

Give your answer in its lowest terms.

[2]

(d) Chris saves \$3500 this year. This is 40% more than he saved last year.

Calculate how much he saved last year.

[3]

Question 3

Sara has \$3000 to invest for 2 years.

She invests the money in a bank which pays simple interest at the rate of 7.5 % per year.
Calculate how much interest she will have at the end of the 2 years.

Question 4

$$\mathcal{E} = \{-2\frac{1}{2}, -1, \sqrt{2}, 3.5, \sqrt{30}, \sqrt{36}\}$$

$$X = \{\text{integers}\}$$

$$Y = \{\text{irrational numbers}\}$$

List the members of

[1]

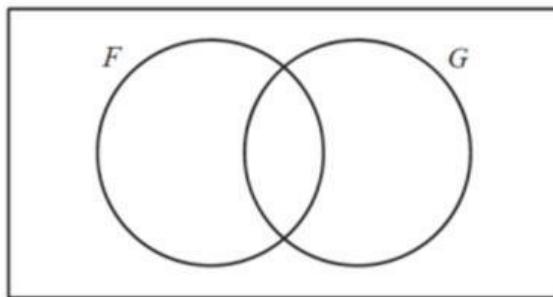
(a) X ,

(b) Y .

[1]

Question 5

(a) In this Venn diagram, shade the region $F \cup G'$.



[1]

(b) $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

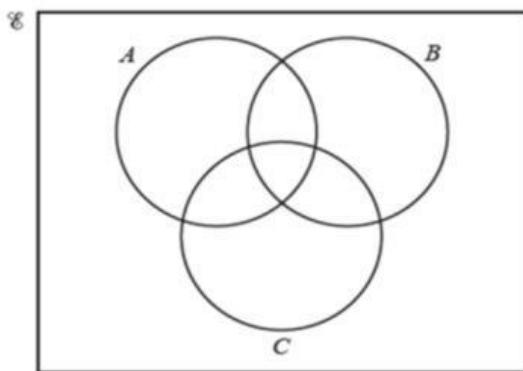
$$A = \{x: x \text{ is an odd number}\}$$

$$B = \{x: x \text{ is a square number}\}$$

$$C = \{x: x \text{ is a multiple of 3}\}$$

(i) Write all the elements of \mathcal{E} in the Venn diagram below.

[2]



(ii) Another number is included in the set \mathcal{E} .
This number is in the region $A' \cap B \cap C$.

[1]

Write down a possible value for this number.

Question 6

A circle has a radius of 8.5 cm correct to the nearest 0.1 cm.

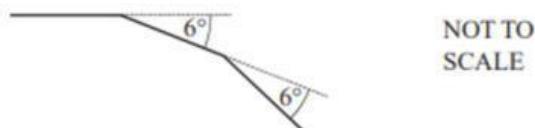
The lower bound for the area of the circle is $p\pi\text{cm}^2$.

The upper bound for the area of the circle is $q\pi\text{cm}^2$.

Find the value of p and the value of q .

[3]

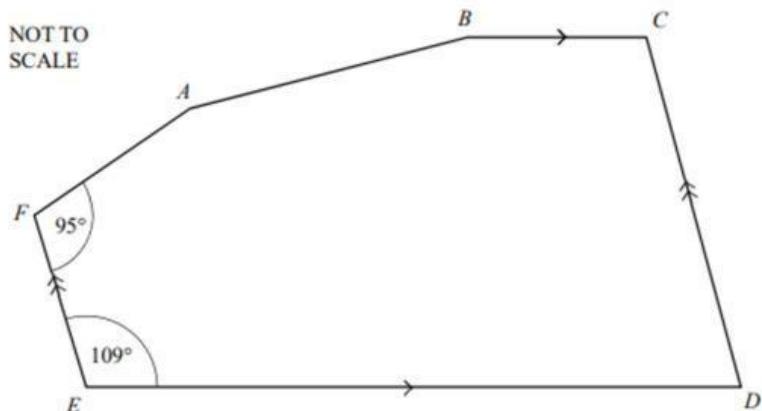
Question 7



The diagram shows two of the exterior angles of a regular polygon with n sides.
Calculate n .

[2]

Question 8



In the hexagon $ABCDEF$, BC is parallel to ED and DC is parallel to EF .

Angle $DEF = 109^\circ$ and angle $EFA = 95^\circ$.

Angle FAB is equal to angle ABC .

Find the size of

(a) angle EDC ,

(b) angle FAB .

Question 9

A shopkeeper paid £30 (cost price) for a coat. She wishes to place a price tag on it so that she can offer a 10% discount on the price marked on the tag and still make a profit of 20% on the cost price. What price should she mark on the tag?

PHYSICS

Multiple Choice

1. A box is placed on the ground. An upward force of 15 N is needed to lift the box at constant speed. Which row correctly describes the box?

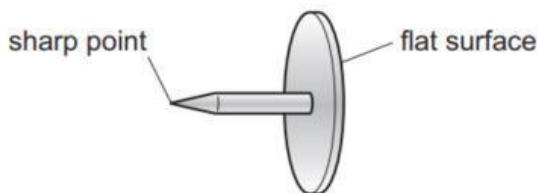
	mass of the box	weight of the box
A	1.5 kg	15 N
B	15 N	1.5 kg
C	15 N	150 kg
D	150 kg	15 N

2. Brakes are used to slow down a moving car.

Into which form of energy is most of the kinetic energy converted as the car slows down?

A chemical **B** elastic **C** thermal **D** sound

3. A drawing pin (thumb tack) has a sharp point at one end and a flat surface at the other end.



The pin is pushed into a wooden board. How do the pressure and the force at the sharp point compare with the pressure and the force on the flat surface?

	force at the sharp point	pressure at the sharp point
A	greater than on the flat surface	greater than on the flat surface
B	greater than on the flat surface	less than on the flat surface
C	the same as on the flat surface	greater than on the flat surface
D	the same as on the flat surface	less than on the flat surface

4. Which row describes the arrangement and the motion of the molecules in a gas?

	arrangement	motion
A	far apart	move freely
B	far apart	vibrate only
C	tightly packed	move freely
D	tightly packed	vibrate only

5. A liquid turns into a gas. This occurs only at one particular temperature, and the change happens throughout the liquid. What is this process called?

A boiling **B** condensation **C** evaporation **D** fusion

6. In a cold country, a bicycle has been left outside all night. The cyclist finds the plastic hand grips feel less cold to the touch than the steel handlebars.

Which row correctly describes the temperature and the property of the two materials?

	the temperature of the two materials	the property of the two materials
A	the temperature of the steel is much lower than that of the plastic	the plastic is a better thermal conductor than the steel
B	the temperature of the steel is much lower than that of the plastic	the steel is a better thermal conductor than the plastic
C	the steel and the plastic are both at the same temperature	the plastic is a better thermal conductor than the steel
D	the steel and the plastic are both at the same temperature	the steel is a better thermal conductor than the plastic

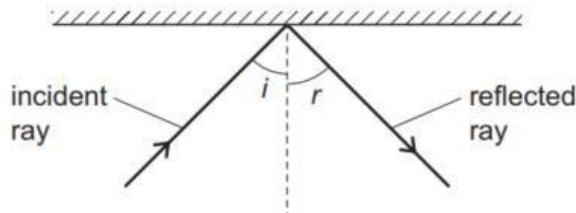
7. The diagram shows a tent made from a new material.



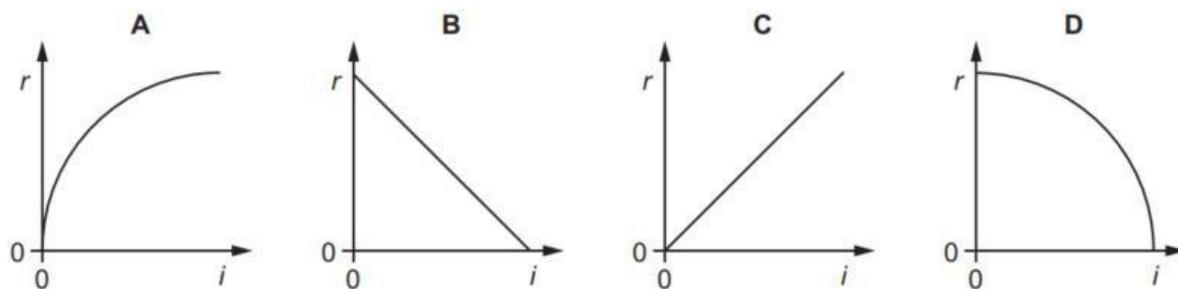
What type of material should the tent be made of to reflect the radiant energy from the Sun?

	material texture	material surface colour
A	dull	black
B	dull	white
C	shiny	black
D	shiny	white

8. A ray of light is incident on a plane mirror. A student measures the angle of incidence i and the angle of reflection r



The student varies the angle of incidence and then plots a graph of r against i . What does the graph look like?



9. Which row gives a possible set of values for the speed of sound in ice, in water and in steam?

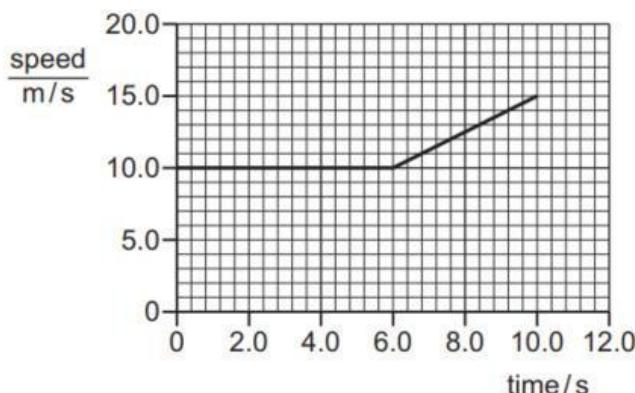
	speed of sound in ice (m/s)	speed of sound in water (m/s)	speed of sound in steam (m/s)
A	500	1500	4000
B	1500	4000	500
C	4000	500	1500
D	4000	1500	500

10. A plastic rod is rubbed with a dry cloth. The rod becomes positively charged. Why has the rod become positively charged?

A It has gained electrons. B It has gained neutrons.
 C It has lost electrons. D It has lost neutrons.

SHORT ANSWER

1. The graph shows how the speed of a car varies during part of a journey.



What is the acceleration of the car between 6.0 s and 10.0 s?

2. A student has an irregularly shaped piece of metal, a beaker of water and a measuring cylinder, as shown in Fig. 2.1.

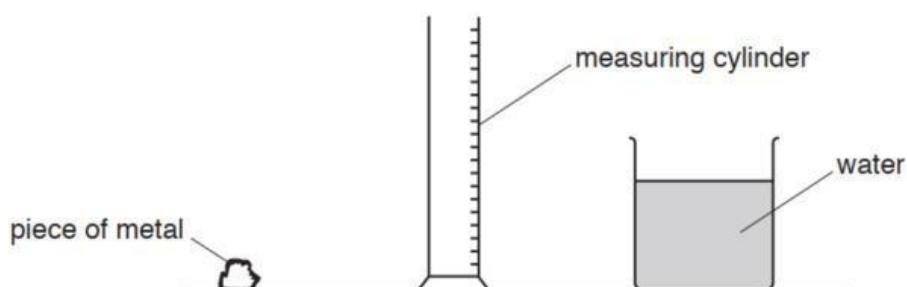


Fig. 2.1

The student measures the mass of the piece of metal. Its mass is 146g.

a. State the name of the tool used to measure the mass.

b. He pours 50 cm³ of water into the graduated cylinder, then places the metal piece inside. At this point, the water level in the cylinder is 70 cm³. Calculate the volume of the metal piece.

c. Calculate the density of the metal. State the unit.

3. Energy sources used to generate electricity are shown in the box.

gas	oil	tides	waves	wind
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Which energy sources are non-renewable?

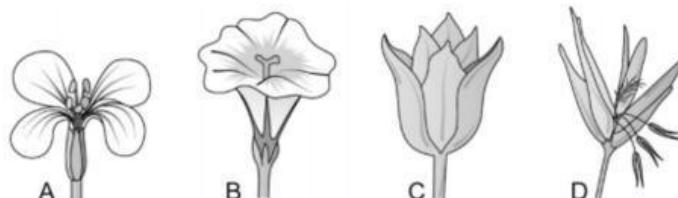
Draw a ring around **each** energy source that is non-renewable.

BIOLOGY

1. Pollination is the transfer of pollen from the anthers to the stigma of a flower. Which part of the flower produces pollen?

A) Stigma B) Ovary C) Anther D) Petal

2. The drawings show four flowers. Which flower (A, B, C, or D) is most likely to be wind-pollinated?



3. Which of these is a characteristic feature of wind-pollinated flowers?

A) Brightly coloured petals B) Strong scent
C) Large, feathery stigmas D) Nectar production

4. What is the main difference between cross-pollination and self-pollination?

A) Self-pollination involves insects, cross-pollination involves wind.
B) Cross-pollination involves pollen transfer between different plants, self-pollination occurs within the same flower or plant.
C) Self-pollination results in more genetic variation.
D) Cross-pollination only occurs in plants with separate male and female flowers.

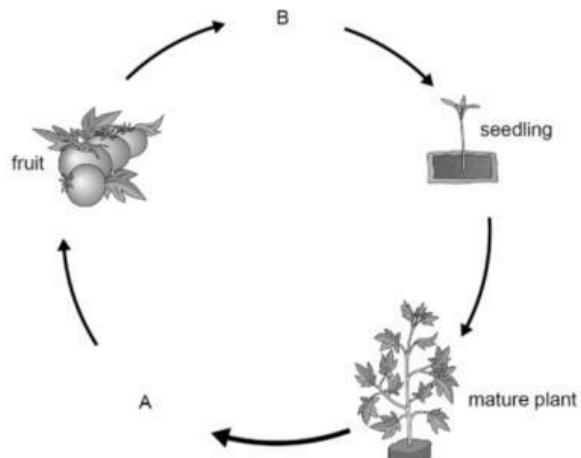
5. After pollination, what is the name of the structure that grows from the pollen grain down to the ovule?

A) Style B) Pollen tube C) Filament D) Ovary

The diagram shows the life cycle of a tomato plant. Use this diagram to answer question 6, 7

6. What process is occurring at Stage A?

A) Seeds germinate
B) Seeds are dispersed
C) Seeds are formed
D) Fertilisation



7. What process occurs at Stage B?

A) Seed dispersal only
B) Germination and flowering
C) Growth, flowering, pollination, and fertilisation
D) Photosynthesis only

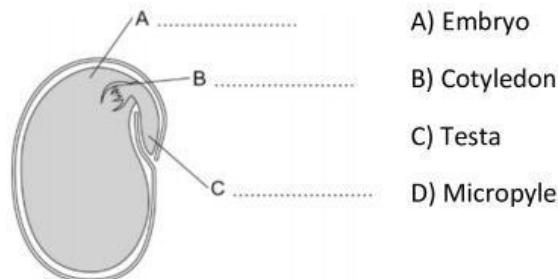
8. What are the reactants for photosynthesis?

A) Glucose and oxygen
B) Carbon dioxide and water
C) Oxygen and water
D) Glucose and carbon dioxide

9. Greenhouses are made of glass to allow lots of light for photosynthesis. What is another way a greenhouse helps tomato plants grow well?

A) It decreases the carbon dioxide concentration.
B) It keeps the temperature warmer.
C) It prevents all insects from entering.
D) It reduces the amount of water needed.

10. The drawing shows the inside of a bean seed. If 'A' points to the main food store, what is this part called?



11. John measured the height of bean seedlings. On Day 6, the average height was 58 mm. On Day 7, the average height was 77 mm. What was the height increase for Day 7?

A) 14 mm B) 19 mm C) 58 mm D) 77 mm

12. The energy for plant growth comes from respiration. Which equation represents aerobic respiration in plants?

A) Glucose + Oxygen \rightarrow Carbon Dioxide + Water + Energy
 B) Carbon Dioxide + Water + Light \rightarrow Glucose + Oxygen
 C) Glucose \rightarrow Lactic Acid + Energy
 D) Glucose \rightarrow Ethanol + Carbon Dioxide + Energy

13. A balanced diet contains the correct amounts of carbohydrates, proteins, fats, vitamins, minerals, water, and fibre. What is the primary role of carbohydrates?

A) Growth and repair B) Insulation
 C) Energy supply D) Preventing constipation

14. Which component of our diet helps food move along the gut and prevents constipation?

A) Carbohydrate B) Vitamins C) Minerals D) Fibre

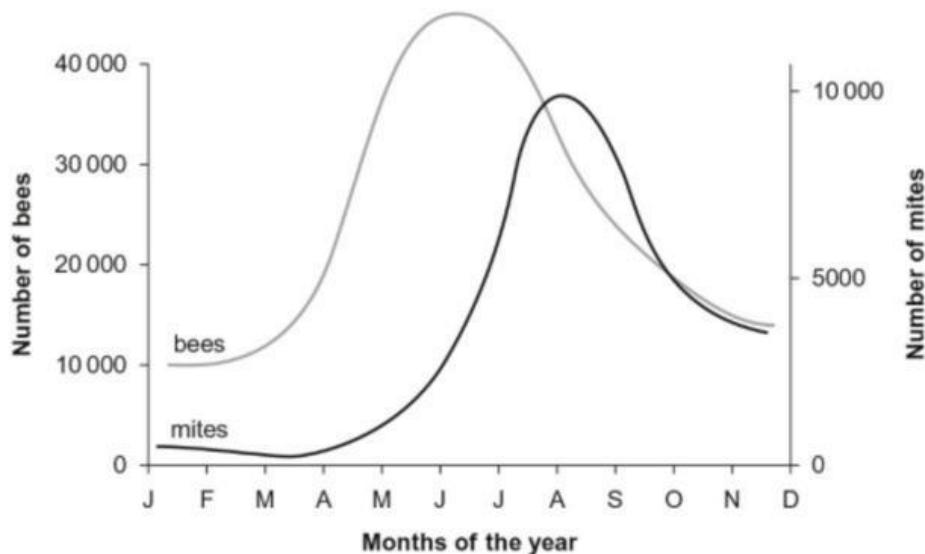
15. What is the difference between starvation and malnutrition?

A) Starvation is too much food; malnutrition is not enough food.
 B) Starvation is not enough food; malnutrition is an unbalanced diet (lacking or too much of certain nutrients).
 C) Starvation is lack of water; malnutrition is lack of vitamins.
 D) They are the same thing.

16. Scurvy is a deficiency disease. What is it caused by a lack of?

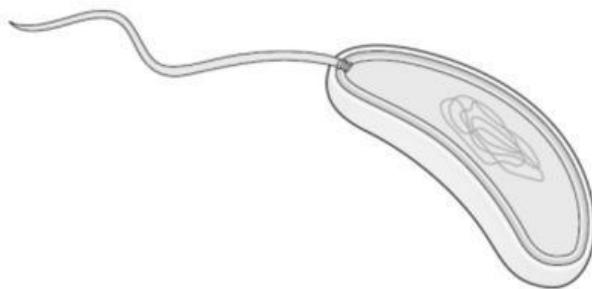
A) Vitamin C B) Iron C) Calcium D) Protein

17. The graph shows changes in the number of bees and mites. In which month are there most bees?



A) April B) June C) August D) October

18. The diagram shows a microorganism with a flagellum. What type of microorganism is most likely shown?



A) Bacterium
B) Virus
C) Protocist
D) Yeast

19. How does keeping food in a refrigerator help it last longer?

A) It kills all microorganisms.
B) It slows down the reproduction and activity of microorganisms.
C) It adds preservatives to the food.
D) It removes oxygen, which microorganisms need.

20. The diagram shows the carbon cycle. Which letter (A, B, C, or D) represents photosynthesis?

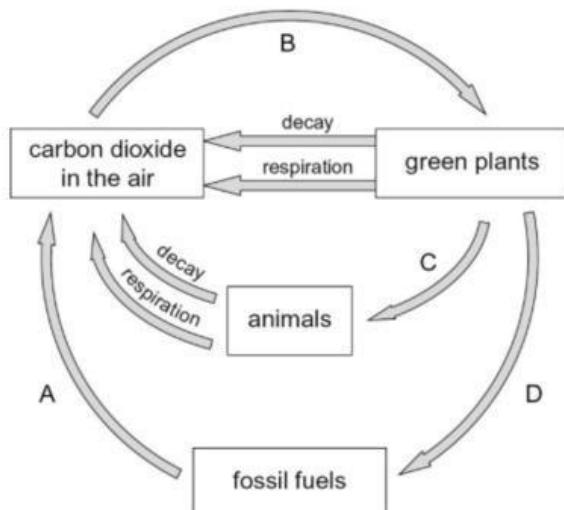
A) A B) B
C) C D) D

21. In the digestive system, what is the process where food enters the mouth called?

A) Digestion B) Absorption
C) Ingestion D) Egestion

22. What is the role of enzymes in digestion?

A) To physically break down food into smaller pieces.
B) To speed up the chemical breakdown of large food molecules into smaller ones.



C) To transport nutrients into the blood.
D) To neutralise stomach acid.

23. Which of these kingdoms consists of organisms that have cell walls made of cellulose and make their own food?

A) Animals B) Fungi C) Plants D) Prokaryotes

24. Which statement correctly describes a difference between inhaled air and exhaled air?

A) Exhaled air has more oxygen and less carbon dioxide.
B) Exhaled air has less oxygen and more carbon dioxide.
C) Exhaled air has less water vapour.
D) Exhaled air has the same composition as inhaled air.

25. Specialised cells in the trachea (windpipe) have cilia and produce mucus. What is the function of these cells?

A) To exchange gases with the blood.
B) To trap dust and pathogens and sweep them away from the lungs.
C) To produce enzymes for digestion.
D) To contract and relax to help breathing.

CHEMISTRY

1 'The movement of a substance very slowly from an area of high concentration to an area of low concentration.'

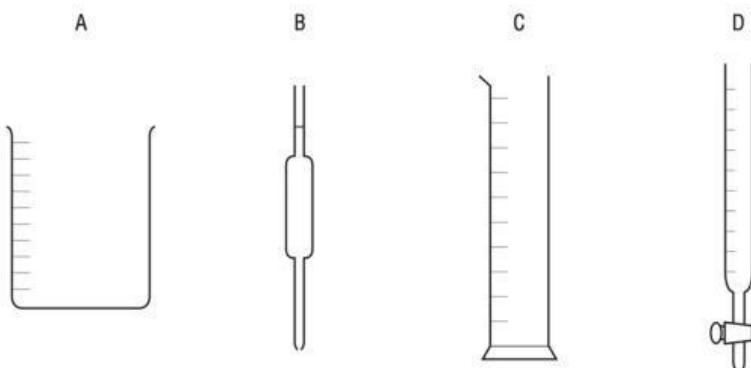
Which process is being described?

A a liquid being frozen B a solid melting
 C a substance diffusing through a liquid D a substance diffusing through the air
 2 Oxygen melts at -219°C and boils at -183°C .

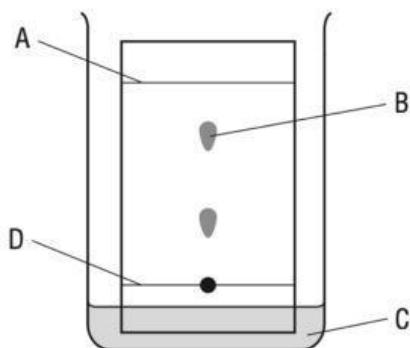
At which temperature is oxygen a liquid?

A -225°C **B** -189°C **C** -175°C **D** 25°C

3 Which diagram shows a burette?



4 In the chromatography experiment shown, which label represents the solvent front?



5 Different methods of separation rely on substances having different properties.

Which property does distillation make use of?

A boiling point B colour C particle size D solubility in different solvents

6 Which element is a non-metal?

A scandium B sodium C strontium D sulfur

7 The relative atomic mass of chlorine is 35.5.

When calculating relative atomic mass, which particle is the mass of a chlorine atom compared to?

A a neutron
B a proton
C an atom of carbon-12
D an atom of hydrogen-1

8 Which process is a physical change?

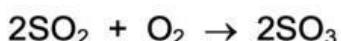
A burning a piece of magnesium B dissolving calcium carbonate in hydrochloric acid
 C melting an ice cube D the rusting of an iron nail

9 Nitrogen, N₂, and hydrogen, H₂, can be converted into ammonia, NH₃, using a catalyst.

What is the purpose of the catalyst?

A to increase the amount of ammonia produced
B to increase the rate of reaction
C to reduce the amount of reactants needed
D to reduce the rate of reaction

10 During the manufacture of sulfuric acid, sulfur dioxide is converted to sulfur trioxide.



Which type of reaction is this?

A displacement B neutralisation
 C combination (synthesis) D thermal decomposition

11 When solid S is heated strongly, it forms gas G.

G turns limewater cloudy.

What are S and G and which type of reaction does S undergo?

	S	G	type of reaction
A	calcium carbonate	carbon dioxide	combustion
B	calcium carbonate	carbon dioxide	thermal decomposition
C	sodium carbonate	oxygen	combustion
D	sodium carbonate	oxygen	thermal decomposition

12 Which of the following represents a neutralization reaction?

A Acid + Base → Salt + Water B Metal + Oxygen → Metal Oxide
 C Acid + Metal → Salt + Hydrogen D Water + Oxygen → Hydrogen Peroxide

13 When a piece of zinc is added to hydrochloric acid, bubbles form. What is responsible for the bubbling?

A Hydrogen gas being released B Oxygen gas being released
 C Zinc evaporating into the air D A reaction between acid and water

14 How can you test for the presence of hydrogen gas?

A Bring a glowing splint near the gas; it will relight if hydrogen is present.
 B Bubble the gas through limewater; it will turn milky if hydrogen is present.
 C Bring a lit splint near the gas; it will produce a 'pop' sound if hydrogen is present.
 D Pass the gas through cobalt chloride paper; it will turn pink if hydrogen is present.

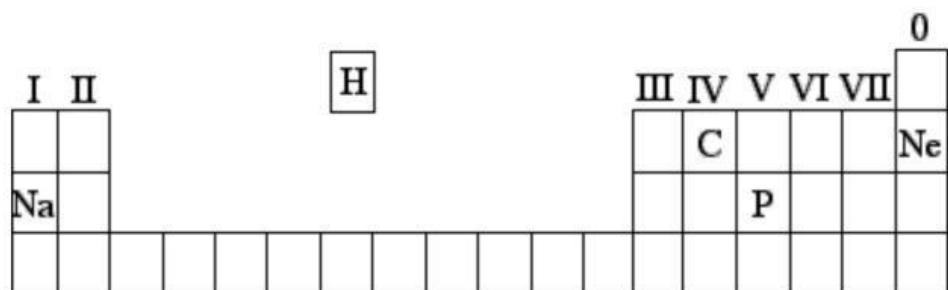
15 What are the two essential substances needed for iron to rust?

A Oxygen and nitrogen B Hydrogen and oxygen
 C Carbon dioxide and water D Water and oxygen

16 Which salt is produced when magnesium reacts with sulfuric acid?

A. Magnesium chloride **B.** Magnesium sulfate
C. Magnesium hydride **D.** Magnesium hydroxide

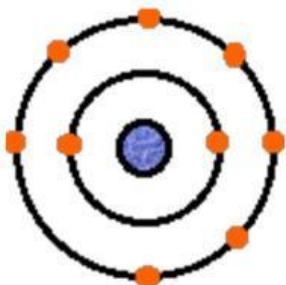
17 Which one of the elements shown in the periodic table below has a full outer shell of electrons?



A. Ne B. C C. P D. Na

18 How many protons are there in the neutral atom shown on the right?

- A. 14
- B. 7
- C. 2
- D. 9



19 The list shows the order of reactivity of some elements.

K Na Ca Mg Zn Fe (H)

Which statement about the reactivity of these metals is correct?

- A Copper reacts with steam to form hydrogen gas.
- B Magnesium is more reactive than calcium.
- C Potassium reacts with water to form hydrogen gas.
- D Sodium oxide is reduced by carbon to sodium.

20 Which substances do not react together?

A calcium + water	B copper + dilute hydrochloric acid
C sodium + water	D zinc + dilute hydrochloric acid