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COMBINED SCIENCE

0653/32

Paper 3 Theory (Core)

February/March 2026

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m/s^2).

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [].
- The Periodic Table is printed in the question paper.

This document has **20** pages.

1 (a) Figure 1.1 is a diagram of a plant cell.

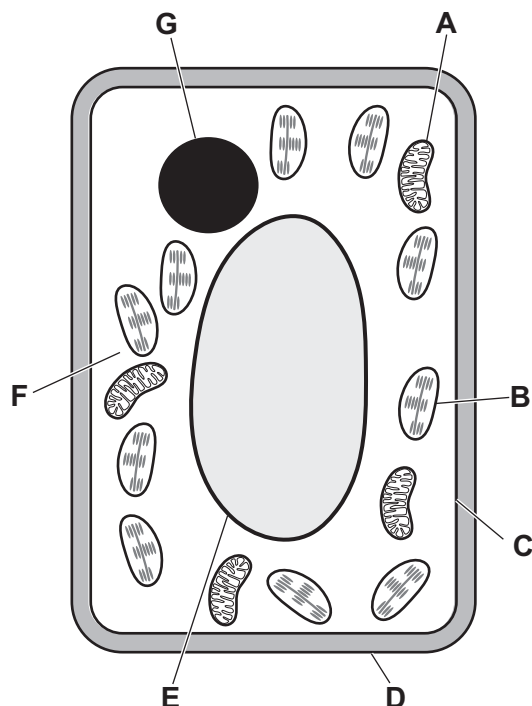


Figure 1.1

(i) State the letter in Figure 1.1 that identifies the part that contains:

the genetic material

sap, and supports the cell.

[2]

(ii) State the letter in Figure 1.1 that identifies the part present in bacterial cells but **not** present in animal cells.

..... [1]

(iii) Complete the word equation for the chemical reaction that occurs in the part labelled **A** in Figure 1.1.



[2]



(b) Some bacteria are pathogens.

(i) Describe what is meant by a pathogen.

.....
..... [1]

(ii) State the name of the type of drug that is used to kill bacteria.

..... [1]

(iii) The skin is an example of a body defence against pathogens.

State **two** other body defences against pathogens.

1
2 [2]

[Total: 9]

- 2 (a) Figure 2.1 is a graph showing the effect of temperature on the activity of enzyme **A** and enzyme **B**.

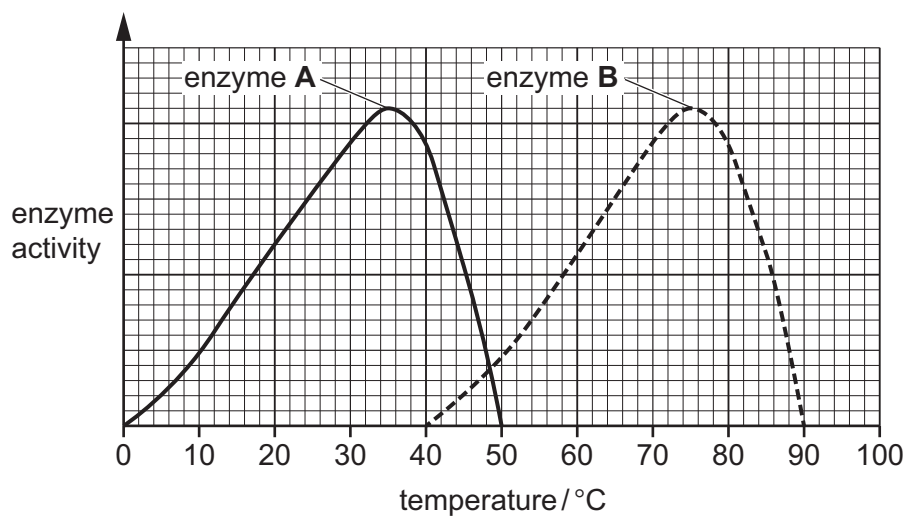


Figure 2.1

- (i) Identify the temperature that gives the highest enzyme activity for enzyme **A** in Figure 2.1.

..... °C [1]

- (ii) Identify the temperature range where both enzyme **A** and enzyme **B** are active in Figure 2.1.

from °C to °C [1]



(b) Enzymes are proteins.

Proteins are large molecules required by the body.

(i) Table 2.1 shows some large molecules and the smaller molecules they are made from.

Complete Table 2.1.

One row has been done for you.

Table 2.1

large molecules	smaller molecules
fats and oils	fatty acids and glycerol
protein	
starch	

[2]

(ii) State the **four** chemical elements present in all proteins.

..... [2]

(c) Fats, proteins and carbohydrates are important nutrients in a balanced diet.

(i) Describe the importance of carbohydrates in the diet.

.....
 [1]

(ii) State the name of **two** other types of nutrient in a balanced diet.

1
 2 [2]

[Total: 9]

3 (a) Deforestation is an example of habitat destruction that reduces biodiversity.

(i) Complete the sentence to describe biodiversity.

Biodiversity is the of different

..... that live in an area.

[2]

(ii) Describe **one** reason why habitats are destroyed.

.....

..... [1]

(iii) State **two** other undesirable effects of deforestation.

1

2 [2]

(b) Figure 3.1 is a food chain from a desert ecosystem.

cactus → rat → snake → hawk

Figure 3.1

Table 3.1 shows some terms that are used to describe the organisms in the food chain in Figure 3.1.

Complete Table 3.1 by placing ticks (✓) in the boxes to show all the terms used to describe each organism in the food chain in Figure 3.1.

One row has been done for you.

Table 3.1

organism	producer	herbivore	secondary consumer	carnivore
cactus				
rat				
snake				
hawk				✓

[4]

[Total: 9]





Turn over



- 4 (a) In an experiment, a student adds excess dilute hydrochloric acid, HCl , to solid copper carbonate, CuCO_3 .

The apparatus used is shown in Figure 4.1.

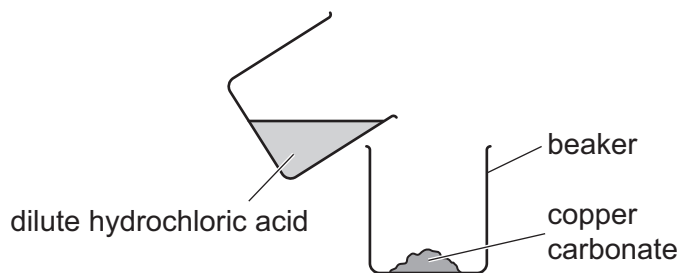
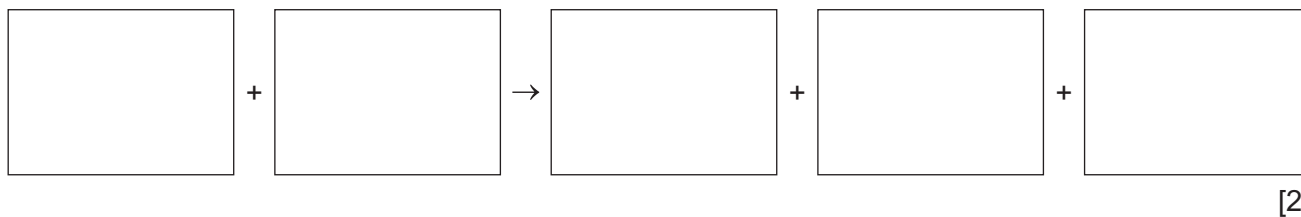


Figure 4.1

- (i) State **one** observation the student makes to show that a chemical reaction occurs in this experiment.

..... [1]

- (ii) Give the word equation for this reaction.



- (iii) State **two** ways to decrease the rate of this reaction.

1

2 [2]

- (iv) Dilute hydrochloric acid is tested with universal indicator.

Complete the sentences.

In a neutral solution, the colour of universal indicator is

In dilute acid, the colour of universal indicator turns [2]



(b) Hydrogen chloride, HCl , is a gas that dissolves in water to form dilute hydrochloric acid.

Complete the dot-and-cross diagram in Figure 4.2 to show the bonding in a molecule of hydrogen chloride.

Show **only** the outer-shell electrons.

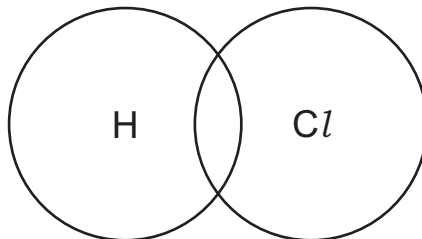


Figure 4.2

[2]

[Total: 9]

- 5 (a) Figure 5.1 shows part of Group I of the Periodic Table.

3 Li lithium 7
11 Na sodium 23
19 K potassium 39

Figure 5.1

- (i) Use Figure 5.1 to determine:

the electronic configuration of an atom of sodium

.....

the number of neutrons in an atom of potassium.

.....

[2]

- (ii) Explain why an atom of lithium has a neutral charge.

.....

.....

..... [2]

- (b) There are trends in the properties of the elements down Group I.

Describe **two** of these trends.

1

2

[2]

- (c) Transition elements are metals.

State **one** general property of transition elements that is different to the general properties of Group I.

..... [1]





(d) Brass and stainless steel are alloys.

Complete the sentences about these alloys.

Brass is a mixture of copper and

The main metal in stainless steel is mixed with other elements such as chromium, nickel and carbon.

[2]

[Total: 9]



- 6 (a) Ethane is an alkane.

Figure 6.1 shows the structure of ethane.

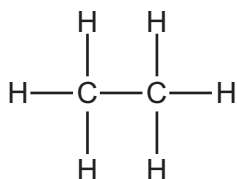


Figure 6.1

- (i) Deduce the molecular formula for ethane.

..... [1]

- (ii) The boiling point of ethane is -89°C .

Circle the state symbol for ethane at 20°C .

(aq)

(g)

(l)

(s)

[1]

- (iii) Tick (✓) **all** the statements in Table 6.1 that are true for ethane.

Table 6.1

statement	true
It is the main constituent of natural gas.	
It contains covalent bonds.	
It is saturated.	
It reacts with aqueous bromine.	

[2]



(b) Methane is another alkane.

During combustion, methane burns in excess oxygen to form carbon dioxide and water.

Balance the symbol equation for this reaction.



[1]

(c) Methane burns in a limited supply of oxygen to form carbon monoxide and particulates.

(i) Name this type of combustion.

..... [1]

(ii) Describe **one** adverse effect of carbon monoxide and **one** adverse effect of particulates.

carbon monoxide

particulates

[2]

[Total: 8]

- 7 (a) Figure 7.1 shows the distance–time graph for a car on a journey.

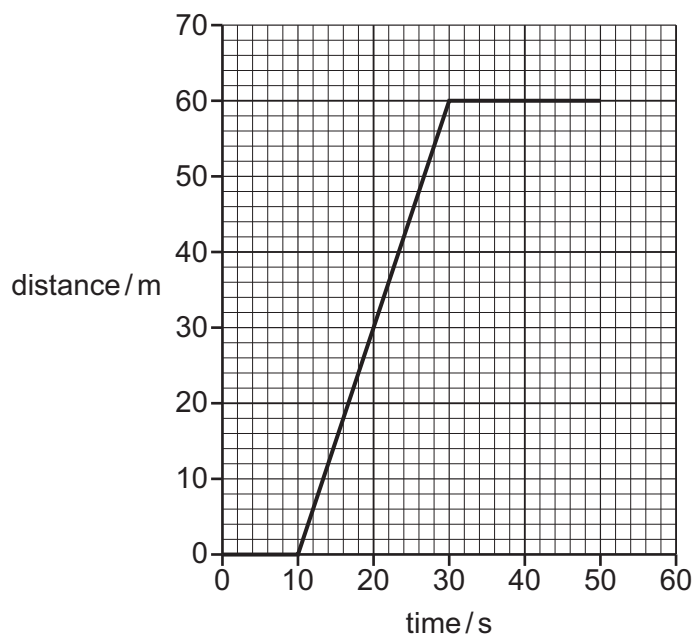


Figure 7.1

- (i) Calculate the speed of the car between 10 s and 30 s in Figure 7.1.

speed = m/s [2]

- (ii) Describe the motion of the car between 30 s and 50 s in Figure 7.1.

..... [1]



- (b) Figure 7.2 shows all the horizontal forces acting on the car while it is moving forwards on a different journey.

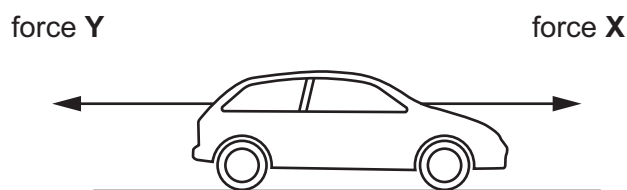


Figure 7.2

Force **X** is 6000 N. Force **Y** is 6000 N.

- (i) Describe the motion of the car in Figure 7.2.

..... [1]

- (ii) State the name of force **Y** in Figure 7.2.

..... [1]

- (c) (i) The weight of the car is 7800 N.

The total area of the car tyres in contact with the ground is 650 cm^2 .

Calculate the pressure exerted by the car on the ground.

pressure = N/cm^2 [2]

- (ii) The car is parked in direct sunlight on a hot day.

The temperature of the car tyres increases.

Describe the effect this increase in temperature has on the motion of the air particles inside the tyres.

.....
 [1]

[Total: 8]



8 (a) Figure 8.1 shows a wave.

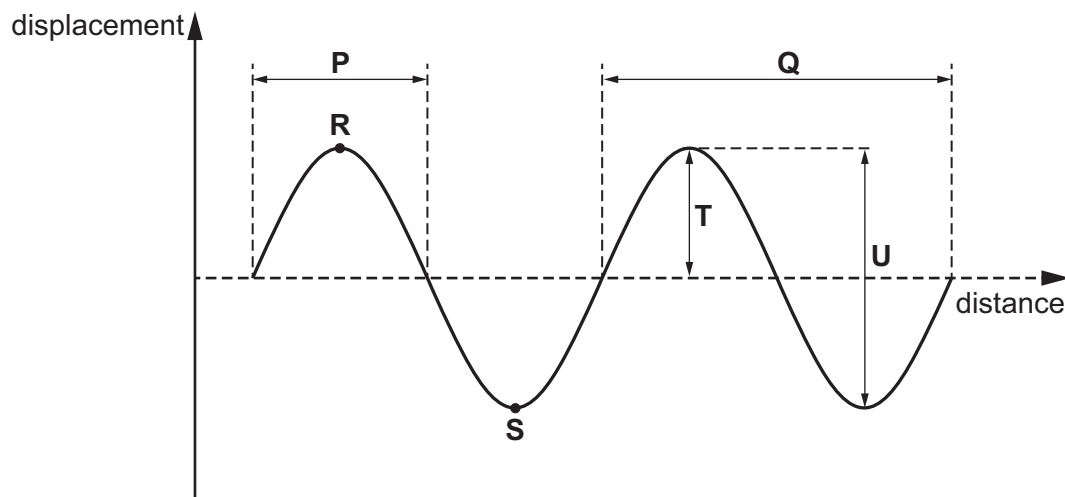


Figure 8.1

(i) State the letter in Figure 8.1 that labels:

a crest (peak)

the wavelength

the amplitude.

[3]

(ii) A radio station broadcasts radio waves of wavelength 750 m.

The radio waves travel at a speed of 3.0×10^8 m/s.

Calculate the frequency of the radio waves.

State the unit.

frequency = unit [3]



(b) Figure 8.2 shows an electric kettle a student uses to boil water.

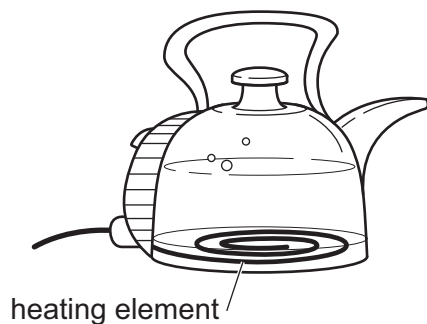


Figure 8.2

- (i) The kettle has a power of 2.0 kW. The student uses the kettle for 6.0 hours during a week.

Electricity costs \$0.25 per kWh.

Calculate the cost of using the kettle.

cost = \$ [2]

- (ii) The water in the kettle is heated by a metal heating element at the bottom of the kettle.

Use the words to complete the descriptions of the thermal energy transfers in the kettle.

Use each word only once.

conduction

convection

radiation

Thermal energy is transferred through the heating element mainly

by

Thermal energy is transferred through the water mainly

by

Thermal energy is transferred from the outer surface of the kettle to the student

standing to the side of the kettle by

[2]

[Total: 10]

- 9 (a) A student uses the circuit in Figure 9.1 to determine the resistance of resistor **K**.

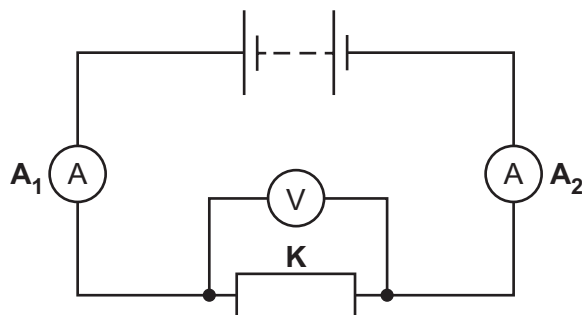


Figure 9.1

The reading on the voltmeter is 9.0 V.

The reading on ammeter **A**₁ is 1.5 A.

- (i) Complete the sentence.

Current is related to the flow of

[1]

- (ii) State the reading on ammeter **A**₂ in Figure 9.1.

Give a reason for your answer.

reading = A

reason

.....

[1]

- (iii) Calculate the resistance of resistor **K** in Figure 9.1.

resistance = Ω [2]





(b) The Sun is mostly made of two gases.

Circle these **two** gases.

chlorine

helium

hydrogen

nitrogen

oxygen

[1]

(c) An object has a weight of 72 N on the Moon.

The gravitational field strength of the Moon is 1.6 N/kg.

Calculate the weight of the object on Earth.

weight = N [4]

[Total: 9]

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The Periodic Table of Elements

[illegible]

lanthanoids

actinoids

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).