Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
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8	
9	
10	
11	
12	
TOTAL	

General Certificate of Secondary Education
Foundation Tier
January 2013

Additional Science 2

AS2FP

Unit 6

F

Friday 25 January 2013 1.30 pm to 3.00 pm

For this paper you must have:
- a ruler
- a calculator
- the Chemistry Data Sheet and Physics Equations Sheet Booklet (enclosed).

Time allowed
- 1 hour 30 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 90.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 11 should be answered in continuous prose. In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

Biology Questions

1 This question is about respiration.

1 (a) (i) Complete the word equation for aerobic respiration.

Choose the correct answers from the box.

carbon dioxide	**enzymes**	**protein**	**water**

glucose + oxygen → ..... + ... (+ energy)

(2 marks)

1 (a) (ii) All cells respire.

Draw a ring around the correct answer in the box to complete the sentence.

Respiration is important to all cells because respiration

- uses oxygen.
- releases energy.
- uses glucose.

(1 mark)

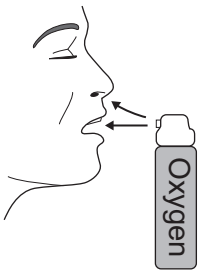
1 (b) In which part of a cell do most of the reactions in aerobic respiration happen?

Draw a ring around the correct answer.

cell membrane **mitochondria** **nucleus**

(1 mark)

1 (c) A sports centre sells oxygen in a can.



Some fitness instructors say that if you breathe in extra oxygen after exercise you will recover more quickly.
Two people, **A** and **B**, investigated this statement.

Before exercise:

- **A** and **B** measured their heart rates at rest.

A and **B** then ran on treadmills at the sports centre.

After running on the treadmills:

- person **A** breathed in extra oxygen from a can
- person **B** breathed in normal air.

A and **B** measured the time for their heart rates to return to the resting rates.

1 (c) (i) Give **three** ways the investigation could have been improved.

Tick (✓) **three** boxes.

A and B should…	Tick (✓)
run for the same time.	
use the same sports centre.	
have the same fitness instructor.	
run at the same speed.	
be the same sex.	
wear the same colour running shoes.	

(3 marks)

1 (c) (ii) Using a heart monitor is better than taking the pulse by hand.

Why?

.....

.....

(1 mark)

8

Turn over ▶

2 Long protein fibres can make meat tough to eat.
Tough pieces of meat can be softened.
Two ways of softening meat are described below.

Using a hammer:
- Hit meat hard with a hammer for 15 minutes.
- This breaks some of the long protein fibres.

Using papaya leaves:
- Wrap meat in papaya leaves.
- Keep in a warm place for 24 hours.
- Enzymes from the leaves break down most of the long protein fibres.
- There is a risk that bacteria in the meat will produce poisons over the 24 hours.

2 (a) Use **only** the information above to answer these questions.

In your answers to this question you must make comparisons between the two ways.

2 (a) (i) Suggest **two** advantages of using a hammer and **not** using papaya leaves to soften meat.

1 .....

.....

2 .....

.....

(2 marks)

2 (a) (ii) Suggest **one** advantage of using papaya leaves and **not** a hammer to soften meat.

.....

.....

(1 mark)

2 (b) Which enzyme in the papaya leaves breaks down the long protein fibres in meat?

Draw a ring around the correct answer.

carbohydrase **lipase** **protease**

(1 mark)

2 (c) The meat wrapped in papaya leaves is put in a warm place, and **not** in a cold place.

Why?

.....

.....

(1 mark)

2 (d) Another way of softening meat is to heat it at 80 °C for three hours.

Heating meat wrapped in papaya leaves at 80 °C does **not** soften meat faster than heating the meat at 80 °C without the leaves.

Why do enzymes **not** work at 80 °C?

.....

.....

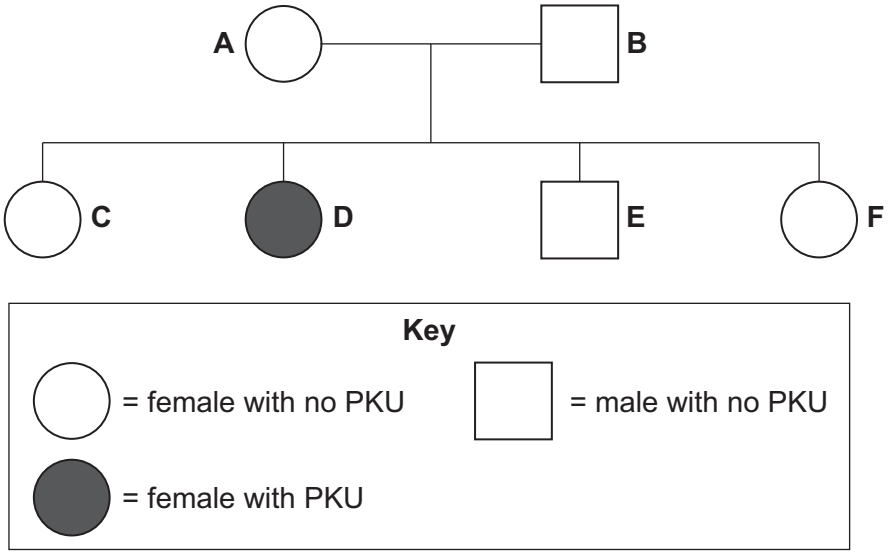
(1 mark)

6

Turn over for the next question

3 PKU is a genetic disorder.

The diagram shows a family tree. One member of the family has PKU.



3 (a) The symbol  is not shown in the key.

Describe the person this symbol would represent.

Use information from the key to help you.

.....

.....

(1 mark)

3 (b) Parents **A** and **B** do **not** have PKU.
Child **D** has PKU.

What does the information in the family tree tell you about the allele for PKU?

Draw a ring around the correct answer in the box to complete the sentence.

The allele for PKU is

recessive.
strong.
dominant.

(1 mark)

3 (c) Parents **A** and **B** produce gametes.

3 (c) (i) Name **one** organ in the body where gametes are produced.

.....

(1 mark)

3 (c) (ii) Human body cells contain 46 chromosomes.

How many chromosomes are there in a human gamete?

.....

(1 mark)

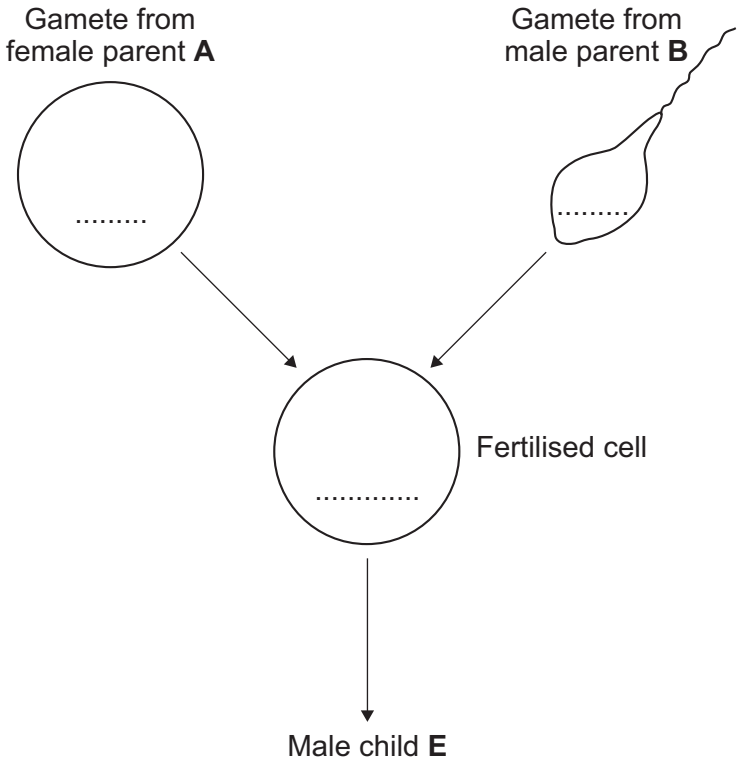
3 (d) Child **E** is male.

Complete the diagram to show:

- the sex chromosomes in each gamete
- the sex chromosomes in the fertilised cell.

Use the symbols **X** and **Y** to represent the sex chromosomes.

Write your answers on the lines on the diagram.



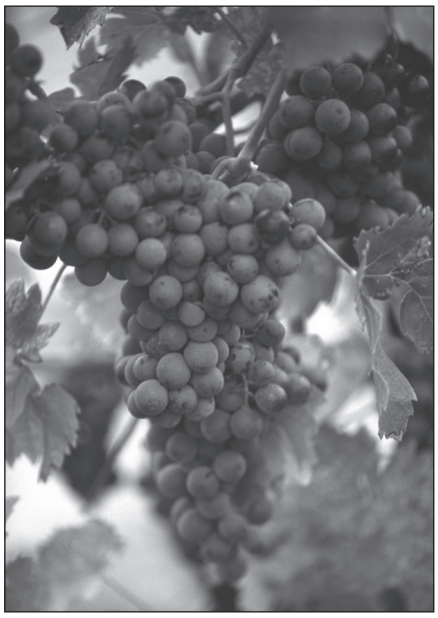
(3 marks)

7

Turn over ▶

Chemistry Questions

4 Copper sulfate solution is sprayed on grapes to stop the growth of fungi.



4 (a) Copper sulfate is made by reacting copper oxide with an acid.

The equation for the reaction is:

$$CuO(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + H_2O(l)$$

4 (a) (i) The formula of the acid used to make copper sulfate is H_2SO_4

What is the name of this acid?

.....

(1 mark)

4 (a) (ii) Which substance in the reaction is a solid?

.....

(1 mark)

4 (a) (iii) Use the correct word from the box to complete the sentence.

crystallising	**dissolving**	**filtering**

Solid copper sulfate can be obtained by .....copper sulfate solution.
(1 mark)

4 (b) White anhydrous copper sulfate can be used to test for water.

Hydrated copper sulfate is produced.

The word equation for the reaction is:

anhydrous copper sulfate + water $\rightleftharpoons$ hydrated copper sulfate

Complete the following sentences.

4 (b) (i) Water is added to anhydrous copper sulfate.

The colour changes from white to ..... .
(1 mark)

4 (b) (ii) The symbol $\rightleftharpoons$ shows that the reaction is ..... .
(1 mark)

5

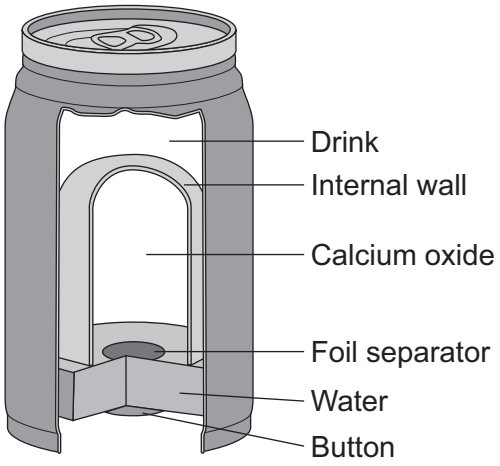
Turn over for the next question

5 Read the information in the box.

A self-heating can is used to make a coffee drink hot.

Can

Diagram showing inside of the can



- To heat the drink, the button is pressed.
- Pressing the button breaks the foil separator.
- The water and calcium oxide mix and react.
- Calcium hydroxide is produced.
- The reaction gives out heat energy.
- The heat is used to warm the drink to 60 °C.

The walls of the can are insulated.
The insulation stops the outside of the can becoming hot.

The drink is added to the can in one factory.
Calcium oxide and water are added to the can at a different factory.

5 (a) Draw a ring around the correct answer to complete the sentence.

The reaction used to heat the drink is

endothermic.

exothermic.

neutralisation.

(1 mark)

5 (b) Complete the word equation for the reaction that takes place between calcium oxide and water.

Use information from the box.

calcium oxide + ... → .....

(1 mark)

5 (c) Give **two** safety features in the way the can is designed and manufactured.

Use the information in the box to help you.

1 .....

.....

2 .....

.....

(2 marks)

Question 5 continues on the next page

5 (d) A scientist investigated three forms of calcium oxide.

The forms were powdered, small lumps and large lumps.

The scientist wanted to find out which form of calcium oxide is the best to use in the self-heating can.

The scientist:

- used three cans
- put a different form of calcium oxide in each can
- pressed the button on each can
- recorded the temperature of the drink in each can after three minutes.

The results are shown in the table.

Form of calcium oxide	Temperature of the drink after three minutes in °C
Powdered	98
Small lumps	62
Large lumps	32

5 (d) (i) The scientist controlled variables to make a fair test.

Suggest **one** variable the scientist should keep the same for each form of calcium oxide.

.....

.....

(1 mark)

5 (d) (ii) Which form of calcium oxide should be used in the can?

Give the reason for your answer.

Form of calcium oxide .....

Reason .....

.....

(2 marks)

5 (e) (i) Which form of calcium oxide results in the fastest reaction?

.....

(1 mark)

5 (e) (ii) Why does this form of calcium oxide result in the fastest reaction?

Tick (✓) **one** box.

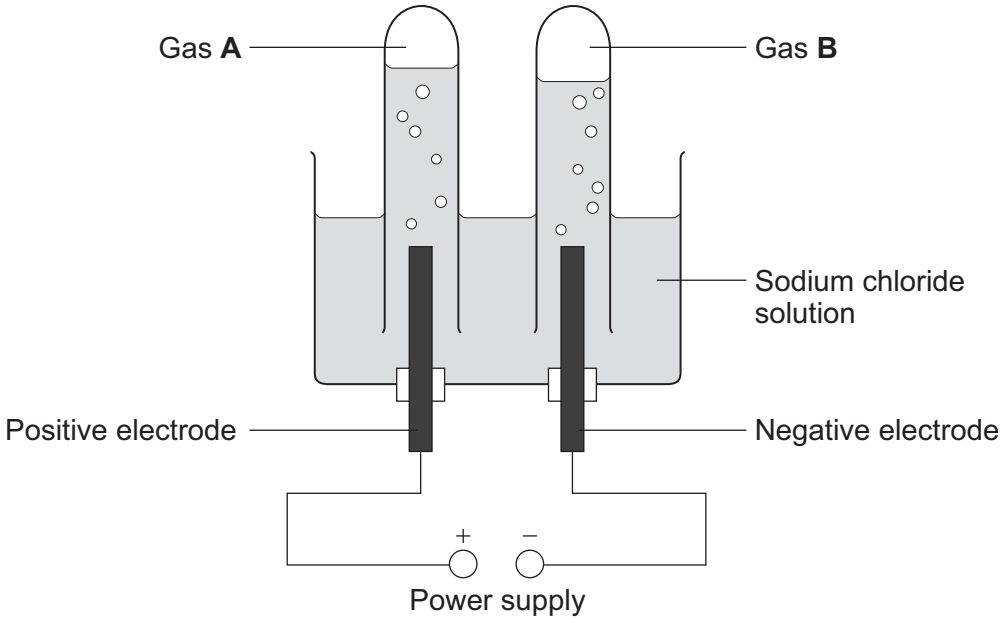
This form of calcium oxide . . .	**Tick (✓)**
has the largest particle size.	
has the largest surface area.	
is acidic.	

(1 mark)

9

Turn over for the next question

6 The diagram shows the electrolysis of sodium chloride solution.



6 (a) Draw a ring around the correct answer in each box to complete each sentence.

6 (a) (i) The electrolyte is

gas **A**.
sodium chloride solution.
an electrode.

(1 mark)

6 (a) (ii) Sodium chloride solution conducts electricity.

This is because the

atoms
ions
molecules

are free to move about.

(1 mark)

6 (b) (i) Use words from the box to complete each sentence.

chlorine	hydrogen	oxygen	sodium hydroxide	sodium sulfate

During the electrolysis of sodium chloride solution, the gases

..... and ..... are formed.

A solution of ..... is also produced.

(3 marks)

6 (b) (ii) The electrolysis of sodium chloride solution is an important industrial process.

Which **two** substances can be made from the products of the electrolysis of sodium chloride solution?

Tick (✓) **two** boxes.

Substance	Tick (✓)
Bleach	
Petrol	
Soap	
Aluminium	

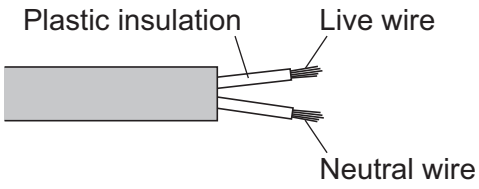
(2 marks)

7

Turn over for the next question

Physics Questions

7 (a) The diagram shows the structure of a two-core cable used to connect a plug to a television.



7 (a) (i) Plastic insulation is used to cover each of the wires.

What colour is the plastic insulation?

On the live wire .....

On the neutral wire .....

(2 marks)

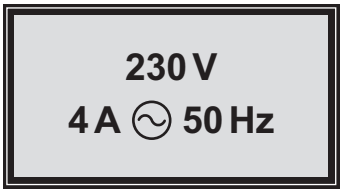
7 (a) (ii) Why is the wire made from copper?

.....

.....

(1 mark)

7 (b) The diagram shows part of a label found on a television.



Draw a ring around the correct answer in each box to complete each sentence.

7 (b) (i) Mains electricity supplies an alternating [current. / resistance. / power.]

(1 mark)

7 (b) (ii) The mains electricity supply has a [potential difference / frequency / time period] of 50 hertz (Hz).

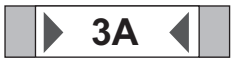
(1 mark)

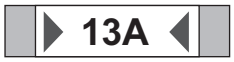
7 (c) Use the information from the label in part **(b)** to answer the following questions.

7 (c) (i) A fuse with the correct rating must be fitted to the television.

Which is the correct fuse to use in the plug?

Draw a ring around the correct fuse.





(1 mark)

7 (c) (ii) What will happen to the fuse if the current exceeds the rating of the fuse?

.....

.....

(1 mark)

7 (c) (iii) Calculate the electrical power of the television.

Use the correct equation from the Physics Equations Sheet.

Show clearly how you work out your answer.

Draw a ring around the correct unit for your answer.

.....

.....

.....

.....

.....

Power = ... J V W

(3 marks)

10

Turn over ▶

8 The Health Protection Agency (HPA) helps to monitor background radiation levels in homes in the UK.

Radon gas is one source of background radiation. Radon gas comes from rocks containing uranium.

8 (a) (i) Name **one** other source of background radiation.

.....

(1 mark)

8 (a) (ii) The element radon has at least 35 different isotopes.

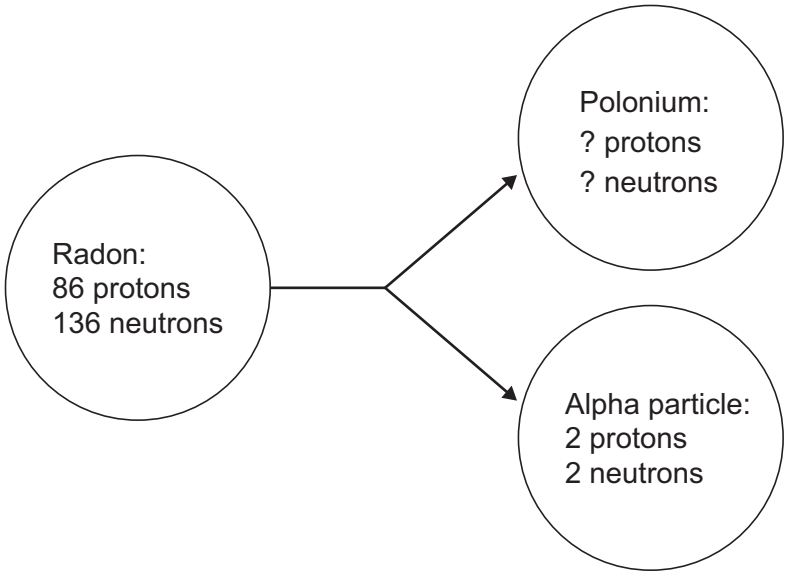
Draw a ring around the correct answers to complete the sentence.

The nuclei in isotopes of radon have the same number of | protons | neutrons | electrons | but a different number of | protons. | neutrons. | electrons.

(2 marks)

8 (a) (iii) Radon gas decays to an isotope of polonium by emission of an alpha particle.

An alpha particle consists of 2 protons and 2 neutrons. These protons and neutrons come from the nucleus of the radon.



How many protons and neutrons are in polonium?

Use information from the diagram.

Number of protons .....

Number of neutrons .....

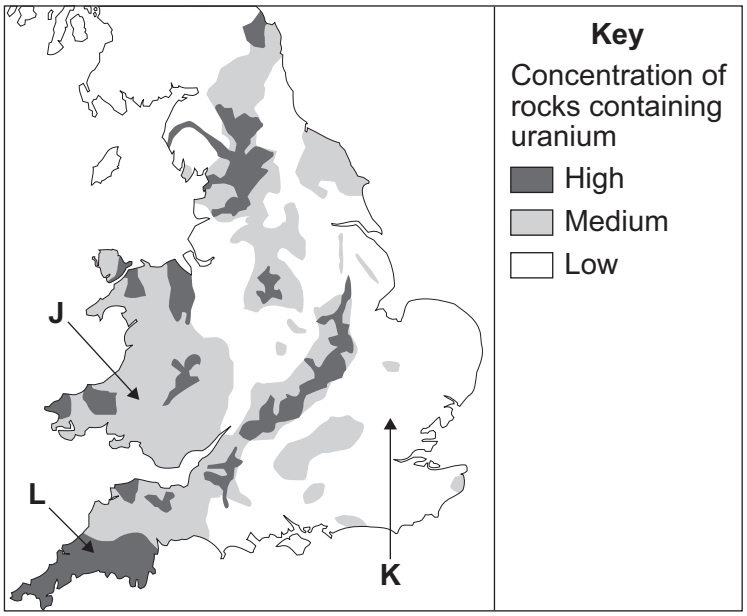
(2 marks)

Question 8 continues on the next page

8 (b) The HPA is concerned that the level of radon gas inside some homes is too high and could be dangerous to people in the home.

The HPA sends out radiation detectors to houses at risk from high levels of radon gas.

The map shows the concentration of rocks containing uranium in different parts of England and Wales.



8 (b) (i) The HPA decided to investigate area **L** for radiation levels first.

Suggest why.

.....

.....

(1 mark)

8 (b) (ii) The HPA sends homeowners **two** radiation detectors. The detectors measure the radiation level.

The table shows the time spent in a room by a person in one day.

Room	Time spent in room in hours
Bedroom	8.0
Kitchen	1.5
Bathroom	0.5
Living Room	3.0

Which **two** rooms should the homeowners put the detectors in?

Explain your answer.

Room 1 ..... Room 2 .....

Explanation .....

.....

.....

.....

(3 marks)

8 (b) (iii) After 3 months the radiation detectors are sent back to the HPA.

The HPA analyses the detectors and writes a report. The report gives advice to the people who live in the house.

The HPA is an independent agency.

Why is it important the advice comes from an independent agency?

Tick (✓) **one** box.

Reason	Tick (✓)
The agency offers unbiased advice.	
The agency will tell the homeowners what to do.	
The agency will carry out the work needed if the radon gas levels are too high.	

(1 mark)

10

Turn over for the next question

Biology Questions

9 Evidence for early life comes from fossils.

9 (a) (i) What is a fossil?

.....

.....

.....

.....

.....

(2 marks)

9 (a) (ii) We do **not** have a complete fossil record from the beginning of life on Earth.

Suggest **two** reasons why.

.....

.....

.....

.....

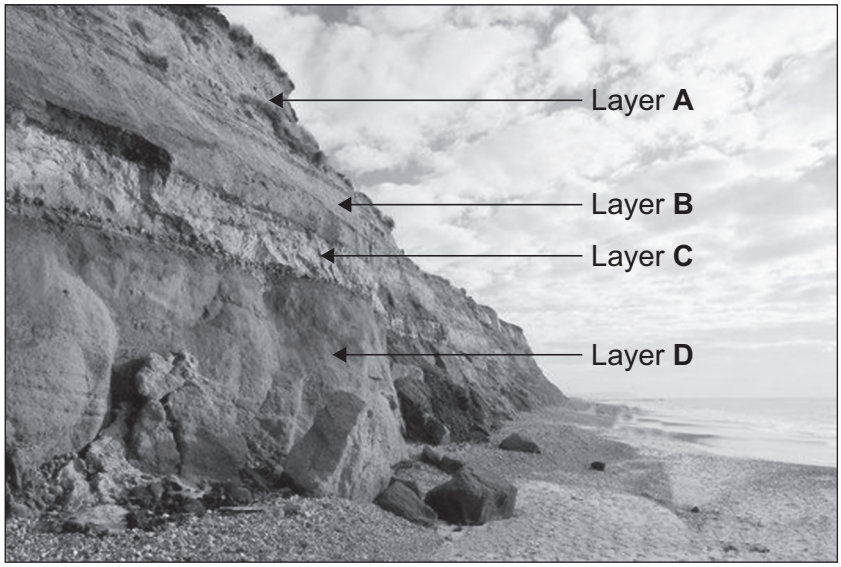
.....

(2 marks)

9 (b) The sea erodes cliffs at the coast. Some cliffs have layers of rocks.

The diagram shows a cliff at the coast.

The cliff has four layers of rock, **A**, **B**, **C** and **D**, that contain fossils.



Which layer of rock, **A**, **B**, **C** or **D**, is likely to contain the oldest fossils?

Write your answer in the box. ☐

Explain your answer.

.....

.....

(2 marks)

9 (c) The fossil record shows that some animals have become extinct.

Give **three** possible reasons why animals become extinct.

.....

.....

.....

.....

.....

.....

(3 marks)

9

Chemistry Questions

10 Phenolphthalein solution is colourless in acid and in neutral solution. Phenolphthalein solution is used as an indicator.

10 (a) (i) Complete the following sentence.

Phenolphthalein solution turns pink when added to a solution of ammonia because

ammonia is .....

(1 mark)

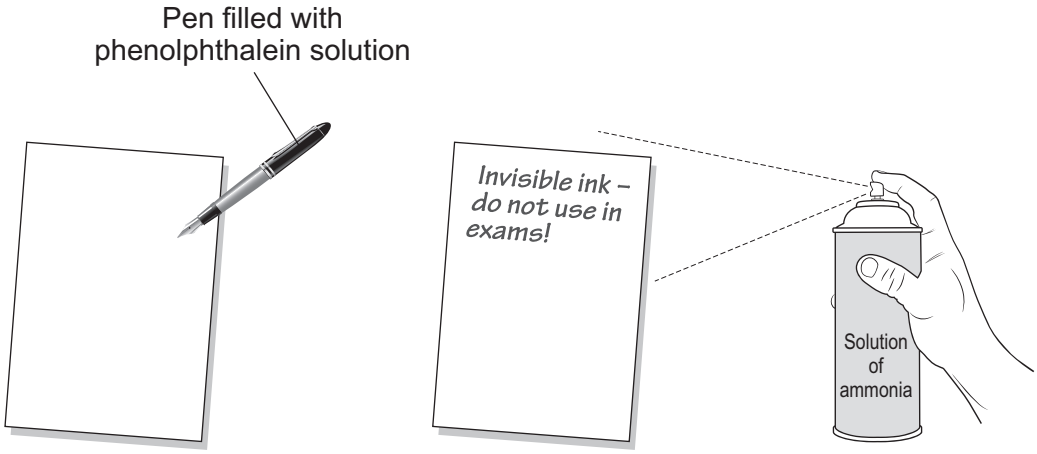
10 (a) (ii) Draw a ring around the correct answer to complete the sentence.

Phenolphthalein solution changes from colourless to pink. This change is caused by

the presence of | H^+ | O^{2-} | OH^- | ions in the ammonia solution.

(1 mark)

10 (b) Phenolphthalein solution can be used as invisible ink.



Phenolphthalein solution can be used as invisible ink.

Suggest why.

.....

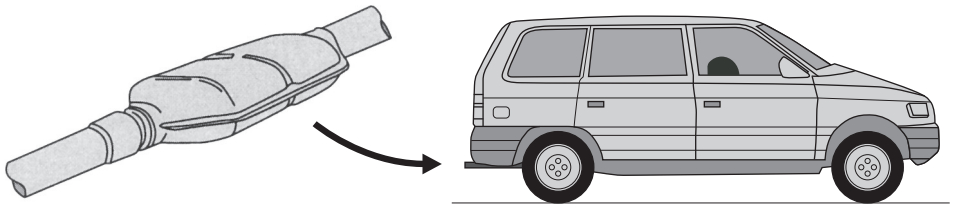
.....

(1 mark)

3

11 *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Platinum is used as a catalyst in industry and in catalytic converters in cars.



A catalyst lowers the activation energy required for a reaction. The activation energy is the minimum amount of energy required for a reaction to take place.

Use this information and your knowledge of catalysts to explain why many **industrial processes** use catalysts.

Suggest why platinum is used as a catalyst even though it is a very expensive metal.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

6

Physics Questions

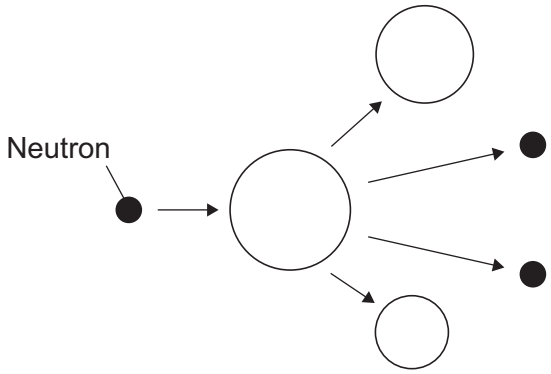
12 (a) Nuclear fission is used in nuclear power stations to generate electricity.

12 (a) (i) Name **one** nuclear fuel that is commonly used in a nuclear reactor.

.....

(1 mark)

12 (a) (ii) The diagram shows a simplified fission reaction in a nuclear power station.



Using the diagram, describe fully the stages of a fission reaction in a nuclear reactor.

.....

.....

.....

.....

.....

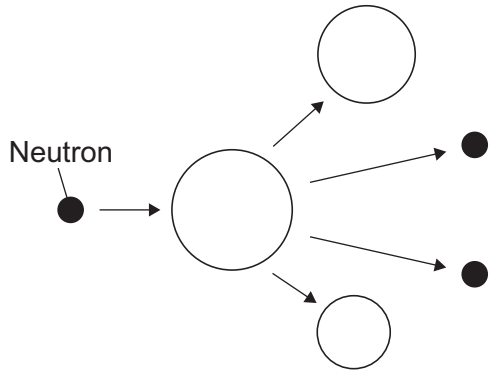
.....

.....

.....

(4 marks)

12 (a) (iii) Complete the diagram below to show the next stage in a chain reaction.



(2 marks)

Question 12 continues on the next page

12 (b) Nuclear fusion takes place in stars.

12 (b) (i) What is nuclear fusion?

.....

.....

(1 mark)

12 (b) (ii) Stars like our Sun convert mass to energy at a rate of 400 million kg every second.

Why are stars able to maintain their energy output for millions of years?

.....

.....

(1 mark)

12 (b) (iii) Fusion reactions need temperatures over 1 000 000 degrees Celsius.

Nuclear fusion is **not** used in nuclear power stations to produce electricity.

Suggest **one** reason why.

.....

.....

(1 mark)

10

END OF QUESTIONS