

Write your name here	
Surname	Other names
Pearson BTEC Level 1/Level 2 First Award	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Centre Number <div style="display: flex; border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"> <div style="flex: 1; border: 1px solid black; width: 15%;"></div> <div style="flex: 1; border: 1px solid black; width: 15%;"></div> <div style="flex: 1; border: 1px solid black; width: 15%;"></div> <div style="flex: 1; border: 1px solid black; width: 15%;"></div> <div style="flex: 1; border: 1px solid black; width: 15%;"></div> <div style="flex: 1; border: 1px solid black; width: 15%;"></div> </div> </div> <div style="width: 45%;"> Learner Registration Number <div style="display: flex; border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"> <div style="flex: 1; border: 1px solid black; width: 15%;"></div> <div style="flex: 1; border: 1px solid black; width: 15%;"></div> <div style="flex: 1; border: 1px solid black; width: 15%;"></div> <div style="flex: 1; border: 1px solid black; width: 15%;"></div> <div style="flex: 1; border: 1px solid black; width: 15%;"></div> <div style="flex: 1; border: 1px solid black; width: 15%;"></div> </div> </div> </div>
<h1 style="margin: 0;">Applied Science</h1> <h2 style="margin: 0;">Unit 1: Principles of Science</h2>	
Tuesday 4 March 2014 – Morning Time: 1 hour	Paper Reference <h2 style="margin: 0;">20460E</h2>
<div style="border: 1px solid black; padding: 5px; min-height: 40px;"> You will need a calculator and a ruler. </div>	<div style="border: 1px solid black; padding: 5px; min-height: 40px;"> Total Marks </div>

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and learner registration number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 54.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

P44055A

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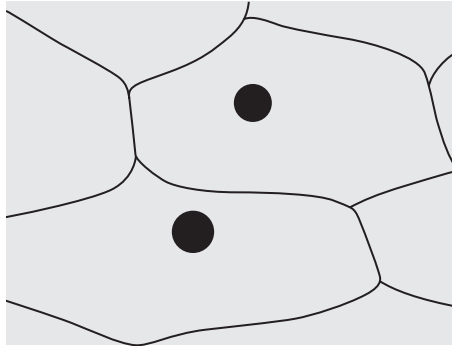


PEARSON

Some questions must be answered with a cross in a box ☒.
If you change your mind about your answer, put a line through the box ☒ and then
put a cross in another box ☒.

SECTION A: Biology

- 1 This is a diagram of a group of cells.



- (a) (i) Draw a line to label a nucleus on the diagram.

(1)

- (ii) Name the structures in the nucleus that contain DNA.

(1)

- (b) Give the name of a group of specialised cells that are similar and work together to carry out a particular function.

(1)

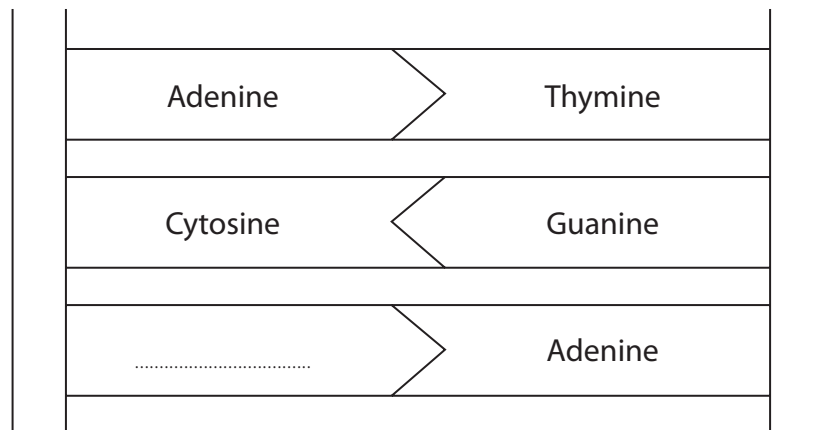


(c) DNA contains a sequence of base pairs.

A section of DNA is shown in the diagram.

Complete the diagram by filling in the missing base.

(1)



(Total for Question 1 = 4 marks)



P 4 4 0 5 5 A 0 3 2 0

2 The body is controlled by two organ systems.

(a) (i) Name the organ system that is made up of the brain and the spinal cord.

(1)

.....

(ii) Name the organ system containing glands that release hormones.

(1)

.....

(b) The simple reflex arc is important in protecting the body from harm.

Fill in the missing components of the reflex arc.

(i) Receptor →

.....

→ spinal cord

(1)

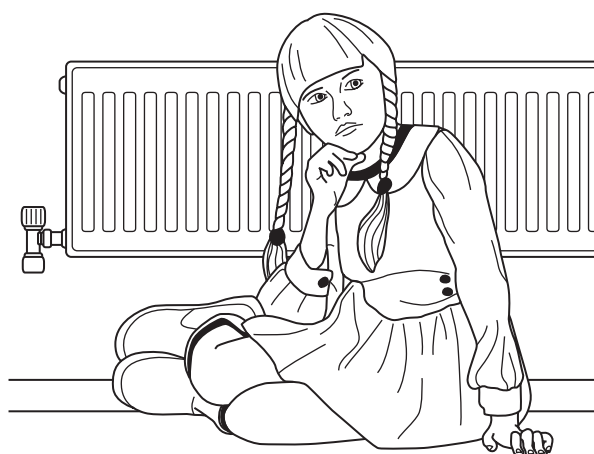
(ii) Spinal cord →

.....

→ effector

(1)





- (c) Julie is sitting in a hot room and her skin goes red. Her body temperature stays the same.

Explain **one** reason why Julie's body temperature stays the same.

(2)

.....

.....

.....

.....

(Total for Question 2 = 6 marks)





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3 Eye colour is determined by alleles.

The allele (B) for brown eyes is dominant.

The allele (b) for blue eyes is recessive.

A man and a woman both have one dominant and one recessive allele. This means they both have brown eyes.

(a) Complete the Punnett square to show the alleles their children may have.

(2)

		Woman	
		B	b
Man	B	BB	Bb
	b		

(b) A long-haired male cat is bred with a short-haired female cat.

The Punnett square shows the possible offspring of these cats.

H is the allele for long hair.

h is the allele for short hair.

	Hh	Hh	
	hh	hh	

(i) Give the genotypes for the male cat.

(1)

(ii) Give the genotypes for the female cat.





(1)

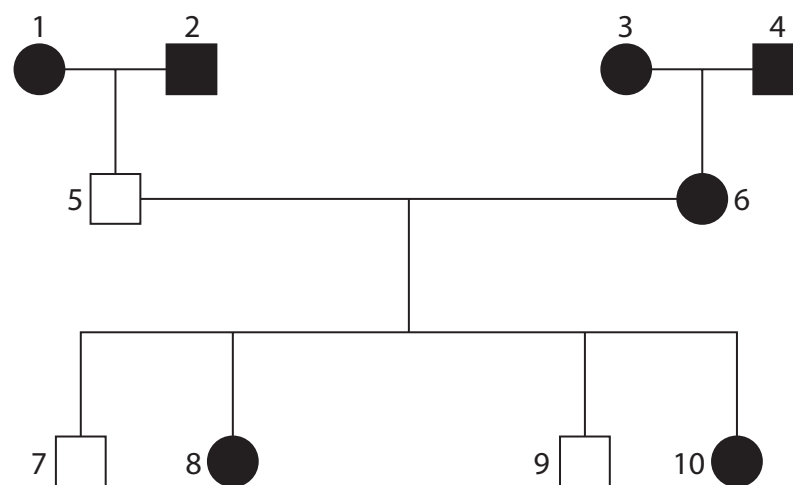


P 4 4 0 5 5 A 0 7 2 0

- (c) A cat breeder has four cats with long tails (cats 1, 2, 3 and 4).
He cannot determine the genotypes of cats 3 and 4 from their offspring.

The diagram shows the tail length of the offspring of cats 1, 2, 3 and 4.

Key		
Female	Male	
		Short tails
		Long tails



The cat breeder thinks that cat 3 is heterozygous for a long tail.
Show how breeding cat 3 with a short-tailed cat can determine this.

You should use the Punnett square to help you.

T is the allele for long tails.

t is the allele for short tails.

(4)

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(Total for Question 3 = 8 marks)

TOTAL FOR SECTION A = 18 MARKS





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SECTION B: Chemistry

4 Hydrochloric acid can be used to make potassium chloride.

(a) Potassium chloride is

(1)

- ☐ **A** an atom
- ☐ **B** a compound
- ☐ **C** an element
- ☐ **D** a mixture

(b) Name the **two** elements in hydrochloric acid.

(2)

(i)

(ii)

(c) What type of chemical is potassium chloride?

(1)

- ☐ **A** An acid
- ☐ **B** An alkali
- ☐ **C** A base
- ☐ **D** A salt

(d) Hydrochloric acid can also be used to make sodium chloride.

(i) Give the formula for hydrochloric acid.

(1)

.....

(ii) Give the formula for sodium chloride.

(1)

.....

(Total for Question 4 = 6 marks)

.....



P 4 4 0 5 5 A 0 1 1 2 0

5 Calcium nitrate is used as a fertiliser.



It provides plants with calcium and nitrogen to keep them healthy.

(a) (i) Give the chemical symbol for calcium.

(1)

(ii) Give the chemical symbol for nitrogen.

(1)

(b) An atom of calcium has 20 protons and 20 neutrons.

(i) How many electrons does an atom of calcium have?

(1)

(ii) Give the mass number of calcium.

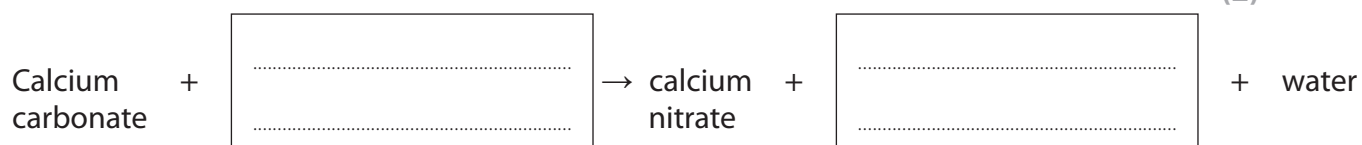
(1)



(c) Calcium nitrate can be made by reacting calcium carbonate with an acid.

Complete the word equation for this reaction.

(2)



(Total for Question 5 = 6 marks)



P 4 4 0 5 5 A 0 1 3 2 0

6 Tamoor wanted to find out why his plants were dying.

He crushed a sample of soil and shook it in water.

He then measured the pH of the soil solution.

He found his soil was too acidic for his plants.

He researched how to lower the acidity of the soil and found that either calcium oxide or calcium carbonate could be used.

How can Tamoor test which chemical would be the most effective to use on his soil?

You **must** include in your answer:

- a description of a method that Tamoor could use
- how he would make the test valid
- how he would know which chemical is the most effective.

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(Total for Question 6 = 6 marks)

TOTAL FOR SECTION B = 18 MARKS



SECTION C: Physics

7 (a) (i) An example of a non-renewable energy source is:

(1)

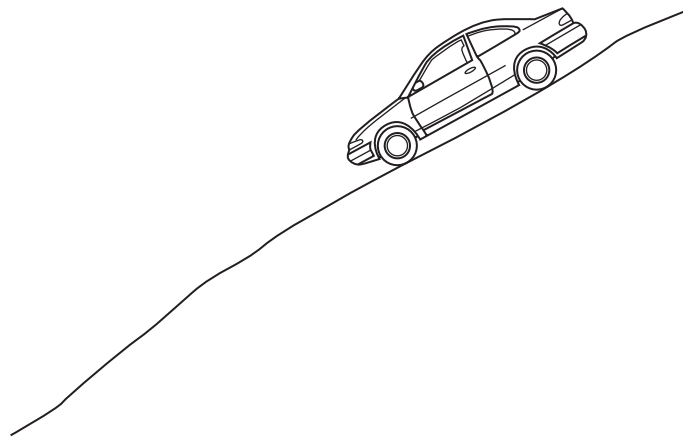
- ☐ **A** nuclear
- ☐ **B** solar
- ☐ **C** wave
- ☐ **D** wind

(ii) The type of energy stored in coal is:

(1)

- ☐ **A** chemical
- ☐ **B** kinetic
- ☐ **C** nuclear
- ☐ **D** thermal

(b) This car is parked at the top of a hill.



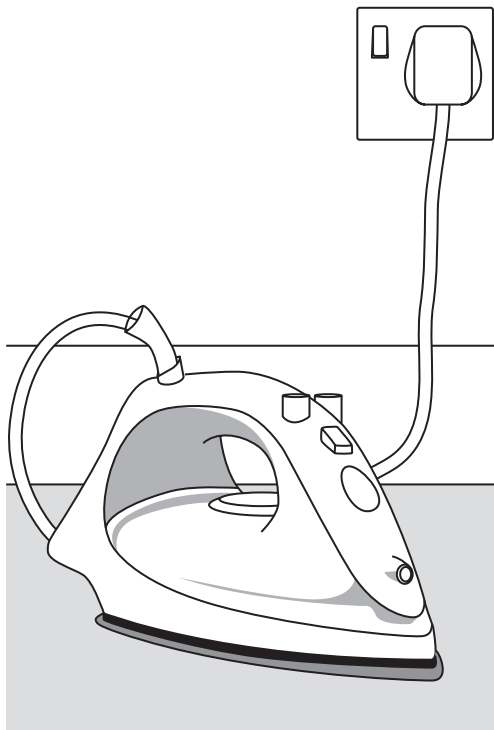
What type of energy does this parked car have?

(1)

- ☐ **A** Elastic potential
- ☐ **B** Gravitational potential
- ☐ **C** Kinetic
- ☐ **D** Sound



P 4 4 0 5 5 A 0 1 5 2 0



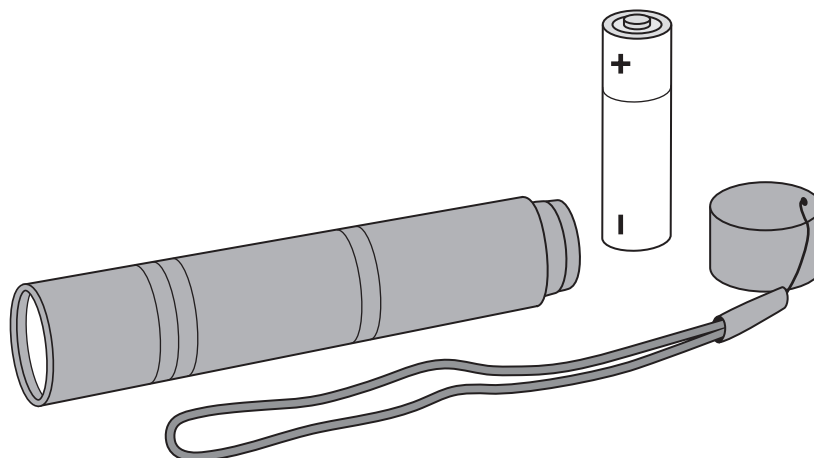
(c) Complete the sentence.

(1)

In an iron, electrical energy is converted into energy.

(Total for Question 7 = 4 marks)

8 A torch uses energy from batteries.



(a) Complete the **two** sentences below.

(2)

(i) Batteries store energy.

(ii) When the torch is switched on the energy in the battery is converted
to energy.

(b) Electricity can be produced from fuel cells. Give the names of the **two** gases used
to produce electricity in fuel cells.

(2)

(i)

(ii)



(c) A 2 watt torch is used for 30 seconds.

(i) Calculate how much energy the torch uses.

$$\text{power (watts)} = \frac{\text{energy (joules)}}{\text{time (seconds)}}$$

(2)

..... J

(ii) The torch bulb is 5% efficient.

When the torch is used for a period of time, the battery transfers 450 J energy.

Calculate how much of this energy is converted to useful light energy in the torch.

$$\text{efficiency} = \frac{\text{useful energy}}{\text{total energy}} \times 100\%$$

(2)

..... J

(Total for Question 8 = 8 marks)



Giving specific examples, discuss the advantages and disadvantages of using different types of electromagnetic waves for communication.

TOTAL FOR SECTION C = 18 MARKS
TOTAL FOR PAPER = 54 MARKS





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