Write your name here

Surname	Other names

Pearson BTEC Level 1/Level 2 First Award

Centre Number

Learner Registration Number

Applied Science

Unit 1: Principles of Science

Tuesday 1 November 2016 – Morning
Time: 1 hour

Paper Reference
20460E

You must have:
Calculator

Total Marks

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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P48180A

1/1/1/

P 4 8 1 8 0 A 0 1 1 6

PEARSON

BLANK PAGE

Answer ALL questions. Write your answers in the spaces provided.

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

SECTION A: Chemistry

1 (a) Sodium is an element.

Sodium reacts with water to produce sodium hydroxide and hydrogen gas.

The word equation for the reaction is

sodium + water → sodium hydroxide + hydrogen

(i) State the name of a **compound** in this reaction.

(1)

.....

(ii) Sodium is a metal.

State where metals are found on the periodic table.

(1)

.....

(iii) Give the chemical symbol for sodium.

(1)

.....

(b) Sodium hydroxide solution is an alkali.

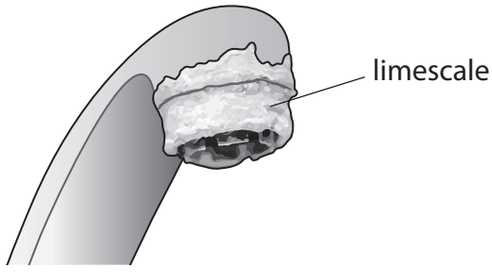
State the colour of the sodium hydroxide solution after universal indicator is added to it.

(1)

.....

(Total for Question 1 = 4 marks)

2 (a) Limescale is a hard white solid that can build up on taps.
Limescale contains calcium carbonate.



A cleaning product used to remove limescale contains a strong acid.
The cleaning product is corrosive.

(i) Identify the hazard symbol used to show that a substance is corrosive.

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) Identify the pH of a strong acid.

(1)

☒ **A** 1

☒ **B** 6

☒ **C** 7

☒ **D** 14

(b) Calcium carbonate reacts with sulfuric acid to form calcium sulfate, carbon dioxide and water.

(i) Explain why some farmers spread calcium carbonate on their fields.

(2)

.....

.....

.....

.....

(ii) Complete the equation for the reaction between calcium carbonate and sulfuric acid.

(2)

$CaCO_3 + H_2SO_4 \rightarrow$ ..... + ... + ...

(Total for Question 2 = 6 marks)

3 (a) Atoms contain electrons, protons and neutrons.

(i) State the relative **charge** of a neutron.

(1)

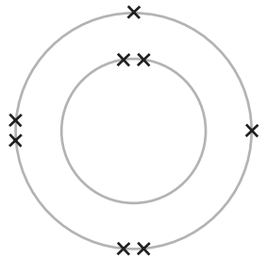
.....

(ii) State the relative **mass** of a neutron.

(1)

.....

(b) The diagram shows the electronic configuration of an atom of oxygen.



Explain what group of the periodic table oxygen is in.

(2)

.....

.....

.....

.....

(c) Nitrogen has two natural isotopes.

The symbols for the two isotopes are shown.

$^{14}_{7}N$	$^{15}_{7}N$

Explain a similarity and a difference between the structures of the two nitrogen isotopes.

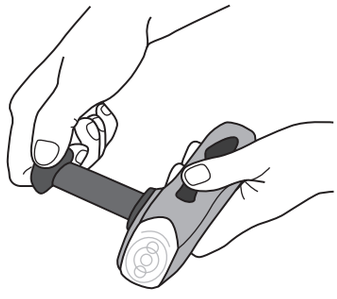
(4)

(Total for Question 3 = 8 marks)

TOTAL FOR SECTION A = 18 MARKS

SECTION B: Physics

4 Mark has a wind-up torch.



(a) Winding the handle will charge the battery in the torch.

(i) State **one** type of energy wasted when winding the handle on the torch.

(1)

.....

(ii) State the type of energy stored in the battery when the torch has been charged.

(1)

.....

(b) The torch produces visible light energy.

Visible light is one part of the electromagnetic spectrum.

The diagram shows the electromagnetic spectrum.

Complete the diagram to show the missing parts of the electromagnetic spectrum.

(2)

radio waves	.....	.....	visible light	ultraviolet	X-rays	gamma rays

(c) Ultraviolet light is part of the electromagnetic spectrum.

(i) State **one** use of ultraviolet light.

(1)

.....

(ii) State **one** harmful effect of excessive exposure to ultraviolet light.

(1)

.....

(Total for Question 4 = 6 marks)

5 (a) The movement of waves can be used as a renewable source of energy.

(i) Give **one** advantage of using the movement of waves, rather than fossil fuels, as a source of energy.

(1)

.....

.....

(ii) Name **one** other renewable energy source.

(1)

.....

(b) To produce power, waves hit a wave turbine in the sea.

The waves hit the wave turbine with a frequency of 0.2 Hz.

(i) Calculate how many waves hit the wave turbine in one hour.

Show your working.

(2)

..... waves

(ii) The waves have a wave speed of 2.5 m/s.

Calculate the wavelength of the waves.

wave speed (m/s) = frequency (Hz) × wavelength (m)

Show your working.

(2)

..... m

(Total for Question 5 = 6 marks)

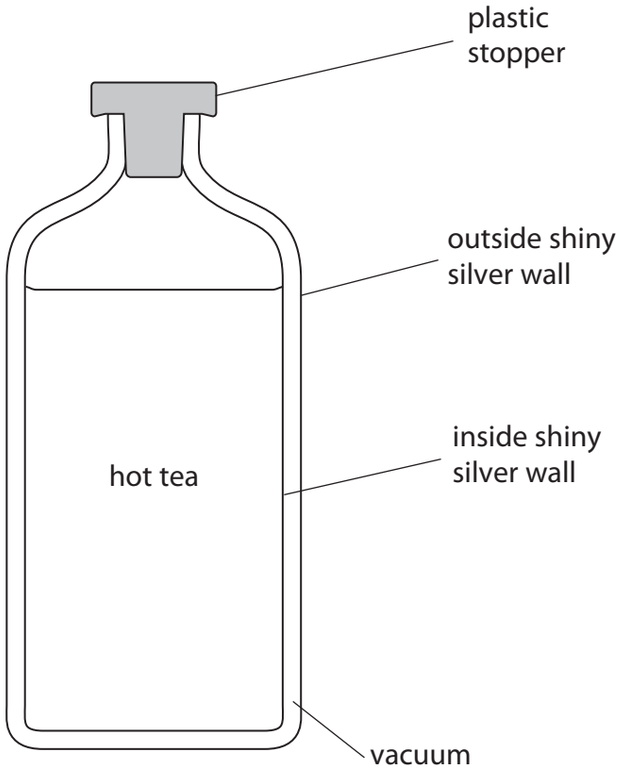
6 Zoe has a vacuum flask containing hot tea.

The vacuum flask has two shiny silver walls.

The air has been removed from between the shiny silver walls to form a vacuum.

The plastic stopper makes the flask airtight.

The diagram shows Zoe's vacuum flask.



Explain, using your knowledge of conduction, convection and radiation, how Zoe's vacuum flask keeps her tea hot.

(6)

(Total for Question 6 = 6 marks)

TOTAL FOR SECTION B = 18 MARKS

SECTION C: Biology

7 (a) The diagram shows a Punnett square for the inheritance of hair colour.

The allele, B, for black hair is dominant.

The allele, b, for blonde hair is recessive.

(i) Complete the Punnett square to show the genotypes of the offspring.

(2)

		female	
		B	B
male	b		
	b		

(ii) State the percentage of the offspring that will have black hair.

(1)

.....

(iii) Give the phenotype for the male in the Punnett square.

(1)

.....

(Total for Question 7 = 4 marks)

8 (a) Homeostasis involves both the central nervous system and the peripheral nervous system.

Name the **two** organs that make up the central nervous system.

(2)

organ 1 .....

organ 2 .....

(b) Blood glucose concentration is one condition in the body that is controlled by homeostasis.

Name **two** other conditions in the body that are controlled by homeostasis.

(2)

condition 1 .....

condition 2 .....

(c) Explain the role of insulin and glucagon in homeostasis.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question 8 = 8 marks)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

9 The picture shows a plant being watered.

Explain how water is transported from the soil through the roots and stem and is then lost to the air through the leaves.

(6)

(Total for Question 9 = 6 marks)

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

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE