

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson BTEC
Level 1/Level 2
First Award**

Centre Number

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Learner Registration Number

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Monday 4 March 2019

Morning (Time: 1 hour)

Paper Reference **20460E**

Applied Science
Unit 1: Principles of Science

You must have:

A 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 ►

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Pearson

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

For multiple-choice questions put a cross in each correct box to indicate your answer. If you change your mind, put a line through the box and then mark your new answer with a cross .

SECTION A : Physics

1 The photograph shows a rechargeable drill.



The battery in the rechargeable drill is charged using electricity.

(a) State the form of energy stored in the battery of the rechargeable drill.

(1)

(b) The battery powers the motor to turn the drill bit.

State the useful form of energy produced by the motor.

(1)

(c) State **one** form of energy that is wasted by the motor.

(1)

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(d) The motor uses 700 joules of energy in 5 seconds.

Calculate the power of the motor.

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

Show your working.

(1)

power = watts

(Total for Question 1= 4 marks)

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2 (a) The image shows part of a human hand.

The image was taken using one type of electromagnetic radiation.



(i) Name the type of electromagnetic radiation used to take this image.

(1)

(ii) State **one** other type of electromagnetic radiation that is used to make images of the human body.

(1)

(b) State the type of electromagnetic radiation that is used to detect forged banknotes.

(1)

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(c) (i) Microwaves are used in microwave ovens.

State **one** other use of microwave radiation.

(1)

(ii) Explain why excessive exposure to microwaves is harmful to human body cells.

(2)

(Total for Question 2 = 6 marks)



3 Solar energy is a renewable energy source.

(a) State what is meant by the term **renewable energy source**.

(1)

(b) Name a **non-renewable source** of energy.

(1)

(c) A solar panel provides 900 kWh of useful energy per year.

The efficiency of the solar panel is 15%.

Calculate the total energy supplied to the solar panel per year.

$$\text{efficiency} = \frac{\text{useful energy (kWh)}}{\text{total energy supplied per year (kWh)}} \times 100\%$$

Show your working.

(2)

total energy supplied per year = kWh

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(d) Solar panels use energy from visible light.

Visible light has a wave speed of 300 000 000 m/s.

One colour of visible light has a frequency of 5×10^{14} Hz.

Calculate the wavelength of this colour of light.

$$\text{wave speed (m/s)} = \text{wavelength (m)} \times \text{frequency (Hz)}$$

Give your answer in standard form.

Show your working.

(4)

wavelength m

(Total for Question 3 = 8 marks)

TOTAL FOR SECTION A = 18 MARKS



SECTION B: Biology

4 (a) DNA is a double helix containing complementary base pairs.

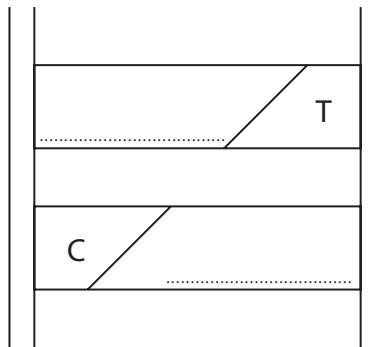
(i) State where in a human cell DNA can be found.

(1)

(ii) The bases in DNA are adenine (A), cytosine (C), guanine (G) and thymine (T).

Label the diagram to show the two complementary base pairs.

(1)



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(b) Huntington's disease is caused by a dominant allele, H.

The diagram shows an incomplete Punnett square for the inheritance of Huntington's disease.

		mother	
		H	h
father	h		
	h		

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

(2)

(ii) State the percentage chance that the offspring could inherit Huntington's disease.

(1)

..... %

(iii) The father is homozygous for the recessive allele.

State what is meant by the term **homozygous**.

(1)

.....

.....

(Total for Question 4 = 6 marks)



5 Photosynthesis takes place in the leaves of plants.

(a) Identify where in a plant cell photosynthesis takes place.

(1)

- A cell membrane
- B chloroplast
- C nucleus
- D vacuole

(b) Name the gas produced during photosynthesis.

(1)

(c) Water used in photosynthesis is taken up by the roots of a plant.

(i) State **one** other function of the roots of a plant.

(1)

(ii) State why the roots of most plants do not contain chlorophyll.

(1)

(iii) Explain how water is transported from the root to the leaf of a plant.

(2)

(Total for Question 5 = 6 marks)

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6 The endocrine system releases hormones.

Explain how hormones help to maintain blood glucose concentrations.

You should include in your answer what happens:

- when the concentration of glucose in the blood is too high
- when the concentration of glucose in the blood is too low.

(6)

Area with horizontal dotted lines for writing the answer.

(Total for Question 6 = 6 marks)

TOTAL FOR SECTION B = 18 MARKS

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SECTION C: Chemistry

7 Fluorine atoms contain the particles: electrons, neutrons and protons.

(a) Underline **one** answer in each box to show the correct position in the atom and the relative charge of each particle.

The position of the proton has been completed for you.

(3)

particle	position	relative charge
proton	<u>nucleus</u> / in shells	-1 / 0 / +1
neutron	nucleus / in shells	-1 / 0 / +1
electron	nucleus / in shells	-1 / 0 / +1

(b) An atom of fluorine has the electronic configuration 2.7.

State the group number of fluorine in the periodic table.

(1)

(Total for Question 7 = 4 marks)

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8 A student has a sample of sulfuric acid.

(a) (i) The student adds a drop of the sulfuric acid onto a piece of litmus paper.

State the colour of the litmus paper after the acid has been added.

(1)

(ii) Identify the pH of the sulfuric acid.

(1)

A 2

B 7

C 9

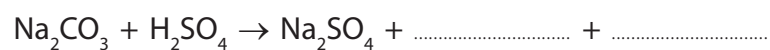
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(b) The student adds sulfuric acid to a sample of sodium carbonate.
The word equation for the reaction is

sodium carbonate + sulfuric acid → sodium sulfate + carbon dioxide + water

(i) Complete the chemical equation for the reaction.

(2)



(ii) Sulfuric acid also reacts with magnesium.

Describe the similarities and the differences between the reaction of sulfuric acid with sodium carbonate and the reaction of sulfuric acid with magnesium.

(4)

similarities.....

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differences.....

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(Total for Question 8 = 8 marks)

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- 9 A sample of chlorine contains two naturally occurring isotopes, chlorine-35 and chlorine-37. The table gives information about the sample.

isotope	atomic mass	atomic number	percentage of isotope present in the sample	relative atomic mass of the sample
chlorine-35	35	17	75	35.5
chlorine-37	37	17	25	

Discuss the data in the table.

(6)

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(Total for Question 9 = 6 marks)

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



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