The Holy Family Catholic School

a voluntary academy

YEAR 11 Trial Examination Summer Term 2024

Student Name ______________________

Candidate Number ______________________

Subject Teacher ______________________

Form ____

Subject: Combined Science

Level: Foundation

Title of Paper: Combined Science Foundation

Duration of Paper: 55 minutes

Head of Subject/Lead: J Brewer

Head of Faculty: J Brewer

Biology Questions

1 Figure 4 shows a diagram of the human blood system.

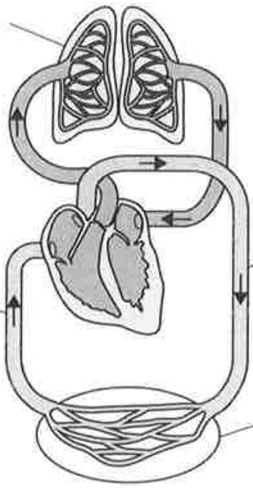


Figure 4

(a) (i) Name blood vessel X.

(1)

....

(ii) Which row of the table shows the width of the wall and blood pressure in blood vessel X?

(1)

		width of wall	blood pressure
☐	**A**	thick	high
☐	**B**	thick	low
☐	**C**	thin	high
☐	**D**	thin	low

(b) Figure 5 shows the pressure of blood flowing through the arteries, capillaries and veins of a person.

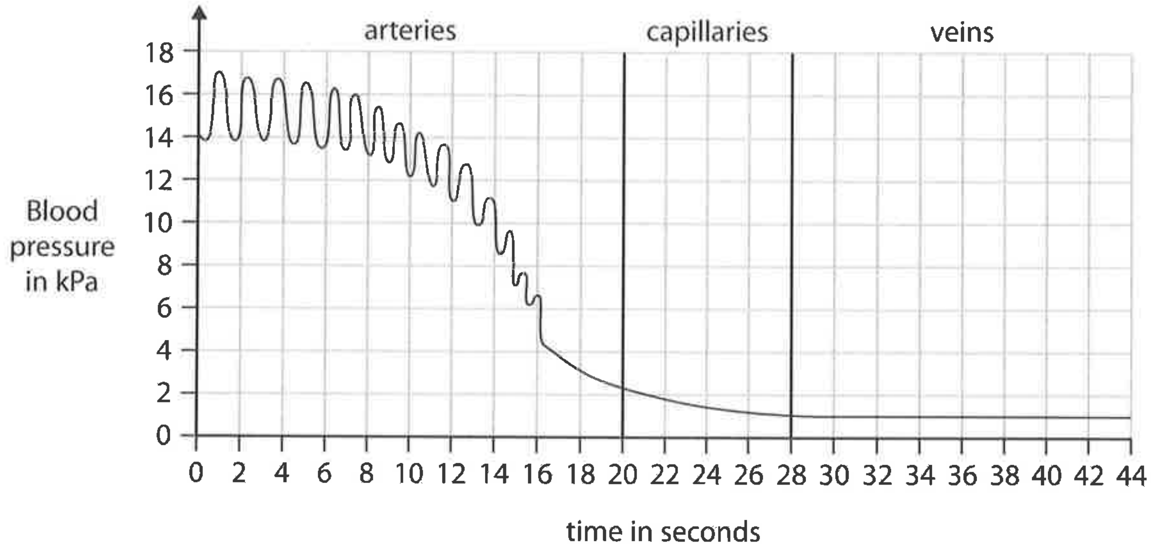


Figure 5

Calculate the difference in blood pressure from the maximum in the arteries to the minimum in the veins.

(2)

.... kPa

(c) Figure 6 shows a diagram of a vein with blood cells.

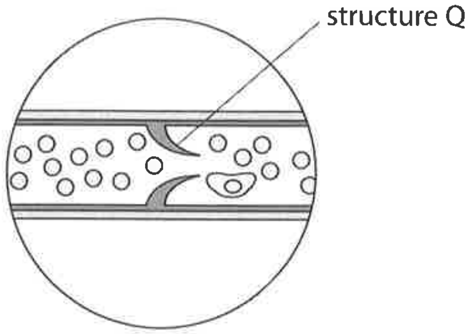


Figure 6

(i) Identify structure Q.

(1)

....

(ii) State the function of structure Q.

(1)

....

....

(d) Describe how the heart causes blood to move to the lungs.

(3)

....

....

....

....

....

....

....

(Total for Question 2 = 9 marks)

2 Respiration occurs in cells.

(a) Why do cells respire?

(1)

☐ **A** to produce nitrogen

☐ **B** to release oxygen

☐ **C** to produce glucose

☐ **D** to release energy

(b) An athlete runs every day as part of their training.

(i) Explain why the breathing rate of the athlete increases when running.

(2)

....

....

....

....

....

(ii) When the athlete is running, their muscle cells use both aerobic respiration and anaerobic respiration.

State **two** differences between aerobic respiration and anaerobic respiration.

(2)

1 ....

....

....

2 ....

....

....

(c) Bromothymol blue (BTB) solution is an indicator of pH.

Figure 10 shows the colour of BTB at different pH levels.

pH	4	5	6	7 (neutral)	8
colour	yellow	yellowy green	light green	green	blue

Figure 10

When air is passed through green BTB, for one minute, the solution stays green.

When a person breathes out through a straw into BTB for one minute the solution turns yellow.

(i) Explain why the air breathed out turns the BTB solution yellow.

(2)

....

....

....

....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

P 7 2 5 6 0 A 0 1 8 2 0

Chemistry Questions

3 (a) Figure 5 shows one molecule of a compound obtained from crude oil.

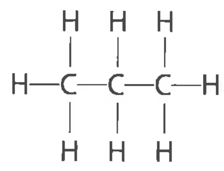


Figure 5

(i) Give the names of the **two** elements in this molecule.

(2)

....

....

(ii) What is the molecule in Figure 5?

(1)

- ☐ **A** an oxide
- ☐ **B** a chain molecule
- ☐ **C** a fullerene
- ☐ **D** a ring molecule

(iii) What is the relative formula mass of the compound in Figure 5?

(relative atomic masses: H = 1.0, C = 12)

(1)

- ☐ **A** 13
- ☐ **B** 42
- ☐ **C** 44
- ☐ **D** 96

(b) Crude oil can be separated into different fractions.

Draw **one** straight line from each fraction to a use of that fraction.

(3)

fraction	use
	fuel for aircraft
petrol	fuel for ships
kerosene	fuel for cars
bitumen	making plastic
	extracting iron
	making road surfaces

(c) Hydrogen chloride gas and sulfur dioxide gas are dissolved in separate test tubes of water.
Blue litmus paper is dipped into each test tube.

State and explain the colour change you would observe in each test tube.

(3)

....

....

....

....

....

(Total for Question 3 = 10 marks)

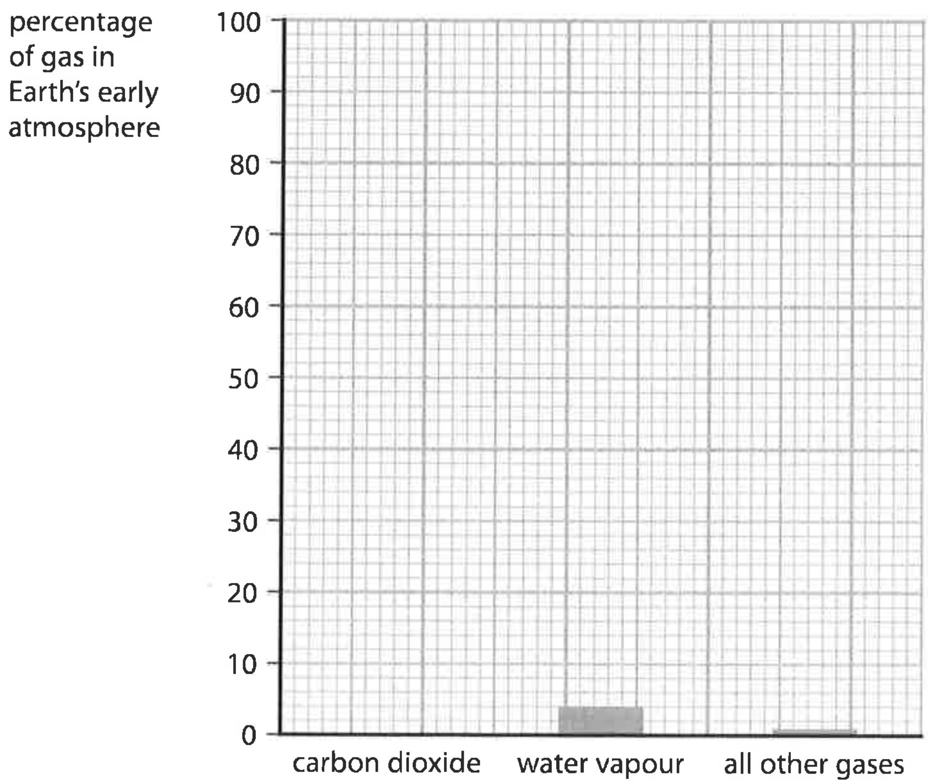
4 A scientist produced the information in Figure 6 about the Earth's atmosphere and the Earth's average surface temperature.

Earth's atmosphere 3 billion years ago		**Earth's atmosphere today**	
gas	**%**	**gas**	**%**
carbon dioxide	95	nitrogen	78.00
water vapour	4	oxygen	21.00
all other gases	1	carbon dioxide	0.04
		all other gases including water vapour	0.96
average surface temperature 3 billion years ago		**average surface temperature today**	
above 400 °C		20 °C	

Figure 6

(a) Complete the bar chart showing the composition of the Earth's atmosphere 3 billion years ago by adding a bar to show the percentage of carbon dioxide.

(1)



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

(1)

has decreased	has increased	has stayed the same

Over the past 3 billion years the average surface temperature of the Earth

....

(ii) The Earth's atmosphere 3 billion years ago contained much more water vapour than today's atmosphere.

Explain what happened to the water vapour.

(2)

....

....

....

....

(c) Scientists think that the decrease in percentage of carbon dioxide was partly due to this gas being used in the growth of primitive plants.

(i) Carbon dioxide was used in the growth of primitive plants and produced oxygen.

Give the name of the process in plants that takes in carbon dioxide and produces oxygen.

(1)

....

(ii) Which of the following tests would show that a gas is oxygen?

(1)

☐ **A** put a lighted splint into the gas and it burns with a pop

☐ **B** put a glowing splint into the gas and it relights

☐ **C** put a lighted splint into the gas and it relights

☐ **D** put a glowing splint into the gas and it burns with a pop

(d) Many people are concerned by the increasing amount of carbon dioxide in the atmosphere.

(i) The amount of carbon dioxide in the atmosphere is measured in parts per million (ppm).

Figure 7 shows the amount of carbon dioxide in the atmosphere in June 2001 and in June 2021.

	amount of carbon dioxide in ppm
June 2001	371.17
June 2021	416.56

Figure 7

Calculate the increase in the amount of carbon dioxide, in ppm, from June 2001 to June 2021.

Give your answer to the nearest whole number.

(2)

....

....

....

increase in amount of carbon dioxide = ... ppm

(ii) State **one** possible effect that could be caused by the increasing amount of carbon dioxide in the atmosphere.

(1)

....

....

(Total for Question 3 = 9 marks)

Physics Questions

5 (a) Figure 4 shows a 10 N weight hanging from a spring.

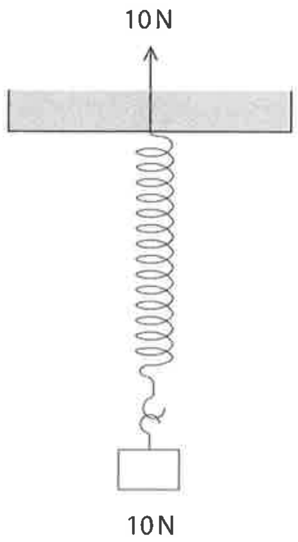


Figure 4

One of the forces acting to stretch the spring is shown in Figure 4.

Complete Figure 4 by adding an arrow to show the other force acting to stretch the spring.

(2)

(b) A weight of 4.0 N is used to extend a spring.
The extension of the spring is 0.06 m.

(i) Calculate the spring constant, k, of the spring.

Use an equation selected from the list of equations given at the end of the question paper.

(3)

spring constant = ... N/m

(ii) State what measurements should be made to determine the extension of the spring produced by the 4.0 N weight.

(2)

....

....

....

....

(c) Another spring has a spring constant of 250 N/m.

Calculate the work done in stretching the spring by 0.30 m.

State the unit.

Use the equation

$$E = ½ \times k \times x^2$$

(3)

work done in stretching the spring = ... unit ....

(Total for Question 3 = 10 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

6 (a) Which of these means changing state from solid directly to gas?

(1)

☐ **A** condensing

☐ **B** freezing

☐ **C** melting

☐ **D** sublimating

(b) An object has a mass of 7.22×10^{-2} kg and a volume of 2.69×10^{-5} m^3.

Calculate the density, ρ, of the object.

Use an equation selected from the list of equations given at the end of the question paper.

(3)

State the unit.

density = ... unit ....

(c) Aluminium has a melting point of 660 °C.

The absolute zero of temperature is −273 °C.

(i) Calculate the melting point of aluminium in kelvin.

(1)

melting point of aluminium = ... K

(ii) Describe the motion of particles in liquid aluminium (above 660 °C).

(2)

*(d) A student needs to determine the specific heat capacity of water.

Figure 12 shows some of the equipment the student uses.

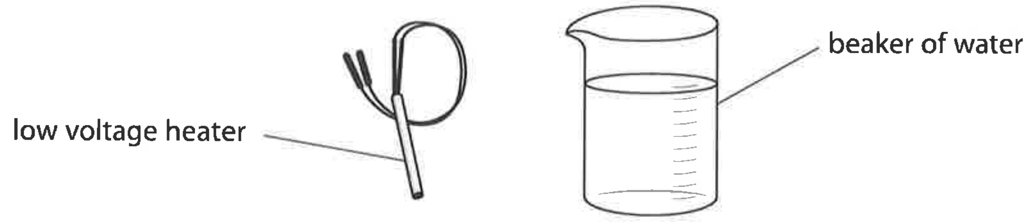


Figure 12

Describe the method the student should use to determine the specific heat capacity of water.

Your description should include, with reasons,

- any other equipment needed
- the measurements needed.

You may draw a diagram if it helps your answer.

(6)

(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS

The periodic table of the elements

Key

relative atomic mass **atomic symbol** name atomic (proton) number

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86

The elements with atomic numbers from 58 to 71 are omitted from this part of the periodic table.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

If you're taking **GCSE (9–1) Combined Science** or **GCSE (9–1) Physics**, you will need these equations:

HT = higher tier

	distance travelled = average speed × time	
	acceleration = change in velocity ÷ time taken	$a = \frac{(v - u)}{t}$
	force = mass × acceleration	$F = m \times a$
	weight = mass × gravitational field strength	$W = m \times g$
HT	**momentum = mass × velocity**	$\mathbf{p = m \times v}$
	change in gravitational potential energy = mass × gravitational field strength × change in vertical height	$\Delta GPE = m \times g \times \Delta h$
	kinetic energy = 1/2 × mass × (speed)^2	$KE = \frac{1}{2} \times m \times v^2$
	efficiency = $\frac{\text{(useful energy transferred by the device)}}{\text{(total energy supplied to the device)}}$	
	wave speed = frequency × wavelength	$v = f \times \lambda$
	wave speed = distance ÷ time	$v = \frac{x}{t}$
	work done = force × distance moved in the direction of the force	$E = F \times d$
	power = work done ÷ time taken	$P = \frac{E}{t}$
	energy transferred = charge moved × potential difference	$E = Q \times V$
	charge = current × time	$Q = I \times t$
	potential difference = current × resistance	$V = I \times R$
	power = energy transferred ÷ time taken	$P = \frac{E}{t}$
	electrical power = current × potential difference	$P = I \times V$
	electrical power = (current)^2 × resistance	$P = I^2 \times R$
	density = mass ÷ volume	$\rho = \frac{m}{V}$

	force exerted on a spring = spring constant × extension	$F = k \times x$
	(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance	$v^2 - u^2 = 2 \times a \times x$
HT	**force = change in momentum ÷ time**	$\mathbf{F = \frac{(mv - mu)}{t}}$
	energy transferred = current × potential difference × time	$E = I \times V \times t$
HT	**force on a conductor at right angles to a magnetic field carrying a current = magnetic flux density × current × length**	$\mathbf{F = B \times I \times l}$
	For transformers with 100% efficiency, potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil	$V_P \times I_P = V_S \times I_S$
	change in thermal energy = mass × specific heat capacity × change in temperature	$\Delta Q = m \times c \times \Delta\theta$
	thermal energy for a change of state = mass × specific latent heat	$Q = m \times L$
	energy transferred in stretching = 0.5 × spring constant × (extension)^2	$E = \frac{1}{2} \times k \times x^2$

If you're taking **GCSE (9–1) Physics**, you also need these extra equations:

	moment of a force = force × distance normal to the direction of the force	
	pressure = force normal to surface ÷ area of surface	$P = \frac{F}{A}$
HT	***potential difference across primary coil / potential difference across secondary coil = number of turns in primary coil / number of turns in secondary coil***	$\mathbf{\frac{V_P}{V_S} = \frac{N_P}{N_S}}$
	to calculate pressure or volume for gases of fixed mass at constant temperature	$P_1 \times V_1 = P_2 \times V_2$
HT	**pressure due to a column of liquid = height of column × density of liquid × gravitational field strength**	$\mathbf{P = h \times \rho \times g}$

END OF EQUATION LIST