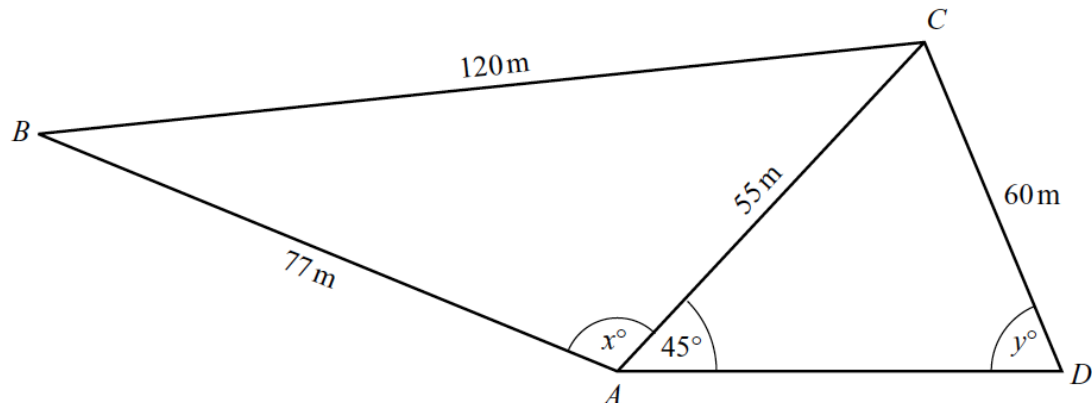


Total Marks: _____/47

Maths

1.



In quadrilateral ABCD, $AB = 77\text{m}$, $BC = 120\text{m}$, $CD = 60\text{m}$ and diagonal $AC = 55\text{m}$.

Angle $CAD = 45^\circ$, angle $BAC = x^\circ$ and angle $ADC = y^\circ$

(a) Calculate the value of x . (4)

Using the cosine rule:

$$\begin{aligned}
 BC^2 &= AC^2 + AB^2 - 2(AC)(AB)\cos BAC \\
 120^2 &= 55^2 + 77^2 - 2(55)(77)\cos BAC \\
 120^2 - (55^2 + 77^2) &= -2(55)(77)\cos BAC \\
 5446 &= -8470\cos BAC \\
 -0.6429... &= \cos BAC \\
 BAC &= 130^\circ
 \end{aligned}$$

(b) Calculate the value of y . (4)

Using the sine rule:

$$\begin{aligned}
 \frac{\sin y}{AC} &= \frac{\sin 45}{CD} \\
 \frac{\sin y}{55} &= \frac{\sin 45}{60} \\
 \sin y &= \frac{\sin 45}{60} \times 55 \\
 y &= 40.4^\circ
 \end{aligned}$$

(c) The bearing of D from A is 090° .

Find the bearing of

(i) A from C, (2)

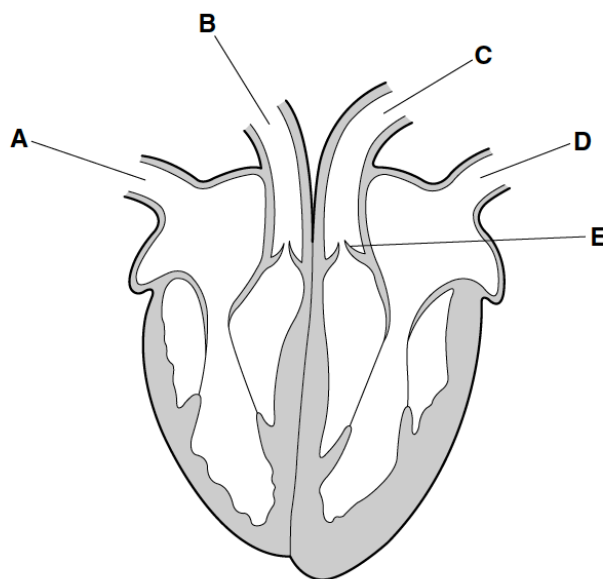
$$180 + 45 = 225^\circ$$

(ii) B from A (2)

$$\begin{aligned}
 360 - (x - 45) &= 360 - (130 - 45) \\
 &= 275^\circ
 \end{aligned}$$

Biology

2.



The above diagram shows a section through the heart.

- (a) (i) Name the two blood vessels **A** and **B**. (2)

A: vena cava

B: pulmonary artery

- (ii) Which of the blood vessels **A**, **B**, **C** or **D** carry oxygenated blood? (1)

Vessels C and D

- (iii) Name valve **E** and state its function (2)

E – semilunar/aortic valve

This valve ensures that blood flows in one direction

- (b) The circulatory system of mammals is known as a double-circulatory system.

Describe what is meant by double-circulation. (3)

There are two circuits of blood from the heart

(Deoxygenated) Blood passes from the heart to the lungs (at low pressure), and (oxygenated blood) back to heart.

(Oxygenated) Blood passes from the heart to organs and body tissues, and (deoxygenated blood) back to heart.

- (d) Some poor diets can increase the risk of a heart attack.

- (i) Suggest two ways in which a poor diet could be changed to reduce the risk of a heart attack. (2)

Reduce salt, reduce fat/cholesterol, increase fibre, limit total intake

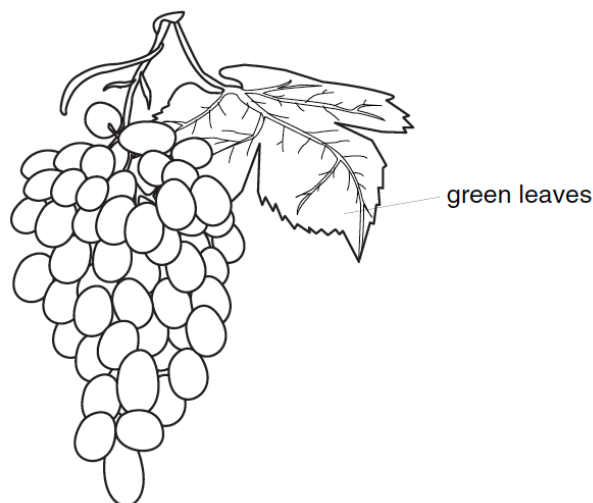
- (ii) Suggest two other factors, apart from diet, that could increase the risk of a heart attack. (2)

Smoking, stress, lack of exercise, genetic predispositions

Chemistry

3.

Fermentation of sugars is one method of making ethanol. Vines produce glucose from photosynthesis. The glucose collects in the grapes which grow in clusters on the vine.



- (a) Vines are attacked by a fungus that ruins the grapes. In 1882 it was discovered that spraying the vines with Bordeaux mixture killed the fungus.

The fungicide, Bordeaux mixture, contains water, calcium hydroxide and copper(II) sulphate.

- (i) Name the raw material from which calcium hydroxide is made. (1)

Limestone/calcium oxide/chalk/marble/calcium carbonate

- (ii) The mixture contains four ions. Complete the list of ions. (2)

Cu^{2+} , OH^-

Ca^{2+} , SO_4^{2-}

- (iii) A different fungicide can be made by the reaction between an excess of aqueous ammonia and copper(II) salt. Describe the **observations** for this reaction. (3)

addition of aqueous ammonia:

blue precipitate forms

then excess aqueous ammonia:

dissolves/forms a deep blue solution

- (b) Explain how the vine produces glucose by photosynthesis. (4)

Water and Carbon Dioxide react to form Glucose and Oxygen in the presence of light (from the sun), and chlorophyll (in the leaves)

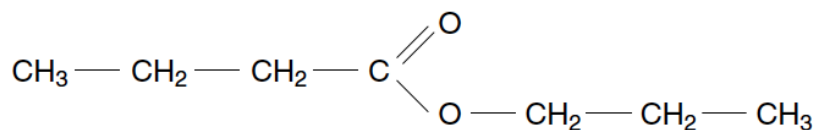
Carbon Dioxide + Water -> Oxygen + Glucose

- (c) The grapes are crushed to extract an aqueous solution of glucose. This solution is fermented to make ethanol. Explain why each of the following is necessary.

- (i) yeast (1)

Provides the enzyme for the reaction

- (ii) an absence of oxygen (2)
Oxygen would oxidize the alcohol to ethanoic acid
- (iii) an optimum temperature of about 35°C (2)
This is the most suitable temperature for enzymes - above 35°C the yeast will be denatured – resulting in a slower reaction.
- (d) Plants can make esters as well as sugars. The formula of a typical ester is drawn below. Deduce the names of the organic acid and of the alcohol from which the ester could have been made.



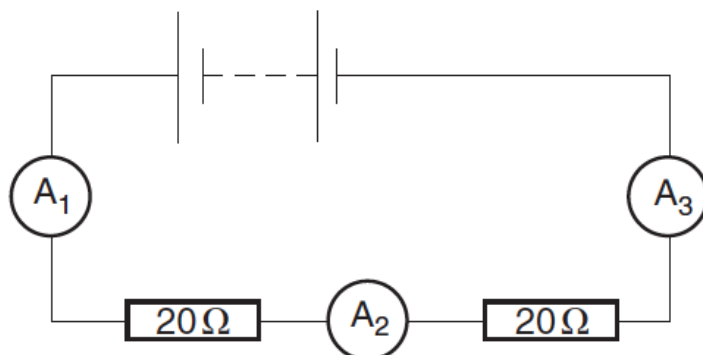
Butanoic acid
Propanol

(2)

Physics

4.

The below figure shows a circuit that includes three ammeters. The resistance of the ammeters and battery can be ignored.



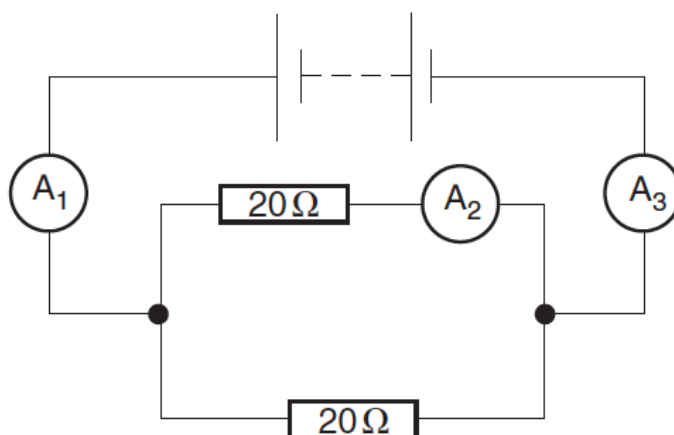
- (a) What is the total resistance of the circuit? (1)

40A

- (b) Ammeter A₁ reads 0.2A. What do the other two ammeters read? (2)

Both read 0.2A

- (c) The below figure shows the same components as above, but connected differently.



- (i) What is the total resistance of this circuit? (1)

Resistors in parallel

$$\frac{1}{R} = \frac{1}{20} + \frac{1}{20} = \frac{1}{10}$$

10Ω

Ammeter A₁ reads 0.8A.

- (ii) Does A₂ read more than 0.8A, less than 0.8A or 0.8A? (2)

Less than 0.8A

- (iii) Does A₃ read more than 0.8A, less than 0.8A or 0.8A?

0.8A