GCSE topic-wise test: Maths Data, Money and Numbers

1. Ketchup is sold in three different sizes of bottle.

A small bottle contains 342 g of ketchup and costs 88p
A medium bottle contains 570 g of ketchup and costs £1.95
A large bottle contains 1500 g of ketchup and costs £3.99

Which bottle is the best value for money?
You must show your working.

(Total 4 marks)

2. Three pigs entered a race around a track. Piggly takes 6 minutes to run one lap. Piglet takes 3 minutes to run one lap and it takes Wiggly 5 minutes to run one lap. If all three pigs begin the race at the same time, how many minutes will it take for all three pigs to be at the starting point again?

(3 Marks)

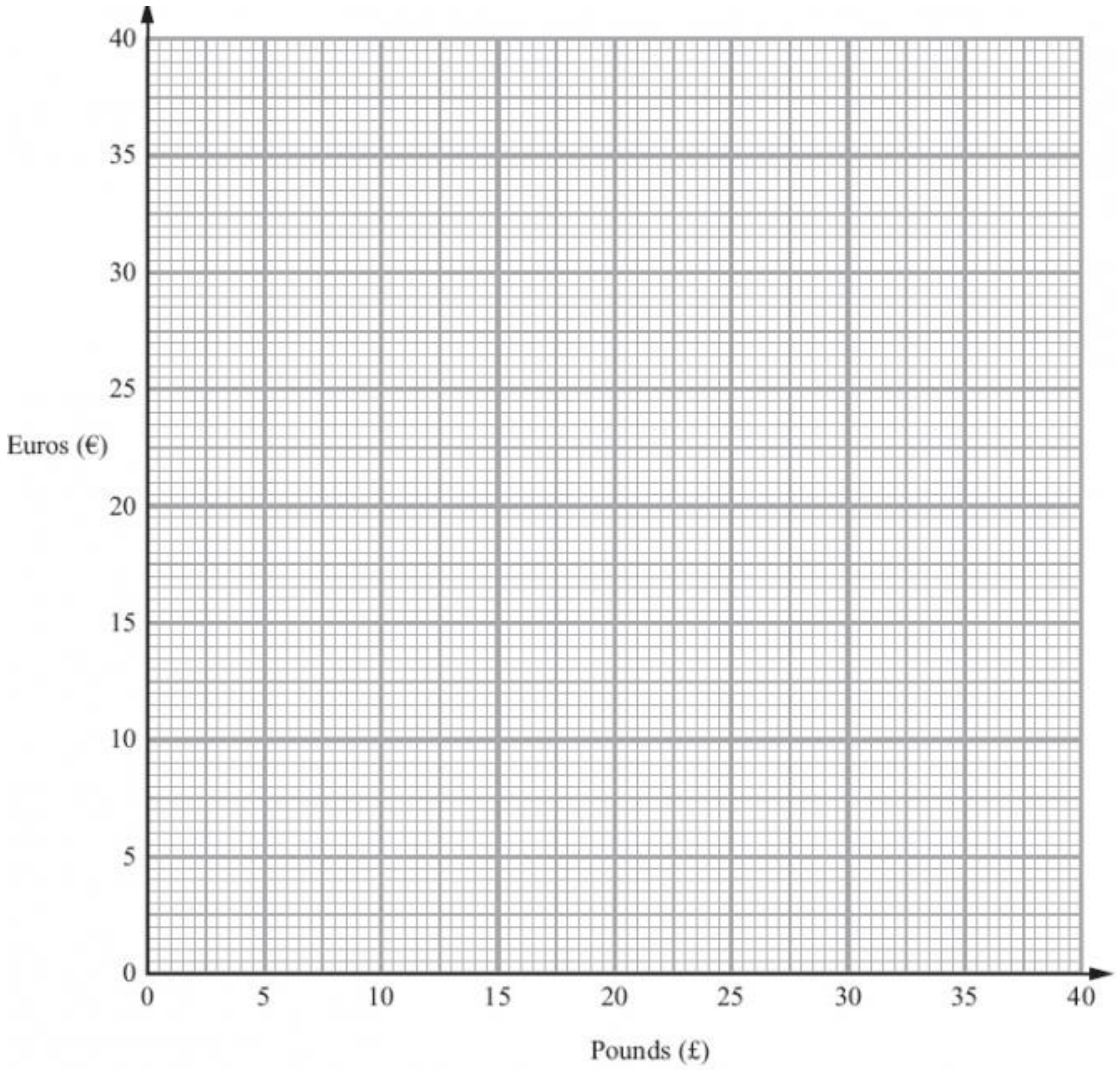
3. The exchange rate for pounds (£) to euros (€) is £1 = €1.20

(*a*)Complete the table of values.

£	0	1	5	10	15	20	25	30
€		1.20	6			24	30	

(2)

(*b*) On the grid, draw a conversion graph for pounds (£) to euros (€).



(2)

Louise changes £250 into euros.

(*c*) Work out how many euros Louise should get.

..... euros

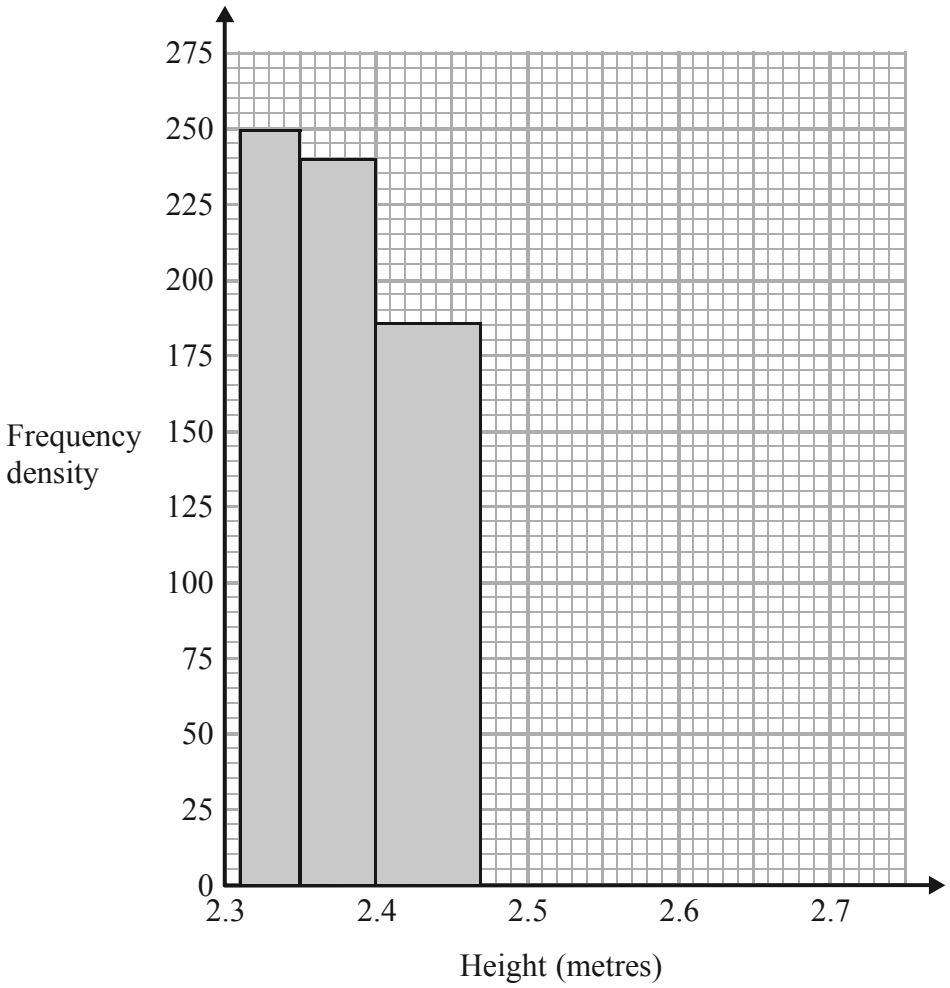
(2)

(Total 6 marks)

4 The table shows information about the heights, in metres, of 45 of the world's tallest men.

Height (h metres)	Number of men
$2.31 < h \leqslant 2.35$	10
$2.35 < h \leqslant 2.40$	12
$2.40 < h \leqslant 2.47$	13
$2.47 < h \leqslant 2.72$	10

(a) Use the information in the table to complete the histogram.



(2)

(b) Find an estimate for the number of these men with height between 2.32 metres and 2.34 metres.

.....

(1)(Total for Question 4 is 3 marks)

5 The table gives information about the ages of all the 90 adults in a supermarket.

Age (t years)	Frequency
$20 < t \leqslant 30$	4
$30 < t \leqslant 40$	28
$40 < t \leqslant 50$	30
$50 < t \leqslant 60$	16
$60 < t \leqslant 70$	8
$70 < t \leqslant 80$	4

One of these 90 adults is picked at random.

(a) Find the probability that this adult's age is more than 50 years.

.....

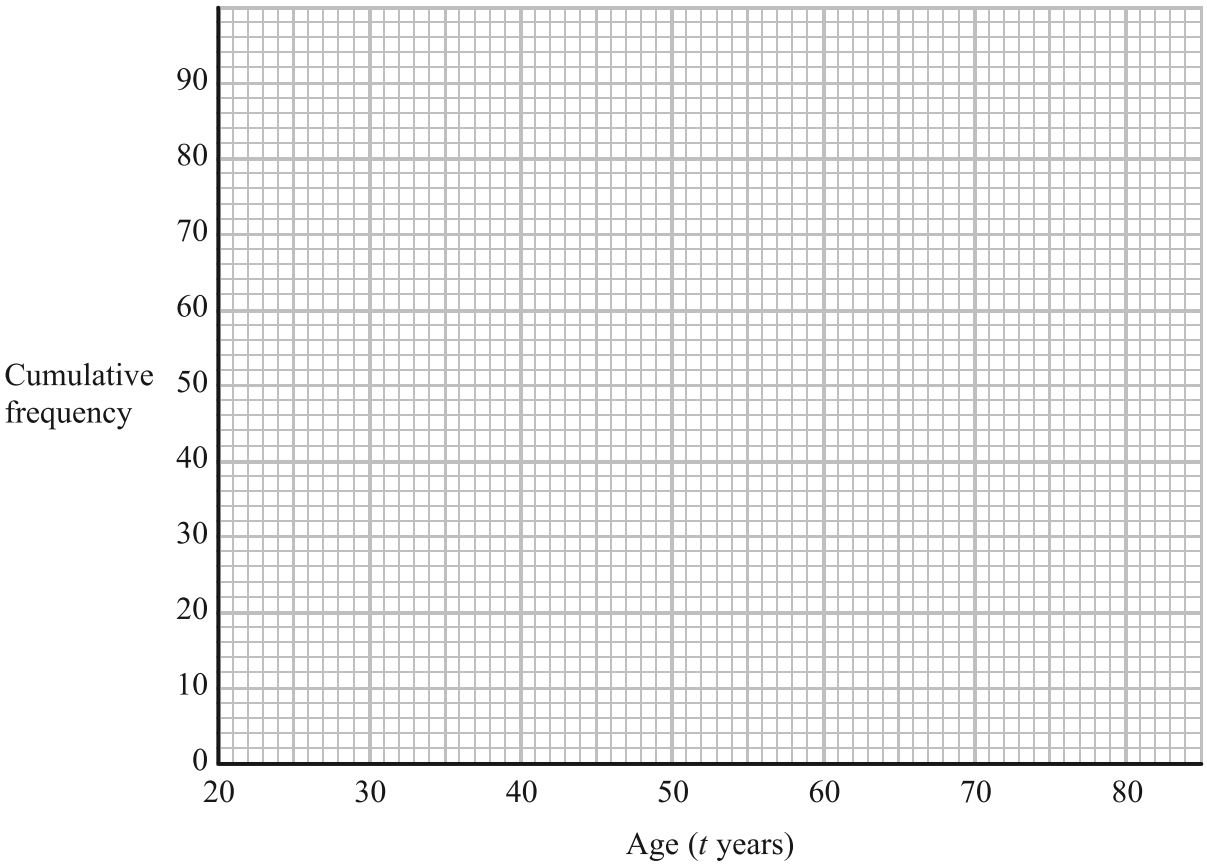
(2)

(b) Complete the cumulative frequency table for these 90 adults.

Age (t years)	Cumulative frequency
$20 < t \leqslant 30$	
$20 < t \leqslant 40$	
$20 < t \leqslant 50$	
$20 < t \leqslant 60$	
$20 < t \leqslant 70$	
$20 < t \leqslant 80$	

(1)

(c) On the grid, draw a cumulative frequency graph for your table.



(2)

All of these adults with an age greater than 65 years receive a discount on their shopping bill.

(d) Use your graph to find an estimate for the number of these adults who receive a discount.

.....

(2)

(Total for Question 11 is 7 marks)

GCSE topic-wise test: Maths Data, Money and Numbers

1. Ketchup is sold in three different sizes of bottle.

A small bottle contains 342 g of ketchup and costs 88p
A medium bottle contains 570 g of ketchup and costs £1.95
A large bottle contains 1500 g of ketchup and costs £3.99

Which bottle is the best value for money?
You must show your working.

Small bottle has the best g/pence

(Total 4 marks)

2. Three pigs entered a race around a track. Piggly takes 6 minutes to run one lap. Piglet takes 3 minutes to run one lap and it takes Wiggly 5 minutes to run one lap. If all three pigs begin the race at the same time, how many minutes will it take for all three pigs to be at the starting point again?

(3 Marks)

LCM of 6, 5, 3 is

$6 = 3 \times 2$

$5 = 5 \times 1$

$3 = 3 \times 1$

LCM $= 3 \times 2 \times 5$

$= 30$ min.

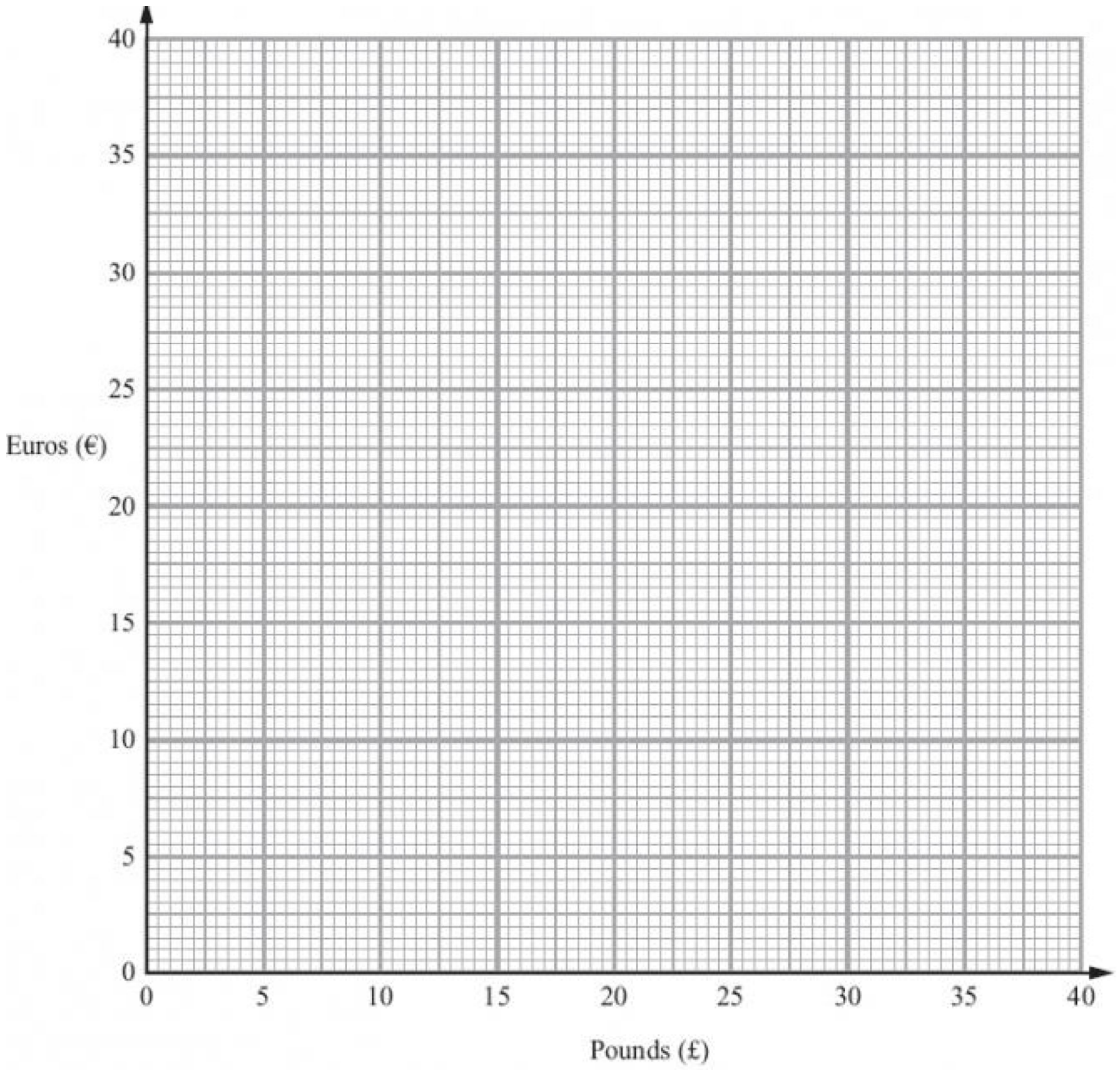
3. The exchange rate for pounds (£) to euros (€) is £1 = €1.20

(*a*)Complete the table of values.

£	0	1	5	10	15	20	25	30
€	0	1.20	6	12	18	24	30	36

(2)

(*b*) On the grid, draw a conversion graph for pounds (£) to euros (€).



(2)

Louise changes £250 into euros.

(*c*) Work out how many euros Louise should get.

300

..... euros

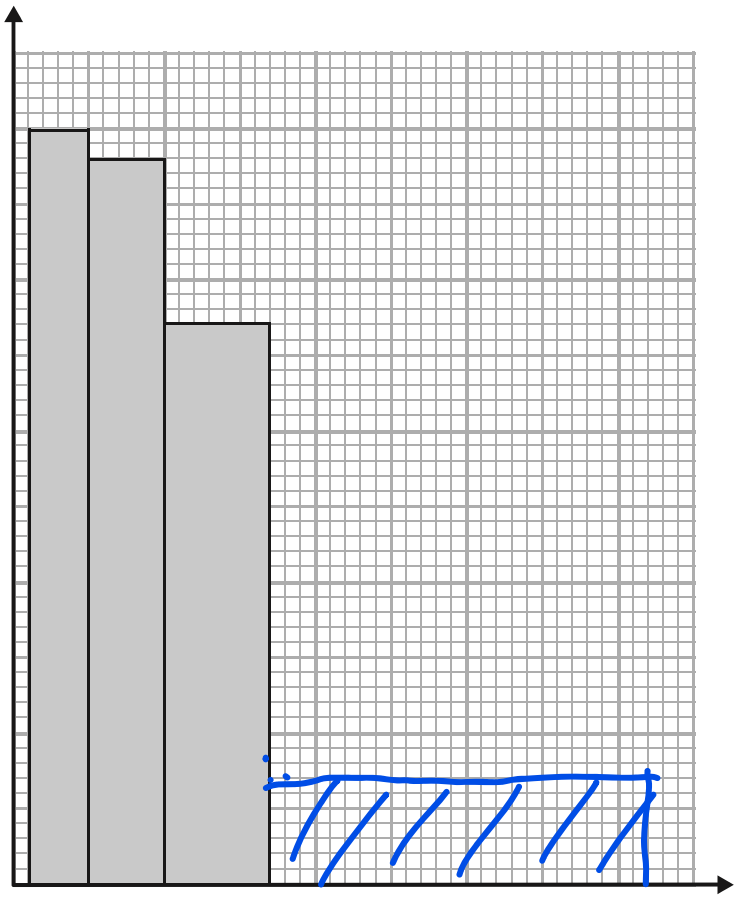
(2)

(Total 6 marks)

4

h	f
$< h \leqslant$	
$< h \leqslant$	
$< h \leqslant$	
$< h \leqslant$	

$fd = f_w$
250
240
185.714
40



4

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$40 < t \leqslant 50$	30
$50 < t \leqslant 60$	16
$60 < t \leqslant 70$	8
$70 < t \leqslant 80$	4

One of these 90 adults is picked at random.

(a) Find the probability that this adult's age is more than 50 years.

$\frac{16+8+4}{90} = \frac{28}{90}$ $\frac{14}{45}$ 0.31

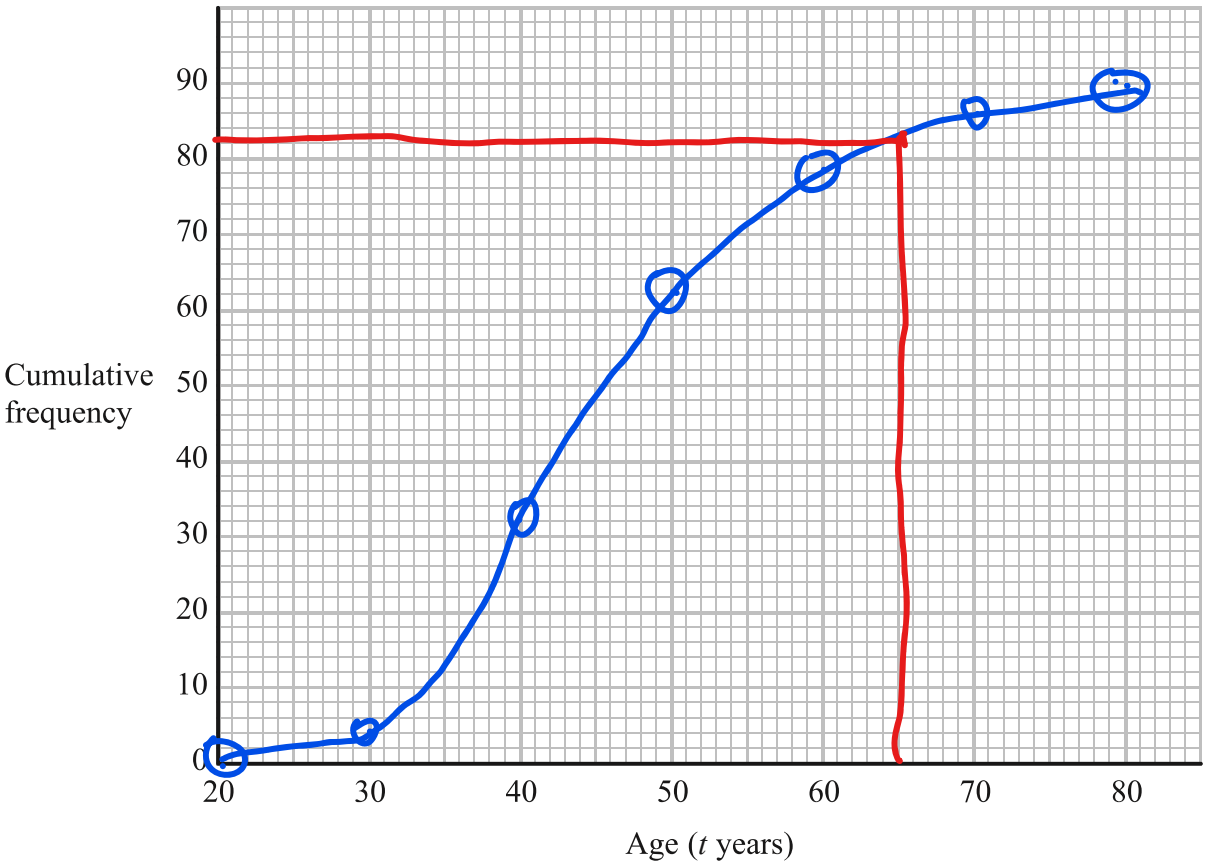
(2)

(b) Complete the cumulative frequency table for these 90 adults.

Age (t years)	Cumulative frequency
$20 < t \leqslant 30$	4
$20 < t \leqslant 40$	32
$20 < t \leqslant 50$	62
$20 < t \leqslant 60$	78
$20 < t \leqslant 70$	86
$20 < t \leqslant 80$	90

(1)

(c) On the grid, draw a cumulative frequency graph for your table.



(2)

All of these adults with an age greater than 65 years receive a discount on their shopping bill.

(d) Use your graph to find an estimate for the number of these adults who receive a discount.

8

.....

(2)

(Total for Question 11 is 7 marks)

GCSE topic-wise test: Physics: Formulas

1. John was in a race, he weighs 56 kg and runs at 3 meters per second.
    a. Calculate his momentum. (2 Marks)

    Accidently he collided with Maria of 44 kg who was standing and watching the race. She was thrown away with a speed.

    b. What would be the maximum value of speed of Maria? (3 Marks)

2. Jonny experienced a force when he placed 25 cm of coil carrying current of 12 Amps inside a electro-magnet of magnetic flux density of 0.8 Tesla. Estimate the maximum force that Jonny might have experienced. (3 Marks)

3. Ben has used a transformer; its output was connected to an 80% efficient 1 kWatt boiler of 1-ton water. The 1 kWatt power is optimum for the transformer outlet. Specific heat capacity of Water is 1 calorie/gram/Kelvin, whereas 1 Calorie = 4.186 Joules.
    a. What would be the maximum heat energy to be supplied to rise the temperature of the water from temperature of 20° C to boiling point. (3 Marks)

    b. In order to boil the water how much time would have taken by the boiler system?

c. The transformer is almost 100% efficient. If the secondary voltage is 230 Volts and the primary voltage is 1kVolts what would be the primary current? (3 Marks)

GCSE topic-wise test: Physics: Formulas

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GCSE topic-wise test: Chemistry Calculations 3/3

1. The energies of some bonds are shown in the table.

Bond	Energy of bond
H–H	436 kJ mol^{-1}
Cl–Cl	243 kJ mol^{-1}
H–Cl	432 kJ mol^{-1}

Hydrogen reacts with chlorine to form hydrogen chloride:

$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$

Calculate the energy change, in kJ mol^{-1}, for the reaction of 1 mol of hydrogen gas, H_2, with 1 mol of chlorine gas, Cl_2, to form 2 mol of hydrogen chloride gas, HCl. **[4 marks]**

2. Sodium thiosulfate solution, $Na_2S_2O_3$, reacts with dilute hydrochloric acid:

$Na_2S_2O_3(aq) + 2HCl(aq) \rightarrow 2NaCl(s) + H_2O(l) + S(s) + SO_2(g)$

The rate of this reaction can be investigated by mixing the reactants and finding the time taken for a precipitate of sulfur to become visible.

A student wants to investigate the effect of changing the temperature on the rate of this reaction.

Devise a method the student could use to find out how the time taken for the precipitate of sulfur to become visible changes with temperature. **[3 marks]**

3. The energy from burning 0.5 g of propane was transferred to 100 cm^3 of water to raise its temperature by 20°C. Calculate the enthalpy change (in kJ), and then use this to calculate the molar enthalpy change (in kJ/mol). (Assume that 1cm^3 of water has a mass of 1 g.) (4 Marks)

4. How long will it take to produce 2 dm^3 of chlorine gas by passing a 6A current through concentrated sodium chloride solution at 25C and 101kPa (1 atmosphere pressure) Note, charge of 1 mole of electrons = 96500 Coulombs that is also called 1 Faraday.

(4 Marks)

GCSE topic-wise test: Chemistry Calculations 3/3

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$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$

Calculate the energy change, in kJ mol^{-1}, for the reaction of 1 mol of hydrogen gas, H_2, with 1 mol of chlorine gas, Cl_2, to form 2 mol of hydrogen chloride gas, HCl. **[4 marks]**

- bonds broken = 436 + 243 = 679 kJ mol^{-1} [1]
- bonds formed = 2 × 432 = 864 kJ mol^{-1} [1]
- energy change = 679 - 864 = -185 kJ mol^{-1} [2]

2. Sodium thiosulfate solution, $Na_2S_2O_3$, reacts with dilute hydrochloric acid:

   $Na_2S_2O_3(aq) + 2HCl(aq) \rightarrow 2NaCl(s) + H_2O(l) + S(s) + SO_2(g)$

   The rate of this reaction can be investigated by mixing the reactants and finding the time taken for a precipitate of sulfur to become visible.

   A student wants to investigate the effect of changing the temperature on the rate of this reaction.

   Devise a method the student could use to find out how the time taken for the precipitate of sulfur to become visible changes with temperature. **[3 marks]**

- suitable method of warming the solutions, eg water bath, Bunsen burner with tripod and gauze, and measure the temperature of each solution using a thermometer [1]
- use the same volumes of the solutions in each experiment [1]
- measure the time for the precipitate to form (and hide a cross) [1]

3. The energy from burning 0.5 g of propane was transferred to 100 cm^3 of water to raise its temperature by 20°C. Calculate the enthalpy change (in kJ), and then use this to calculate the molar enthalpy change (in kJ/mol). (Assume that 1cm^3 of water has a mass of 1 g.) (4 Marks)

Mass of water = 100 g

Energy transferred = mass of water heated × specific heat capacity of water × temperature rise

= 100 × 4.2 × 20 = **8,400 J**

It is also useful to remember that 1 kilojoule, 1 kJ, equals 1,000 J. So the energy transferred is **8.4 kJ**. So, we can say that the enthalpy change is **8.4 kJ**.

Now, move on the next step – which is to calculate the molar enthalpy change.

Remember: moles = mass ÷ relative formula mass (M_r)

Moles of propane burned = 0.5 ÷ 44 = **0.01136**.

So, the **molar enthalpy change**, ΔH = **8.4 ÷ 0.01136 = 739 kJ/mol**

However, we also need to remember that exothermic reactions, like this one, must have negative enthalpy changes, so the **final answer** is **-739 kJ/mol**.

4. How long will it take to produce 2 dm^3 of chlorine gas by passing a 6A current through concentrated sodium chloride solution at 25C and 101kPa (1 atmosphere pressure)

   Note, charge of 1 mole of electrons = 96500 Coulombs that is also called 1 Faraday.

(4 Marks)

- (+) anode **$2Cl^- - 2e^-$ ==> Cl_2**
- therefore chlorine to be produced = 2/24 = 0.08333 moles of chlorine
- 2 moles of electrons must be removed from 2 moles of chloride ions to produce 1 mole of chlorine gas,
- therefore, moles of electrons required = 0.08333 x 2 = 0.1666
- 1 mole of electrons = 96500 Coulombs, therefore quantity of electricity required
- = 0.1666 x 96500 = 16077 Coulombs
- quantity of electricity in Coulombs = current in A x time in seconds
- 16077 = 6 x time in seconds, so time in seconds = 16077 / 6 = **2679.5 seconds**
- or 2679.5 / 60 = **44.66 minutes to produce 2 dm^3 of chlorine gas**.

5.**a** bubbles of gas or similar [1]

b hydrogen [1]

c burning splint [1] gas pops [1] [2]

d [2] for accurate plotting, [1] for a smooth curve going
through points [3]

e new line to the left [1] and rising higher [1] [2]

GCSE topic-wise test Biology: Organisation

1. Choose the best answer: (10 X 0.5 = 5 marks)

1

What substance(s) is transported in the xylem?

Water

Water and mineral ions

Sugars and amino acids

2

What feature of palisade cells makes them efficient at photosynthesis?

They have a thick, waxy coating

They are packed with chloroplasts

They are very close to most of the stomata

3

In which direction are substances transported in the phloem?

Upwards only

Downwards only

Upwards and downwards

4

What is the process that transports substances in the phloem?

Transpiration

Translocation

Transcription

5

How is the rate of water uptake by a plant measured?

By the increase in mass of plant leaves

Counting the number of stomata on a leaf

Using a potometer

6

What type of cells release the energy required for phloem transport?

Companion cells

Sieve tubes

Vessels

7

How does water enter a root hair cell?

By osmosis

By active transport

By diffusion

8

Why do Christmas tree growers spray the trees with a chemical that blocks the trees' stomata?

To increase the rate of photosynthesis

To reduce the transpiration rate so they they lose less water

To make them look attractive for Christmas

9

What is a representative sample?

A sample that accurately represents the whole of the group

As small a sample as is possible

A sample that is carefully selected to include the subject of the investigation

10

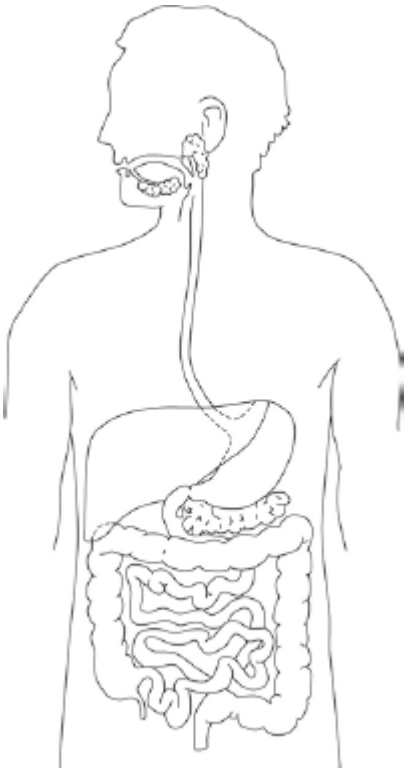
Why does the rate of transpiration increase as the light intensity is increased?

The plant is respiring more so will require less carbon dioxide

The plant will need to get rid of excess water

The plant opens its stomata to allow the entry of carbon dioxide for photosynthesis

Q2. The diagram below shows the human digestive system.



(a) Label the stomach and pancreas on the diagram.

(1)

(b) Many people suffer from stomach ulcers caused by a species of bacteria called *Helicobacter pylori*.

The stomach is lined with a protective lining of mucus.

Helicobacter pylori are acid-tolerant bacteria which can damage this mucus lining.

Suggest how an infection with *Helicobacter pylori* might result in a stomach ulcer developing.

.....

.....

.....

.....

(2)

(c) *Helicobacter pylori* can also cause stomach cancer.

Describe how a person infected with *Helicobacter pylori* could also develop liver cancer.

.....

.....

.....

.....

.....

.....

(3)

(d) Gluten is a form of protein found in some grains.

Describe the test you would use to find out if protein is present in food.

.....

.....

.....

.....

.....

.....

(2)

(e) Coeliac disease is a disease of the digestive system.

It damages the lining of the small intestine when foods that contain gluten are eaten.

When people with coeliac disease eat foods that contain gluten:
1. their immune system forms antibodies to gluten
2. these antibodies attack the lining of the small intestine
3. this causes inflammation in the intestines and damages the villi.

Symptoms of coeliac disease include poor growth.

Suggest why a person with coeliac disease might have this symptom.

.....

.....

.....

.....

.....

.....

.....

.....

(4)
(Total 12 marks)

Q3. The concentration of cholesterol in the blood affects people's health.

(a) Give **two** factors that affect the concentration of cholesterol in the blood.

1 .....

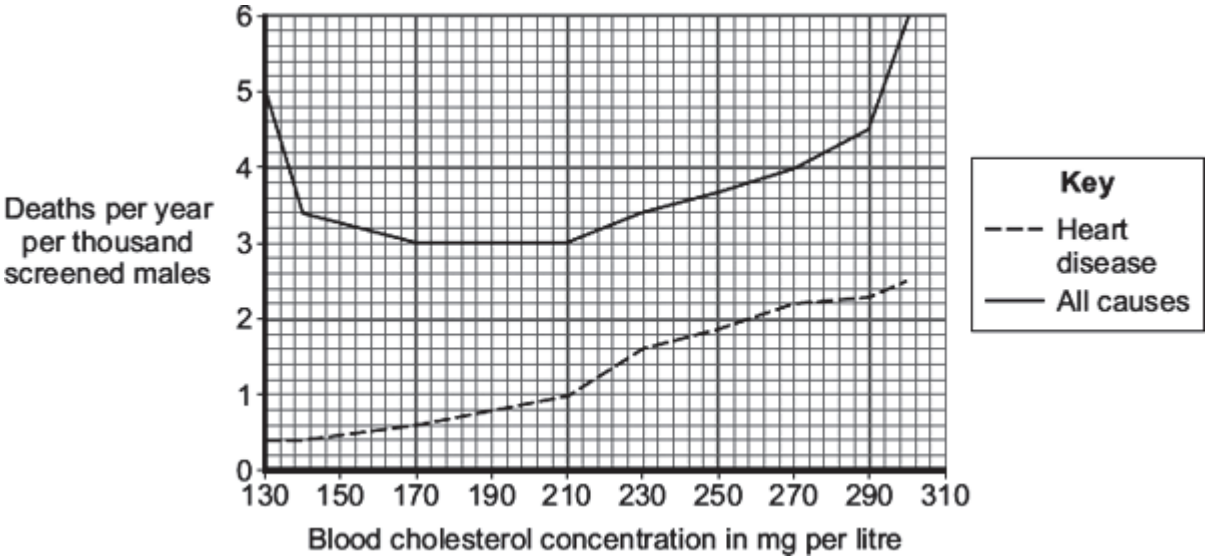
2 .....

(2)

(b) Doctors screened men for blood cholesterol concentration.

The doctors then compared death rates from heart disease with deaths from all causes in this screened group.

The graph shows the results.



(i) Which is the best conclusion that can be drawn from the data?

Tick (✓) **one** box.

There is a positive correlation between blood cholesterol concentration and deaths from all causes. ☐

There is a negative correlation between blood cholesterol concentration and deaths from all causes. ☐

Blood cholesterol concentration is only one of several factors affecting death from all causes. ☐

(1)

(ii) Based on the data in the graph **only**, which is the ideal range for blood cholesterol concentration?

Range ..... to..... mg cholesterol per litre.

(1)

(Total 4 marks)

Q4. Drugs are used to treat cardiovascular diseases (diseases of the heart and blood vessels).

(a) What is a drug?

.....

.....

(1)

(b) People can be treated for cardiovascular diseases with statins or aspirin.

Information about these two drugs is given in the table.

STATINS	ASPIRIN
Statins are only available on prescription from doctors.	Aspirin can be bought over the counter. Treatment with aspirin costs up to £15 per year.
In studies, 30 000 patients were monitored over several years. Statins were found to reduce the rate of non-fatal heart attacks by about 30%.	In a study of 1000 patients, aspirin was found to cause bleeding of the stomach in around 0.5% of patients and there was a slightly increased risk of poor blood clotting at cuts.
Approximately 0.1% of the patients suffered serious muscle damage and 0.01% suffered kidney failure.	There was a slightly increased risk of damage to the blood vessels in the brain in older patients.
Statins reduce blood cholesterol which builds up in the walls of blood vessels. The cost of treating patients with statins can vary between £150 and £500 per year, depending on the type of cardiovascular disease being treated.	Aspirin was found to reduce the risk of non-fatal heart attacks by 31%.

Would you recommend statins or aspirin for the treatment of cardiovascular diseases?

In your answer you should:

- give your recommendation
- use information from the table to support your recommendation by making comparisons of the two drugs.

.....

.....

.....

.....

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.....

(5)
(Total 6 marks)

Q5. The pancreas and the liver are both involved in the control of the concentration of glucose in the blood.

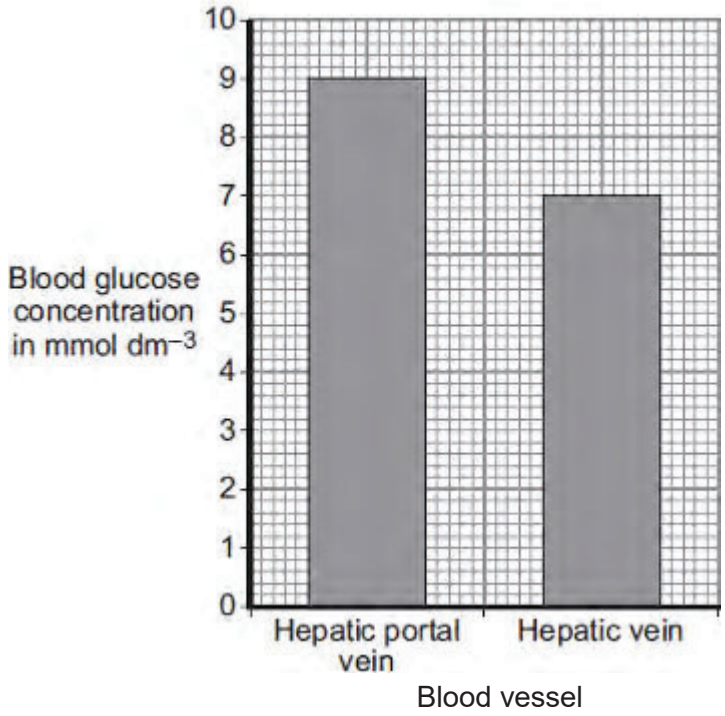
The liver has two veins:

- the hepatic portal vein taking blood from the small intestine to the liver
- the hepatic vein taking blood from the liver back towards the heart.

Scientists measured the concentration of glucose in samples of blood taken from the hepatic portal vein and the hepatic vein. The samples were taken 1 hour and 6 hours after a meal.

Graph 1 shows the concentration of glucose in the two blood vessels 1 hour after the meal.

Graph 1



(a) The concentration of glucose in the blood of the two vessels is different. Explain why.

.....

.....

.....

.....

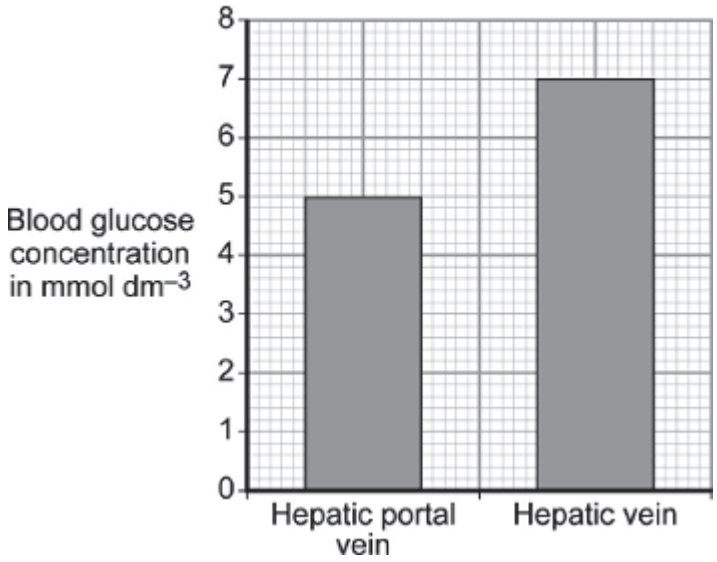
.....

.....

(3)

(b) **Graph 2** shows the concentration of glucose in the two blood vessels 6 hours after the meal.

Graph 2



(i) The concentration of glucose in the blood in the hepatic portal vein 1 hour after the meal is different from the concentration after 6 hours.

Why?

.....

.....

(1)

(ii) The person does **not** eat any more food during the next 6 hours after the meal.

However, 6 hours after the meal, the concentration of glucose in the blood in the hepatic vein is higher than the concentration of glucose in the blood in the hepatic portal vein.

Explain why.

.....

.....

.....

.....

.....

.....

(3)
(Total 7 marks)

Q2.(a) stomach and pancreas correctly labelled

1

(b) bacteria not killed (by stomach acid / HCl) and so they damage mucus lining

1

so acid / HCl damages stomach tissue / causes an ulcer

allow bacteria infect stomach tissue

1

(c) if the cancer is malignant

1

(cancer) cells can spread to other organs

1

via the blood forming a secondary tumour

do not award marking points 2 or 3 without marking point 1

1

(d) add Biuret reagent to food sample

allow sodium / potassium hydroxide (solution) + copper sulfate(solution)

1

mauve / purple colour shows protein present

1

(e) damaged villi reduce surface area for absorption (of food molecules)

1

(therefore) fewer amino acids and glucose absorbed

1

with less glucose transfer of energy from respiration is reduced

1

and fewer amino acids available to build new proteins

1

[12]

M2. (a) any **two** from:

- diet

  ignore exercise

  accept any reasonable reference to diet
  *do **not** accept salt / blood pressure*
  ignore age / gender / HDL / LDL

- heredity / genes / genetic makeup
- reference to cholesterol production by liver

2

(b) (i) Blood cholesterol concentration is only one of several factors affecting death from all causes

1

(ii) 170 – 210

accept 210 - 170

1

[4]

Q4. (a) (substance / chemical) that affects body chemistry / chemical reactions in the body

1

(b) statin / aspirin / neither recommended

no mark, may be implied. If no recommendation or implication, max 4 marks

answers should be comparative

any **five** from:

- argued evaluation in favour of aspirin or statin or neither

answers could include reference to

*accept converse for statins / aspirin but **not** as advantage of one **and** disadvantage of other*

for statins:

- more people in studies
- so data / findings more repeatable

  accept reliable for repeatable

  ignore accurate / precise
- reduces cholesterol but aspirin doesn't

  allow reduces cholesterol but no evidence about aspirin
- aspirin (may) causes bleeding / poor clotting but statins do not

  allow aspirin causes bleeding / poor clotting but no evidence about statins
- smaller (total) percentage suffer side-effects
- monitored by doctor, aspirins not

for aspirin:

- cheaper
- can be bought over the counter rather than prescribed
- statins cause serious damage / muscle damage / kidney failure but aspirins do not

similarities:

- both have similar effect on reducing (non-fatal) heart attacks
- incidence of side-effects low in both

  allow (for aspirin) higher reduction of risk of heart attack

5

[6]

Q5. (a) (concentration high) in the hepatic portal vein is blood with glucose absorbed from the intestine

1

concentration is lower in the hepatic vein because insulin

1

(has caused) glucose to be converted into glycogen

1

or

allows glucose into liver cells

(b) (i) (after 6 hours) most of the glucose has been <u>absorbed</u> from the intestine **or** from food into the blood

1

(ii) because glucagon (made in the pancreas) causes

if biological terms incorrectly spelt they must be phonetically accurate

*do **not** accept glucagon <u>made</u> / <u>produced</u> by the liver*

1

glycogen to be converted into glucose

1

glucose released into blood

allow the liver maintains the correct / constant level of glucose in the blood

1

[7]

lactase works best / well in alkali / high pH / neutral / non-acidic conditions

allow any pH of 7 and above

accept works slowly in acid conditions

*allow figures from table with a **comparison***

ignore reference to temperature

1

(b) any **three** from:

- (below 40(°C)) increase in temperature increases rate / speed of reaction
- reference to molecules moving faster / colliding faster / harder / more collisions
- enzyme optimum / works best at 40°C

  allow value(s) in range 36 – 44

  ignore body temperature unless qualified
- high temperatures (above 40°C) / 45°C / 50°C enzyme denatured

  *allow synonyms for denaturation, but do **not** allow 'killed'*

  *denaturation at high <u>and</u> low temperature does **not** gain this mark*

  ignore references to time / pH

3

(c) any **two** from:

- acid neutralised or conditions made neutral / alkali

  accept bile is alkaline
- (allow) emulsification / greater surface area (of lipid / fat)

  allow description of emulsification eg fat broken down / broken up <u>into droplets</u>

  *do **not** accept idea of chemical breakdown*
- lipase / enzymes (in small intestine) work more effectively / better

  allow better for enzymes

  ignore reference to other named enzymes

2

[7]

M6. (a) (i) mitochondrion / mitochondria

must be phonetically correct

1

(ii) carbon dioxide / CO_2

1

water / H_2O

1

in either order
*accept CO2 but **not** CO^2*
*accept H2O **or** HOH but not H^2O*

(iii) diffusion

1

high to low concentration
allow down a concentration gradient

1

through (cell) membrane **or** through cytoplasm
*do **not** accept cell wall*

1

(b) ribosomes make proteins / enzymes

1

using amino acids

1

part A / mitochondria provide the energy for the process
allow ATP
*do **not** accept produce or make energy*

1

[9]

M7. A + B most effective (treatment)
ignore descriptions of LDL levels

1

D is (the most) effective (treatment)

D is the best single (treatment)

1

neither A nor B (alone) are effective

allow increase risk of heart disease instead of not effective

1

can't tell if C is effective**OR**A + C is not effective

1

[4]

M8. (a) (i) diaphragm

accept phonetic spelling

1

(ii) (because) the volume (inside the jar) increases

*maximum **two** marks if no reference to correct part of model*

1

(causing) the pressure to decrease

1

(and) air enters the balloon

allow oxygen

1

(b) (i) (so it moves by) diffusion

*do **not** allow osmosis or active transport*

1

from a high concentration (of oxygen) to a low concentration

*allow down its / oxygen concentration gradient from the air **or** to the blood*

or

(because) there is a high(er) concentration (of oxygen) in the air **or** there is a low(er) concentration of oxygen in the blood

ignore reference to amount of oxygen

1

(ii) many gill <u>filaments</u>

must be in the correct pairs to gain 2 marks

1

(give a) large surface / area

*do **not** allow surface area to volume ratio*

or

thin

(so) short diffusion pathway

or

good blood supply

(to) maintain the concentration gradient

or

water continually flows over them / continually ventilated

(to) maintain the concentration gradient

1

[8]