AMPLEFORTH COLLEGE

SIXTH FORM SCHOLARSHIP EXAMINATION

SPECIMEN PAPER

GENERAL PAPER

ANSWER **ONE** OF THE QUESTIONS BELOW. TIME ALLOWED – 45 MINUTES

1. What will a post-Brexit future for Britain look like?

2. Is it better to be happy or holy?

3. Which is your favourite building? Explain why you like it so much.

4. What do you consider to be the most important scientific breakthrough in the last 20 years?

5. Is Donald Trump the most dangerous man on the planet?

6. What historical event or moment do you wish you could have witnessed?

7. Should assisted suicide be legalised in specific cases?

8. Is it justifiable to keep large mammals in captivity?

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BIOLOGY

Answer THREE of the following questions (you may use diagrams to help)
All the questions are worth 15 marks
Take care to look at the number of marks available for each question

Time allowed: 45 minutes.

1. a) Give the functions of the following:
      (i)   Mitochondrion (1)
      (ii)   Vacuole (1)
   b) Using a labelled diagram to help, describe the structure of a bacterial cell (3)
   c) Give two characteristics of a fungus (2)
   d) Describe and explain the effect of temperature on the activity of an enzyme (4)
   e) Write concisely about how plants use osmosis as a means of supporting themselves (4)

2. a) Distinguish between the terms Population and Community (2)
   b) Distinguish between Xylem and Phloem (3)
   c) Give two minerals used by plants and their functions (2)
   d) Describe and explain how you would compare the distribution of daisy flowers on two different fields? (4)
   e) Write concisely about how a leaf is adapted for photosynthesis (4)

3. a) Distinguish between the following pairs of terms:
      (i)   Egestion and ingestion (2)
      (ii)   Absorption and assimilation (2)
   b) Describe and explain how carbon dioxide concentration affects the rate of photosynthesis (include a sketch graph) (4)
   c) Describe the digestion of proteins in the human gut (4)
   d) What is meant by a balanced diet? (1)
   e) What is persistalsis? (2)

4. a) Give a balanced equation for aerobic respiration in animals (2)
   b) Compare and contrast aerobic and anaerobic respiration in animals (3)
   c) Describe and explain how the lungs are well adapted for gas exchange? (4)
   d) Explain in as much detail as you can how a human breathes in (4)
   e) Describe the structure of a virus (2 marks)

5. a) Why does a unicellular organism (single celled) not need a circulatory system or gas exchange system? (2)
   b) What is transpiration? (1)
   c) What is the role of blood plasma? (2)
   d) Describe how vaccination makes a person immune to a disease (3)

e) Describe how you would investigate how light intensity affects rate of transpiration in a plant (4)

f) Describe the sequence of events that occur in the heart during one heartbeat (3)

6. a) What is excretion? Besides urine, give an excretory product in humans (3)

b) Using your knowledge of the kidney explain why a human does not excrete protein in their urine? (3)

c) Describe and explain the role of ADH and its effect on urine production in a person who has not drunk water for several hours (4)

d) What is meant by the term mutation? How can the incidence of mutation be increased? (3)

e) Explain the term recessive allele (2)

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CHEMISTRY

Answer **any three** of the questions below: **Time allowed**: 45 minutes.

Candidates are allowed calculators and a copy of the Periodic table.

1.   The first "black powder", now known as gunpowder, was most likely made in China in the tenth century. Gunpowder contains potassium nitrate, KNO_3, charcoal and sulphur.

   a) What is the relative formula mass of potassium nitrate? (1)
   b) When gunpowder is ignited, the reaction produces a large volume of gases very quickly and also potassium sulphide, K_2S solid.

$$2KNO_3 + S + 3C \rightarrow K_2S + 3CO_2 + N_2$$
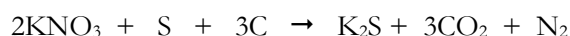
   Calculate the mass of potassium sulphide produced if 404g of potassium nitrate completely reacts. (3)
   c) Draw a dot cross diagram for $K_2S.$ (2)
   d) Potassium sulphide is an ionic compound. State what type of structure it has and explain why it has a high melting point. (3)
   e) State two other physical properties of potassium sulphide you would expect it to have given that it is an ionic compound. (2)
   f) State two forms of carbon that are giant covalent structures. (1)
   g) Sulphur has a low melting point. Explain why with reference to its structure. (3)

2.   Alkenes are important in the chemical industry. Simple alkenes occur naturally and form a small percentage of the hydrocarbons in crude oil.

   a) Name the process used to separate individual groups of hydrocarbons in crude oil. (1)
   b) On which property of the hydrocarbons does this process depend? (1)
   c) Define a hydrocarbon. (2)
   d) Draw the displayed formula for:
      i)   propane (1)
      ii) ethene (1)
   e) Give the term used to describe molecules, such as alkenes, containing a C=C bond. (1)
   f) About 10% of crude oil is converted into alkenes by the process of catalytic cracking. Write a balanced symbol equation for the cracking of octane (C_8H_{18}) to form propene and one other product. (2)
   g) Catalysts are used in cracking. Explain the term catalyst and how they work. (3)
   h) Cracking is also carried out at high temperatures to break down a long chain alkane. What type of reaction is this? (1)
   i) The propene produced by this method can be converted into polypropene. What is this process called and draw the repeating unit for polypropene. (2)

3.   Study the information about elements in the table below and then answer the questions that follow.

Name of element	Melting point (^oC)	Boiling point (^oC)	Type of bonding in element	Reactivity with air and water	Date of discovery	Formula of common oxide(s)
Aluminium	660	2470	metallic	low	1827	Al_2O_3
Carbon	3730	4830	covalent	low	ancient	CO and CO_2
Copper	1083	2595	metallic	low	ancient	CuO
Fluorine	-220	-188		high	1866	F_2O
Helium	-270	-269	n/a	unreactive	1868/1895	none
Magnesium	650	1110	metallic	moderate	1808	MgO
Sodium	98	890	metallic	high	1807	
Silicon	1410	2360	covalent	low	1824	SiO_2

a) Which elements in the table above are gases at 20 ^oC? (1)
b) Which elements in the table above are liquids at 500 ^oC? (1)
c) What is the chemical formula for sodium oxide? (1)
d) The electron arrangement for carbon can be written as 2.4 . State the electron arrangement for fluorine. (1)
e) Fluorine atoms bond together to form a molecule of fluorine (F_2). Draw a dot cross diagram to show the electron arrangement in a fluorine **molecule**. (2)
f) Suggest why it is not appropriate to give a type of bonding for helium in the table above. (1)
g) The elements sodium, magnesium and aluminium are adjacent to each other in the periodic table.
   i)   What pattern do you notice in their melting points? (1)
   ii) Suggest a reason for this pattern. (1)
h) What links are there, if any, between the date of discovery of the elements above and their reactivity? (2)
i) Sodium and magnesium were isolated with a year of each other by Humphrey Davy. He also isolated calcium, barium and potassium between 1807 and 1808. Suggest why these elements were discovered within such a short period of time. (1)
j) Write a balanced symbol equation for the reaction of sodium with water to form sodium hydroxide and hydrogen. Include state symbols in your answer. (3)

4.   You are provided with five containers labelled A, B, C D and E. In each container is a pure sample of a different chemical – each one is a solid. You are given a list of the names of these five solids (see below) but you do not know which one is which.

You are supplied with a range of apparatus and chemicals typically found in a school laboratory.

Explain how you would find the identity of the five unknown solids using your knowledge of chemistry and chemicals provided.

Marks will be awarded for:
a) Describing chemical tests. (5)
b) Describing what you would observe. (5)
c) Writing balanced symbol equations for any of the reactions you would carry out. (5)

Five 'unknown' solids to identify	Chemicals provided
Sodium iodide (NaI)	Bunsen burner
Copper carbonate ($CuCO_3$)	Nichrome wire
Zinc (Zn)	Dilute nitric acid
Lithium sulphate (Li_2SO_4)	Sodium hydroxide solution
Potassium bromide (KBr)	Limewater
	Barium chloride solution
	Silver nitrate solution

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SPECIMEN PAPER

DESIGN AND TECHNOLOGY

Attempt all questions.

Time allowed: 45 minutes.

Allocated marks are shown in brackets after each question.

Give your answers on the separate sheets of A3 paper provided.

Question 1. Product Analysis (suggested time 20 mins)
Figure 1
Study carefully the item in Figure 1, above.
Complete a product analysis for this item and justify your comments under each of the headings below:
a) Function; how does it work and why is it designed in this way?
b) User needs; who in particular would buy this and why?
c) Materials; what are the main components made from and why have they been chosen?
d) Production; which likely methods are used to make this and on what sort of scale will it be produced?
e) Ergonomics
f) Aesthetics
g) Safety [20]

Question 2. Design (suggested time 25 mins)
Figure 2 shows an OLED lamp fitting with a touch switch which is intended to be used in a bedroom lighting device.
The OLED panel is 100mm x 100mm x 2.5mm.
The switch is 48mm x 48mm x 9mm
Figure 2
Using **sketches** and **notes**, develop at least **three** alternative designs for a bedroom lighting device.
☐ Your designs must hold the OLED panel and switch in a secure manner.
☐ Your designs could provide the facility to adjust the direction of the OLED panel.
Your notes should include reference to materials and manufacturing processes. [25]

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SPECIMEN PAPER

ENGLISH

Here are two poems about the coast. The first is by the English poet **Peter Didsbury** (b. 1946), who spent much of his career working as an archaeologist; the second is by the American **poet Robert Frost**, who wrote many powerful poems about the relationship between mankind and nature. Towards the end of his poem, Didsbury speaks about his powerful feelings of 'emptiness' as he walks the shoreline; Frost, by contrast, anticipates 'a night of dark intent' in his poem.

In what ways do the poets communicate their feelings for the coast in their poems?

To help you answer the question you might like to consider:
- the different ways the poets think and observe
- the ways the poets describe their coastal settings
- the ways the poets use words, imagery and verse form

You may compare the poems or write in detail about just **one** of the poems, if you prefer.

The Shore

A minute past noon,
And deeply cold on the shore.
The sun with its rare but un-marvellous halo
Starts climbing back down the sky.
The air stills. Wind lies over field
Like a razor held above a leather strop[1].
The beach is locked and hard.
Its uncut gems, and small round leaves
Like patinated[2] coins,
It keeps beneath plate glass.
How empty things are.
The cliff behind us acts from some notion of presence,
but very faintly, like a host of spirits
crowding to sip at a pool.
The world of phenomena gathers at the surface
Of a system of unity powered by emptiness.
Hills. River. Line of winter farms.
A barge coming down the navigable channel
From somewhere inland, with nothing in its hold.

Peter Didsbury

---

[1] A device, typically a strip of leather, for sharpening razors.
[2] polished

Once by the Pacific

The shattered water made a misty din.
Great waves looked over others coming in,
And thought of doing something to the shore
That water never did to land before.
The clouds were low and hairy in the skies,
Like locks blown forward in the gleam of eyes.
You could not tell, and yet it looked as if
The shore was lucky in being backed by cliff,
The cliff in being backed by continent;
It looked as if a night of dark intent
Was coming, and not only a night, an age.
Someone had better be prepared for rage.
There would be more ocean-water broken
Before God's last *Put out the Light* was spoken.

Robert Frost

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SPECIMEN PAPER

FRENCH

Time allowed: 45 minutes.

Choisissez **ou** la question 1 **ou** la question 2. Ecrivez en français entre 150 et 200 mots.

1. Vous préparez un article sur votre ville pour le journal régional.

   Mentionnez:

   - une description générale de la ville

   - les activités disponibles pour les jeunes de la région

   - les avantages et les inconvénients d'y habiter

   - ce que vous changeriez, s'il y en avait la possibilité

   - si vous aimeriez habiter là quand vous serez plus âgé(e)

2. Vous écrivez une lettre à votre correspondant(e) français(e), dans laquelle vous discutez vos projets d'avenir.

   Mentionnez:

   - ce que vous voudriez étudier l'année prochaine, et pourquoi

   - si vous aimeriez aller à l'université ou trouver un emploi après avoir quitté l'école

   - ce que vous pensez faire comme travail à l'avenir

   - les avantages et les inconvénients de ce genre de travail

   - si vous aimeriez vous marier, et les qualités de votre partenaire idéal(e)

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SPECIMEN PAPER

GEOGRAPHY

Answer ONE of the following questions.

Time allowed: 45 minutes.

1. a) Explain why many scientists believe that human, rather than natural causes, may be more to blame for recent climate change
    b) Explain why some nations will suffer more than others from the impacts of climate change.

2. a) Explain how physical factors influence coastal landscapes.
    b) Compare the effectiveness of two contrasting coastal management strategies.

3. a) Suggest why some places are at more risk than others of experiencing a major tectonic disaster.
    b) Globally disasters are affecting more people but causing fewer deaths than in the past. Explain these two trends.

4. a) Explain the role that TNCs play in the growth of globalisation
    b) Examine how globalisation can have both positive and negative effects on people.

5. a) Explain the benefits of migration for **host** nations.
    b) Examine the effects of a greying (ageing) population on health and welfare services.

6. a) Explain the **physical** factors that contribute to the distribution of flooding.
    b) Describe the methods used to manage **one** type of extreme weather event and comment on their effectiveness.

Candidates are encouraged to draw on case study examples of places they have studied whenever possible. Illustrations such as graphs, diagrams, and sketches are permitted

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HISTORY

Answer ONE of the following:

1. How valid is the view that Japan and Italy were the main causes of international tension in the 1930s? You should consider the importance of Japan and Italy compared to any other countries or factors that you consider important.

2. How valid is the view that Stalin was the main cause of the start and escalation of the Cold War, 1945-53? You should consider the importance of Stalin compared to any other leaders or factors that you consider important.

3. How valid is the view that changes in government occur mainly as a result of economic crisis? Explain your answer using **one or more examples** from your studies. You should consider the importance of economic crises compared to any other factors that you consider important.

4. How valid is the view that the most important changes in society have been brought about by ordinary men and women rather than by governments? Explain your answer using **one or more examples** from your studies. You should consider both sides of this issue.

5. How valid is the view that written sources (eg. diaries, letters, government records) are more useful as historical sources than visual ones (eg. photographs, posters, art)? You should consider the usefulness (or otherwise) of written sources compared to visual, with examples where appropriate.

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LATIN

Answer **both** of the following questions below:

Time allowed: 45 minutes.

It is not necessary to complete the paper, but credit will be given for doing as much as possible. Meanings of words underlined are given in the glossary under each passage.

A. **Read the short introduction in English and translate the following passage into English. Write your translation on alternate lines.**
                                          Total marks = 50

A slave comes to someone's rescue and gets into trouble. He is finally forgiven and receives a reward.

olim servus a iuvene <u>vituperatus</u>, humi iactus est. alter tamen servus eum defendere conans, iuvenem vulneravit. Antonius, pater iuvenis, iratissimus erat. statim servum <u>minari</u> coepit. "poenam dare debes quod tu fuisti stultissimus", inquit. servus, his verbis perterritus, fugere constituit. sed multos dies tristissimus erat quod dominus cognoverat eum fugere parare. itaque servus punitus est. postea Antonius servum rogavit cur filium vulneravisset. servus "re vera dicere non possum" respondit "abi!" Antonius adeo mirabatur hominem audacem ut nihil diceret discederetque.

multis post annis, Antonius ad forum iter faciens, servo accurrit. servus, iam senex, rem totam Antonio narravit. Antonius, quod ipse stultus fuerat, pecuniam servo dedit.

vitupero, vituperare, vituperavi, vituperatus   = I curse
minor, minari, minatus sum   = I threaten

B.   Read the following passage carefully and answer (in English) the questions below it. Marks are given after each question.
Total marks = 30

Fires broke out in Rome which seemed to be started deliberately. A slave came forward to offer information and is rewarded.

hoc anno res dira Romae accidit. multa et ingentia <u>incendia</u> enim prope quaedam templa visa sunt. tantae erant <u>flammae</u> ut templum <u>Vestae</u> vix defenderetur auxilio servorum. eodem tempore octo tabernae deletae sunt. plurimi cogitabant haec scelera ab hominibus malis facta esse, quod ignes multis <u>diversis</u>que locis simul orti erant.

ubi tandem vis <u>flammarum</u> superata erat, consul <u>populo</u> imperavit ut conveniret. deinde rogavit omnes num scirent qui tantum scelus contra urbem <u>suscepissent</u>. magnum praemium promisit: liberto argentum, servo libertatem. hoc spe inductus, quidam servus dixit dominum suum cum quattuor comitibus fecisse. tum consul, servo laudato, statim milites misit ut eos quam celerrime invenirent.

coniurati a militibus capti sunt. servo fideli libertas data est.

incendium, incendii [n]	= fire
flamma, flammae [f]	*= flame*
Vesta, Vestae [f]	*= the goddess Vesta*
diversus-a-um	*= various, different*
populus, populi [m]	*= the people*
suscipio, suscipere, suscepi, susceptus	*= I take up, undertake*

1. Look at line 1 [*hoc...accidit*]. What happened in Rome in that year?   **1**

2. Look at lines 1-2 [*multa...visa sunt*].

   a) Where were the fires seen?   **1**
   b) How are they described?   **2**

3. Look at lines 2-3 [*tantae...servorum*]. What was the result of the flames being so great?   **3**

4. Look at line 3 [*eodem....deletae sunt*]. What happened here?   **2**

5. Look at lines 3-5 [*plurimi...ortae erant*].
   a) How are the people who committed the crimes described?   **1**
   b) What was the reason for this?   **2**

6. Look at line 6 [*ubi...conveniret*].

a) What did the consul order? **2**
b) When did he do this? **3**

7. Look at line 7 [*deinde...suscepissent*]. What did the consul then ask? **4**

8. In line 8 [*magnum...libertatem*], what did the consul promise and for whom? **2**

9. Look at lines 8-10 [*hoc... invenirent*].

   a) What did a certain slave say? **3**
   b) What did the consul then act to the slave? **1**
   c) What did he then do? **3**

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SPECIMEN PAPER

MATHEMATICS

Do all of question 1 and **three** of the remaining questions – you may complete more, in which case the marks of the highest scoring three questions will be used.
Write your answers neatly, and show all relevant working.

You may use a calculator.

1.

    a.   Evaluate $\dfrac{\sqrt{w^2-z}}{2z-w}$ when:

        i. $w = -10$, $z = 4$ (answer in exact form)

        ii. $w = 2.6$, $z = 1.2$ (answer to 3 s.f.)

    b.

        i.   Factorise fully: $2 + x - 3x^2$

        ii. **Hence** solve: $2 + \cos\theta - 3\cos^2\theta = 0$ for
            $0 \le \theta \le 360$
            (answers to 1 d.p.)

    c.   Factorise $2ac - 4bc + ad - 2bd$

    d.   Solve the simultaneous equations: $x^2 + 2y^2 = 36$
                                                          $x + y = 6$

    e.   Solve: $\dfrac{2}{x+1} + \dfrac{3}{x-1} = \dfrac{5}{x^2-1}$

[25]

[5]

2. Prove that the difference of the squares of any two consecutive odd numbers is always a multiple of 8.

3. A bag contains $(n + 7)$ tennis balls of which n are yellow and the other 7 are white.

    John takes a random ball from the bag, notes its colour, and replaces it in the bag. Mary then takes a random ball from the bag.

    Given that the probability that John and Mary takes balls of different colours is $\dfrac{4}{9}$, calculate the probability that John and Mary will both take white balls.

[5]

4. If Jack invests £700 in the Trump pyramid scheme at 100% per year for x years and then invests this for a further y years in the Trump mega-pyramid scheme at 300% per year, how much does he have at the end of the period in terms of x and y?

    Give your final answer in the form $a \times 2^b$ where $1 \le a < 10$ and b is an expression in terms of x and y.

[5]

[5]

[5]

5. The equation $\dfrac{24x^2+25x-47}{ax-2} = -8x - 3 - \dfrac{53}{ax-2}$ is true for all values of $x \neq \dfrac{2}{a}$, where a is a constant.
    What is the value of a?

[5]

6. In triangle *ABC*, the measure of angle *B* is 90º, *BC* = 16, and *AC* = 20. Triangle *DEF* is similar to triangle *ABC*, where vertices *D*, *E*, and *F* correspond to vertices *A*, *B* and *C* respectively, and each side of triangle *DEF* is $\frac{1}{3}$ the length of the corresponding side of triangle *ABC*. What is the value of *sin F* ?

[5]

7. It took John 3.5 hours to drive from city A to city B. On his way back to city A he increased his speed by 20 km/hr and it took him 3 hours.
Find the average speed for the whole journey.

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PHYSICS

Instructions for candidates:

Answer <u>all</u> questions in Sections A and B.
Answer <u>one</u> question from Section C.
The total time allowed for the paper is 45 minutes.
The maximum mark for the paper is 59 marks (including 4 for your Quality of Written Communication in Section C).

The use of calculators is allowed.
Please use black or blue pen. The use of pencils is also allowed.
Do not use correction fluid.

In section C the good use and quality of English will gain marks.

<u>These are formulas you may find helpful.</u>

$E = m \times c \times \theta$	E energy transferred m mass θ temperature change c specific heat capacity
efficiency = $\dfrac{\text{useful energy out}}{\text{total energy in}}$ (× 100%)	
efficiency = $\dfrac{\text{useful power out}}{\text{total power in}}$ (× 100%)	
$E = P \times t$	E energy transferred P power t time
$v = f \times \lambda$	v speed f frequency λ wavelength

Formula	Symbols
$I = \dfrac{Q}{t}$	I current Q charge t time
$V = \dfrac{W}{Q}$	V potential difference W work done Q charge
$V = I \times R$	V potential difference I current R resistance
$P = \dfrac{E}{t}$	P power E energy t time
$P = I \times V$	P power I current V potential difference
$E = V \times Q$	**E** **energy** **V** **potential difference** **Q** **charge**

$a = \dfrac{F}{m}$ or $F = m \times a$	F resultant force m mass a acceleration
$a = \dfrac{v - u}{t}$	a acceleration v final velocity u initial velocity t time taken
$W = m \times g$	W weight m mass g gravitational field strength
$F = k \times e$	F force k spring constant e extension
$W = F \times d$	W work done F force applied d distance moved in the direction of the force
$P = \dfrac{E}{t}$	P power E energy transferred t time taken
$E_p = m \times g \times h$	E_p change in gravitational potential energy m mass g gravitational field strength h change in height
$E_k = \dfrac{1}{2} \times m \times v^2$	E_k kinetic energy m mass v speed
$p = m \times v$	p momentum m mass v velocity

Section A

1. Which of the following are **scalar** quantities? **Circle the correct answers – there are more than three.**

Mass	Length	Time
	Electric Charge	Work done
Momentum	Activity (i.e. Radioactivity)	Velocity
	Force	[3]

2. How much current flows when a charge of 20 coulombs passes a point in 20 seconds? **Circle the correct answer.**

A. 0.1A
B. 1.0A
C. 400A
D. 40A
E. none of the above
　　　[1]

3. A 150 g hockey ball is lifted 2 metres above the ground. What is the gravitational potential energy of the ball? (Let the value of gravity on Earth equal 10 N/kg) **Circle the correct answer.**

A. 300 J
B. 30J
C. 3 J
D. 0.75 J
E. None of the above
　　　[1]

4. A body falls freely, with negligible air resistance. What quantity of the body is its rate of change of momentum? **Circle the correct answer.**

Mass
Power
Kinetic energy
Weight

[1]

5.	In an experiment to investigate static electricity, two objects were found to attract

each other. One possible explanation for this is:	(**Circle the correct**

answer).

A. Both objects were positively charged

B. Both objects were negatively charged

C. Both objects were uncharged

D. One object was positively charged and the other was uncharged

E. One object was plastic and the other was metal

[1]

6.
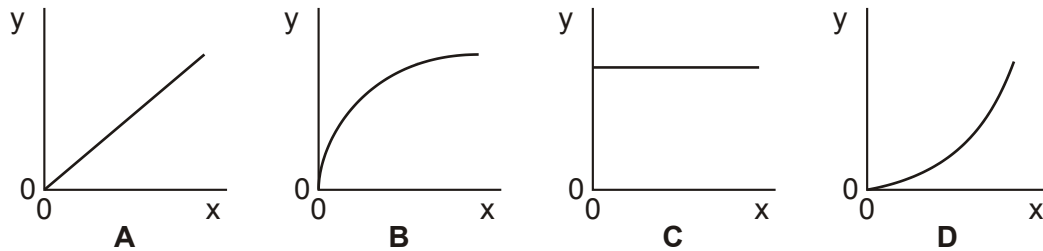
Which graph, **A**, **B**, **C** or **D**, is obtained when the y and x axes represent the
two quantities given in each case below?

(a)	x-axis: the **potential difference** across a filament bulb

y-axis: the **current** through the same filament bulb (as caused by that
potential difference)

answer ....

(b)	x-axis: the **force** applied to the end of the same spring

y-axis: the **extension** of a spring obeying Hooke's law

answer ....

[2]

There are no questions on this page; please turn over to section B.

Section B

7. An investigation was carried out to show how thinking distance, braking distance and stopping distance are affected by the speed of a car.

    The results are shown in the table.

Speed in metres per second	Thinking distance in metres	Braking distance in metres	Stopping distance in metres
10	6	6	12
15	9	14	43
20	12	24	36
25	15	38	53
30	18	55	73

    (a) Draw a ring around the correct answer to complete each sentence.

    As speed increases, thinking distance

    > decreases.
    > increases.
    > stays the same.

    As speed increases, braking distance

    > decreases.
    > increases.
    > stays the same.

    (2)

    (b) One of the values of stopping distance is incorrect.

    Draw a ring around the incorrect value in the table.

    Calculate the correct value of this stopping distance.

    ....

    Stopping distance = ... m   **(2)**

(c) (i) Using the results from the table, plot a graph of braking distance against speed.

Draw a line of best fit through your points.

Speed in metres per second
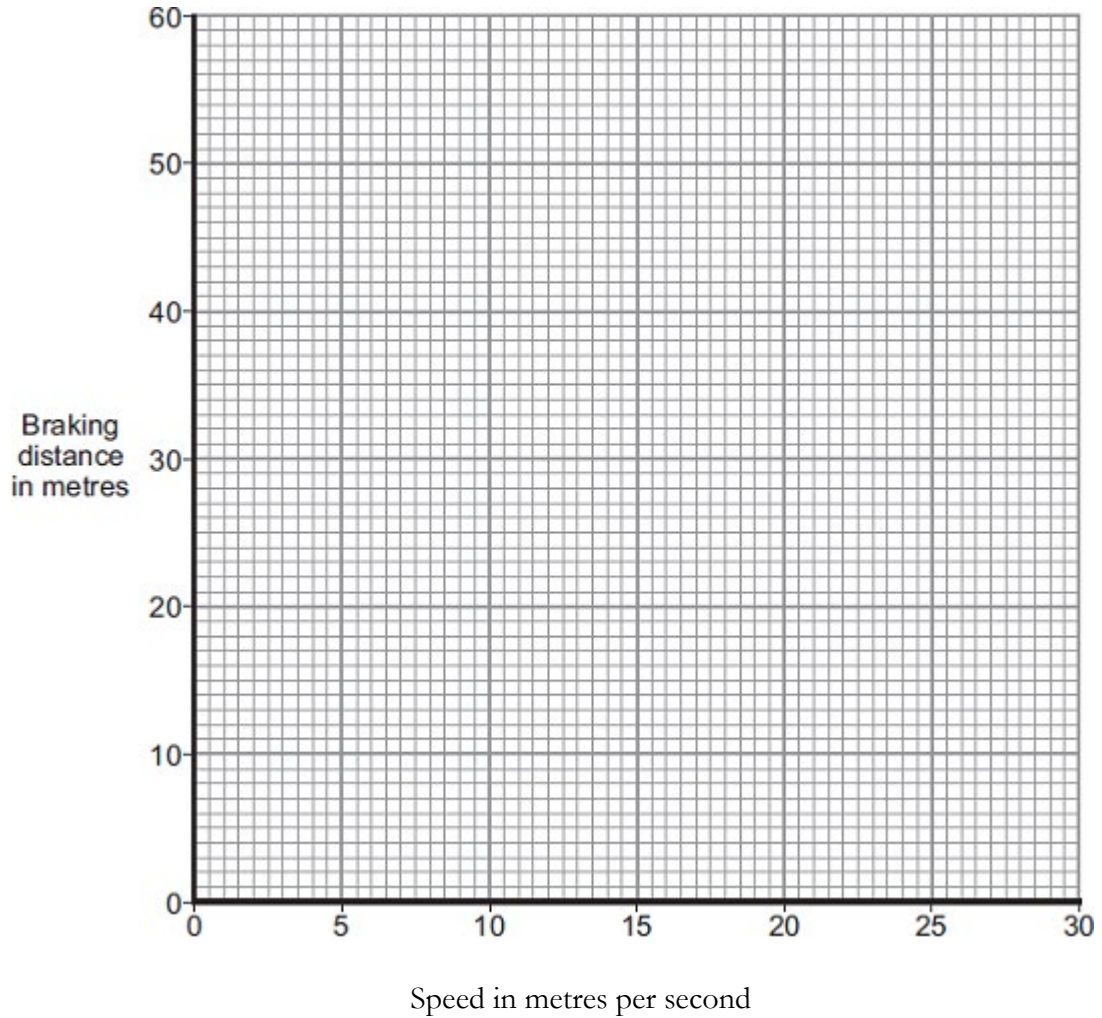
(3)

(ii) Use your graph to determine the braking distance, in metres, at a speed of 22 m / s.

Braking distance = ... m

(1)

(d) The speed–time graph for a car is shown below.

While travelling at a speed of 35 m/s, the driver sees an obstacle in the road at time $t = 0$. The driver reacts and brakes to a stop.

Time in seconds
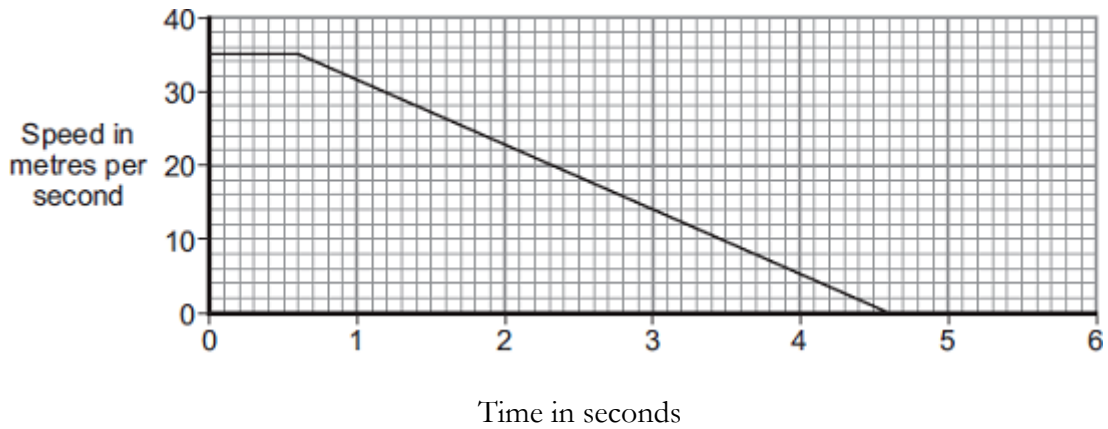
(i) Determine the braking distance.

....

....

....

....

Braking distance = ... m

(3)

(ii) If the driver was driving at 35 m/s on an icy road, the speed–time graph would be different.

Add another line to the speed–time graph above to show the effect of travelling at 35 m/s on an icy road and reacting to an obstacle in the road at time $t = 0$.

(3)

(e) A car of mass 1200 kg is travelling with a velocity of 35 m/s.

(i) Calculate the momentum of the car.

Include an appropriate unit for the answer.

....

....

Momentum = ...

(3)

(Total 17 marks)

8. Different radioactive isotopes have different values of half-life.

(a)   What is meant by the 'half-life' of a radioactive isotope?

....

....

....

(1)

(b)   **Figure 1** shows how the count rate from a sample of a radioactive isotope varies with time.

Figure 1

Time in days
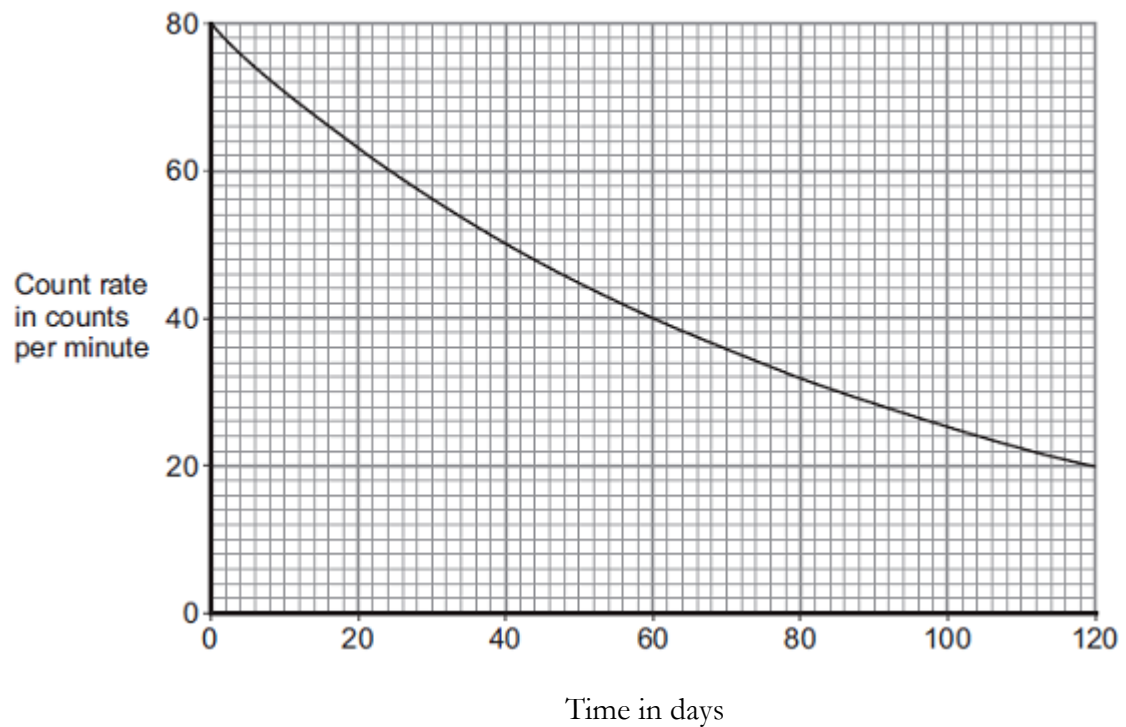
Use information from **Figure 1** to calculate the half-life of the radioactive isotope.

Show clearly on **Figure 1** how you obtain your answer.

Half-life = ... days

(2)

(c)   The table below shows data for some radioactive isotopes that are used in schools.

Radioactive isotope	Type of radiation emitted	Half-life in years
Americium-241	Alpha and gamma	460
Cobalt-60	Gamma	5
Radium-226	Alpha, beta and gamma	1600
Strontium-90	Beta	28
Thorium-232	Alpha and beta	1.4×10^{10}

(i)   State which radioactive isotope in the table above emits only radiation that is **not** deflected by a magnetic field.

Give a reason for your choice.

....

....

....

(2)

(ii) **Figure 2** shows a radioactive isotope being used to monitor the thickness of paper during production.

Figure 2
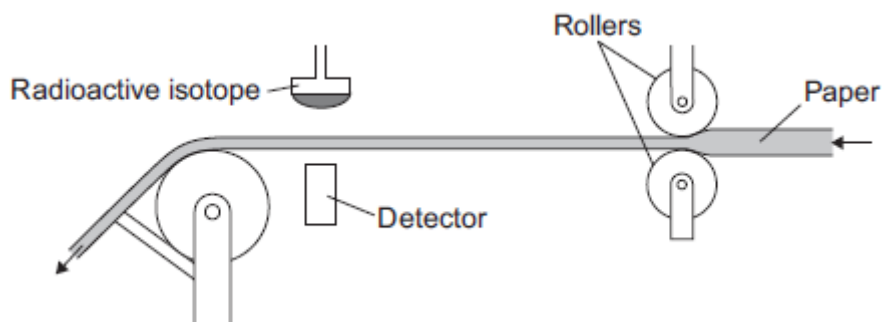
State which radioactive isotope in the table should be used to monitor the thickness of the paper.

Explain your choice.

....

....

....

....

(3)

All the radioactive isotopes in the table have practical uses.

State which source in the table would need replacing most often.

Explain your choice.

....

....

....

....

(3)

(iii) When the radioactive isotopes are not in use, they are stored in lead-lined wooden boxes.

The boxes reduce the level of radiation that reaches the surroundings.

Figure 3 shows two of these boxes.

Figure 3

© David McKean

State **one** source from the table which emits radiation that could penetrate the box.

Explain your answer.

....

....

....

....

(3)
(Total 14 marks)

9.   You will probably have never seen this material before, but have a go.

Data analysis question

Capillary action can cause a liquid to rise up a hollow tube. **Figure 1** shows water that has risen to a height h in a narrow glass tube because of capillary action.

Figure 1
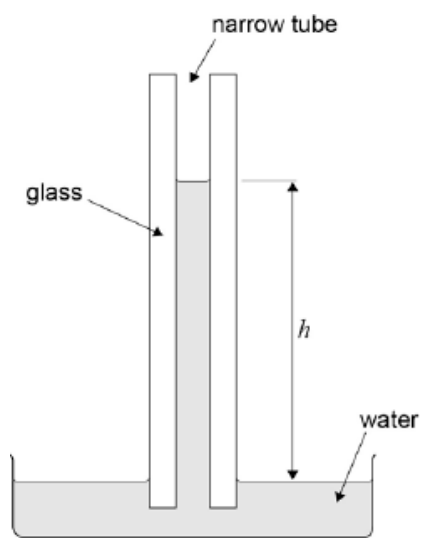
Figure 2 shows the variation of h with temperature θ for this particular tube.

Figure 2
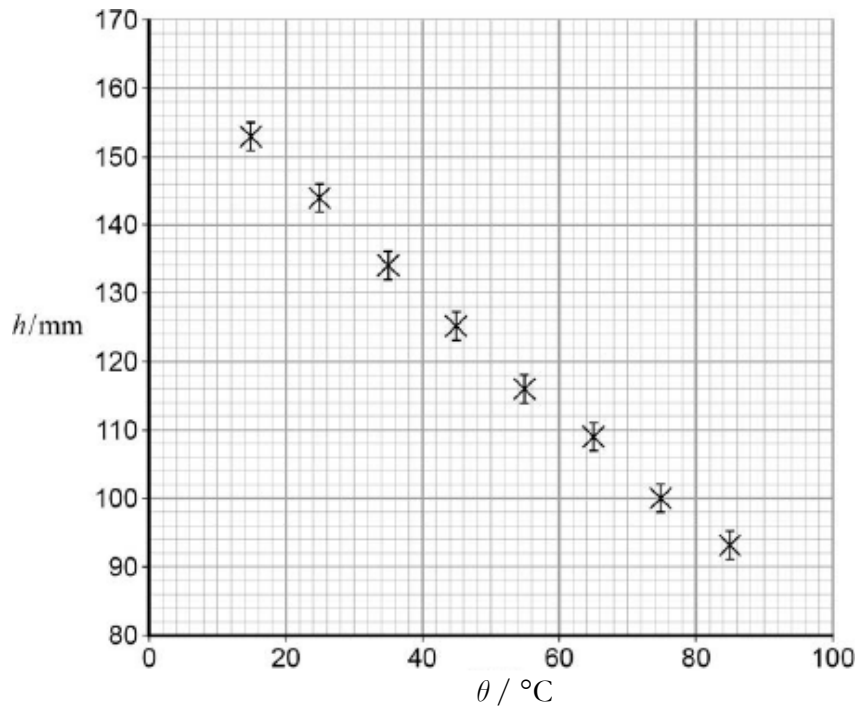
The uncertainty in the measurement of h is shown by the error bars. Uncertainties in the measurements of temperature are so small as to be ignored.

(a)   Draw a best-fit straight line for these data **(Figure 2)**.

(1)

(b)   It is suggested that the relationship between h and θ is

$$h = - (h_0 k)\theta + h_0$$

where h_0 and k are constants.
Use the graph to determine h_0, the value at $0\ ^0C$.

h_0 = ... mm

(1)

(c)   Show that the value of $h_0 k$ is about 0.9 mm $^\circ C^{-1}$.

(3)

(d)   Determine the value of k. State a unit for your answer.

k = ... unit = ...

(2)

(e)   A similar experiment is carried out at constant temperature with tubes
       of varying internal diameter d. **Figure 3** shows the variation of h with
       $\frac{1}{d}$ at a constant temperature.

Figure 3
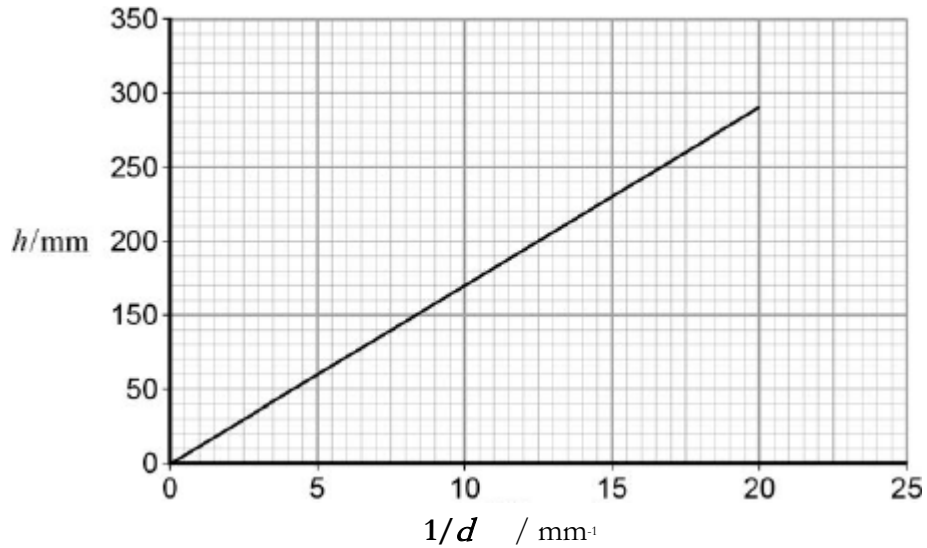
It is suggested that capillary action moves water from the roots of a
tree to its leaves.

The gradient of **Figure 3** is 14.5 mm².

The distance from the roots to the top leaves of the tree is 8.0 m.

Calculate the internal diameter of the tubes required to move water
from the roots to the top leaves by capillary action.

(2)
(Total 9 marks)

Section C

10.   Describe in detail an experiment to investigate whether the starting temperature of water in a beaker has an effect on the rate of heat loss from the beaker.
Please include a diagram(s) if you think it relevant.

[

6]

or

11.   Describe in detail an experiment to investigate whether changing the size of the current that flows through an electromagnet affects the lifting force that it can provide.
Please include a diagram(s) if you think it relevant.

[6]

Quality of written English in section C [4]
Total for the paper [59]

The question I am going to answer is ………….. .

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| End of the test – now check your answers. |

AMPLEFORTH COLLEGE

SIXTH FORM SCHOLARSHIP EXAMINATION

SPECIMEN PAPER

SPANISH

Time allowed: 45 minutes.

Elige la pregunta 1 **o** la pregunta 2. Escribe en español entre 180 y 200 palabras.

1 El verano pasado trabajaste como voluntario para Oxfam. Escribe una carta a un amigo/a sobre tu experiencia.

Habla de los puntos siguientes:

- por qué querías trabajar para esta organización

- el primer día de trabajo y por qué fue difícil

- lo que hiciste para resolver el problema

- tus impresiones sobre la experiencia y qué cambiarías

- cómo piensas que te servirá en el futuro

2 Vas a un concierto en tu instituto. Escribe una carta a tu amigo/a.

  Habla de los siguientes puntos:

- cuándo es el concierto

- por qué has decidido ir

- el tipo de música que prefieres y que recomendarías a un amigo

- lo que ocurrió la última vez que fuiste a un concierto y cómo te sentiste

- la importancia de la música para los jóvenes

AMPLEFORTH COLLEGE

SIXTH FORM SCHOLARSHIP EXAMINATION

SPECIMEN PAPER

THEOLOGY

Time allowed: 45 minutes.

Answer **one** of the questions below:

1. 'All desire by nature to know.' What did Aristotle mean and is it true?

2. Is there any reason to believe in the soul?

3. 'Conscience is formed through our experiences, upbringing and education, it does not come from God.' Assess this statement.

4. 'Morality can never be universal.' Discuss.