



HARROW SCHOOL

ENTRANCE SCHOLARSHIPS EXAMINATION 2016

BIOLOGY

30 Minutes

GENERAL INSTRUCTIONS:

*You have 30 minutes to answer all of the questions.
You may use a calculator.*

Question 1

Answer the following multiple-choice questions. Underline the correct answer with a ruler and pencil as shown in the example below:

Example question: What is the maximum magnification that can be achieved using a standard light microscope when the magnification of the eyepiece lens is x10 and the magnification of the high power objective lens is x40?

- i. x40
- ii. x50
- iii. x400
- iv. x410

a) Which of the following molecules is NOT a carbohydrate? (1)

- i. starch
- ii. glucose
- iii. amylase
- iv. cellulose

b) The diameter of a cell when viewed down a microscope is 1.2 cm. If the magnification of the microscope is x400, what is the actual diameter of the cell in mm? (1)

- i. 4800
- ii. 30
- iii. 0.48
- iv. 0.03

c) Which of the following food chains is correct? (1)

- i. plankton → humpback whale → herring → killer whale
- ii. herring → plankton → humpback whale → killer whale
- iii. humpback whale → killer whale → herring → plankton
- iv. plankton → herring → humpback whale → killer whale

d) Which is the correct order of events in the life cycle of a flowering plant? (1)

- i. germination → fertilisation → pollination → seed dispersal
- ii. pollination → fertilisation → seed dispersal → germination
- iii. fertilisation → pollination → germination → seed dispersal
- iv. seed dispersal → fertilisation → germination → pollination

e) Which of the following biological disciplines is associated with the study of the brain? (1)

- i. neurology
- ii. ecology
- iii. microbiology
- iv. cardiology

f) Which of the following groups of animals evolved first? (1)

- i. fish
- ii. dinosaurs
- iii. insects
- iv. amphibians

g) Which is the correct sequence of organs that blood flows through from the liver to the kidney? (1)

- i. liver → heart → kidney
- ii. liver → heart → lungs → heart → kidney
- iii. liver → heart → lungs → kidney
- iv. liver → kidney

h) Which of the following diseases is caused by a virus? (1)

- i. tuberculosis (TB)
- ii. cholera
- iii. malaria
- iv. Ebola

i) Which reagent would be used to stain the nucleus of a cell? (1)

- i. iodine solution
- ii. methylene blue
- iii. Benedict's solution
- iv. bicarbonate indicator solution

/ 9 marks

Question 2

Below is a picture of a Boxer, a breed of domestic dog.



All domestic breeds of dog, including Boxers, belong to the same species: *Canis familiaris*. They were selectively bred by humans from a wolf-like ancestor such as that shown below.



- a) What key feature, visible in the pictures above, indicates that both Boxers and wolves are mammals? (1)

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- b) Describe one other characteristic, not shown, that is unique to mammals. (1)

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- c) Describe how the process of selective breeding could have created a Boxer from a wolf-like ancestor. (3)

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- d) In theory, because they are all the same species, Boxers should be able to reproduce successfully with other breeds of domestic dog. Suggest why in practice this may not be possible. (1)

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In December 2015, it was announced in the news that two puppies had been successfully produced by cloning from a Boxer dog called Dylan that had recently died. In this procedure, to produce each puppy, the nucleus from one of Dylan's cells (e.g. a skin cell) was inserted into an egg cell from another dog that had had its own nucleus removed. The cell that was created was then stimulated (using electric shock) to undergo cell division to form an embryo. The embryos produced in this way were then implanted into the uterus of a female dog. The cloned puppies are genetically identical to each other and to Dylan.

- e) Draw a diagram of a normal egg cell in the space below. Label the cell membrane, nucleus and cytoplasm. (3)

- f) What is contained in the nucleus of a cell. (1)

.....

- g) If, during embryo formation, each cell divides to form two cells every 12 hours, how many cells would there be in the embryo after one week of development (starting with one cell). Show your working. (2)

Answer = cells

- h) Describe two ways by which the process of cloning is different to sexual reproduction. (2)

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- i) Despite being genetically identical, suggest why the puppies may not grow up to look or behave in exactly the same way as Dylan did. (2)

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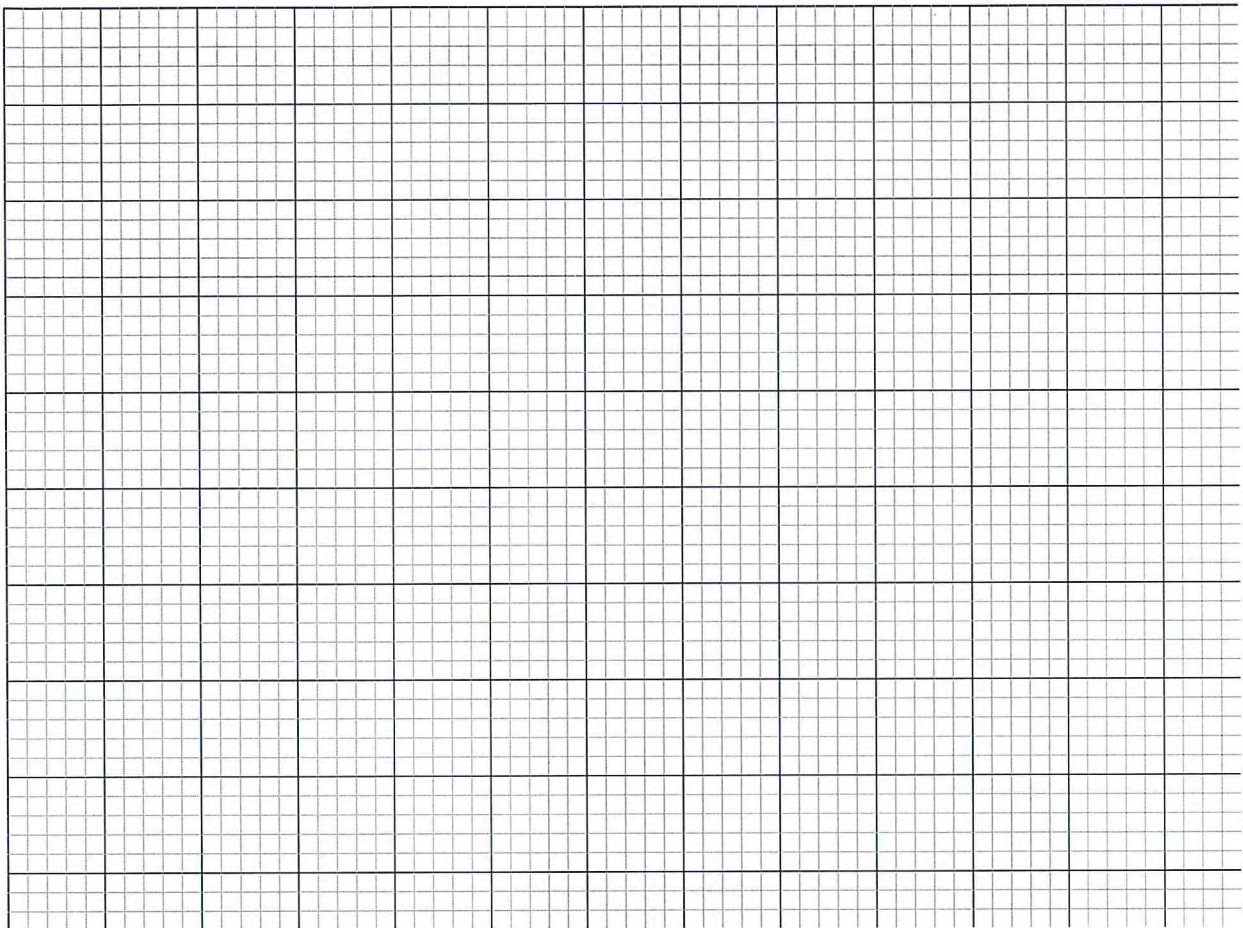
Animal cloning is not a very successful procedure. Most of the embryos created do not develop into live offspring as shown in the table below. Those that do often have health problems and die prematurely.

Animal	Number of embryos created	Number of live offspring	Cloning success rate (%)
mouse	2468	31	1.3
cow	440	6	
sheep	417	14	
pig	977	5	
goat	285	3	

- j) Complete the last column of the table. (1)

- k) Plot the cloning success rates for the different animals in a suitable graph or chart.
Make sure that the axes are fully labelled.

(4)



- l) Suggest two reasons why people are opposed to the cloning of humans.

(2)

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.....

/ 23 marks



HARROW SCHOOL

SCHOLARSHIP ENTRANCE EXAMINATION 2016

CHEMISTRY

30 Minutes

GENERAL INSTRUCTIONS:

Answer all questions in the spaces provided.

You will need a calculator.

1. This question is about displacement reactions and the reactivity series of metals.

If you place a small piece of metal into a test tube containing some copper nitrate solution, a displacement reaction might occur. It will only occur if the metal added is more reactive than copper. The word equation for the reaction that might happen is as follows:

metal + copper nitrate \rightarrow metal nitrate + copper

All displacement reactions are exothermic. This means that the reaction is accompanied by an increase in temperature. The more reactive the metal added to the copper nitrate solution, the greater the temperature rise.

A pupil conducts a series of experiments in which he places pieces of metal into tubes that contain copper nitrate solution and he measures the maximum temperature rise using a thermometer. He conducts the experiments in such a way that he can make a fair comparison between the results that he measures for each metal.

(a) Name three things that the pupil will need to keep the same in his experiments to allow him to make a fair comparison between the metals.

i) _____

ii) _____

iii) _____

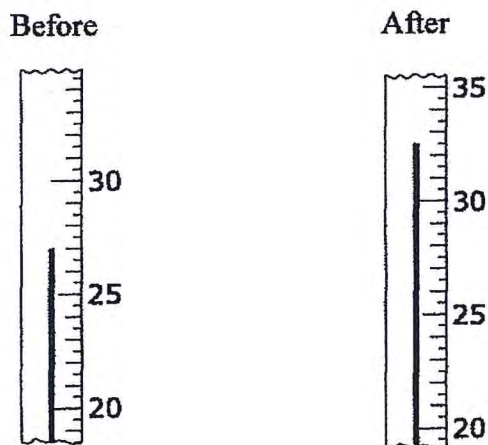
[3]

He tries each different metal three times and averages the results. He records all his results in a table, which is shown below with some omissions.

Metal added	Temperature change (°C)			Average temperature change (°C)
	Experiment 1	Experiment 2	Experiment 3	
iron	11.5	11.0	10.5	11.0
zinc	15.0	14.5	15.0	14.8
lead		5.0	5.0	
gold	0.0	0.0	0.0	0.0
silver	0.0	0.0	0.0	0.0
tin	7.0	7.0	7.5	
copper	0.0	0.0	0.0	0.0

(b) The picture below shows the temperature of the solution before and after the piece of lead was placed in the copper nitrate solution in experiment 1. Use these diagrams to work out the temperature change that occurs in this experiment. Record your answer in the table above.

[2]



(c) Calculate the average temperature rises for lead and tin, giving your answers correctly rounded to one decimal place. Enter your answers in the correct spaces in the table.

[2]

(d) Explain fully why it is important to measure the maximum temperature rise rather than waiting for a fixed period of time before measuring the final temperature. Give two reasons.

[4]

(e) Why is there no temperature rise when copper is used?

[1]

(f) Why is there no temperature rise when gold is used?

[1]

(g) Give the names of the four most reactive metals used, and place them in order of reactivity.

Most reactive _____

[2]

(h) Why is it not possible to determine the least reactive metal out of the seven tested?

[1]

(i) Suggest the name of a compound that could replace copper nitrate that would allow you to determine which metal is the least reactive.

[1]

(j) Using the information you have gained from this question, determine which of the following mixtures will react. If there is no reaction, write "NR". If you think that a reaction will take place, give the names of the products after the arrow.

i) iron + zinc nitrate →

ii) zinc + lead nitrate →

iii) lead + gold nitrate →

[3]

2. This question is about how solids change their solubility in water as the temperature changes.

Most solids are more soluble in hot water than in cold water. Solubility is measured in grams of solid that will dissolve in 100 grams of water at a certain temperature. When this much solid has dissolved in 100 g of water, the resulting solution is said to be saturated.

To measure the solubility of a solid in water at a particular temperature, the following experiment is done.

- i) Make a saturated solution of the solid in water at a known temperature;
- ii) weigh an empty dish;
- iii) pour some of the saturated solution into the dish, and reweigh the dish and solution together;
- iv) gently evaporate all the water by heating the solution, and when all the water has gone, reweigh the dish with the solid that remains.

The table below shows the results of one such experiment, conducted at 35 °C.

Mass of empty dish (g)	45.5
Mass of dish + saturated solution (g)	113.8
Mass of dish + solid that remains after removing the water (g)	74.1

(a) Calculate the mass of saturated solution placed in the dish.

_____ g [1]

(b) Calculate the mass of solid that remains after the water is evaporated.

_____ g [1]

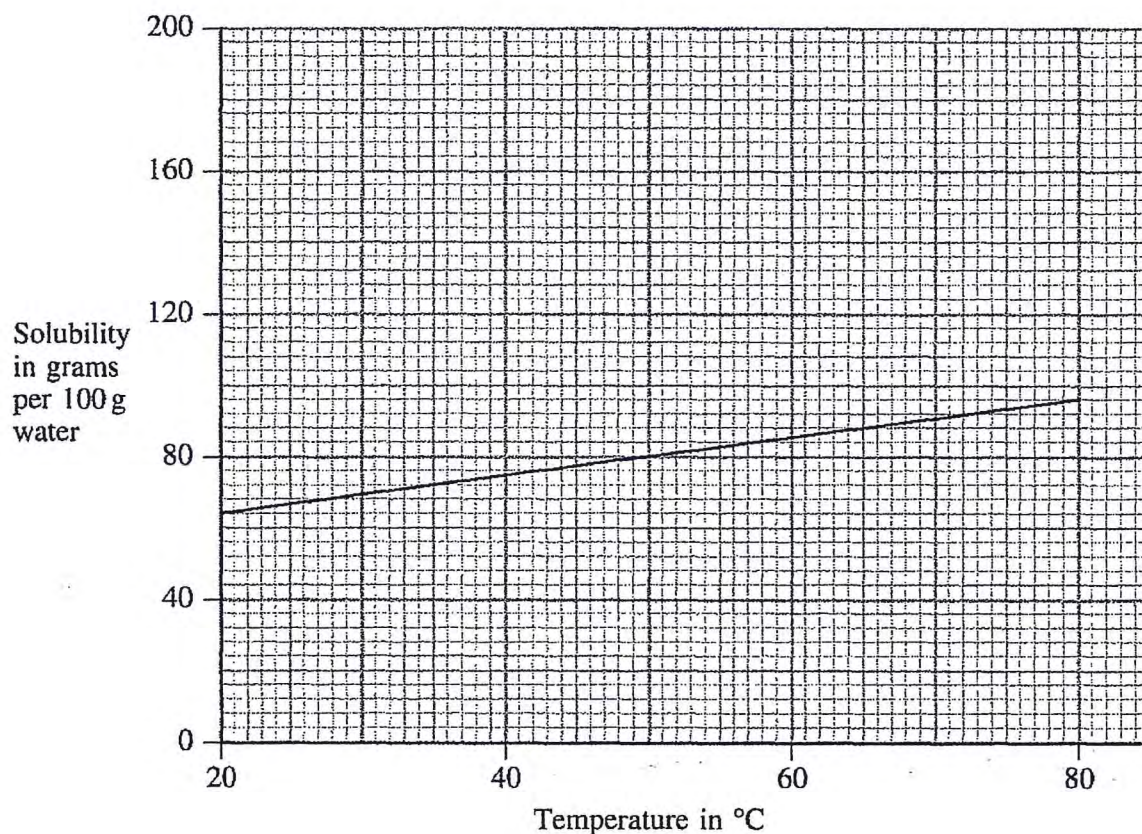
(c) Hence calculate the mass of solid that would dissolve in 100 g of water at 35 °C.

_____ [2]

(d) If not all the water was evaporated, what would happen to the value of the solubility that this experiment determined?

_____ [1]

This experiment is repeated at many different temperatures and the solubility of the solid is plotted against temperature.



(e) Using the graph, determine the solubility of the solid at 65 °C.

_____ g / 100 g water [1]

(f) The whole experiment was repeated using a different solid, called potassium nitrate. The results are shown in the table below.

Temperature (°C)	20	30	40	60	70	80
Solubility of potassium nitrate (g per 100 g water)	32	46	64	104	132	170

Plot these data on the graph above and draw the line of best fit.

[3]

(g) At what temperature do potassium nitrate and the original solid have the same solubility?

_____ °C [1]

(h) What is the maximum temperature at which the solubility of any solid in water can be measured. Explain your answer.

[2]

(i) A saturated solution of potassium nitrate was cooled from 60 °C to 40 °C. What do you expect to see happen as the cooling takes place? Explain your answer, making reference to readings taken from your graph.

[3]

Total = 35 marks



HARROW SCHOOL

ENTRANCE SCHOLARSHIPS EXAMINATION 2016

ENGLISH

1 Hour 30 Minutes

GENERAL INSTRUCTIONS:

You should attempt both sections.

You are advised to spend 45 minutes on Section A (15 minutes reading and making notes and 30 minutes writing) and 45 minutes on Section B.

Section A – Reading and close-analysis (45 minutes, 50 marks)

Read the following passage from Shakespeare's *Julius Caesar* and answer the questions that follow. In this passage Cassius is explaining to his friend, Brutus, what he thinks and feels about Caesar's rise to power and tells Brutus two stories about Caesar from the past.

Cassius:	I know that virtue to be in you, Brutus, As well as I do know your outward favour. Well, honour is the subject of my story. I cannot tell what you and other men Think of this life; but, for my single self, I had as lief not be as live to be In awe of such a thing as I myself. I was born free as Caesar; so were you: We both have fed as well, and we can both Endure the winter's cold as well as he: For once, upon a raw and gusty day, The troubled Tiber chafing with her shores, Caesar said to me 'Darest thou, Cassius, now Leap in with me into this angry flood, And swim to yonder point?' Upon the word, Accoutred as I was, I plunged in And bade him follow; so indeed he did. The torrent roar'd, and we did buffet it With lusty sinews, throwing it aside And stemming it with hearts of controversy; But ere we could arrive the point proposed, Caesar cried 'Help me, Cassius, or I sink!' I, as Aeneas, our great ancestor, Did from the flames of Troy upon his shoulder The old Anchises bear, so from the waves of Tiber Did I the tired Caesar. And this man Is now become a god, and Cassius is A wretched creature and must bend his body, If Caesar carelessly but nod on him. He had a fever when he was in Spain, And when the fit was on him, I did mark How he did shake: 'tis true, this god did shake; His coward lips did from their colour fly, And that same eye whose bend doth awe the world Did lose his lustre: I did hear him groan: Ay, and that tongue of his that bade the Romans Mark him and write his speeches in their books, 'Alas', it cried 'Give me some drink, Titinius,' As a sick girl. Ye gods, it doth amaze me A man of such a feeble temper should So get the start of the majestic world And bear the palm alone.	5 10 15 20 25 30 35 40
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Glossary

'lief' – rather 'Tiber' – river in Rome 'accoutred' – dressed 'lusty' – strong 'sinews' – muscles
'Aeneas' and 'Anchises' – characters from the story of the fall of Troy: Anchises was Aeneas's father
'lustre' – shine

Questions on the passage

1) Describe **in your own words** the two memories Cassius has of Caesar, as recounted in the passage?

(10 marks)

2) Based on your reading of the passage, what does Cassius feel about Caesar's rise to power and why? Use examples from the passage to support your answer.

(20 marks)

3) Select **two** examples (lines, sentences, phrases or images) from the passage that you think are particularly effective and explain why.

(10 marks for each example – 20 marks total)

*** START A NEW PIECE OF PAPER FOR SECTION B ***

SECTION B: Composition – 45 minutes, 50 marks.

25 marks will be awarded for **content** and 25 marks for **quality of writing**.

Choose **one** of the composition tasks below.

1) Discursive writing

Discuss the role of books in your life.

2) Persuasive writing

'The world would be a better place without so much technology.' Argue for or against this view.

3) Creative

'The Red Hat' – write a short story with this as the title.

4) Descriptive

Describe a train journey and what you see outside the window as you travel.



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ENTRANCE SCHOLARSHIPS EXAMINATION 2016

FRENCH

1 Hour

GENERAL INSTRUCTIONS:

*You should start a new sheet of paper for each exercise.
Please write all of your answers ON ALTERNATE LINES.*

The marks are shown at the end of each exercise. Use your time accordingly.

1. Translate into English. You should write ON ALTERNATE LINES.

L'été dernier, Pierre et son père ont voyagé aux Pays-Bas pendant les vacances. Ils voulaient dormir dans une tente à la campagne, donc avant de partir, ils avaient réservé un emplacement sur un camping près de la côte. C'était un endroit tranquille et pittoresque avec une vue magnifique de la mer, un terrain de sport et deux blocs sanitaires à proximité. Pour un site tellement bien situé en haute saison, le prix était raisonnable et même la location de vélos n'était pas chère.

La visite au zoo était une des meilleures journées de leur séjour. Le zoo se trouvait dans une petite ville à environ cinq kilomètres du camping et ils avaient envie d'y aller parce qu'ils s'intéressaient aux animaux. Le coût de l'entrée était bon marché, donc ils ont décidé que s'ils revenaient, ils iraient encore une fois. Le seul inconvénient était qu'il fallait s'y rendre à vélo car il n'y avait ni train ni bus.

Cette année, ils ont voulu aller en Suisse au mois de juillet mais ce n'était pas possible à cause de Pierre et son voyage scolaire. Au lieu de cela, ils ont décidé d'aller en Espagne en août. Ils prendront l'avion et resteront dans un hôtel de luxe au centre de la ville capitale. Bien que le vol pour Madrid ne dure que deux heures, ils se demandent si une semaine sera assez pour pouvoir se détendre complètement. Pierre attend quand même les vacances avec impatience car ça lui plaît énormément de découvrir des cultures différentes.

(30 marks)

PLEASE START ANOTHER SHEET OF PAPER AND WRITE ON

ALTERNATE LINES

2. Translate the following sentences into French:

- a) She is called Anne
- b) We eat the salad
- c) They have read the postcard from their aunt
- d) He was returning home
- e) The boy used go horseriding
- f) I was drinking some tea
- g) Frank and Simon arrived at the station
- h) I buy two newspapers
- i) They have written a long letter
- j) We had decided to stay
- k) My mother had already left
- l) Michel is going to win
- m) I am going to watch the match
- n) It is windy today
- o) The girls will be intelligent

(30 marks)

PLEASE START ANOTHER SHEET OF PAPER AND WRITE ON

ALTERNATE LINES

3. You recently went to the theme park in France. Write an article for your school website talking about your day out.

You should include details about:

- **When you went and how you travelled to the theme park**
- **Where the theme park was exactly**
- **Who did you go with**
- **What you did**
- **Whether you liked it and will you return**

(40 marks)

The account may be true or imaginary.

No credit will be given for pre-learnt but irrelevant material.

You should write using any tenses you consider appropriate. When you have finished, you should **CHECK YOUR WORK VERY CAREFULLY**, looking especially at verb forms, genders, adjectives and spelling.

Please do not write more than 150 words. You should concentrate on **accuracy** (and quality rather than quantity).



HARROW
SCHOOL

ENTRANCE SCHOLARSHIPS EXAMINATION 2016

GEOGRAPHY

1 hour 30 minutes

GENERAL INSTRUCTIONS:

Questions **one** and **two are compulsory** and must be answered.

Answer **one** essay title from a choice of four for question three.

An O.S. map extract is included with this examination.

Answer all questions in the space provided.

QUESTION 1

Answer ALL of Question 1
[Spend 25 minutes on this section]

Use the Ordnance Survey map extract showing part of the Manchester area to answer the following questions:

- (a) Complete the following table by identifying the land use at each grid reference. [3]

Grid reference	Land use
806 022	Parking
781 004	
767 023	
794 020	

- (b) Which of the following statements describe the location of the industrial estate on the western side of the map extract (7601/7602)?

Tick the **two** correct boxes. [2]

The industrial estate is:

Close to a motorway	
Next to a river	
Surrounded by open countryside	
Next to a number of residential areas	

- (c) A person lives in Charlestown (8100) and works in the industrial estate (7601/7602).

- i) In which direction does this person travel to get to work? [1]

.....

- ii) To the nearest kilometre, what is the straight line distance of this person's journey to work? [2]

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- (d) Using map evidence, suggest **two** reasons why people might choose to live in the housing estate at Roe Green (7501) on the western edge of the map extract. [2]

1

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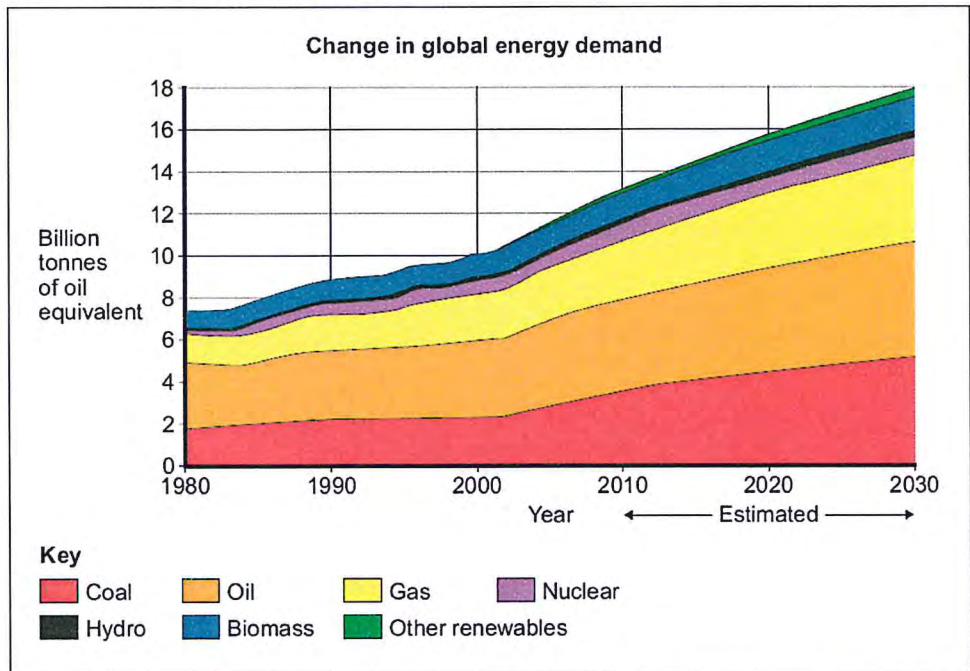
2

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QUESTION 2

Answer ALL of Question 2
[Spend 30 minutes on this section]

Study Figure 1 below, which shows change in global energy demand over time.



(a) i) Describe the change in global energy demand between 1980 and 2010. [4]

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ii) Explain two reasons that might account for these changes?

1

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..... [2]

2

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..... [2]

QUESTION 3

[Spend 35 minutes on this section]

Answer any **one** of the following essay questions and in each case refer to specific examples, places and processes.

Credit will be given for the use of named and located examples and the use of well-labelled sketch maps and diagrams where appropriate.

EITHER

- a) What use is geography to David Cameron, the British Prime Minister? [20]

OR

- b) With reference to **either** volcanic eruptions, **or** earthquake events, explain why the impacts of such natural hazards vary around the world. [20]

OR

- c) What are the causes of river flooding and how does man seek to manage rivers that are prone to flooding? [20]

OR

- d) Over 50% of the world's population now live in cities. Why is this and will we ever start to move back into the countryside? [20]

Space to plan your answer:

[illegible]

This image shows a full page of a document template designed for handwriting practice or general note-taking. It consists of approximately 28 evenly spaced horizontal dotted lines across the entire width of the page. The background is plain white, and there are no margins, headers, footers, or other markings present.

[Total: 20 marks]

[Exam Total: 60 marks]

END OF EXAMINATION

ROADS AND PATHS *Not necessarily rights of way*

M1 or A61(M) Motorway
A35 Dual carriageway
A30 Main road
B3074 Secondary road
Narrow road with passing places
Road under construction
Road generally more than 4 m wide
Road generally less than 4 m wide
Other road, drive or track, fenced and unfenced
Gradient: steeper than 20% (1 in 5)
14% (1 in 7) to 20% (1 in 5)
(V) Vehicle; (P) Passenger
Path

RAILWAYS

Multiple track } Standard gauge
Single track }
{ Narrow gauge or Light Rapid Transit System (LRTS) and station
Road over, road under, level crossing
Cutting; tunnel; embankment
Station, open to passengers; siding

PUBLIC RIGHTS OF WAY *Not shown on maps of Scotland*

Footpath
Bridleway
Byway open to all traffic
Restricted byway
The representation on this map of any other road, track or path is no evidence of the existence of a right of way

OTHER PUBLIC ACCESS

Other routes with public access
National Trail / Long Distance Route; Recreational route
Permitted footpath
Permitted bridleway } See note below
Footpaths and bridleways along which landowners have permitted public use but which are not rights of way. The agreement may be withdrawn.
Traffic-free cycle route
National cycle network route number—traffic free
National cycle network route number—on road

BOUNDARIES

National
County (England)
Unitary Authority (UA), Metropolitan District (Met Dist), London Borough (LB) or District (Scotland & Wales are solely Unitary Authorities)
Civil Parish (CP) (England) or Community (C) (Wales)
National Park

HISTORICAL FEATURES

Site of antiquity
Site of battle (with date)
VILLA Roman
Non-Roman
Visible earthwork

GENERAL FEATURES

Gravel pit
Sand pit
Other pit or quarry
Landfill site or slag heap
Slopes
Place of worship
Current or former place of worship
Building; important building
Glasshouse
Youth hostel
Bunkhouse / camping barn / other hostel
Bus or coach station
Lighthouse; disused lighthouse;
Beacon
Triangulation pillar
Mast
Windmill; with or without sails
Wind pump; wind turbine
Electricity transmission line
Boundary post
Boundary stone
Clubhouse
Footbridge
Milepost; milestone
Monument
Post office
Police station
School
Town Hall
Normal tidal limit
Well; spring

HEIGHTS AND NATURAL FEATURES

Ground survey height
Air survey height
Surface heights are to the nearest metre above mean sea level. Where two heights are shown, the first height is to the base of the triangulation pillar and the second (in brackets) to the highest natural point of the hill
Vertical face/cliff
Loose rock
Outcrop
Scree
Water; mud
Sand; sand and shingle

VEGETATION

Vegetation limits are defined by positioning of symbols

Coniferous trees
Non-coniferous trees
Copse
Orchard
Scrub
Bracken, heath or rough grassland
Marsh, reeds or saltings

ACCESS LAND (England & Wales)

Access land boundary and tint
Access land in wooded area
Access information point
Access permitted within managed controls, for example, local byelaws

ACCESS LAND (Scotland)

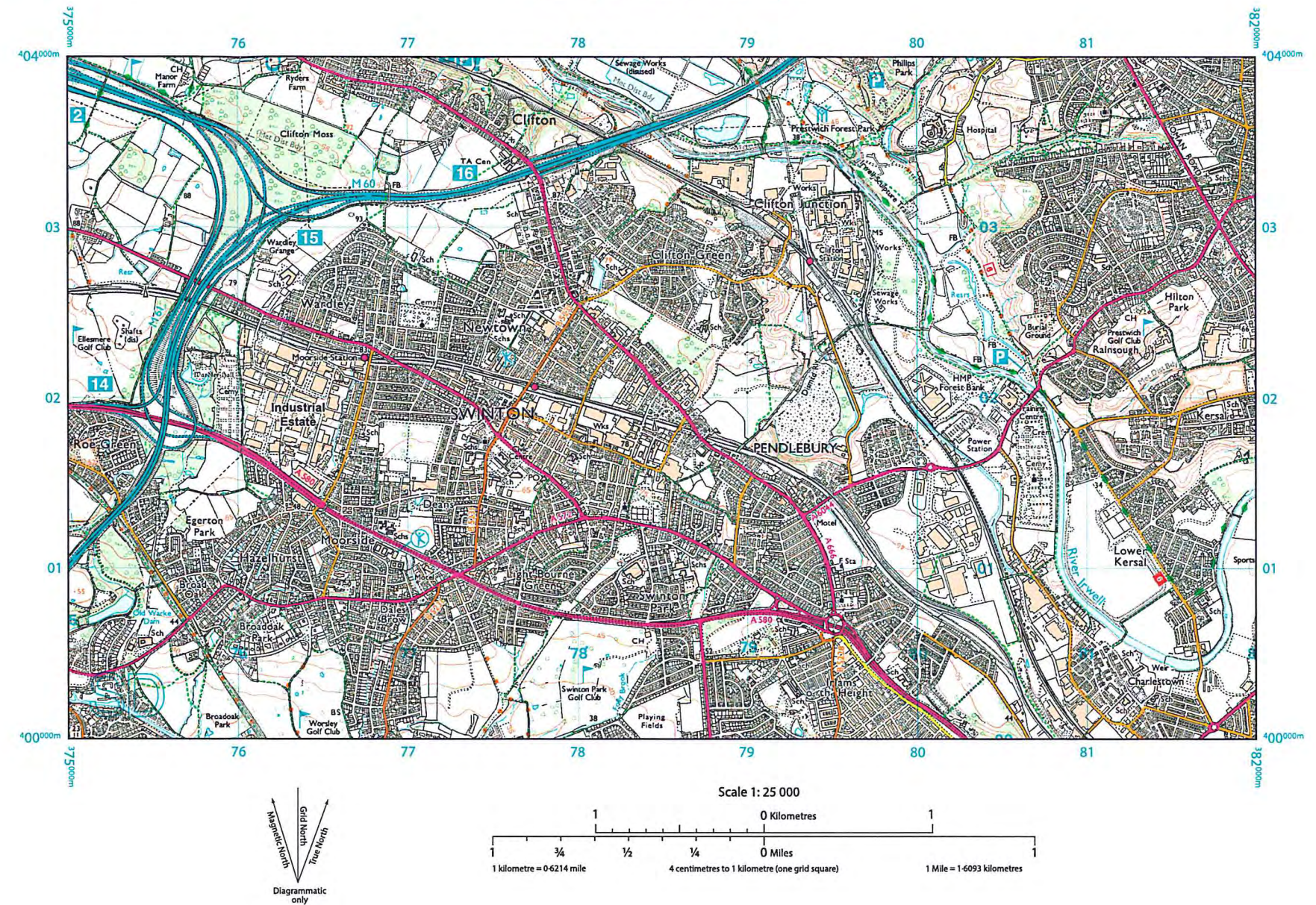
Land open to the public by permission of the owners. The agreement may be withdrawn.
National Trust for Scotland Property, always open
National Trust for Scotland Property, limited access—observe local signs
Forestry Commission Land
Woodland Trust Land

OTHER ACCESS

Firing and test ranges in the area. Danger! Observe warning notices

TOURIST AND LEISURE INFORMATION

Building of historic interest
Cadw (Welsh heritage)
Camp site
Caravan site
Camping and caravan site
Castle / fort
Cathedral / Abbey
Country park
Cycle trail
English Heritage property
Fishing
Forestry Commission visitor centre
Garden / arboretum
Golf course or links
Information centre
Information centre, seasonal
Horse riding
Museum
Nature reserve
National Trust property
Other tourist feature
Parking
Park and ride, all year / seasonal
Picnic site
Preserved railway
Public Convenience
Public house/s
Recreation / leisure / sports centre
Slipway
Telephone (public / motoring organisation / emergency)
Theme / pleasure park
Viewpoint
Visitor centre
Walks / trails
Water activities
World Heritage site or area





HARROW SCHOOL

ENTRANCE SCHOLARSHIPS EXAMINATION 2016

GREEK

GENERAL INSTRUCTIONS:

Before you begin, state at the top of your answer sheet how long you have been studying Greek and for how many lessons per week.

Answer as many questions as you can. Use the whole paper for help with vocabulary.

Write your answers on A4 paper

You should make an intelligent guess at words you do not know.

SECTION A (60 marks)

1 Identify the following; some are real, some are fictional.

- (a) Ἄρτεμις
- (b) Ἡφαιστος
- (c) Ἥραρη κηνε
- (d) Ἀχιλλεύς
- (e) Λυσανδρος [5]

2 Transliterate the following (i.e. write them in Greek letters). Long vowels are indicated with a macron (e.g. 'ē' or 'ō'). Remember to add breathings where appropriate:

- (a) mania
- (b) Andromachē
- (c) acanthus [*us* is the Latin form of ος]
- (d) alpha
- (e) phōton
- (f) tēlescōpos [6]

3 Imagine that each letter of the Greek alphabet is represented by a number (α = 1, β = 2, etc.). Write down in Greek and translate the words represented by the following number sequences. Remember to add breathings where appropriate:

- (a) 13 – 5 – 10 – 17 – 15 – 18
- (b) 8 – 1 – 20 – 12 – 1 – 6 – 24
- (c) 15 – 20 – 4 – 5 – 9 – 18
- (d) 22 – 17 – 7 – 12 – 1 – 19 – 1 [8]

4 Translate into English:

- (a) ἡ χώρα την οἰκίαν φυλάσσει [3]
- (b) οἱ τοῦ ἀγγέλου λόγοι νυν πειθοῦσι τον δημον [4]
- (c) ὁ στρατιωτης προς τον στρατον τρεχων βοην ἤκουσεν [4]
- (d) τίνες εἰσιν αἱ γυναῖκες αἱ το στρατοπεδον λειποντες; [4]
- (e) δεκα στρατιωται μετα δυοιν ἵππων τον κηρυκα προς την ναυν
προσηγαγον [4]

[19]

5 Change the following nouns from plural to singular, keeping the same case. Write out the Greek singular form and give the basic meaning of each word.

Example: τους κηρυκας = τον κηρυκα (= herald)

- (a) οἱ ἡγεμονες

- (b) τα ἄθλα
(c) των νυκτων [6]

6 Change the following nouns from singular to plural, keeping the same case. Write out the Greek plural form and give the basic meaning of each word.

- (a) ἡ ὕδωρ
(b) τῷ παιδί
(c) τῆς πολεως [6]

7 The following English words are derived from Greek words. What do they mean? If you recognise the Greek word(s) they come from, write it/them down (you may be credited for this, even if you cannot define the English word).

- (a) anachronism
(b) triskaidekaphobic
(c) ballistics
(d) autograph [4]

8 Write out any TWO of the following:

- (a) The strong aorist active of κελεῦω.
(b) ὁ γερων in all its cases (singular & plural).
(c) ἡ ναυς in all its cases (singular & plural).
(d) The Definite Article in all genders and cases (singular & plural). [6]

BONUS QUESTION:

Work out the title of the play from the sentence below:

Α μιδσυμμερ νιγητ`ς δρεαμ [2]

SECTION B (10 marks)

Translate into Greek:

- (a) The father prepared the city [3]
(b) The sons were able to leave [3]
(c) The disgraceful mothers slept here [4]
[10]

p.t.o. for Section C

SECTION C (30 marks)

Translate the passage into good English (25 marks) and answer the comprehension questions on the next page. Remember that the questions may carry clues that help you to complete the translation. You may find you can answer the questions, even if you can't translate the whole passage.

Write your translation on alternate lines.

Vocabulary is given at the foot of the page.

You are strongly advised to write a translation in rough, and not to write out your neat copy translation until you have considered the whole story.

Some of the **names** in this story are mentioned in the description below the title (see below), and you should use the English description of the story to help you work out the Greek.

Agamemnon and Iphigenia

When the Greek army is assembled at Aulis, Agamemnon is told that he must sacrifice his daughter Iphigenia before they can sail to Troy.

οἱ δὲ τῶν Ἑλλήνων στρατιῶται¹ συνήλθον² εἰς τὴν Αὐλίδαν³ ἵνα⁴ πλευσείαν
πρὸς τὴν Τροίαν.⁵ ἐκεῖ πολὺν χρόνον μένειν ἠναγκασθῆσαν,⁶ οὐκ ἔχοντες
ἀνέμους ἐπιτηδείους.⁷ τέλος δὲ ὁ μαντις⁸ προσελθὼν εἶπε τῷ Ἀγαμέμνονι⁹
ὅτι ἡ Ἀρτεμις¹⁰ ὀργίζεται.¹¹ “καὶ ἡ θεὰ” ἔφη “κέλευε σε, ὦ βασιλεῦ, τὴν σὴν
θυγατέρα θῦσαι· τοῦτο γὰρ ποιήσας, αἴρησεις¹² τὴν τῶν πολέμων πόλιν.”
ταῦτα οὖν ἀκούσας ὁ βασιλεὺς ἐν μεγίστῃ ἀπορίᾳ¹³ ἦν. τὴν μὲν γὰρ
θυγατέρα ἐφίλει, τοὺς δὲ στρατιώτας ἐφοβείτο. ἀλλὰ αὕτη ἡ παῖς,
Ἰφιγενεία¹⁴ ὀνοματι, οὕτως ἀνδρεία ἦν ὥστε ἠθέλησεν ὑπὲρ τῆς στρατιᾶς
ἀποθανεῖν. ἀφικομένης δὲ τῆς Ἰφιγενείας πρὸς τὸν βῶμον,¹⁵ πάντες οἱ
στρατιῶται ἔδρακρυον,¹⁶ οὐχ οἷοι τ’ ὄντες σκοπεῖν.¹⁷ ἀλλὰ οὐδεὶς ἔγνω¹⁸ τί

¹ ἡ στρατιώτης ον: soldier

² συνερχομαι *aor* συνήλθον: I assemble, gather

³ ἡ Ἀυλὶς ἰδος: Aulis (*port in central Greece*)

⁴ Introduces a purpose clause

⁵ ἡ Τροία ας: Troy

⁶ *Aor pass* ἀναγκάζω: I force, compel

⁷ ἐπιτηδείους α ον: suitable

⁸ ὁ μαντις εως: prophet

⁹ ὁ Ἀγαμέμνων ονος: Agamemnon

¹⁰ ἡ Ἀρτεμις ἰδος: Artemis

¹¹ ὀργίζομαι: I grow angry

¹² αἴρω: I take

¹³ ἡ ἀπορία ας: difficulty

¹⁴ ἡ Ἰφιγενεία ας: Iphigenia

¹⁵ ὁ βῶμος ον: altar

¹⁶ δακρυω: I cry

¹⁷ σκοπεω: I watch

¹⁸ γιγνώσκω *irreg aor* ἔγνω: I know

μετα ταῦτα ἐγενετο.¹⁹ οἱ μὲν γὰρ λεγουσιν ὅτι ὁ πατήρ ἀπεκτείνει τὴν
θυγατέρα· οἱ δὲ νομιζουσι²⁰ τοὺς θεοὺς αὐτὴν σῶσαι.²¹

Questions on the passage:

- (a) Why did the Greek army go to Aulis? [1]
- (b) Because the winds were not suitable, what did this mean they were forced to do?[1]
- (c) Why was the king in a dilemma after he had heard the words of the prophet? [1]
- (d) What two things did the soldiers do which showed how devastated they were at Iphigenia's actions? [1]
- (e) What two versions of the story are mentioned at the end of the passage? [1]

Total: 100 marks

¹⁹ γιγνομαι *irreg aor ἐγενομην*: I become, happen

²⁰ νομιζω: I think

²¹ σῶζω: I save



HARROW SCHOOL

ENTRANCE SCHOLARSHIPS EXAMINATION 2016

HISTORY

1 hour 30 minutes

*GENERAL INSTRUCTIONS:
There are three sections*

You are advised to spend approximately 30 minutes on each.

The quality of your answers is more important than the quantity, so spend 5-10 minutes thinking and 20-25 minutes writing for each section.

Each section is worth 30 marks in total.

SECTION A

Study the three sources and then answer both questions.

Background information

In the years leading up to the First World War Germany often expressed two concerns. The first was the fear of being encircled as the result of the Entente Cordiale of 1904 (an agreement signed by Britain and France which settled some longstanding disagreements and established friendly relations between them) and the Triple Entente of 1907 (a similar understanding between Britain, France and Russia); the second was the fact that Germany was alone amongst the great powers in not having a major overseas empire. The German Emperor Kaiser Wilhelm II often complained about this, and in the words of his Foreign Secretary Bernhard von Bülow, Germany must have its 'place in the sun'. The Moroccan Crises of 1905–6 and 1911 involved both of these issues, with Germany trying to disrupt international alliances and attempting to maintain an influence in Morocco. In the years leading up to the First World War Germany claimed that it was merely responding to these two concerns and that it was acting defensively. However, other countries claimed that German foreign policy was aggressive and threatened peace in Europe. To support their views they pointed to extreme organisations in Germany like the Pan-German League, which preached hatred of France, Britain and Russia and supported an aggressive policy of overseas expansion.

SOURCE A:

From a speech by Bernhard von Bülow to the Reichstag (the German Parliament) on 11 December 1899.

In the nineteenth century, England has increased its colonial empire – the largest the world has seen since the days of the Romans – further and further; the French have put down roots in North Africa and East Africa and created for themselves a new empire in the Far East; Russia has begun its mighty course of victory in Asia. The Sino-Japanese War has put things further in motion; it has led to great, momentous, far-reaching decisions, shaken old empires, and added new and serious upheaval. The English Prime Minister has said that the strong states were getting stronger and stronger and the weak ones weaker and weaker. We don't want to step on the toes of any foreign power, but at the same time we don't want our own feet trod on by any foreign power and we don't intend to be pushed aside by any foreign power, not in political nor in economic terms. To stand dreamily to one side while other people split up the pie, we cannot and we will not do that. We cannot for the simple reason that we now have interests in all parts of the world. If the English speak of a 'Greater Britain'; if the French speak of a 'Nouvelle France'; if the Russians open up Asia; then we, too, have the right to a greater Germany, not in the sense of conquest, but indeed in the sense of peaceful extension of our trade. But we'll only be able to keep ourselves in front with power, a strong army and a strong fleet. In the coming century the German people will be the victors or the defeated.

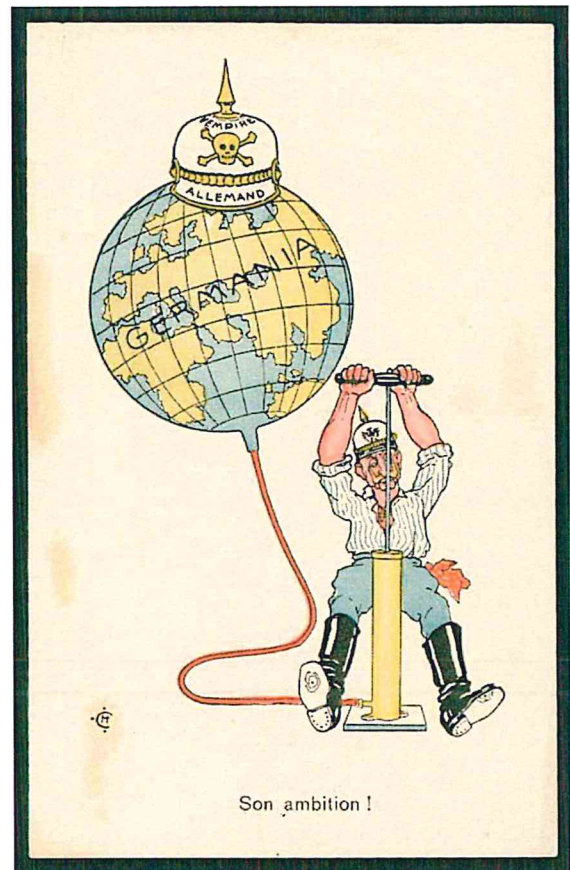
SOURCE B:

A British cartoon, published in the early 20th century.



SOURCE C

A French cartoon, published in the early 20th century.



1. Study Source A. In your own words, summarise the views expressed by Bülow in Source A. Do not write more than 150 words.
2. Study all the sources. How and why do Sources B and C differ from Source A in their interpretation of German ambitions?

SECTION B

Answer **ONE** of these questions.

Either

3. Why have wars happened when most people throughout History have said that they don't like war? Use any historical period or periods you have studied to answer this question. [30 marks]

or

4. What makes a great leader? Use any historical period or periods you have studied to answer this question. [30 marks]

SECTION C

5. *What Might Have Been* is a collection of twelve so-called 'counterfactual' essays, in which historians speculate about how history might have taken a different path if various events had or had not happened.

Read this description of the book, which is taken from amazon.co.uk. Then choose a historical event of your own, and write a counterfactual essay explaining how History would have been different if that event had or had not occurred.

Try to write about what *would* have happened, not just what would not have happened.

Do not use too much material that you have already included in your answer to Section B.

[30 marks]

Throughout history, great and terrible events have often hinged upon luck. Tiny changes can produce profoundly different results. We all ask 'what might have been?' about our own lives. Now award-winning historian Andrew Roberts has asked a team of twelve leading historians and biographers what might have happened if major world events had gone differently. Each concentrating in the area in which they are a leading authority, historians as distinguished as Antonia Fraser (the Gunpowder Plot), Norman Stone (Sarajevo 1914) and Anne Somerset (the Spanish Armada) consider the question: what if? Robert Cowley demonstrates how nearly Britain won the American war of independence. Amanda Foreman muses on what would have happened if Lincoln's Northern States of America and Lord Palmerston's Great Britain had gone to war, as they so nearly did in 1861. Whether it's Stalin fleeing Moscow in 1941 (Simon Sebag Montefiore), or Napoleon not being forced to retreat from it in 1812 (Adam Zamoyski), the events covered here are important, world-changing ones. Former White House advisor David Frum considers what Al Gore's response to 9/11 would have been if he had been President instead of George W. Bush; while Simon Heffer imagines a Michael Heseltine premiership had Margaret Thatcher been assassinated by the IRA in Brighton in 1984. Conrad Black wonders how the United States might have entered the Second World War if the Japanese had not bombed Pearl Harbor in 1941.



HARROW SCHOOL

ENTRANCE SCHOLARSHIPS EXAMINATION 2016

LATIN

1 hour 30 minutes

GENERAL INSTRUCTIONS:

You must attempt all questions on the paper.

***You are not permitted to write anything down for the first 10 minutes of the examination.
This time should be spent reading the examination paper.***

It will help if you study the Latin passages and the English introduction to each passage during the first 10 minutes. You are also advised to read all the footnotes carefully, as they contain helpful information.

New words in this paper are only given in footnotes the first time they appear.

You should make an intelligent guess at words you do not know, using any hints in the footnotes or in the English introduction to each passage.

Try to base any guesses on elements in the sentence that you definitely DO know and make sure that they make sense in context.

Question One

Please note that the Latin passages in Questions One - Three form a continuous story.

Read the following passage and answer the questions on the facing page.

Pyramus and Thisbe (1): *Pyramus and Thisbe are determined to overcome obstacles to their love:*

Pyramus in Babylonia¹ habitabat. iuvenis pulcherrimus erat et Thisben² valde amabat. illa et eum amabat sed parentes matrimoniam impediverunt. quamquam domus eorum vicini³ erant, tamen parentes eos in matrimonio coniungi⁴ vetuerunt.⁵ sed in muro⁶ duarum domuum fissura⁷ minima erat et per illam clam⁸ loqui poterant. saepe Pyramus dicebat “o mure, cur nos matrimonio coniungi vetas? o fissura, cur non maior es?” saepe murum osculabantur.⁹ illi tandem, quod idem semper facere non volebant, e domibus media nocte ire constituerunt ut in sepulchrum¹⁰ Nini¹¹ convenirent. itaque hoc consilio facto, Thisbe, cum ad sepulchrum prima advenisset, sub moro¹² celeriter dormivit. tum fruges¹³ arboris albae¹⁴ erant. subito leaena¹⁵ in faucibus¹⁶ multa sanguine¹⁷ aperuit et Thisbe timebat ne a bestia feroci consumeretur. cum leaena constitisset se aquam bibituram esse, Thisbe statim fugit. illa tam celeriter cucurrit ut se fasciam¹⁸ demississe¹⁹ non intellexeret. simulac leaena fasciam invenit, eam ferociter laniavit.²⁰ postea fasciam cruentam²¹ humi reliquit.

Questions on Passage One:

- a) What **three** things do we learn initially about Pyramus? [3]
- b) *illa et eum amabat* (line 1): what would be a good translation of *et* here? [1]
- c) Explain the reaction of the parents (lines 1-3). [2]
- d) Why was this surprising? [2]

¹ Babylonia, ae (f): Babylon

² Thisbe, es (f): Thisbe (*Thisben* here is a Greek *accusative*)

³ vicinus a um: neighbouring, near

⁴ coniungo, coniungere, coniunxi, coniunctum: to join, unite, bind

⁵ veto, vetare, vetui, vetitum: to forbid

⁶ murus, i (m): wall

⁷ fissura, ae (f): crack, chink

⁸ clam (adv): in secret

⁹ osculor, osculari, osculatus sum: to kiss

¹⁰ sepulchrum, i (n): grave, tomb

¹¹ Ninus, i (m): Ninus

¹² morus, i (f): mulberry tree

¹³ frux, frugis (f): fruit

¹⁴ albus a um: white

¹⁵ leaena, ae (f): lioness

¹⁶ fauces, ium (f): jaws

¹⁷ sanguis, sanguinis (m): blood

¹⁸ fascia, am (f): scarf

¹⁹ demitto, demittere, demisi, demissum: to drop

²⁰ lanio, laniare, laniavi, laniatum: to tear in pieces

²¹ cruentus a um: bloody

- e) How did Pyramus and Thisbe overcome the wishes of their parents? [4]
- f) How did Pyramus and Thisbe show their love for one another despite being separated? [2]
- g) What plan did they come up with? [4]
- h) Why did they feel they needed to do this? [3]
- i) Explain Thisbe's subsequent actions? [4]
- j) Why did Thisbe become afraid? [2]
- k) How did she escape? [2]
- l) What tragic mistake did she make? [2]
- m) Why do you think this mistake will be so tragic? [2]
- n) From the passage, give in Latin one example of each of the following:
- (i) An imperfect subjunctive [1]
 - (ii) An adverb [1]
 - (iv) A deponent verb [1]
 - (v) A present infinitive [1]
 - (vi) A perfect indicative [1]
- o) Explain the case of *se* (line 10). [1]
- p) Choose one Latin word from the passage which suggests the ferocity of the lioness. [1]

[40 marks]

Please turn over for Question Two

Question Two

Translate the following passage into good English. Write your translation on alternate lines. Vocabulary given in the previous passage will also help you here.

Pyramus and Thisbe (2): *Their plan goes tragically wrong, but they are united in death:*

1 brevi tempore Pyramus advenit. vestigiis¹ leaenae visis, ille ad sepulchrum progredi timebat. subito
2 fasciam cruentam conspexit et statim putavit Thisben carissimam nechatam esse. “ego iam” inquit
3 “moriar. quod hic serius² adveni, mihi culpandum est!” tum gladio se necavit. Thisbe tamen mox
4 revenit ut iuvenem quaereret. ubi corpus Pyrami et fasciam cruentam conspexit, statim intellexit quod
5 accidisset. “ego etiam” inquit “moriar. quamquam in domo eadem habitare non poteramus, in
6 monumento³ eodem tamen parentes nos sepelient.”⁴ deinde gladio etiam eodem ipsa se interfecit.
7 propter haec misera, morus iam colorem sanguinis habet.

[25 marks]



Question Three

Answer the following grammar questions based on the previous passage:

- a) Explain the case of *brevi tempore* (line 1) [1]
- b) Explain the case of *vestigiis...visis* (line 1) [1]
- c) What form of the verb is *progredi*? (line 1) [1]
- d) What construction is introduced by *putavit* in line 2? [1]
- e) Give an example from the passage of the following:
 - i. A purpose clause [1]
 - ii. A superlative adjective [1]
 - iii. An adverb [1]
 - iv. A pluperfect subjunctive [1]

¹ vestigium, i (n): footprint

² serius (adv): too late

³ monumentum, i (n): tomb

⁴ sepelio, sepelire, sepelivi, sepultum: to bury

f) What tense is the tense of *poteramus*? (line 5) [1]

g) What is the nom. masc. sing. of *eodem*? (line 6) [1]

Translate the following sentences into Latin:

h) I thought that my father was following the army. [5]

i) Since the queen was so sad, she prepared to kill herself. [5]

j) The old man hid the money in the ground so that his wife would not find it. [5]

[25 Marks]

Question Four

Read the following passage from Ovid (an English translation is provided to assist you with the Latin). It covers the story of Pyramus and Thisbe which is featured in the earlier passages in this paper. Answer the questions that follow:

Sed postquam remorata suos cognovit amores,
percutit indignos claro plangore lacertos,
et laniata comas amplexaque corpus amatum
vulnera supplevit lacrimis fletumque cruori
miscuit et gelidis in vultibus oscula figens 5
“Pyrame” clamavit “quis te mihi casus ademit?
Pyrame, responde: tua te carissima Thisbe
nominat: exaudi vultusque attolle iacentes!”
Ad nomen Thisbes oculos iam morte gravatos
Pyramus erexit, visaque recondidit illa. 10

But when, staying a moment longer, she recognises her lover, she cries out loud with grief, striking at her innocent arms, and tearing at her hair. Cradling the beloved body, she bathes his wounds with tears, mingling their drops with blood. Planting kisses on his cold face, she cries out ‘Pyramus, what misfortune has robbed me of you? Pyramus, answer me! Your dearest Thisbe calls to you: obey me, lift your fallen head!’ At Thisbe’s name, Pyramus raised his eyes, darkening with death, and having looked at her, buried them again in darkness.’

(trans. A. S. Kline)

- a) Lines 1-6: how does Ovid make these lines dramatic? You should comment on **three** specific Latin words or phrases in your answer [6]
- b) Lines 7-10: what makes this such a tragic end to the passage? You should comment on **two** specific Latin words or phrases in your answer [4]

[10 Marks]

[Total Marks for Paper = 100 marks]



HARROW SCHOOL

ENTRANCE SCHOLARSHIPS EXAMINATION 2016

MATHEMATICS I

90 Minutes

GENERAL INSTRUCTIONS:

*You may attempt all questions if you have time,
but greater credit will be given for complete solutions.*

*Show all your working.
Calculators may be used.*

1. The average (mean) length of four lizards is 51.4 cm. The lengths for three of the lizards are 48.0 cm, 52.2 cm and 55.3 cm.
- How long is the fourth lizard?
 - Three more lizards join the previous four, making the new average length 49 cm. What is the average length of these three new lizards?

2. a) A business makes a profit of £35 000.

The directors Alan and Rupert, divide it in the ratio 3:4.

- How much do they each receive?
 - Alan now realizes that he has done more work than Rupert and demands that Rupert gives him some of his share of the profit. Rupert cooperates and hands over 30% of his profit to Alan. What is the ratio of the profit between Alan and Rupert now?
 - What is Alan's percentage increase in his profit? Why is it not 30%?
- b) Rupert and Alan continue their successful partnership. In 2013 they made a profit of 15%, but in 2014 they made a loss of 10%. In 2015 their business was worth £496800. What was their business worth in 2013?

3. Simplify the following:

a) $\frac{(2xy)^2}{x^2y}$

b) $y(2 - x) + x(y - 3)$

c) $\frac{x}{4} - \frac{3x}{16}$

d) $\frac{5x - 5y}{y - x}$

e) $\frac{7}{x} + \frac{5}{2x} - \frac{3}{4x}$

4. This question is about exchange rates, where the following information is given:

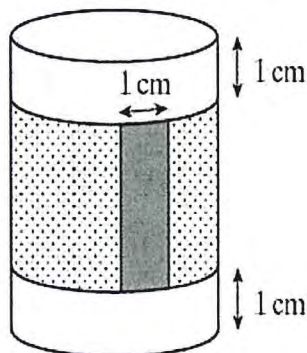
£1 = R 22.85 British pounds to South African Rand

£1 = €1.28 British pounds to Euros

\$1 = R 15. 81 US Dollars to South African Rand

- a) How many Rand would be worth \$200.00?
 - b) How many pounds would be worth €60 ?
 - c) R 4570 is changed into British Pounds and then changed into 32319 Japanese Yen. To the nearest Yen, work out the exchange rate of one British Pound to Japanese Yen.
 - d) In parts a), b) and c) the transactions were free of charge. Now each time money is changed a charge of 2% of the money changed is deducted as a charge for the service. Calculate how many British Pounds I would receive for \$300 if I had changed my US Dollars into Rand and then my Rand into Pounds and been charged 2% for each transaction?
5. The equation $v^2 = u^2 + 2as$ is known as an equation of motion. In the equation u is the initial speed of an object, v is its final speed, a is the acceleration of the object and s is the distance it travels.
- a) Find the value of final speed of an object when $u = 7.1$, $a = 9.8$ and $s = 12.4$
 - b) Find the value of a when $v = 13$, $u = 20$ and $s = 10$.
What do you think this answer means?
 - c) Another equation of motion is $v = u + at$ where v, u, a all represent the same things as before, t represents time. Calculate s , the distance travelled when $u = 10$, $a = 2$ and $t = 3$

6. A cylindrical tin of diameter 7 cm and height 12 cm has a label around it.



The label is glued together using a 1 cm overlap. There is a 1 cm gap between the label and the top and the bottom of the tin. Find the length and the height of the label.

7. (a) Solve the following linear equations

(i) $2(x^2 + 1) - 4(x + 2) = 3(x + 5) + 2x(x - 1)$

(ii) $\frac{x-1}{2} + \frac{x+1}{2} = 5 - \frac{x+2}{4}$

(b) Solve the following set of simultaneous equations

i) $4x + 2y = 10$

$$3x - 5y = 1$$

ii) $4(a + b) + 2(4a - b) = 10$

$$3(a + b) - 5(4a - b) = 1$$

(c) Solve the following inequalities

(i) $2x - 12 \leq 18$

(ii) $\frac{x}{3} - 7 > \frac{x}{4} - 6$

List all the possible integer (whole number) values of x which would be valid for both of the above inequalities.

8. A triangle has sides x , $3x - 5$ and $x + 2$. It has the same perimeter as a square with sides of length x . Find the perimeter of the triangle and the area of the square.

9. Please answer the whole of this question on the hand out provided

a) Complete the table of values on the handout for the curve $y = x^3 - 2x^2 - x + 2$

(b) On the axes, plot and draw the curve $y = x^3 - 2x^2 - x + 2$

(c) Use your curve to solve the equation $y = x^3 - 2x^2 - x + 2 = 0$

(d) How many times between $x = -2$ and $x = 3$ does your curve have a y coordinate of -0.5 ?

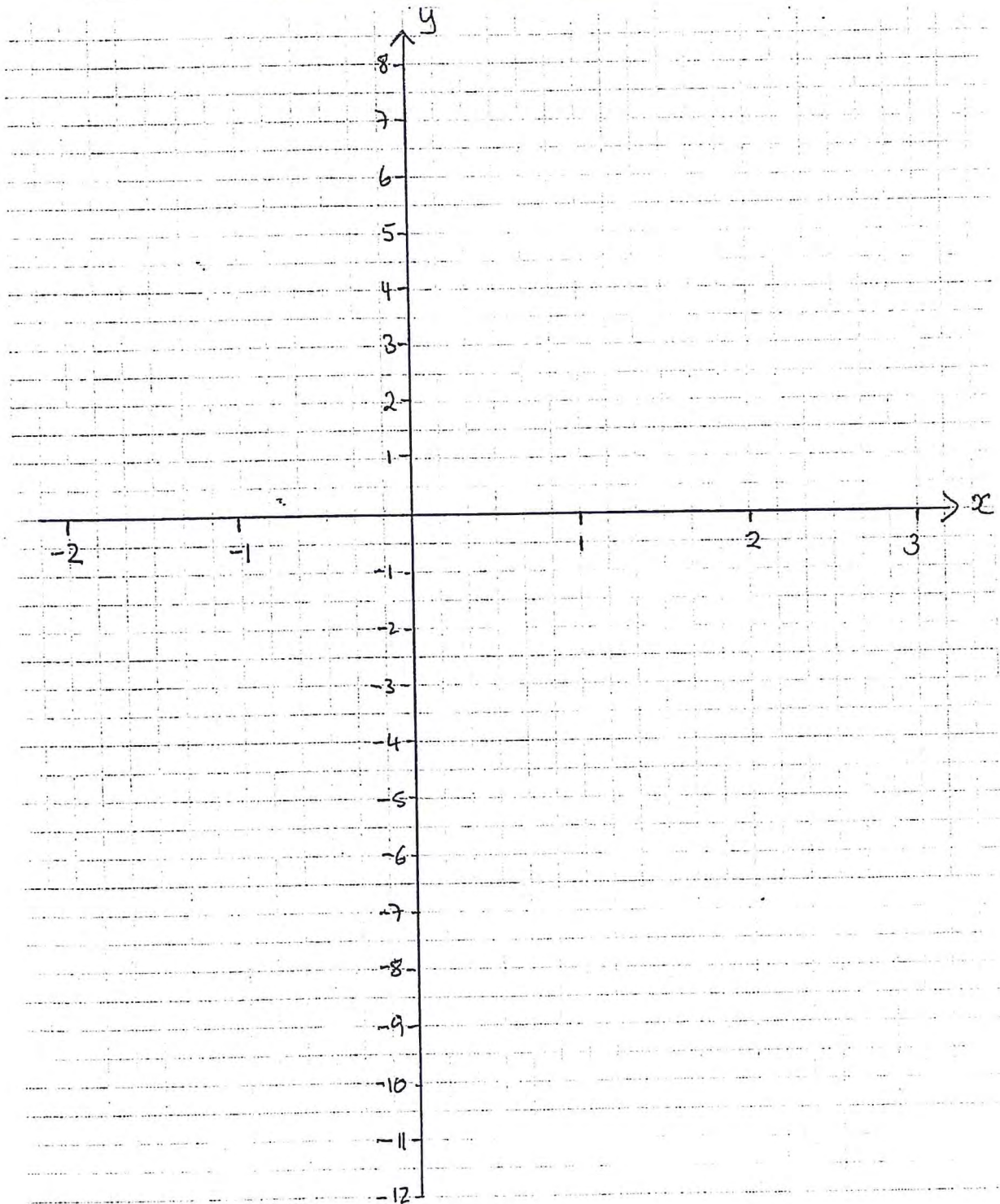
Indicate these points on your graph in a distinctive way.

THE END

Please answer Q9 on this sheet:

$$y = x^3 - 2x^2 - x + 2$$

x	-2	-1	0	1	2	3
x^3	-8	-1	0		8	27
$-2x^2$		-2	0		-8	-18
$-x$		+1	0	-1	-2	-3
$+2$	+2	+2	+2	+2	+2	+2
y		0	2		0	8





HARROW SCHOOL

ENTRANCE SCHOLARSHIPS EXAMINATION 2016

MATHEMATICS II

90 Minutes

GENERAL INSTRUCTIONS:

You may attempt all questions if you have time, but greater credit will be given for complete solutions.

Show all your working.

Calculators may NOT be used.

PLEASE NOTE: This paper is not just about getting the right answers; correct answers on their own will earn few marks. You will be marked more on the PRESENTATION of your solutions, the EXPLANATION of your working and the JUSTIFICATION of your final answers.

This paper is very difficult. You will earn more credit for complete solutions to the questions you do (even if you don't do them all), rather than incomplete solutions to all the questions.

1. Solve simultaneously

$$\frac{y}{x} = 4; \quad \frac{x+1}{y+1} = \frac{1}{2}$$

2.

- a. Express 10 000 as a product of prime factors.
- b. Find two whole numbers which multiply to give 10 000, neither of which end in a 0.

3. Julian covered the 340 miles between Amsterdam and Berlin taking a total of 5 hours. He drove part of the way at 60mph and the rest at 84mph. How far did he travel at 60mph?

4. Solve:

a. $\frac{3x+2}{7} - \frac{7x-8}{5} = -2$

b. $\frac{3x^2+2}{7} - \frac{7x^2-8}{5} = -2$

5. In this question, x^* is defined to mean the *whole number part* of the square root of x .

For example, $\sqrt{14} = 3.74165\dots$, so $14^* = 3$ (the whole-number part of $\sqrt{14}$).

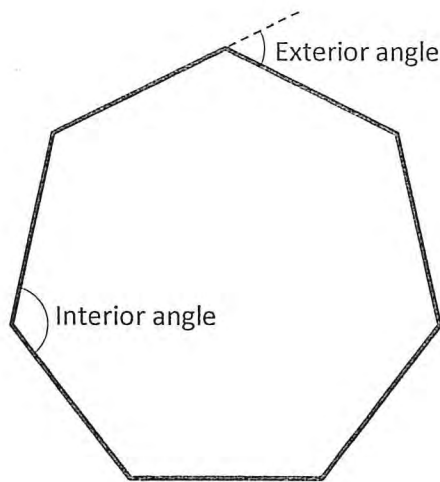
a. Showing your working, evaluate:

- i. $7^* \times 18^*$
- ii. $(7 \times 18)^*$
- iii. $[(161^*)^*]^*$

b. How many whole-number solutions are there to the equation $x^* = 4$?

c. The whole number N is such that $(2N)^* = 4$ and $(3N)^* = 6$. What is N ?

6. This question is about regular polygons (that is, polygons with all sides equal and all angles equal). The diagram below shows a regular heptagon (7-sided shape) with an interior and exterior angle indicated.
- Explain why, for every regular polygon (regardless of the number of sides it has), all of the *exterior* angles must add up to 360° .
 - Write down an expression for the size of one exterior angle of a regular polygon with n sides.
 - By finding its exterior angle, find the number of sides the regular polygon with internal angle 168° has.
 - How many regular polygons are there which have an internal angle between 160° and 170° inclusive?
 - How many of these have an internal angle which is a whole number of degrees?



7. Two boxes each contain three jewels. When a jewel worth £5000 is transferred from one box to the other, the mean value of the jewels in the first box increases by £1000, and the mean value of the jewels in the second box also increases by £1000. What is the total value of the six jewels together?
8. In the nation of Worrah, the currency is the Worrah dollar (W). There are two coins, one worth $\text{W}5$ and one worth $\text{W}7$. You have a large supply of both coins.
- Show how you can pay $\text{W}36$ exactly
 - Show that you cannot pay $\text{W}23$ exactly
 - Show that $\text{W}23$ is the largest whole-number amount it is not possible to pay using these two coins. (Hint: you may find it helps to show that you can pay values of $\text{W}24$, $\text{W}25$, $\text{W}26$, $\text{W}27$ and $\text{W}28$.)
- In neighbouring Neto, the currency is the Neto Lira (N). Again there are two coins, this time worth $\text{N}6$ and $\text{N}15$.
- Is there a largest whole-number “non-payable” amount in Neto? Explain your reasoning carefully.



HARROW SCHOOL

ENTRANCE SCHOLARSHIPS EXAMINATION 2016

PHILOSOPHY AND APPLIED ETHICS

1 hour 15 minutes

GENERAL INSTRUCTIONS:

This paper is designed to explore your ability to read and respond intelligently to material that you have not seen before.

We will aim to reward candidates who can construct a concise and well structured argument, that includes relevant information to support your line of reasoning.

- *You should aim to spend approx. 15 minutes reading and annotating the text.*
- *Do give evidence that you have planned your answer carefully. This may be in the form of notes or bullet points.*
- *You should aim to write between one and a half to two sides and the word limit is 1,000 words.*
- *Your rough work will be collected in with your final answer so that we can see some evidence of how you have approached and planned this piece of work.*

Read the following sources (you are encouraged to read, highlight and underline the key points) and answer the question that follows.

SOURCE A

"Between April and June 1994, an estimated 800,000 Rwandans, men women and children, were killed in the space of 100 days. Most of the dead were Tutsis - and most of those who perpetrated the violence were Hutus. If countries like Britain and America had used their military to protect the innocent in Rwanda far fewer people would have been killed. By doing nothing to stop the killing, the International Community became complicit in this terrible genocide."

SOURCE B

Jesus crucified

When they came to the place called the Skull, they crucified him there, along with the criminals—one on his right, the other on his left. ³⁴ Jesus said, "Father, forgive them, for they do not know what they are doing." *The Gospel according to St Luke, chapter 23*

SOURCE C

The Theory of a Just War

Introduction

The just war theory is a largely Christian philosophy that attempts to reconcile three things:

- taking human life is seriously wrong
- states have a duty to defend their citizens, and defend justice
- protecting innocent human life and defending important moral values sometimes requires willingness to use force and violence

The theory specifies conditions for judging if it is just to go to war, and conditions for how the war should be fought. Although it was extensively developed by Christian theologians, it can be used by people of every faith and none.

Purpose

The aim of Just War Theory is to provide a guide to the right way for states to act in potential conflict situations. The theory is not intended to justify wars but to prevent them, by showing that going to war except in certain limited circumstances is wrong, and thus motivate states to find other ways of resolving conflicts.

Elements

There are two parts to Just War theory, both with Latin names:

- **Jus ad bellum:** the conditions under which the use of military force is justified.
- **Jus in bello:** how to conduct a war in an ethical manner.

A war is only a Just War if it is both justified, and carried out in the right way. Some wars fought for noble causes have been rendered unjust because of the way in which they were fought.

Jus ad bellum: What is a Just War?

Six conditions must be satisfied for a war to be considered just:

- The war must be for a just cause.
- The war must be lawfully declared by a lawful authority.
- The intention behind the war must be good.
- All other ways of resolving the problem should have been tried first.
- There must be a reasonable chance of success.
- The means used must be in proportion to the end that the war seeks to achieve.

Jus in bello: How should a Just War be fought?

A war that starts as a Just War may stop being a Just War if the means used to wage it are inappropriate.

- Innocent people and non-combatants should not be harmed.
- Only appropriate force should be used.
 - This applies to both the sort of force, and how much force is used.
- Internationally agreed conventions regulating war must be obeyed.

SOURCE D

Arguments Against the Theory of the Just War

Here are some of the arguments that have been put forward against Just War theory:

- all war is unjust and has no place in any ethical theory
 - morality must always oppose deliberate violence
 - just war ideas tend to make violence OK, rather than restrain it
- war so disrupts the normal rules of society that morality goes out of the window.
- War is a terrible thing, so if a war must be fought the overriding aim of war should be to achieve victory as quickly and cheaply as possible
 - if the cause is just, then no restrictions should be placed on achieving it
 - the rules of conduct of war are mere camouflage because they are always over-ruled by 'military necessity'
- the existence of nuclear, chemical or biological weapons of mass destruction requires a different approach to the problem
 - these weapons can only be used for unrestricted war and so the condition of proportionality can't be met if they are used
 - using these weapons guarantees civilian casualties, and thus breaks a basic rule of the conduct of war
- terrorists are inherently uninterested in morality, so following any ethical theory of war handicaps those whom terrorists attack - thus a different approach is needed

Question:

Can the killing of other people ever be justified?



HARROW SCHOOL

ENTRANCE SCHOLARSHIPS EXAMINATION 2016

PHYSICS

30 Minutes

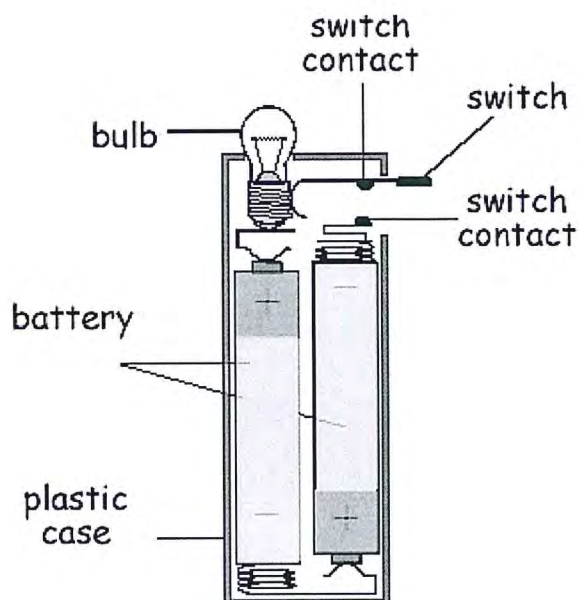
GENERAL INSTRUCTIONS:

Answer all. questions in the spaces provided.

All Working must be shown.

You may use a calculator if you wish.

Q1. The diagram below shows the components of a battery operated torch.



- a. The switch is closed. Explain why this turns on the bulb.

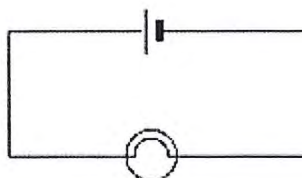
1 mark

- b. Draw a labeled circuit diagram for this torch.

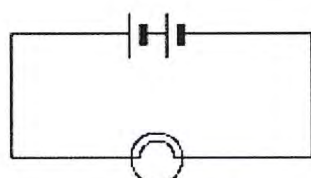
Use the correct circuit symbols, if you can, for the bulb, battery of two cells and the switch.

2 marks

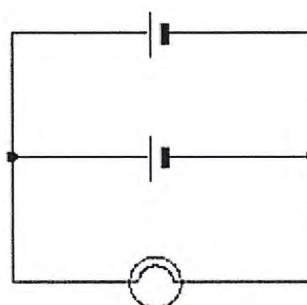
Q2. Bob sets up the circuit shown below:



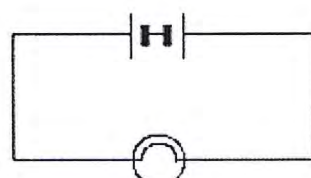
- a. Bob decides the bulb is not bright enough. His friend, Derek, suggests four circuits which he thinks could be used to make the bulb brighter.



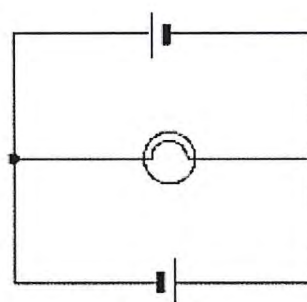
circuit A



circuit B



circuit D



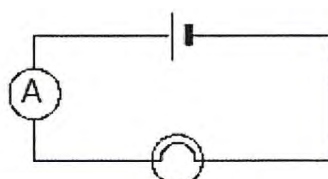
circuit C

Which is the correct circuit to use: A, B, C or D?

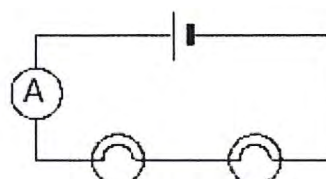
Answer: ____

1 mark

- b. Bob sets up circuit E (shown below) and notes the ammeter reading. He then places another bulb in the circuit to make circuit F and notes the new ammeter reading.



circuit E



circuit F

How will the ammeter reading in circuit F compare with that in circuit E? Explain your answer.

2 marks

- c. Draw **TWO** different circuit diagrams (side by side in the space below) in which two bulbs are lit as brightly as the bulb in circuit E, and the ammeter reading is the same as in circuit E. One of your circuits should use ONE cell only and the other should use TWO cells..

4 marks

- d. A third bulb is now added to circuit F such that it is in parallel to the series combination of the other two bulbs but is NOT in parallel with the ammeter.
- i. Sketch this new circuit

2 marks

- ii. State how the brightness of this third bulb will compare to the other two: dimmer, the same or brighter.

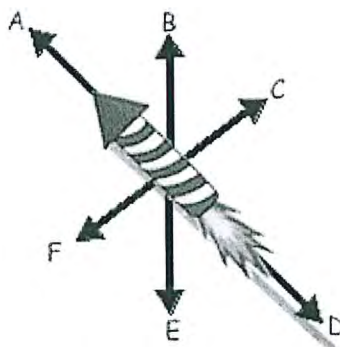
Answer: _____

- iii. State how the reading of the ammeter will compare to its value before: less, same as or more

Answer: _____

2 marks

Q3. The diagram shows a firework rocket in flight.



Three forces act on the rocket as it flies through the air.

- a. State the letter (A – F) of each arrow that shows the direction of each of the three forces and name each force:

Arrow

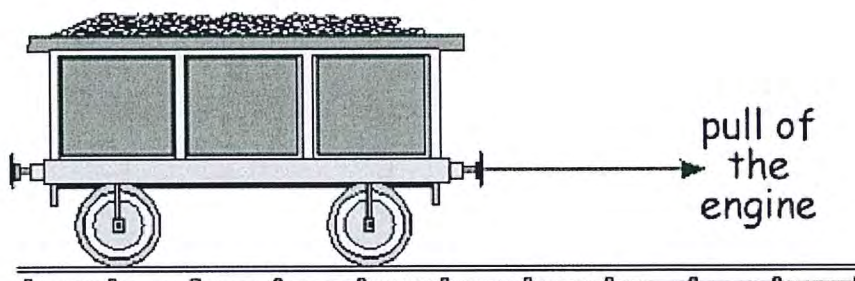
Name of Force

3 marks

- b. Describe what happens to the speed of the rocket through the air from the moment its fuel runs out until it hits the ground.

2 marks

Q4. A train engine is being used to try and pull a wagon along a level track.



- a. When the wagon's brakes are off, the engine pulls the wagon forwards. A frictional force also acts on the wagon. In what direction does this frictional force act?

Answer: _____

1 mark

- b. The pull of the engine is 5000 N. When the wagon's speed is increasing, how large is the frictional force (A, B, C or D from the table of choices below)?

A	zero
B	between 0 and 5000 N
C	5000 N
D	more than 5000 N

Answer: _____

1 mark

- c. Eventually the wagon reaches a top steady speed. The engine is still pulling with a force of 5000 N. How large is the frictional force now?

A	zero
B	between 0 and 5000 N
C	5000 N
D	more than 5000 N

Answer: _____

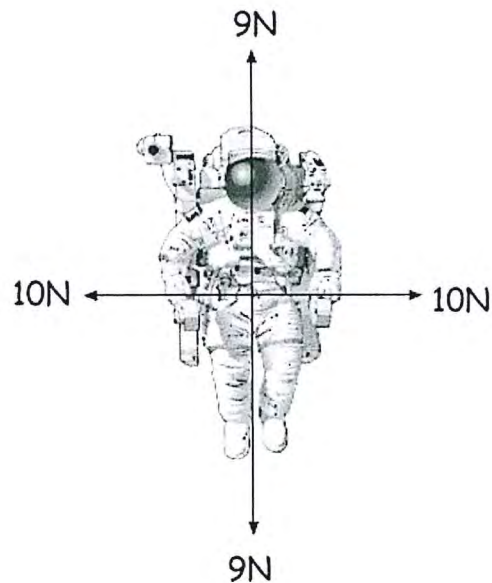
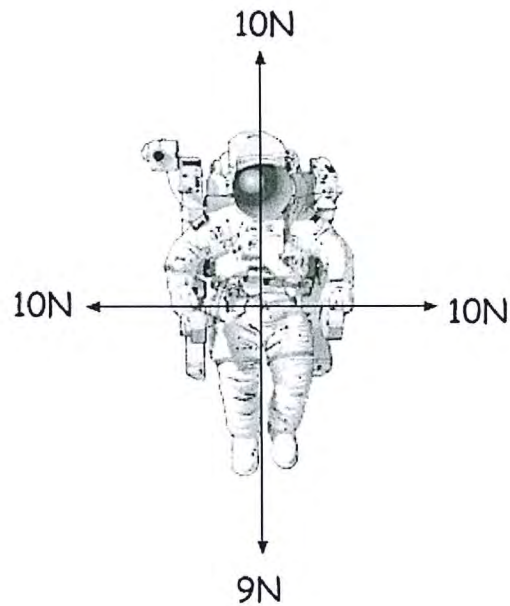
1 mark

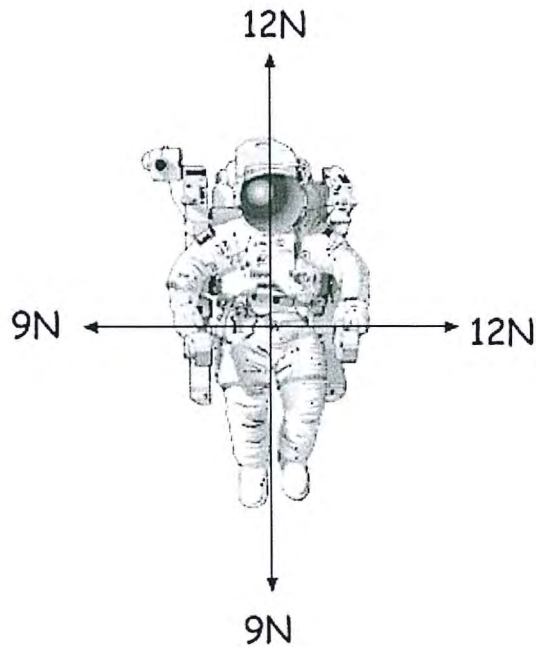
- d. Some of the statements in the list below describe forces and some do not. Ring the letters of the statements which describe forces.

A	the movement of a car travelling along a road
B	the push of a jet engine on an aeroplane.
C	the flow of electricity through a light bulb.
D	the weight of a book on a table.
E	the pull of a horse pulling a cart.
F	the speed of a hockey ball flying through the air.

3 marks

- Q5.** An astronaut of mass 120 kg (including all his kit) floating in space has four small jets attached to his space suit. Initially he is stationary. The jets are then turned on simultaneously and produce forces in the directions shown. For each of the three diagrams below, describe as fully as you can how the astronaut will move once the jets are turned on. You may add to the diagrams if you wish to illustrate your answers.





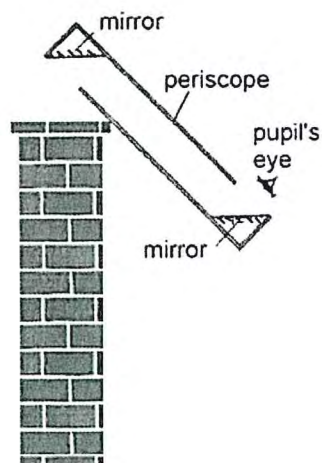
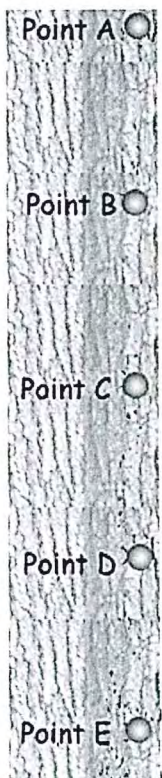
6 marks

Q6. Rodney is using a periscope to look at a tree trunk (he's hoping to spot a woodpecker!).

Which point on the tree (A – E) is he looking at with the periscope in the position shown?

Answer: _____

Draw, as accurately as possible, the path of the ray of light on the diagram to show how he sees this point.

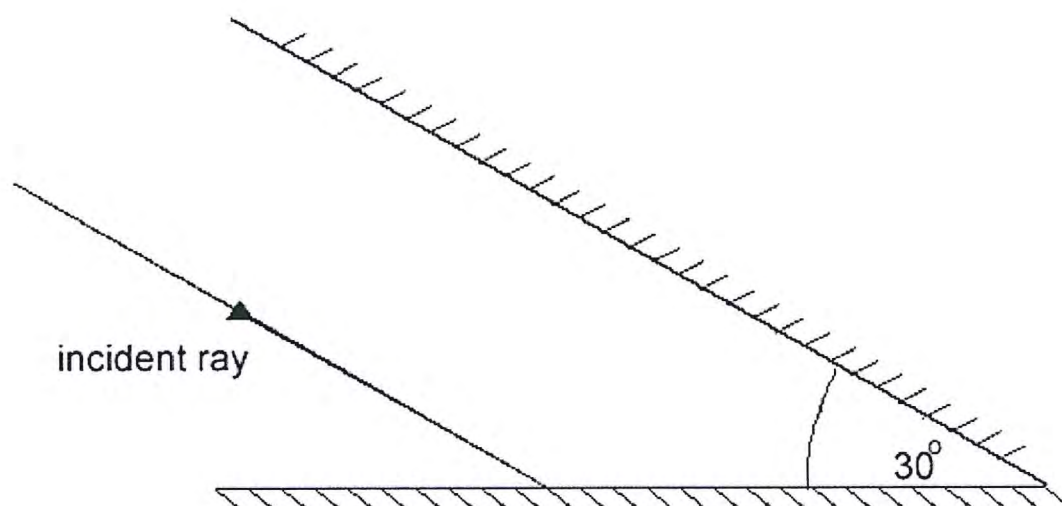


What should the pupil do to the periscope to look at point C?

5 marks

- Q7.** Two plane mirrors are arranged so that, as shown in the diagram below, they are at an angle of 30° to each other. A ray of light strikes one of the mirrors as shown. Its original path is parallel to one of the mirrors.

As accurately as you can, draw on the diagram below the path of the ray of light until it emerges from the two mirrors.



3 marks

- Q8.** The table below gives information about the planets in the Solar System. They are listed in alphabetical order.

planet name	average distance from the Sun /million km	diameter /km	time for one orbit round the Sun	time for one rotation on its axis /hours	temperature on surface of planet / $^\circ\text{C}$
Earth	150	13 000	365 days	24	+22
Jupiter	780	140 000	12 years	9.8	-150
Mars	230	6800	687 days	25	-23
Mercury	58	4900	88 days	1400	+350
Neptune	4500	51 000	165 years	16	-220
Pluto	5900	2300	248 years	150	-220
Saturn	1400	120 000	29 years	10.2	-180
Uranus	2900	51 000	84 years	17	-210
Venus	110	12 000	225 days	5800	+480

- a. Explain why Neptune and Pluto are the coldest planets

2 marks

- b. Explain why there could be no liquid water on the surface of:

- i. Mars

- ii. Venus

2 marks

- c. On which planet would the time between sunrise and sunset be the shortest? Explain your answer.

2 marks

- d. Which planet has the shortest year? Explain your answer.

2 marks

- e. Give the name of the force which keeps the planets in their orbits.

1 marks

- f. Which planet will move most slowly through space in its orbit? Explain your answer.

2 marks