ADMISSION TEST FOR THE DEGREE COURSE IN MEDICINE AND SURGERY

Academic Year 2012/2013

Thinking Skills

1 Many people argue that the many government programmes intended to increase road safety have caused a steady decline in the number of accidents on our roads. However, some observers report that the real number of accidents may be much higher than is shown in the official records as many accidents are not reported by drivers. They also say that during the time when accident figures have decreased, the number of people going to hospitals because of road accidents has stayed constant.

Which one of the following can be drawn as a conclusion from the above passage?

A Road safety has improved greatly in recent years.

B Drivers should be required to report all accidents that occur on the road.

C Positive views about continually improving road safety may not be supported by what actually happens.

D Government programmes have been unsuccessful in reducing the number of accidents.

E Hospital admissions are a good way of measuring changes in the number of accidents on our roads.

2 In 2010 there were over 110,000 incidents of arson (deliberately setting fire to buildings) in the UK in which over 100 people were killed, usually in attacks on people's homes. Only a small percentage of homes have smoke alarms. If more homes had smoke alarms, the number of domestic fires would be significantly reduced. There should be a campaign to persuade people to install smoke alarms in their home as this would reduce the number of deaths.

Which one of the following identifies the flaw in the above argument?

A It assumes that having smoke alarms will prevent fires.

B It assumes that all deaths in fires are from arson attacks.

C It overlooks the fact that smoke alarms may not work.

D It assumes that people will be willing to install smoke alarms.

E It assumes that all arson attacks are on people's homes.

© UCLES 2012

3 Nicotine chewing gum is already available in chemists. Nicotine is an addictive drug, but by itself it causes little, if any, harm. Unlike other addictive substances it does not reduce the brain's performance, make people lazy, anti-social, or have more accidents. But until recently nicotine has been taken only in the form of tobacco, which also contains cancer-causing chemicals and deadly gases that kill one third of the people who smoke it. The chewing gum does not contain these chemicals, and is not dangerous in any other way.

Which one of the following is a conclusion which can be drawn from the above passage?

A Nicotine chewing gum should be banned as it is addictive.

B Nicotine chewing gum is a relatively safe alternative to tobacco for those addicted to nicotine.

C Tobacco smokers can get rid of their addiction by chewing nicotine gum.

D Nicotine chewing gum will make nicotine addiction more common by removing some of its risks.

E Tobacco companies should put money into the manufacture and marketing of nicotine chewing gum.

4 Television programmes that show young people in a school environment continue to feature highly in viewing schedules. Few of the programmes, however, give any emphasis on the time spent studying and the work required for academic success. Many of the actors used are far older than the characters they portray, suggesting attitudes, behaviour and appearances that are inaccurate and sometimes inappropriate. Broadcasters and producers should try to correct this.

Which one of the following must be assumed in the above argument?

A Young people may feel that their social life is dull compared with that shown in television programmes.

B It is often impractical to use young people in television programmes given the restrictions on how many hours they can work.

C It is important to represent school life accurately.

D Television programmes about other areas such as the police are not accurate.

E School work and academic success are important to all students.

5 The volume of water expands by 9% when it freezes.

If you want a block of ice 40 cm^3, how much water would you need to put into a freezer?

A 36.7 cm^3

B 38.2 cm^3

C 38.0 cm^3

D 40.0 cm^3

E 37.0 cm^3

© UCLES 2012

6 In a children's story there are three types of monster, Bongles, Crannies and Dervies. Some, but not all, Bongles are Crannies and all Crannies are Dervies.

Which one of the following is definitely **NOT** true?

A Some Dervies are both Bongles and Crannies.

B Some Dervies are neither Bongles nor Crannies.

C All Crannies are either Bongles or Dervies or both.

D No Dervies are Bongles.

E Some Bongles are Dervies.

7 Alice works until 5pm each day from Monday to Friday. On Friday she is planning to go to the cinema with friends. There is a local bus service which passes her workplace, home and cinema. Part of the bus timetable is shown in the table below. Alice plans to take the bus home, where she will get ready to go to the cinema and then she will catch the bus to get to the cinema. It will take Alice 45 minutes to get ready and she will also need 10 minutes when she reaches the cinema to buy her ticket before a film starts. Films start every 15 minutes starting from 6pm.

Work	16:39	17:04	17:39	18:04	18:39	19:04	19:39
Home	17:08	17:33	17:58	18:33	18:58	19:33	19:58
Cinema	17:33	17:58	18:33	18:58	19:33	19:58	20:33

What is the earliest time that she can watch a film?

A 18:15

B 18:30

C 18:45

D 19:00

E 19.15

8 Modern technology has given us the power to use renewable natural resources faster than they can be replaced. The decline of fish numbers provides one example of the way in which modern technology can rapidly use up a natural resource. Modern fishing ships equipped with fish detecting systems and huge nets can gather up vast quantities of fish quicker than the sea can renew them. Because high technology gives us such harmful powers, we must learn to use the renewable resources of the earth carefully, rather than waste them.

Which one of the following best expresses the main conclusion of the above passage?

A Modern technology simply takes from the environment and destroys its resources.

B Fishing is now a serious threat to the world's environment and should cease.

C Fish need to be carefully protected to prevent them from being destroyed.

D Most people are unaware of the damaging effects of modern technology.

E Humans must preserve renewable resources by learning how to use them carefully.

© UCLES 2012

9 Shower gel is now used much more than soap when people take a shower. This is unfortunate. Shower gel requires much more packaging which means more rubbish. There is also a tendency for people to use more of it when washing in comparison with soap. Therefore more natural resources are consumed in the manufacturing process than would be if people used only soap. So, the trend towards shower gel is bad for the environment. This is because it creates more problems of waste disposal and uses up more resources than soap. We should make people more aware of the environmental impact of such simple decisions.

Which one of the following is an expression of the main conclusion of the above argument?

A The increased popularity of shower gel is bad for the environment.

B It is unfortunate that shower gel has become more popular than soap.

C People should be made more aware of the environmental consequences of choosing shower gel.

D The use of shower gel increases the problems of waste disposal.

E The manufacture of shower gel is more wasteful of natural resources.

10 Ten years ago in many European cities, offices typically had spaces for six bicycles, half of which were never used and spaces for 50 cars which were always full. Today, there are fewer car spaces and many more spaces for bicycles which are always full. This change to cycling may seem strange to some as cycling is more effort. Possible causes are rising fuel prices, the introduction of higher parking charges for drivers in major cities, increasing awareness of environmental issues, expensive public transport and traffic jams.

Which one of the following can be drawn as a conclusion from the above passage?

A Using a bicycle is now the most popular way of travelling to work.

B Travellers are now much more environmentally aware than they were 10 years ago.

C People will not cycle to work unless employers provide more cycle spaces on site.

D Travellers are now less happy to pay the costs of car use than they were ten years ago.

E More people cycle to work now than 10 years ago.

11 I wish to repaint the walls of my garage. It is 3 metres high, 4 metres wide and 9 metres deep. I shall not need to paint the electronic door which covers one 3 x 4 metre end, nor the window, which is 2 metres wide and 1 metre high, nor the rear door which is 1 metre wide and 2 metres high. 1 litre of paint covers 3 square metres.

How many 1 litre tins will be needed to complete the painting?

A 26

B 22

C 25

D 18

E 21

© UCLES 2012

12 Approximately 1 in 14 men over the age of 50 has prostate cancer. The level of 'prostate specific antigen' (PSA) is used as a preliminary screening test for prostate cancer.

7% of men with prostate cancer do not have a high level of PSA. These results are known as 'false negatives'.

75% of those men with a high level of PSA do not have cancer. These results are known as 'false positives'.

If a man over 50 has a normal level of PSA, what are the chances that he has prostate cancer?

A 7%

B 25%

C 5%

D 0.7%

E 0.5%

13 The National Farmer's Union (NFU) approves of controlled killing of badgers to reduce their numbers, saying that it is needed to help farming. Badgers are animals believed to be responsible for the spread of *bovine tuberculosis* which results in large numbers of cows having to be destroyed every year. Animal rights supporters have criticised the proposal, but it is clear that the lives of more cattle can be saved by destroying a smaller number of badgers. This controlled killing should be allowed to go ahead.

Which one of the following is the best statement of the flaw in the above argument?

A It attacks the animal rights supporters rather than their argument.

B It assumes that the animal rights supporters believe that animals that are living freely have a greater right to life than those that are being bred on farms.

C It assumes that the animal rights supporters believe that badgers have a greater right to life than cows.

D It assumes that the arguments from the animal rights supporters are about the number of deaths.

E It assumes that animal rights supporters always disagree with the NFU.

14 Global warming is threatening the survival of California's redwoods. These trees benefit from coastal fog which is captured by the trees, causing water to drip onto the soil and therefore watering them. Since fog is now 30 percent less frequent than it was 50 years ago the trees will not have this source of water and are therefore likely to begin to die out.

Which one of the following must be assumed in the above argument?

A Global warming is to blame for the reduction in coastal fog.

B The levels of fog will continue to decline.

C Other trees will not be able to thrive in these conditions.

D Redwoods in other areas of the world are being similarly affected.

E Rainfall has also reduced over the past 50 years.

© UCLES 2012

15 One of the fastest-growing beauty treatments in Britain, fish pedicures - where tiny toothless fish called *garra rufa* smooth feet by eating dead skin - has come under scrutiny from animal rights campaigners. One campaigner said, 'Fish are covered by the Animal Welfare Act. They need a stable environment and clean water, uncontaminated by perfume or lotions.' A spa in London's West End was closed recently by the local council when many of the fish in its pedicure pool died. There should be a complete ban on this type of pedicure, or else there will soon be no *garra rufa*.

Which one of the following is the best statement of the flaw in the above argument?

A Beauty spas which offer fish pedicures are not especially numerous at present.

B It would be less harmful if people washed their feet before using the spa.

C Fish in the wild are likely to die if their environment changes.

D The death of the fish in the London spa may not be a typical occurrence.

E The public does not immediately associate fish with the Animal Welfare Act.

16 The 100W light bulb (cost €0.60) is not going to be used anymore and is being replaced with the 20W (cost €3) low energy light bulb.

If electricity is charged at €0.15 per kWh, for how many hours must the low energy bulb be used in order for the lower cost of running it to exactly compensate for its higher initial cost?

A 0.25

B 250.00

C 200.00

D 160.00

E 720.00

17 Three months ago, Jane had 5 times as many DVDs as Duncan. Since then they have both bought 12 more DVDs. Jane now has twice as many as Duncan.

How many DVDs does Jane have now?

A 72

B 32

C 52

D 62

E 42

© UCLES 2012

18 In preparation for my holiday in Bolandia last June, I changed €300 into Bolandian dollars every pay day from January to May (I am paid monthly).

The exchange rates were as follows:

	January	**February**	**March**	**April**	**May**
€1=	$2.74	$2.79	$2.76	$2.83	$2.81

How many more Bolandian dollars would I have received altogether if, instead, I had changed the whole €1500 in May?

A 36

B 48

C 66

D 180

E 105

19 Rating figures for music are now much more difficult to calculate compared to a decade ago. The introduction of new formats for selling music means that figures have to be calculated based on more methods such as downloads, in addition to the sales of CDs in shops. Additionally, the availability of more formats means that there is more potential for copies of works to be shared with other fans, who do not pay for them. These fans do not show up in the ratings, so the official ratings do not reflect the relative popularity of a work.

Which one of the following, if true, would most strengthen the above argument?

A The calculation of ratings based on downloads and sales together is not difficult.

B Sharing copies of purchased works with others is against the law.

C Artists are not interested in the popularity of their work, just the sales figures.

D The sharing of works with other fans is more widespread for certain types of music.

E Official ratings have never reflected popularity very well.

20 It has been argued that since there has to be some limit on the funding of university education by governments, it would be best to target such funding, giving a lower priority to subjects which provide little benefit to society. Some subjects, such as Medicine, Engineering and Computing should be well funded, because they are clearly of great worth to the community. Subjects such as Classics, Literature and Art should be funded at a much lower level. These subjects are primarily of interest to the individual, and a wealthy society should give some subsidy to hobby subjects. However, it must be recognised that the future of society lies in the training and development of those people who will contribute the most.

Which one of the following must be assumed in the above argument?

A Subjects which are of interest to individuals can also provide benefit to society.

B The training of those people who will contribute most to society requires an increase in government funding in university education.

C Medicine, Engineering and Computing are not very interesting subjects to study.

D A wealthy society should not subsidise subjects which are of interest only to individuals.

E The study at universities of Classics, Literature and Art provides little benefit to society.

© UCLES 2012

21 Roughly 60 percent of today's world population is bilingual or multilingual and it is argued that this is a new phenomenon. Today Spanish and Arabic are widely spoken whilst English is the world's most commonly spoken and written language. However, 500 years ago it was Latin which was the main language of education, religion, commerce and government in the Western World despite this not being most people's first language. In the 17th century, French and Italian gained in importance as languages of international trade.

Which one of the following can be drawn as a conclusion of the above passage?

A English will one day be replaced as the main language of communication.

B Speaking another language has always been an important practical consideration.

C The majority of bilingual or multilingual people speak English.

D The number of bilingual or multilingual people in the world will continue to grow.

E English is the most common world language today because of the spread of the internet.

22 Child actors tend to become addicted to drink and drugs in later life, usually when they become adults but are not as successful as they were previously. The actors frequently blame their parents, who often manage their children's career and so have a reason to work them hard when they are young and enjoy the wealth their children generate for them. The child actors who avoid this are often the ones who were encouraged to keep up their schooling and explore other career options.

Which one of the following can be drawn as a conclusion from the above passage?

A Child actors should have other interests that allow for other career opportunities.

B Drug abuse is common in the entertainment industry.

C Young actors who continue to work live happy, healthy lives.

D Parents should not be allowed to manage the careers of their children.

E There are fewer jobs available for adult actors.

23 According to the Food Standards Agency, film goers should be told how many calories there are in the popcorn, ice cream and fizzy drinks that they buy in cinemas and smaller portions of popcorn and drinks should also be available. As two thirds of adults and a third of children are already obese or overweight, with serious risk of heart disease, diabetes and cancer, the need for proper labelling to warn people about the calorie content of these items is urgent.

Which one of the following, if true, most strengthens the argument in the passage above?

A People who are overweight are sometimes more concerned with their looks than the long term health risks.

B A large box of salted popcorn contains as many calories as a three course meal.

C Cinemas rely on sales of food and drink to boost their profits.

D Trials show that consumers alter their eating habits when food is calorie-labelled.

E Many people think that the food and drink consumed at the cinema is as important to the visit as the film.

© UCLES 2012

24 Tom shared out some money between his three children in the ratio 5:3:2. He later had an extra €6 which he gave to the child who received the least originally. This meant that the money had been shared into one large and two equal smaller shares.

How much money in total did Tom give to the three children?

A €36

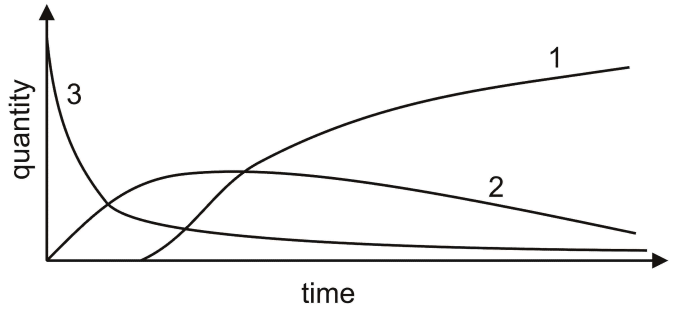
B €26

C €60

D €20

E €66

25 One radioactive substance, P, is gradually changed by radioactive decay into another, Q. Q itself decays into a third substance, R, which does not decay. The graphs below show how the quantities of P, Q and R varied with time during an experiment.



What do the graphs 1, 2 and 3 represent?

A 1:R 2:Q 3:P

B 1:Q 2:P 3:R

C 1:Q 2:R 3:P

D 1:P 2:Q 3:R

E 1:R 2:P 3:Q

26 The Chief Executive of the Royal Opera House has recently offered 100 seats on any Monday night for £10. Normally these seats can cost up to £175 therefore it represents a considerable saving. However the hopes of the Chief Executive that this will attract a broader audience are likely to be disappointed. It is not the financial costs that put people off opera - it is simply that they do not like it. Many young people spend considerable sums of money going to premier football matches or 'clubbing'. This suggests, therefore, that the problem of attracting a more diverse audience to opera is more a question of culture than economics.

Which one of the following is an expression of the main conclusion of the above argument?

A The 'cheap seats' policy is unlikely to attract a more diverse audience.

B The intention of the 'cheap seats' policy is that it will attract a broader audience.

C A considerable amount of money can be saved as a result of this offer.

D Many young people do not like the idea of going to the opera.

E Attracting a broader audience for opera is a problem of taste rather than expense.

© UCLES 2012

27 The ingredients list on a tin of baked beans reads as follows (in order of descending weight):

- Navy beans (51%)
- Water
- Sugar
- Tomato puree (4.5%)
- Modified maize starch
- Salt
- Natural flavourings
- Onion powder
- Paprika

What is the maximum percentage of water the tin could contain?

A 22.2%

B 17.5%

C 49.0%

D 40.0%

E 44.5%

28 Three friends, Adam, David and Sue are sharing out a bag of marbles. To do this more quickly, they take 10 marbles each time and repeat until the bag is empty. There are not enough marbles for Sue to take 10 on the last turn. Adam and David then give her two marbles each and they all have the same.

How many marbles did Sue take on the last turn?

A 4

B 2

C 8

D 6

E 3

29 In a street, a survey showed that out of a hundred households 60 had a cat, 40 had a dog, and 20 had neither a cat nor a dog.

How many households had a cat but no dog?

A 20

B 50

C 40

D 10

E 30

© UCLES 2012

30 After a long period of dry weather, the water container in my garden contained only 28% of its capacity of water. Last week's rain, however, increased the amount of water in the container by 25%, and according to the weather forecast, a similar amount of rain is expected to fall this coming week.

If, as expected, the container gets the same amount of rainwater this coming week as it did last week, what percentage of its capacity will it then contain?

A 66.25%

B 42.00%

C 78.00%

D 60.00%

E 43.75%

31 There are four rivers in Bolandia, each claiming to be the longest. Tourist board brochures in the regions containing the rivers, make the following statements:

1. The Dile is shorter than the Cubba.

2. The Bongo is shorter than the Esun.

3. The Esun is longer than the Cubba.

If all of the above are correct, which one of the following statements is definitely true?

A The Bongo is longer than the Cubba.

B The Esun is longer than the Dile.

C The Dile is longer than the Esun.

D The Cubba is longer than the Bongo.

E The Dile is shorter than the Bongo.

32 The table below shows the number of people who voted for each candidate in the recent school election:

Name	Alison	Harold	Kevin	Peter	Rachel
Votes	84	100	72	126	63

When drawing a pie chart of the results one of the numbers above was not read correctly (the other four were correct). The angles were calculated as 113.4 degrees, 90 degrees, 75.6 degrees, 56.7 degrees, and 24.3 degrees.

Whose score was copied incorrectly when the pie chart was constructed?

A Kevin

B Peter

C Rachel

D Alison

E Harold

33 A regular train service operates between Jayford and Kayton, a 16 km journey which takes 19 minutes. The trains travel at a constant speed of 60 km per hour in both directions except through a tunnel, where they are limited to 20 km per hour. Trains travelling towards Kayton enter the tunnel 4 km after setting off from Jayford.

How long is the tunnel?

A 4.5 km

B 2.5 km

C 1.5 km

D 3.5 km

E 0.5 km

34 After Northern Europe experienced the coldest weather for several years last winter, people are claiming that the theories of global warming are incorrect. This is not a conclusion that can be drawn from the information as it is only based on a single year's data. Global warming is based on long term changes in average temperature. It therefore does not mean that the temperature will increase every year. The extreme weather last winter was caused by cold air from the Arctic which is normally kept there by strong winds around the pole. Last winter those winds were not as strong.

Which one of the following, if true, would most strengthen the above argument?

A Some of the people claiming that the theories of global warming are incorrect do not come from areas that had very cold weather last winter.

B Although the weather was very cold last winter, the winter before was of average temperature.

C Other regions of the Northern Hemisphere were hotter last winter than in previous years.

D All the people claiming that theories of global warming are incorrect come from areas that had very cold weather last winter.

E The claims that theories of global warming are incorrect are supported by further evidence.

35 A student gives his friends small, short-term loans for periods of 1, 2 or 3 weeks after which time they must be repaid in full. He always lends on a Friday afternoon. He starts with €120 and loans out the following amounts each week:

Week	1	2	3	4
Amount	€45	€25	€18	€20

What is the smallest amount of money he has by the end of the 4th Friday?

A €82

B €12

C €77

D €100

E €57

© UCLES 2012

36 Hundreds of miles of motorways are lit by unnecessary street lights. There is a need to save energy usage in all public services and it is time that the government considered turning off street lighting. Modern cars have powerful headlights which provide a clear view of the road ahead even without overhead lighting. There is also evidence to suggest that when drivers move from an area with lighting to an area without they are more likely to have an accident than those drivers who have driven exclusively on roads without lighting.

Which one of the following, if true, would most strengthen the above argument?

A There is evidence that there are fewer daytime accidents on those motorways without lighting.

B Driving in well-lit areas at night can lead to a lack of concentration.

C Research suggests that older drivers find driving without lighting more difficult.

D Many drivers find driving on unlit roads difficult.

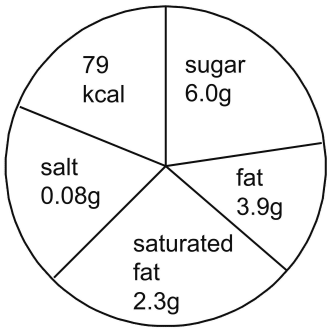
E Street lighting costs less than other types of road maintenance.

37 The following information appears on a 200g packet of biscuits:

Typical values per 100g:

Energy	Kj	2137
	Kcal	510
Protein		5g
Carbohydrate		65.7g
of which sugars		38.5g
Fat		25.3g
of which saturates		14.6g
Fibre		1.7g
Sodium		0.21g
Equivalent as salt		0.52g

Each biscuit contains:



How many biscuits are there in a full packet?

A 22

B 11

C 6

D 13

E 7

38 A restaurant owner who has put grey squirrel on the menu has called it the 'ultimate ethical food'. The grey squirrel, a small, tree-dwelling rodent introduced to Britain over a century ago, is breeding so rapidly that the native red squirrel is disappearing. Encouraging the consumption of the grey species as food may help protect the red one, in her view. The owner added that squirrel meat was free range, low fat and low on air miles. However, we can challenge this, as it is all just a cheap publicity stunt to increase business in the restaurant. Squirrels should not be on the menu!

Which one of the following is the best statement of the flaw in the above argument?

A It attacks the owner's motive rather than her reasons.

B It assumes the disappearance of the red squirrel justifies eating the grey squirrel.

C It attacks the whole notion of an ethical food.

D It assumes that eating grey squirrels will protect the red squirrel.

E It assumes that red squirrels don't need protecting.

© UCLES 2012

39 Health services should find better ways to take blood pressure readings for patients thought to be suffering from high blood pressure (hypertension). One third of patients thought to have high blood pressure may actually have 'white coat' hypertension, according to a new study. 'White coat' hypertension means that a patient's blood pressure is high at the doctor's surgery, probably due to anxiety, but normal in everyday life. In the study, patients said to have hypertension had their blood pressure measured in a normal environment; more than one third of these patients' blood pressures were in the normal range when they were at home or participating in their usual activities. It is worrying that patients are being treated with drugs with some negative side effects to reduce high blood pressure which they do not actually have.

Which one of the following best expresses the conclusion of the argument above?

A Two thirds of patients said to have hypertension are being wrongly treated.

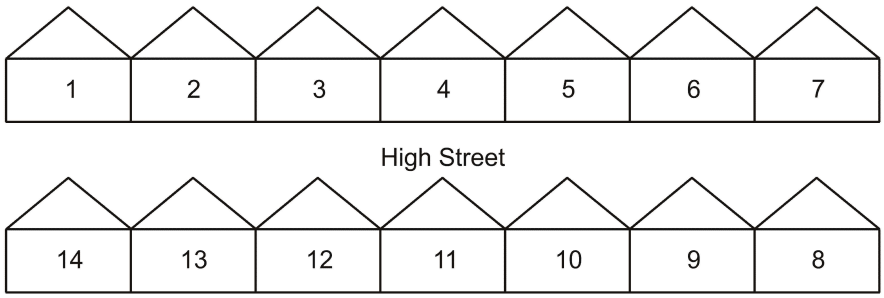
B More effective ways of measuring blood pressure are needed.

C Health services could save money currently spent on unnecessarily prescribed drugs.

D Anxiety is the most common cause of high blood pressure.

E 'White coat' hypertension has no medical significance.

40 As John walks along the High Street, the numbers to his left increase while the numbers to his right decrease, as in the diagram below.



The street where he lives is numbered in the same way. He lives at number 8 Princess Road and the house directly opposite his house is number 11.

How many houses are there on Princess Road?

A 18

B 16

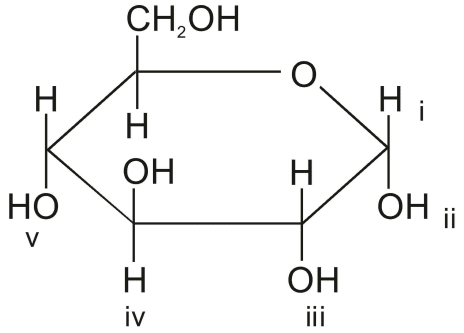
C 20

D 14

E 19

Biology

41 If a glucose molecule became incorporated as a non-terminal component of starch, which two regions, labelled **i** to **v**, would be involved in forming glycosidic bonds?



A i and iii

B iii and v

C ii and iv

D i and iv

E ii and v

42 In a reflex arc that comprises a pain receptor cell in the skin, three neurones and a muscle (effector), the number of synapses found in the central nervous system (CNS) is:

A 3

B 5

C 4

D 1

E 2

43 Which one of the following molecules will contain the greatest number of different elements?

A amino acids

B polysaccharide carbohydrates

C lipids

D monosaccharide carbohydrates

E water

44 Which of the examples of homeostasis do **NOT** require the brain to be involved in the control process?

1. temperature regulation
2. osmoregulation (regulation of the water content of blood)
3. blood glucose concentration regulation

A 2 and 3 only

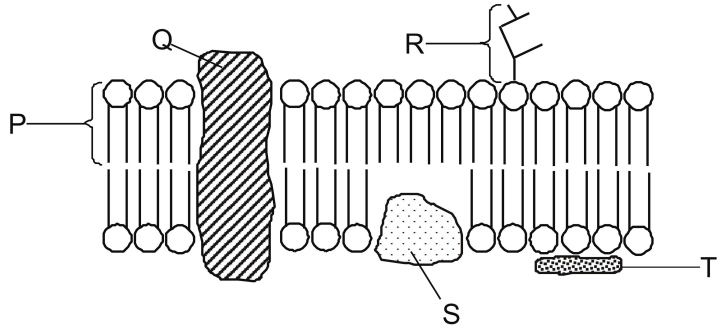
B 3 only

C 1 and 2 only

D 2 only

E 1 only

45 The diagram below represents the fluid mosaic model of the cell (surface) membrane.



Only two of the labelled molecules have both hydrophobic and hydrophilic areas. Which two molecules are they?

A P and Q

B R and S

C Q and R

D S and T

E P and T

46 Which row of the table correctly identifies a blood vessel that has a low concentration of carbon dioxide and a vessel that has a low concentration of urea?

	low carbon dioxide	**low urea**
Row 1	renal vein	pulmonary artery
Row 2	pulmonary vein	renal vein
Row 3	renal artery	pulmonary vein
Row 4	pulmonary vein	renal artery
Row 5	pulmonary artery	renal vein

A Row 5

B Row 2

C Row 4

D Row 3

E Row 1

47 Gene expression can be regulated by:

A transcription factors

B DNA replication factors

C RNA polymerase

D rough endoplasmic reticulum

E the position of the genes on the alleles

48 In a set of genetic crosses the offspring produced showed the same phenotype ratio of 9:3:3:1.

Which of the following statements could be true?

1. two genes each with two alleles were studied
2. all parents were heterozygous
3. some offspring had a phenotype different to the parents
4. some offspring had a phenotype the same as the parents

A 1, 2, 3 and 4

B 1 and 2 only

C 3 and 4 only

D 2 and 3 only

E 1 only

© UCLES 2012

49 Which one of the following would be different in a pair of non-identical twins?

A alleles

B amount of nuclear DNA

C the total of adenine plus guanine

D genes

E chromosome number

50 Which one of the following is **NOT** correct about human chromosomes?

A They contain regions called genes.

B They are made of DNA and protein.

C They are sometimes not found in pairs

D They can attach to the spindle at the centriole.

E They are sometimes found in pairs.

51 Which one of the following is **NOT** true of human hormones?

A They are all released from glands and flow down ducts into the bloodstream.

B A hormone may affect one or more structures in the body.

C They travel at the speed of blood flow.

D They are all chemicals.

E Some, such as testosterone and oestrogen, can be steroids.

52 Which of the following transport mechanisms require the use of protein molecules found in membranes and ATP?

1. Active transport

2. Diffusion

3. Facilitated diffusion

A 1 and 2 only

B 2 and 3 only

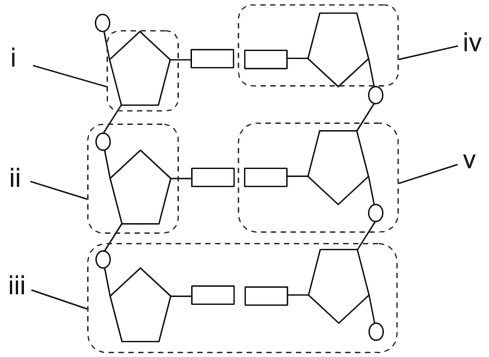
C 3 only

D 1 only

E 1 and 3 only

© UCLES 2012

53 Which one of the following labels, **i** to **v**, represents a nucleotide?



A i
B iv
C v
D ii
E iii

54 Which of the following crosses is most likely to produce offspring of genotype GgNn?

A ggNN x GGNn
B GGNn x GgNn
C ggNn x GGNN
D GGNN x ggnn
E GgNn x GgNn

55 Antibiotics are becoming less effective due to:

A people becoming immune to them
B people not finishing the full course
C new antibiotics being available
D people becoming resistant to them
E artificial selection

© UCLES 2012

56 The following organelles are involved in processing amino acids into glycoprotein:

1. Golgi apparatus

2. Ribsomes

3. RER

Which sequence is correct for this process?

A 3 → 1 → 2

B 2 → 3 → 1

C 1 → 2 → 3

D 1 → 3 → 2

E 2 → 1 → 3

57 Which of the following are increased when the level of adrenaline rises in a human?

1. heart rate
2. breathing rate
3. impulse rate in a sensory neurone

A 1 and 3 only

B 1 only

C 2 and 3 only

D 1 and 2 only

E 1, 2 and 3

58 Which of the following is/are true about hydrogen bonds between water molecules?

1. They are weak bonds.

2. They are strong bonds.

3. They are temporary bonds.

4. They require hydrolysis to break.

A 1 only

B 2 and 4 only

C 1 and 3 only

D 2 and 3 only

E 1 and 4 only

Chemistry

59 Which one of the following could **NOT** be the formula of an aldehyde?

A $C_6H_{12}O_2$

B $C_5H_{10}O_2$

C $C_5H_{10}O$

D $C_5H_{12}O$

E $C_6H_{12}O$

60 Which of the following statements are correct about the solvent properties of water?

1. All ionic substances dissolve in water.
2. All covalent substances are insoluble in water.
3. The solubility of solids usually increases with a rise in temperature.

A 1 only

B 2 only

C 2 and 3 only

D none

E 3 only

61 In the following reactions, which substances are acting as oxidising agents?

$C(s) + O_2(g) \rightarrow CO_2(g)$

$2Fe^{3+}(aq) + 2I^-(aq) \rightarrow Fe^{2+}(aq) + I_2(aq)$

$Mg(s) + 2H^+(aq) \rightarrow Mg^{2+}(aq) + H_2(g)$

A $C(s)$, $Fe^{3+}(aq)$, $H^+(aq)$

B $C(s)$, $Fe^{3+}(aq)$, $Mg(s)$

C $O_2(g)$, $I^-(aq)$, $H^+(aq)$

D $O_2(g)$, $Fe^{3+}(aq)$, $H^+(aq)$

E $O_2(g)$, $I^-(aq)$, $Mg(s)$

62 Which one of the following is **NOT** correct about Fe, Cu and Zn, which are in the first row of the transition metals?

A They all form basic oxides.

B They all have densities greater than those of Group 1 metals.

C They are all reactive metals.

D All of them form M^{2+} ions.

E Only two of them form coloured ions.

© UCLES 2012

63 The Avogadro constant is 6.0×10^{23} mol^{-1}.

How many hydrogen atoms are there in 0.420 g of cyclohexane?

[A_r: H = 1; C = 12]

A 1.8×10^{23}

B 1.8×10^{22}

C 3.0×10^{21}

D 3.0×10^{22}

E 3.6×10^{22}

64 What is the total number of electrons in the ions of sodium chloride?

A sodium ion = 11; chloride ion = 17

B sodium ion = 8; chloride ion = 8

C sodium ion = 11; chloride ion = 18

D sodium ion = 10; chloride ion = 18

E sodium ion = 10; chloride ion = 17

65 Which one of the following is correct about the first and second electron affinities of oxygen?

A first = slightly exothermic; second = very endothermic

B first = slightly exothermic; second = very exothermic

C first = slightly endothermic; second = very exothermic

D first = slightly endothermic; second = very endothermic

E first = very exothermic; second = very exothermic

66 The positions of some elements in the Periodic Table are shown below.

Li	**Be**												**C**		**O**		
Na	**Mg**												**Si**		**S**	**Cl**	
K	**Ca**															**Br**	
Rb	**Sr**															**I**	

Which one of the following pairs of elements is most likely to form a covalent bond?

A magnesium and bromine

B strontium and oxygen

C potassium and chlorine

D calcium and chlorine

E beryllium and iodine

67 Consider the following reactions.

$C_2H_5Br + OH^- \rightarrow C_2H_5OH + Br^-$

$Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$

$Mg(s) + Cu^{2+}(aq) \rightarrow Mg^{2+}(aq) + Cu(s)$

Which one of the following types of reaction is **NOT** included in this list?

A substitution
B oxidation/reduction
C displacement
D precipitation
E elimination

68 Which rows of the table correctly describe the reactions of the aqueous acids with amines and amides?

		Amines	**Amides**
Row 1	**Ethanoic acid**	reacts	does not react
Row 2	**Nitrous acid**	reacts	reacts
Row 3	**Sulphuric acid**	does not react	hydrolyses

A Rows 2 and 3
B Rows 1 and 3
C None of the rows
D All of the rows
E Rows 1 and 2

69 Which one of the following is **NOT** the correct formula for a lithium compound?

A Li_2S
B $LiCO_3$
C CH_3CO_2Li
D $LiHSO_4$
E Li_3N

Physics and Mathematics

70 What is the set of values of x for which $x^2 < 9$ and $2x + 3 \geq 5$?

A $x > 3$

B $x \geq -1$

C $1 \leq x < 3$

D $x < -3$ or $x \geq 1$

E $x > -3$

71 A block of iron at 100 ^{o}C is transferred to a plastic cup containing water at 20 ^{o}C.

Which one of the following is **NOT** necessary in order to find the specific heat capacity of iron?

A The specific heat capacity of water.

B The mass of the block of iron.

C The thermal conductivity of the iron.

D The final temperature.

E The mass of water.

72 At the melting point, which of the following are correct about paraffin wax?

1. The substance becomes more disordered.
2. The wax takes in heat but its temperature stays the same.
3. Bonds between the carbon and hydrogen atoms are broken.

A 1, 2 and 3

B 2 and 3 only

C 2 only

D 1 and 3 only

E 1 and 2 only

73 When cooled below 4.2 K, mercury becomes a superconductor, which means it has no electrical resistance. When a current is passed through mercury under these conditions, which of the following effects will be present?

1. thermal
2. chemical
3. magnetic

A 1 and 3 only

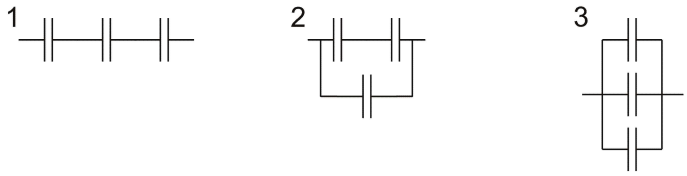
B 1, 2 and 3

C 2 only

D 3 only

E 1 only

74 Three identical capacitors are connected as follows:



Which of the following shows the order of increasing capacitance (smallest first)?

A 3, 2, 1
B 1, 3, 2
C 2, 1, 3
D 1, 2, 3
E 2, 3, 1

75 Which one of the following is **NOT** a vector?

A velocity
B weight
C electric charge
D electric field
E acceleration

76 Which of the following is equivalent to $\ln\left(x^2y\right) - 2\ln(xy) + 3\ln y$?

A 0
B $\ln x + \ln y$
C $2\ln y$
D $2\ln x + 2\ln y$
E $\ln x + 2\ln y$

© UCLES 2012

77 In a group of students, exactly $\frac{2}{5}$ are male and exactly $\frac{1}{3}$ study mathematics. The probability that a male student chosen at random from the group studies mathematics is p.

Which of the following is the range of possible values of p?

A $\frac{1}{3} \le p \le 1$

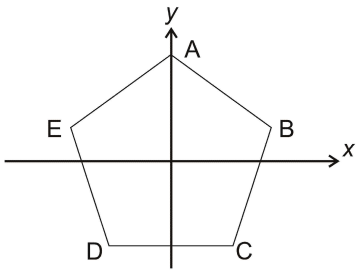
B $0 \le p \le \frac{5}{6}$

C $\frac{1}{3} \le p \le \frac{2}{5}$

D $\frac{2}{5} \le p \le \frac{5}{6}$

E $0 \le p \le \frac{1}{3}$

78 ABCDE is a regular pentagon. The transformation R is a rotation about the origin and maps A to B, B to C, C to D, etc. The transformation S is a reflection in the y-axis.



Which of the following sequences of transformations (performed in the order that they are listed) would **NOT** leave vertex D in the same position?

A R R S R S R

B S R

C S R R S R S

D R S R S

E R S R R

79 The line L has equation $y = 2x - 1$.

Four of the following five points are the same distance from the line L. Which one is at a different distance?

A (1, -1)

B (1, 3)

C (4, 9)

D (6, 9)

E (5, 13)

80 A man of mass 75 kg lies on a bed of 10 000 nails. The tip of each nail has an area of 1.0 square millimetre.

What pressure does the man experience?

[g = 10 N/kg]

A 7.5×10^6 Pa

B 7.5×10^4 Pa

C 7.5×10^3 Pa

D 7.5×10^7 Pa

E 7.5×10^5 Pa

© UCLES 2012

© UCLES 2012

IMAT 2012

Answer Key

Question	Answer
1	C
2	A
3	B
4	C
5	A
6	D
7	E
8	E
9	C
10	E
11	E
12	D
13	D
14	A
15	D
16	C
17	B
18	A
19	D
20	E
21	B
22	A
23	D
24	E
25	A
26	A
27	D
28	A
29	C
30	B
31	B
32	A
33	C
34	C
35	E
36	B
37	D
38	A
39	B
40	A

Question	Answer
41	E
42	E
43	A
44	B
45	A
46	B
47	A
48	A
49	A
50	D
51	A
52	D
53	C
54	D
55	B
56	B
57	D
58	C
59	D
60	E
61	D
62	C
63	E
64	D
65	A
66	E
67	E
68	E
69	B
70	C
71	C
72	E
73	D
74	D
75	C
76	C
77	B
78	A
79	E
80	B

© UCLES 2012