# ADMISSION TEST FOR THE DEGREE COURSE IN MEDICINE AND SURGERY

**Academic Year 2013/2014**

Thinking Skills - General Knowledge and Logical Reasoning

**1** A significant social trend in the 20th century was for people to move away from their place of birth in order to access education and work. This gave individuals more opportunities and helped the economy by producing mobility within the workforce. The negative side of this is now being felt as more and more elderly people face the problems of old age without family members nearby to care for them. This has negative effects on the economy as well as on the individual, as more and more state funding for care is needed.

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

**A** The benefits of a mobile workforce have to be compared with the costs to elderly people and the economy.

**B** Elderly people are expecting the state to provide care for them rather than relying on their children.

**C** People should try to find education and work close to their place of birth.

**D** The state should provide care for elderly people to make mobility of the workforce possible.

**E** People should make caring for their elderly parents a priority over choice of work opportunities.

© UCLES 2012

**2** Any company that wishes to sell a new drug must provide the government with details of research about its safety and possible side effects. At present, this information is confidential, but there are plans to make it available to the public. While patients are surely entitled to more information about the drugs they are prescribed, this will also inevitably make public vital details about the ingredients of certain drugs and how they are manufactured. Drug companies are naturally reluctant to release this information to their competitors. Therefore, through fear of imitators, drug companies will no longer introduce new and important drugs into the country.

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

**A** There are sufficient drugs already on the market and so there is no necessity to introduce new ones.

**B** The drug industry is a very competitive business and secrecy is vital if companies are to survive.

**C** People may be reluctant to use certain drugs when they have fuller information about them.

**D** People are better informed about the side effects of drugs abroad than they are in this country.

**E** Strong patent laws prevent companies from using the information to create rival drugs.

**3** There is an increasing number of historical or significant buildings in the UK which are said to be 'At Risk'. Without a change in the law most of these buildings are doomed to crumble into the ground. This is because these buildings are no longer structurally sound. The exisiting strict renovation laws mean that they are too expensive or impractical for private individuals or developers to renovate or repair. There are certainly people out there who would be willing to maintain these buildings if they could use more modern and less expensive techniques and materials. Surely it is better to sacrifice some of the original building's character rather than lose the entire structure.

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

**A** There is nothing wrong with changing the character of historic buildings.

**B** 'At Risk' buildings need to be renovated according to strict rules.

**C** A change in the law is needed if we hope to preserve more 'At Risk' buildings.

**D** Existing laws make 'At Risk' buildings too expensive for most developers.

**E** Historians can learn more from buildings which have not been modernised by modern developers.

© UCLES 2012

**4** Many people believe that foreign travel broadens the mind and that there is some inherent benefit in spending some time in a culture different from your own. Many students are taking 'gap' years where they spend time in another country. Whilst this may offer some benefits in terms of confidence and independence, it is wrong to assume that foreign travel alone can provide this. Global travel can have negative impacts on local cultures and the environment. Home country based 'gap' projects are often seen as unglamourous but the benefit of working with different groups and cultures within our own society can be equally rewarding.

Which one of the following is the main conclusion of the above passage?

**A** Foreign gap year projects must have an element of community work for them to be worthwhile.

**B** Foreign travel is not the only way to gain confidence and independence.

**C** Projects within our own society can be as rewarding as foreign travel.

**D** There is inherent benefit in spending some time abroad.

**E** It is important that gap year students consider the impact of their travel on the communities they work in.

**5** After looking at interviews conducted with a number of adult learners, our research suggested that the learners who felt they were most successful were all highly motivated. We noticed that early success had heightened motivation in some cases and saw that both success and motivation may be due to a special aptitude for learning. We also noticed that many of those who felt they were most motivated were also learning in favourable conditions or for fun, which meant they may have become motivated since starting their classes. Though these conditions seemed persuasive, the results led us to the same conclusion. It's impossible to learn anything without motivation.

Which one of the following is **NOT** a flaw in the above argument?

**A** It assumes that those who felt they were successful actually were.

**B** It assumes that those who felt they were motivated actually were.

**C** The research does not establish that there are no successful learners who lacked motivation.

**D** The research is only concerned with adult learners.

**E** It assumes that in order to be motivated you have to have a special aptitude for learning.

© UCLES 2012

**6** In which modern day country was the Inca civilization centred?

**A** Chile

**B** Peru

**C** Brazil

**D** Ecuador

**E** Bolivia

**7** A placebo is:

**A** a type of pain killer.

**B** a form of local anaesthetic.

**C** a form of mild stimulant.

**D** an inactive drug or treatment.

**E** a sedative.

**8** A nationwide survey showed that the majority of people would not be willing to give up their car in favour of public transport. However, in a recent survey of people living in an area with heavy traffic problems, 76% stated that they would prefer to travel to work by public transport if the system was made more reliable. This shows that the previous findings were wrong. We should, therefore, restrict car use and start a programme of improving the nation's public transport network as soon as possible.

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

**A** It fails to specify which types of public transport are to be improved.

**B** The counter arguments are not explained in detail.

**C** The statistic presented may not be representative of the whole population.

**D** It does not consider the 24% who would not prefer to use public transport.

**E** It fails to explain how the public transport system can be improved.

© UCLES 2012

**9** Which general famously crossed the Alps with his army?

**A** Octavius

**B** Hannibal

**C** Hamilcar

**D** Augustus

**E** Antony

**10** The headquarters of the World Health Organisation (WHO) is found in which of these cities?

**A** Nairobi

**B** Washington DC

**C** Rome

**D** London

**E** Geneva

**11** A multi-storey car park has eight levels.

On the top seven levels there are eight rows of parking. Two of these rows hold 15 cars each whilst the others hold 10 cars each.

On the road level there are two rows holding 15 cars but only four rows holding 10 cars each.

The entry control system counts cars in and out. The system stops admitting cars once 90% of the total capacity is in use.

Four spaces on the road level are reserved for staff parking and these are not available to the public.

What is the maximum number of public cars which can be admitted?

**A** 644

**B** 500

**C** 696

**D** 630

**E** 626

© UCLES 2012

**12** Coffee granules are available in two jar sizes, regular and large. The regular jar contains 250 grams and costs €4.50. The large jar is 60% bigger, containing 400 grams, but at €6.30 costs only 40% more than the regular jar.

By how much per kilogram is the large jar of coffee better value for money than the regular jar?

**A** €3.60

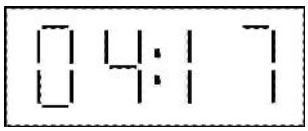
**B** €6.00

**C** €2.25

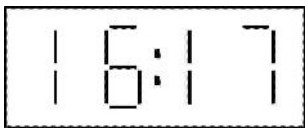
**D** €3.15

**E** €0.90

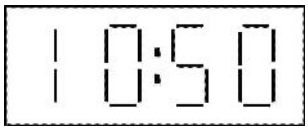
**13** My watch is a twenty four hour digital watch, so that, for instance 4.17am appears as:



and 4.17pm appears as:



One morning recently I woke up, picked up my watch and saw:



I panicked, thinking that I had overslept, until I realised I had picked up the watch upside down and it was only one minute past five.

At which one of the following times would the display appear the same whichever way I picked it up?

**A** 5.51am

**B** 5.51pm

**C** 1.01am

**D** 3.21pm

**E** 3.51pm

© UCLES 2012

**14** At a society meeting, 1000 people are entitled to vote in the elections for Chairperson with a one-person-one-vote system. The election rules state if no candidate obtains more than 50% of the votes cast in the first ballot, a second ballot must be held between the top two candidates. 350 votes were cast for a particular candidate in the first ballot. Then a second ballot took place.

Under these circumstances which one of the following is possible?

**A** The candidate won the election, came second, or came third.

**B** The candidate either won the election or came second.

**C** The candidate came second or third, but did not win.

**D** The candidate came third.

**E** The candidate definitely won the election.

© UCLES 2012

**15** The table below shows the winning time for the men's 200m run in the Olympic Games since 1900, when the event was first held, until 1988.

| year | seconds | year | seconds |
|---|---|---|---|
| 1900 | 22.2 | 1948 | 21.1 |
| 1904 | 21.6 | 1952 | 20.81 |
| 1908 | 22.6 | 1956 | 20.75 |
| 1912 | 27.1 | 1960 | 20.62 |
| 1916 | * | 1964 | 20.36 |
| 1920 | 22.0 | 1968 | 19.83 |
| 1924 | 21.6 | 1972 | 20.00 |
| 1928 | 21.8 | 1976 | 20.23 |
| 1932 | 21.2 | 1980 | 20.19 |
| 1936 | 20.7 | 1984 | 19.80 |
| 1940 | * | 1988 | 19.75 |
| 1944 | * | - | - |

* Olympics not held in these years.

What is the longest number of years for which the Olympic record stood unbroken?

**A** 6

**B** 16

**C** 24

**D** 28

**E** 20

© UCLES 2012

**16** Ever since Uranus was discovered, astronomers have thought there might be more planets in the Solar System. Because of small deviations in the orbits of Uranus and Neptune - deviations which would occur if another planet existed - some astronomers think there must be an undiscovered planet - Planet X. But these deviations cannot tell us whether Planet X exists, because they would occur if the orbits had been wrongly predicted. Since Uranus and Neptune take many decades to circle the sun, astronomers rely on old data to calculate their orbits. As this is likely to be inaccurate, the calculated orbits are probably wrong, and so Uranus and Neptune will deviate from them even if there is no Planet X.

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

**A** The use of old and inaccurate data indicates that Planet X cannot exist.

**B** Astronomers are right to think that there must be an undiscovered planet.

**C** The deviations in the orbits of Uranus and Neptune cannot tell us whether Planet X exists.

**D** The calculations of the orbits of Uranus and Neptune are probably wrong.

**E** Uranus and Neptune will deviate from the predicted orbits whether or not Planet X exists.

**17** According to a recent analysis of university entrance records, you are more likely to go to university if your name is John than if it is Wayne. Therefore, if you want your child to go to university, you are better off calling him John than Wayne.

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

**A** It draws a general conclusion from specific evidence.

**B** It confuses a necessary condition with a sufficient one.

**C** It jumps to a conclusion without any evidence.

**D** It confuses a correlation with a cause.

**E** It fails to consider other names than Wayne or John.

© UCLES 2012

**18** The low level of literacy among science undergraduates is an issue across all universities. One of the biggest problems is that pupils in school spend more time perfecting their SMS text messaging and emailing skills than they do writing grammatically correct pieces of literature. It is important to get across to undergraduates that good writing matters. Employers take on scientists believing they can communicate their findings fluently and accurately. We need to deliver science graduates with these skills.

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

**A** Education is failing those who leave with poor writing skills.

**B** Students must be helped to recognise the importance of good literacy skills.

**C** Many science graduates are unable to write in a grammatically correct way.

**D** Employment often depends on good ability in literacy.

**E** Students do not concentrate properly in lessons in school.

**19** My packet of washing powder claims to contain enough powder for 24 washes. This claim is based on using the plastic scoop supplied with the packet and filling it once for each wash.

Living in a soft water area I find I only need to fill the scoop three-quarters full.

How many washes can I get from this packet?

**A** 42

**B** 18

**C** 32

**D** 26

**E** 30

© UCLES 2012

**20** It has recently been suggested that some degrees can be completed in two years instead of the traditional three years. But staff teaching engineering and medicine at degree level say that the current first year mostly involves getting students up to a common level of maths and physics, which in the past was achieved by high school teaching. By the end of the second year few students have reached the level of attainment that students did 40 years ago. Two year degrees are not realistic - certainly not for engineering.

Which one of the following is an assumption of the argument in the passage above?

**A** Two year degree courses will have the same amount of teaching per year as three year courses.

**B** School examinations are easier now than they were 40 years ago.

**C** Maths and physics are more important elements of engineering than they were 40 years ago.

**D** Engineering students are less motivated than they were 40 years ago.

**E** Two year degree courses will be more popular with students than three year courses.

**21** One in four deaths caused by road accidents involving commercial vehicles is caused by the driver falling asleep at the wheel. The problem even affects police men and women, who are now more likely to die due to driving when tired than by physical attacks. Evidence at the scene (such as tyre marks) can tell investigators how quickly the car driver braked: late breaking would indicate lack of concentration which might be caused by tiredness. The problem with this evidence is that it is not conclusive, whereas conclusive evidence can be offered for other offences such as drink driving.

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

**A** Accidents caused by drivers falling asleep at the wheel are a greater problem than drink driving.

**B** Commercial vehicle drivers and the police are more prone to falling asleep at the wheel because of the long hours they work.

**C** The number of hours per day that commercial drivers should be allowed to drive should be reduced.

**D** It will not be as easy to prosecute drivers for falling asleep at the wheel as it is for drink driving.

**E** It would be unfair to prosecute people for falling asleep at the wheel.

© UCLES 2012

**22** Which one of these did Galileo **NOT** do?

**A** Discover the movement of a pendulum produces a regular time measurement.

**B** Develop the telescope.

**C** Design an electric battery.

**D** Design a thermometer.

**E** Develop the microscope.

**23** The pasta that I buy in the local supermarket usually costs €1.60 per packet. This week the packet is marked '€0.20 off normal price'.

In addition the following sign is on display '10% off all bills when you spend €10 or more'.

Assuming that I spend over €10 altogether, how much will the packet of pasta cost?

**A** €1.26

**B** €1.24

**C** €1.30

**D** €1.12

**E** €1.18

**24** A study on identical twins concluded that genes contribute roughly half of the attributes we need to be happy. People often find such studies scary, seeing something sinister about us being mere puppets of our biology. However, put in non-scientific terms, it sounds like common sense. Parents talk about how their children had different personality traits from a very young age. Perhaps it's nicer to think this is caused by something 'fluffy' like a soul - but even if that were true, why is that more reassuring than the thought that genes are responsible? Either way, you're born as you are.

Which one of the following statements is best supported as the conclusion of the passage above?

**A** Roughly half of what we need to be happy is decided by our genetic make up.

**B** We may as well accept the idea that our potential for happiness in life is to some extent decided at birth.

**C** Whether or not you are happy in life is either determined by your soul or your genes.

**D** Whether or not you are happy in life is not something over which you yourself have any control.

**E** The person you are at birth is the person you will be throughout your life.

© UCLES 2012

**25** Two companies have just started a round-the-clock air taxi service between Rome and Milan. They use the same flight path and fly at constant speeds at different altitudes. Planes owned by the company Alpha-Air take off from Rome every 10 minutes and take 90 minutes to reach Milan. Planes owned by the company Beta-Air take off every 5 minutes and take 60 minutes to reach Milan. Captain Johnston, who flies for Beta-Air, takes off from Rome 5 minutes after the previous Alpha-Air flight has departed.

How many Alpha-Air planes (flying from Rome to Milan) will Captain Johnston have passed as he lands in Milan?

**A** 0

**B** 3

**C** 2

**D** 1

**E** 4

**26** Stephen is currently involved in a long distance charity walk from Alphcaster to Omegham. He left Alphcaster 9 days ago and has just completed 60% of his journey.

He hopes to complete 60% of the rest of the walk during the next 4 days. This will leave him just 60 miles from Omegham, which he aims to complete in a further 2 days.

How far is it from Alphcaster to Omegham?

**A** 375 miles

**B** 250 miles

**C** 300 miles

**D** 225 miles

**E** 450 miles

© UCLES 2012

**27** A safe has external dimensions as follows:

Width 48cm
Depth 44cm
Height 52cm

The entire safe is made of steel 4cm thick except the base which is 8cm thick.

What are the internal dimensions of the base of the safe?

**A** 40cm x 40cm

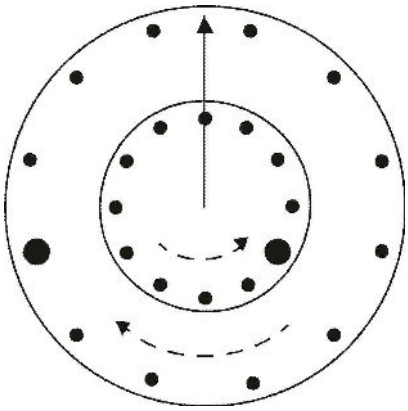
**B** 36cm x 36cm

**C** 40cm x 32cm

**D** 44cm x 40cm

**E** 40cm x 36cm

**28** A novelty shop sells a rather unusual clock designed to puzzle users. There is only one hand, which points upwards. It has two faces. The larger hour face rotates clockwise and the smaller minute face rotates anticlockwise. Each face has one big dot, representing 12 o' clock or 0/60 minutes and 11 smaller marks counting one hour or five minute divisions. There are no numbers.



What time is it when the clock looks as shown in the diagram?

**A** 9:20

**B** 3:20

**C** 8:40

**D** 3:40

**E** 8:20

© UCLES 2012

**29** The table below shows the consumer price inflation and unemployment rate for 5 countries:

| **Consumer price inflation % rate** | **March** | **February** |
|---|---|---|
| United States | +0.4 | +0.3 |
| Japan | +0.2 | +0.5 |
| Germany | +0.1 | +0.1 |
| France | +0.3 | 0.0 |
| UK | +0.2 | +0.5 |
| **Unemployed % rate** | **March** | **February** |
| United States | 5.9 | 6.1 |
| Japan | 3.0 | 3.0 |
| Germany | 9.2 | 9.3 |
| France | 12.6 | 12.6 |
| UK | 9.1 | 9.2 |

A newspaper comparing March to February reported that:

'Unemployment has fallen but there has been a rise in the inflation rate'

Which country is the statement referring to?

**A** Japan

**B** UK

**C** France

**D** United States

**E** Germany

© UCLES 2012

**30** Horrific images of the earthquake in Haiti were seen immediately all over the world, and by the next day the full extent of the damage was seen by the entire world. Clearly, the main problem was moving aid from the airport to distant areas, and with the roads largely blocked the only practical method was to use helicopters. The great nations of the world should be ashamed that food was not getting to the people who needed it, and that even a week later their relief still depended on the ability of courageous and skillful drivers to reach them in trucks.

Which one of the following is an underlying assumption of the argument above?

**A** The relief agencies were able to import trucks to Haiti but not helicopters.

**B** The great nations of the world had helicopters at their disposal which could reach Haiti within a week.

**C** There was enough food in Haiti to supply all the people in the weeks after the earthquake.

**D** The images failed to prompt the great nations of the world into relief operations after the earthquake.

**E** The people of Haiti were able to clear their roads within a week of the earthquake.

© UCLES 2012

**31** The direct product of transcription of recombinant DNA can be:

**A** insulin.

**B** monoclonal antibodies.

**C** mRNA.

**D** the primary structure of a protein.

**E** a replicate DNA molecule.

**32** Which one of the following is found below the diaphragm in a human?

**A** Heart

**B** Pulmonary vein

**C** Liver

**D** Pulmonary artery

**E** Alveoli

**33** Which one of the following does not contain amino acids?

**A** Cell membranes

**B** Amylose

**C** Viruses

**D** Enzymes

**E** Antibodies

© UCLES 2012

**34** Which statement about ribosomes is **NOT** correct?

**A** Ribosomes are involved in protein synthesis.

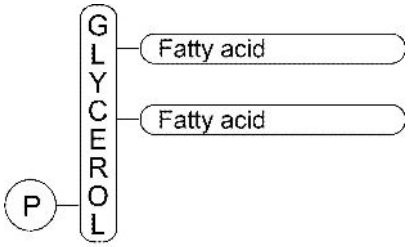
**B** Ribosomes can be found in the cytoplasm.

**C** Ribosomes can be found on rough endoplasmic reticulum (RER).

**D** Ribosomes can have RNA associated with them.

**E** Ribsosomes can carry out transcription.

**35** The diagram below shows a phospholipid.




P = phosphate

When this molecule is broken into a phosphate, glycerol and two fatty acids, the number of water molecules released is:

**A** 2

**B** 3

**C** 0

**D** 1

**E** more than 3

**36** A section of one strand of DNA has a base sequence of:

ACG-GCT-GGT-TCC

Which of the following are correct?

1. The other DNA strand would include a CGA triplet.
2. If adenine always binds with 2 H bonds to its complementary base and guanine with 3 H bonds, then each of these triplets will have a total of 8 H bonds.
3. The mRNA sequence transcribed from this DNA sequence would contain 3 uracil bases.

**A** 1 only

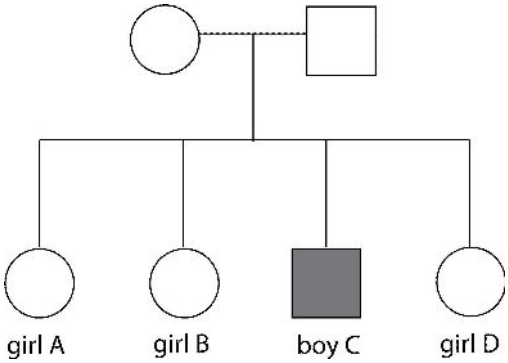
**B** 2 and 3 only

**C** 3 only

**D** 2 only

**E** 1 and 2 only

**37** The family pedigree shows that boy C has a genetic condition. No other member of the family shows the same genetic condition.




Which one of the following could **NOT** explain why boy C has the condition?

**A** Sex-linked dominant condition

**B** Sex-linked recessive condition

**C** Both parents are carriers

**D** Autosomal recessive condition

**E** Mutation

**38** Which one of the following is not involved in defending the body against infection?

**A** Antibodies

**B** T cell

**C** Beta cell

**D** B cell

**E** Phagocyte

**39** In which of the following stages of mammalian respiration is $CO_2$ released?

1. Glycolysis
2. Anaerobic respiration
3. Krebs cycle

**A** 3 only

**B** 1 and 2 only

**C** 1 only

**D** 2 and 3 only

**E** 2 only

**40** A sample of DNA contains 32 % guanine.

Which answer shows the percentage of thymine in the same sample?

**A** 32

**B** 18

**C** 23

**D** 34

**E** 24

© UCLES 2012

**41** Which of the following comes immediately after anaphase in mitosis?

**A** Telophase

**B** Interphase

**C** Prophase

**D** Metaphase

**E** Cytokinesis

**42** The increase in the frequency of one phenotype in a wild population of fish could be due to:

1. an advantageous mutation.
2. increased reproductive success of individuals with that phenotype.
3. a change in the environment.

**A** 3 only

**B** 1 and 2 only

**C** 1, 2 and 3

**D** 2 and 3 only

**E** 1 only

**43** Which one of the following molecules is made in both photosynthesis and respiration?

**A** Glucose

**B** Reduced NADP

**C** Carbon dioxide

**D** ATP

**E** Oxygen

© UCLES 2012

**44** A liver cell in the metaphase of mitosis can be identified as being eukaryotic because it has:

1. mitochondria
2. ribosomes
3. a nucleus

**A** 1 only

**B** 2 and 3 only

**C** 1 and 3 only

**D** 1 and 2 only

**E** 1, 2 and 3

© UCLES 2012

**45** Which name of the following phase changes is **NOT** correct?

**A** Solid to liquid = Melting

**B** Gas to solid = Freezing

**C** Solid to gas = Sublimation

**D** Liquid to gas = Evaporation

**E** Gas to liquid = Condensation

**46** The compound $(CH_3)_2CHCH_2NH_2$ can be synthesised by the following route.

$$CH_3CH{=}CH_2 \xrightarrow{1} CH_3CHBrCH_3 \xrightarrow{2} (CH_3)_2CHCN \xrightarrow{3} (CH_3)_2CHCH_2NH_2$$

What types of reaction are used in stages 1, 2 and 3?

**A** 1=substitution; 2=addition; 3=reduction

**B** 1=substitution; 2=addition; 3=hydrolysis

**C** 1=addition; 2=substitution; 3=reduction

**D** 1=addition; 2=addition; 3=reduction

**E** 1=addition; 2=substitution; 3=hydrolysis

© UCLES 2012

**47** Which of the following must be correct about organic isomers?

1. They have the same molecular formulae.
2. Their physical properties are very similar.
3. They have different structural formulae.

**A** 1 and 2 only

**B** 1, 2 and 3

**C** 2 and 3 only

**D** 1 only

**E** 1 and 3 only

**48** Which of the following are correct about carbon to carbon bonds?

1. The length of carbon to carbon bonds increases in the order C≡C, C=C, C-C.
2. The strength of the C=C bond is less than twice the strength of the C-C bond.
3. The carbon atoms are joined by six electrons in the C≡C bond.

**A** 2 and 3 only

**B** 1 and 3 only

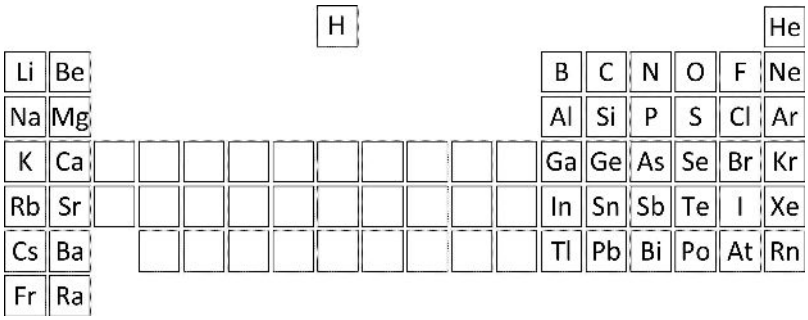
**C** 1, 2 and 3

**D** 1 and 2 only

**E** 3 only

© UCLES 2012

**49** The positions of the main group elements in the Periodic Table are shown below:




Which one of the following formulae is **NOT** correct?

**A** $GaCO_3$

**B** $CsNO_3$

**C** $BeSO_4$

**D** $SnS_2$

**E** $Ba(HCO_3)_2$

**50** The following are some compounds of nitrogen:

NOCl, $KNO_2$, $NO_2$, $NO_2Cl$, $Ca(NO_3)_2$

What oxidation numbers are shown by nitrogen in these compounds?

**A** 3, 4, 5, 6

**B** 2, 3, 4, 5

**C** 2, 3, 4, 5, 6

**D** 4, 5, 6

**E** 3, 4, 5

© UCLES 2012

**51** What value does **c** need to be so that the following equation can be balanced?

$4KMnO_4 + \mathbf{a}H_2SO_4 + 5C_2H_5OH \rightarrow 4MnSO_4 + \mathbf{b}K_2SO_4 + 5CH_3CO_2H + \mathbf{c}H_2O$

**A** 21

**B** 11

**C** 16

**D** 17

**E** 26

**52** How many atoms of hydrogen are there in 3.0kg of ethane?

[relative atomic mass: H=1, C=12; Avogadro constant = $6.0 \times 10^{23}$ per mol]

**A** $3.6 \times 10^{26}$

**B** $3.9 \times 10^{26}$

**C** $6.0 \times 10^{25}$

**D** $3.6 \times 10^{23}$

**E** $6.0 \times 10^{22}$

© UCLES 2012

**53** A mass is connected to a spring and it vibrates up and down, forming a simple harmonic system.

Which of the following are correct?

1. The kinetic energy of the mass is at a maximum half way up.
2. The potential energy of the system is at a maximum at the top of the mass's motion.
3. The potential energy of the system is at a maximum at the bottom of the mass's motion.

**A** 1, 2 and 3

**B** 1 and 2 only

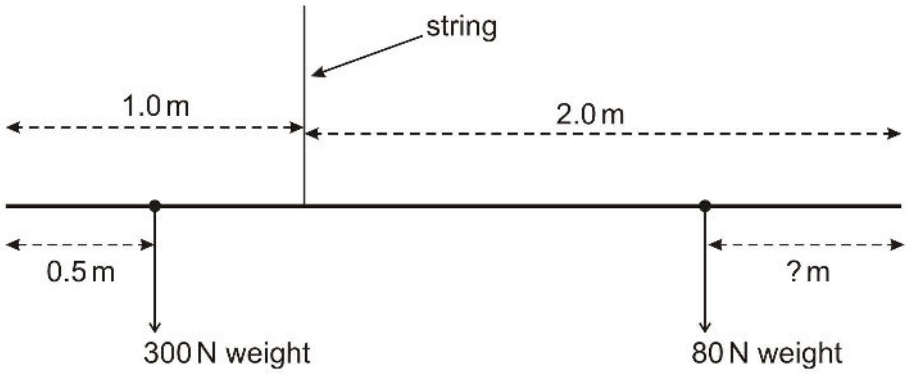
**C** 2 only

**D** 3 only

**E** 1 only

**54** A uniform beam, 3.0m long, of weight 100N has a 300N weight placed 0.50m from one end. The beam is suspended by a string 1.0m from the same end.

A diagram of the weights placed on the beam is given below:




How far from the other end must a weight of 80N be placed for the beam to be balanced?

**A** 0.75m

**B** 2.25m

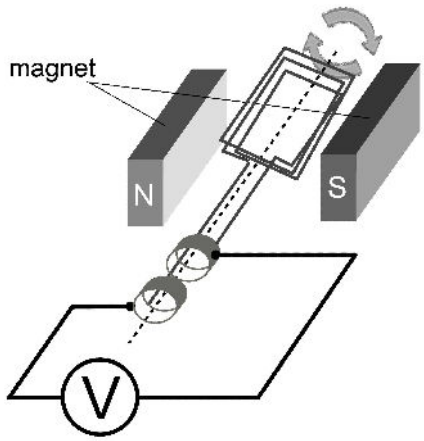
**C** 1.25m

**D** 1.875m

**E** 0.125m

© UCLES 2012

**55** In an AC (alternating current) generator, a coil of wire rotates in a magnetic field.




Which of the following would change the potential difference measured by the voltmeter in the system above?

1. Use more turns of wire in the coil
2. User thicker wire
3. Change the speed of rotation

**A** 3 only

**B** 1, 2 and 3

**C** 1 and 2 only

**D** 2 only

**E** 1 and 3 only

**56** Which of the following is the equation of the circle with centre (-1.5, 0.5) and radius 3?

**A** $2x^2 - 6x + 2y^2 + 2y - 13 = 0$

**B** $2x^2 + 6x + 2y^2 - 2y - 14 = 0$

**C** $2x^2 - 6x + 2y^2 - 2y - 13 = 0$

**D** $2x^2 + 6x + 2y^2 - 2y - 13 = 0$

**E** $2x^2 + 6x + 2y^2 - 2y - 23 = 0$

© UCLES 2012

**57** In the expressions below: $g$ = gravitational acceleration; $h$ = height; $m$ = mass; $R$ = electrical resistance; $t$ = time; $v$ = velocity; $V$ = voltage.

Which of the following expressions have units of power?

1. $\frac{mv^2}{2t}$
2. $\frac{V^2}{R}$
3. $\frac{mgh}{t}$

**A** 1 and 2 only

**B** 1 only

**C** 2 and 3 only

**D** 1 and 3 only

**E** 1, 2 and 3

**58** Simplify

$$\ln\frac{x^2}{4y} + \ln xy + \ln 8$$

**A** $3\ln x + 2\ln 2$

**B** $\ln\frac{x^2 + 4xy^2 + 32y}{4y}$

**C** $3\ln x + 2\ln y + \ln 32$

**D** $3\ln x + \ln 2$

**E** $4\ln x + \ln 2$

**59** What is the set of values for which $12 - x^2 > 8$ and $2x + 3 \geq 5$?

**A** $1 \leq x$

**B** $1 < x \leq 2$

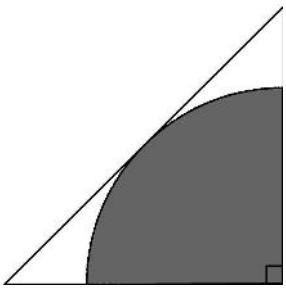
**C** $1 \leq x < 2$

**D** $2 < x$

**E** $-1 \leq x < 2$

**60** The diagram shows a quarter of a circle surrounded by an isosceles triangle.

The radius of the circle is $r$.



Which one of the following expressions represents the unshaded area?

**A** $\left(1 - \frac{\pi}{4}\right)r^2$

**B** $r^2 - \frac{\pi r^2}{2}$

**C** $r^2 - \frac{\pi r}{2}$

**D** $(4 - \pi)r^2$

**E** $\left(2 - \frac{\pi}{4}\right)r^2$

© UCLES 2012

© UCLES 2012

© UCLES 2012

© UCLES 2012

© UCLES 2012

© UCLES 2012

© UCLES 2012

© UCLES 2012

© UCLES 2012

© UCLES 2012

© UCLES 2012