

BioMedical Admissions Test

4500/01

Wednesday

5th November 2008

Morning

One hour



SECTION 1 Aptitude and Skills

Instructions to Candidates

Please read this page carefully, but do not open the question paper until you are told that you may do so.

A separate answer sheet is provided for this section. Please check you have one.
You also require a soft pencil and an eraser.

Please first write your name, date of birth, BioMedical Admissions Test candidate number and centre number in the spaces provided on the answer sheet.
Please write very clearly.

Speed as well as accuracy is important in this section. **Work quickly, or you may not finish the paper.** There are no penalties for incorrect responses, only points for correct answers, so you should attempt all 35 questions.
Unless otherwise stated, all questions are worth one mark.

Answer on the sheet provided. Many questions ask you to show your choice between options by shading a circle (or circles, if specified in the question).
If questions ask you to write in words or numbers, be sure to write clearly in the spaces provided. If you make a mistake, erase thoroughly and try again.

Any rough work should be done on this question paper.

Calculators are NOT permitted.

Please wait to be told you may begin before turning this page.

This paper consists of 23 printed pages and 5 blank pages.

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- 1 Some Malgons are Zanders and all Zanders are Tvints

Which one of the following statements is definitely true?

- A All Zanders are both Malgons and Tvints.
- B All Malgons are Tvints
- C All Tvints are Malgons
- D Some Malgons are Tvints
- E Nothing can be said about the relationship between Malgons and Tvints

- 2 Simplistic interpretations of traditional evolutionary theory suggest that animals are never altruistic (selfless). In other words their only compelling drive is for personal survival. There are, however, examples in the animal kingdom of "reciprocal altruism", when an altruistic act is carried out, which may be returned at another time. Warning calls by a bird, for example, put the bird at higher personal risk, but the bird will benefit in the long run if others reciprocate. In this case, "altruism" has clear paybacks for the bird.

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

- A Altruism can be seen in humans as well as animals.
- B Traditional evolutionary theory is discredited by increasing knowledge.
- C Reciprocal altruism is compatible with traditional evolutionary theory.
- D Birds operate as a social group with shared interests.
- E Examples of altruism contradict the idea of 'survival of the fittest'.

- 3 Jim has all his screws jumbled up in a big jar. The number of screws it contains is as follows:

		length		
		25 mm	35 mm	45 mm
diameter	3 mm	68	10	2
	4 mm	22	20	18
	5 mm	10	54	46

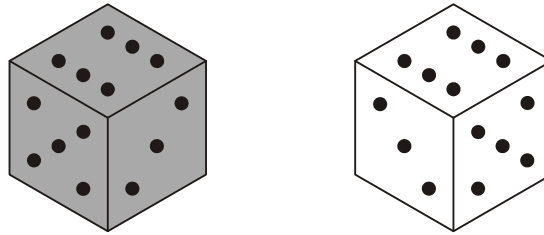
He needs a 4 mm screw but doesn't mind whether it is 35 or 45 mm long. If he takes one out at random, what are the chances that it will suit his purpose? (Answer to the nearest 1 %)

- A 8 %
- B 15 %
- C 22 %
- D 25 %
- E 27 %
- 4 It is often claimed that the use of animals in medical research is justified by the fact that such use has been involved in the major discoveries of drugs to treat serious and fatal illnesses. But the law requires that new drugs are tested on animals for effectiveness and safety, so, of course, every new wonder-drug involves the use of animals at some stage. Thus to claim that the very fact of animal testing proves the value of using animals in medical research is as nonsensical as claiming that wearing lab coats whilst doing experiments proves the value of lab coats in finding new cures. The important question in relation to animal experiments is, therefore, whether they are crucial in providing the necessary weight of evidence on effectiveness and safety of drugs, not _____

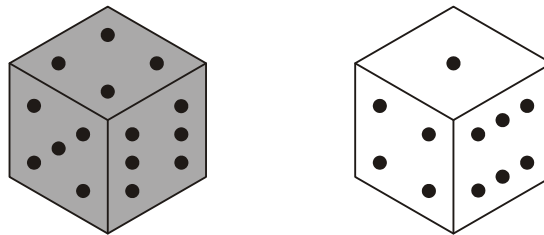
Which **one** of the following most logically completes the above argument?

- A whether they have been involved in major drug discoveries.
- B whether new wonder-drugs can cure serious illnesses.
- C whether laws on animal experimentation need to be changed.
- D whether scientists ill-treat the animals used in medical research.
- E whether they enable us to avoid testing new drugs on humans.

- 5 I played a game at a friend's house yesterday that involved throwing a pair of dice. When I threw them for my first turn they landed as follows:



It was clear they were not identical. On my second turn they landed like this:



Now I could see that there was something very odd about them. Closer inspection revealed that one of them was a conventional die (with opposite faces totalling seven), whilst the other one appeared to have had its faces numbered from one to six unconventionally.

What number is on the opposite face to two on the “unconventional die”?

- A One
- B Three
- C Four
- D Five
- E Six

6

Growing digital divide between age groups

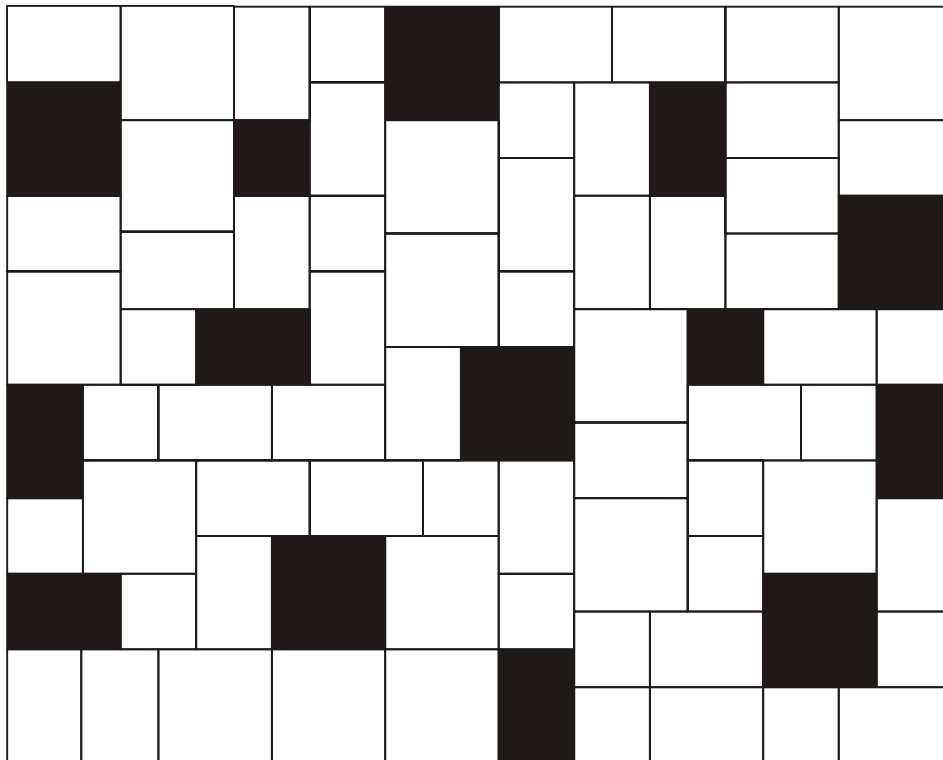
55 % of males aged 15 – 19 regularly browse social networking sites according to a survey in early 2008, whereas only 13 % of 45 – 54 year old men do the same.

Which of the following express(es) why the headline does not accurately reflect the evidence provided by the survey?

- 1 45 – 54 year old men might be using other digital applications.
- 2 Evidence from a single survey is insufficient to show that a gap is growing.
- 3 Surveys can be misleading if they are taken from unrepresentative samples.

- A** 1 only
- B** 2 only
- C** 3 only
- D** 1 and 2
- E** 1 and 3
- F** 2 and 3
- G** 1, 2 and 3

- 7 My rectangular patio is 5 m long and 4 m wide. It is covered with white tiles, and some black tiles, of three different sizes (60 cm x 60 cm, 60 cm x 40 cm and 40 cm x 40 cm), giving it the following appearance:



What percentage of the area of my patio is black?

- A 17.5 %
- B 17.8 %
- C 18.4 %
- D 19.6 %
- E 20.8 %

Questions 8 - 11 refer to the following information:

12,178 women were questioned about their reproductive history, demography, lifestyle and innate hand preference, and their answers were recorded to provide a "baseline". The same women were interviewed 16 years later, and the data was used to calculate total person-years lived in the sample.

The sample comprised 11.6% left-handed women. Mean age at baseline was similar for left and non-left-handed women: 47.4 and 47.0 years respectively. These groups did not differ in anthropometry, socioeconomic status, smoking habits or family history of breast cancer. The only difference was in child bearing: 21.8% of left-handed versus 10.9% of non-left-handed women had borne no children. 426 women from the whole group had breast cancer.

The non-left-handed group was taken as the reference group. The relative risk for breast cancer in left-handed women compared with non-left-handed women was calculated and was 1.39 overall (see table).

Association between handedness and incidence of breast cancer in study participants followed up at 16 years			
Innate handedness	Cases of breast cancer	Estimated person-years lived	Relative risk
Total			
non-left-handed	361	153422	1
left-handed	65	19119	1.39
Pre-menopausal breast cancer*			
non-left-handed	57	32113	1
left-handed	15	3329	2.41
Post-menopausal breast cancer*			
non-left-handed	257	127426	1
left-handed	39	17665	1.12
Body mass index ≤ 25			
non-left-handed	217	95964	1
left-handed	45	11332	1.62
Body mass index > 25			
non-left-handed	144	57458	1
left-handed	20	7787	1.05
Had not borne children			
non-left-handed	61	16486	1
left-handed	9	3759	0.68
Had borne children			
non-left-handed	300	136936	1
left-handed	56	15360	1.58

* in 58 cases information on timing of menopause relative to incidence of breast cancer was not available.

- 8** What is the overall percentage increase in risk of breast cancer in left handed women over non-left-handed women?

- 9 What, from the table, is the incidence of breast cancer in the entire study group expressed as cases per 1000 person-years?
- A 0.7
 - B 2.5
 - C 3.4
 - D 7.2
 - E 46.0
- 10 What is the incidence of breast cancer per 1000 person-years lived for those having a body mass index of over 25?
- A 2.5
 - B 5
 - C 39
 - D 54
 - E 62
- 11 Which one of the following, if true, would be a plausible reason for the apparent increased risk of breast cancer in left-handed women shown by the study?
- A Normalising the data to 1 for right handed women will bias the percentages.
 - B Having a child increases the risk of breast cancer.
 - C In the 16 years of the study, women may develop breast cancer but are unlikely to change from being left to right handed.
 - D The same hormonal changes in the mother cause the foetus to have a tendency to be left-handed and to have a susceptibility to breast cancer.
 - E The large majority of right-handed women in the group means that their breast cancer incidence will be divided by a very large number.
-

- 12** Adults all pay the same admission price to watch a football match. There is no charge for children under 16.

Following record low takings of £1560 at the last match it was decided to reduce the admission price by 25 % this week in an attempt to increase the attendance figures. As a result, exactly 40 % more adults than last time have paid to watch today's match.

How much has been taken at the gate today?

- A £1638
- B £1704
- C £2067
- D £2149
- E £2496

- 13** Figures show that, during the course of a year, cars in the UK emit 69.9 million tonnes of CO₂, whereas domestic and international flights from the UK emit 37.5 million tonnes. Even though emissions of CO₂ at high altitude can be more environmentally damaging than at ground level, cars still make a greater contribution to climate change than do planes. However, the number of people who think that flying is the bigger contributor has risen rapidly in the past eighteen months, a period during which there has been an increase in activity by pressure groups opposed to any growth in air travel. In a National Statistics survey 34 % of those questioned thought that cars contributed more than planes to climate change, while 40 % thought planes contributed more than cars. 47 % thought that air travel should be limited, but only 15 % were willing to fly less often.

If the statements in the above passage are true, which of the following must also be true?

- 1 Some people's opinions about the impact of flying on climate change have been influenced by pressure groups.
 - 2 Some people in the UK are mistaken about the relative contributions of aviation and car travel to climate change.
 - 3 Some people in the UK who believe that air travel should be limited are not willing to fly less often.
- A 1 only
 - B 2 only
 - C 3 only
 - D 1 and 2
 - E 2 and 3
 - F 1, 2 and 3

- 14** The table below shows the all-time top 14 ranked men at 1500m running on the track as at February 2008. When Steve Cram set his time in July 1985, he broke the World Record.

Rank	Time	Name	Date
1	3:26.00	Hicham El Guerrouj	14/07/1998
2	3:26.34	Bernard Lagat	24/08/2001
3	3:27.37	Noureddine Morceli	12/07/1995
4	3:28.12	Noah Ngeny	11/08/2000
5	3:28.95	Fermín Cacho	13/08/1997
6	3:28.98	Mehdi Baala	05/09/2003
7	3:29.02	Daniel Kipchirchir Komen	14/07/2006
8	3:29.14	Rashid Ramzi	14/07/2006
9	3:29.18	Vénuste Niyongabo	22/08/1997
10	3:29.29	William Chirchir	24/08/2001
11	3:29.46	Saïd Aouita	23/08/1985
12	3:29.46	Daniel Komen	16/08/1997
13	3:29.51	Ali Saïdi-Sief	04/07/2001
14	3:29.67	Steve Cram	16/07/1985

According to the table above how many other World Record holders have there been since then?

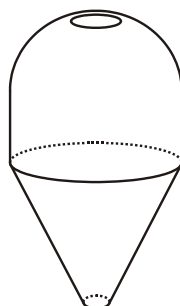
- A** 3
- B** 4
- C** 5
- D** 9
- E** 13

- 15** Radiation from mobile phones is not strong enough to heat biological tissue or break chemical bonds in cells. However, it may affect cell behaviour. Researchers exposed ten female volunteers to radiation at 900 MHz from mobile phones to simulate an hour long phone call. They screened 580 different proteins in their skin cells. They found that the numbers of one protein increased by 89 % in all volunteers. Numbers of a second protein decreased by 32 % in all volunteers. This is the first study to show molecular effects of phone radiation on humans.

Which of the following can reliably be concluded from the evidence in the passage?

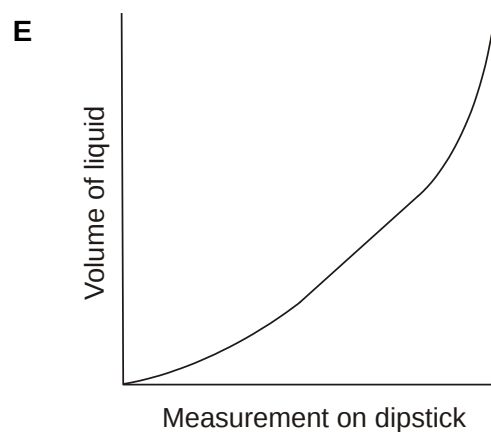
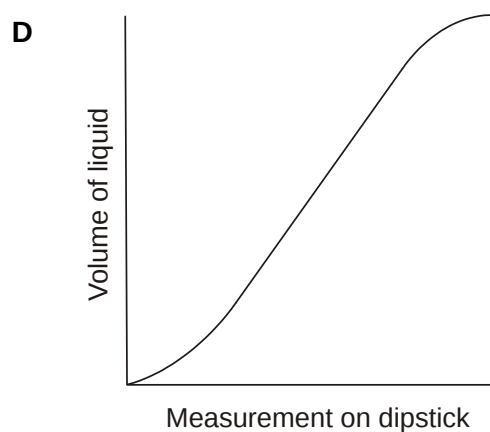
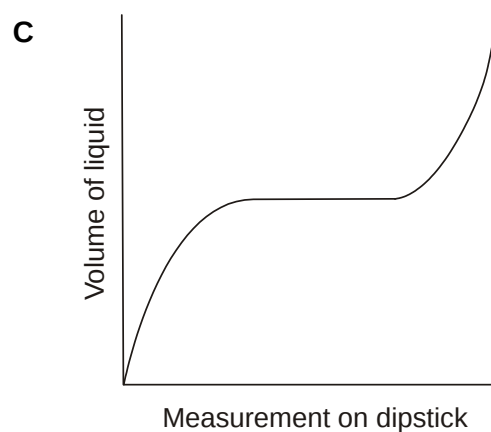
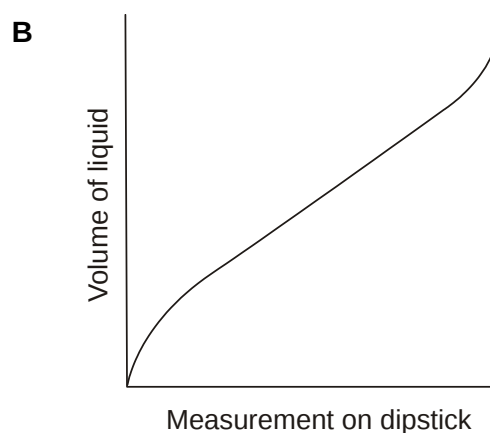
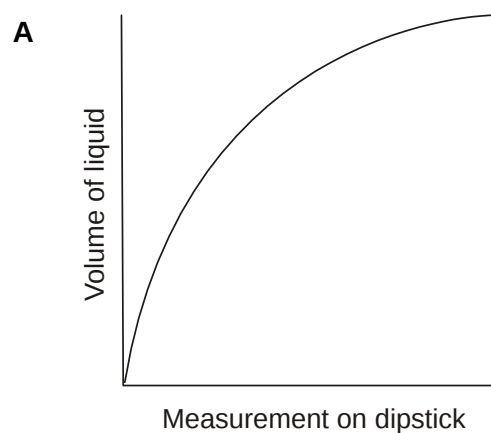
- A** Overuse of mobile phones will have a negative effect on human health.
- B** The human body has a negligible reaction to low level radiation from mobile phones.
- C** People should keep mobile phone conversations to less than an hour.
- D** The human body reacts to low level radiation from mobile phones.

- 16 A farmer has a tank for storing diesel of the form shown below, buried in his farmyard.



He calculates the volume remaining in the tank using a dipstick which measures the depth of diesel and then referring to a chart. Unfortunately he has calibration charts for several different tanks and is not sure which is his.

Which one of the following best represents the correct calibration chart for the tank?



- 17 “As one of the millions around the world watching the much anticipated Live Earth concerts, I found myself increasingly irritated by the artists chosen to make us all more aware of the damage we are doing to the environment. Fly less, drive less, waste less, recycle more. Yet these pop stars rack up thousands of miles a year on increasingly large world tours, leading to higher sales of CDs, which in turn produce thousands of tonnes of waste in plastic packaging. They own private jets, fleets of cars, and heat and light huge mansions that are empty for half the year. They then go and pocket extra cash and exposure advertising cars and soft drinks. By taking part, the artists increase their public profile and gain exposure to new audiences, thereby landing bigger tours, selling more CDs and being able to buy more planes, cars and houses, all whilst encouraging me to give up my holidays and cycle to work. Rather than let these people lecture me about what I could do, I left my TV on standby and went for a drive.”

If true, which of the following present effective challenges to the position taken by the writer?

- 1 Pop stars and celebrities have a broader appeal than politicians and environmentalists and are more likely to influence the public.
- 2 By becoming more aware of themselves, the artists will start to do more to raise awareness of environmental issues.
- 3 The artists weren't paid to perform and therefore did not gain financially from the concert.

- A 1 only
- B 2 only
- C 1 and 2 only
- D 2 and 3 only
- E All of the above

- 18 It is known that droplets of a certain chemical have a volume of 0.02 cm^3 (rounded to the nearest 0.01 cm^3).

What is the maximum number of droplets of the chemical that can be mixed with 10 cm^3 of water (rounded to the nearest 10 cm^3) if the resulting solution **must not** have more than 1 % of the chemical in?

- A 2
- B 4
- C 5
- D 6
- E 10

Questions 19 - 22 refer to the following information:

Even moderate exercise boosts longevity, study says

Sorry, couch potatoes - the verdict is in: people who exercise regularly really do live longer.

In fact, people who get a good workout almost daily can add nearly four years to their lives, according to the first study to quantify the impact of physical activity this way.

The researchers looked at records of more than 5,000 middle aged and elderly Americans and found that those who had moderate to high levels of activity lived 1.4 to 3.6 years longer than those who got little exercise, largely because they put off developing heart disease - the nation's leading killer. Men and women benefited about equally.

Previous studies have found that being physically active has a host of health benefits. It reduces the risk of being overweight and of developing many illnesses and improves overall quality of life. But the new study is the first to directly calculate the effect on how long people live.

Oscar Franco, of the Erasmus M.C. University Medical Center in Rotterdam, and his colleagues analysed the data from the Framingham Heart Study, a well-known research project that has followed 5,209 residents of one Massachusetts town for more than 40 years, collecting detailed information about their lifestyles and health.

People who engaged in moderate activity - the equivalent of walking for 30 minutes a day - lived on average 1.4 years longer than those who were less active. Those who took on more intense exercise - the equivalent of running half an hour a day - extended their lives on average by 3.6 years, the researchers found.

Franco and others noted that this and other studies show that people do not have to be exercise fanatics to reap the benefits. "What we're talking about is small changes," said James Hill of the University of Colorado in Denver. "We're telling people to get out and walk more. Fifteen, 20 or 30 minutes of walking each day is probably enough."

- 19** If the average lifespan of an American male who does not exercise is 75, to how much might this average be expected to be increased by running for 30 minutes a day? (Answer to the nearest year.)

20 What, approximately, is the percentage increase in extra years of lifespan due to running for 30 minutes a day, rather than walking for the same time?

- A 2.9 %
- B 4.8 %
- C 157 %
- D 257 %

21 "Franco's findings show that even for people who are already middle-aged, exercising more can add years to their lives."

What is the relationship of this observation and the information given in the passage?

- A It is a conclusion which may be drawn from the passage.
- B It is a necessary reason for the main conclusion of the passage.
- C It infers more than is supported by the evidence in the passage.
- D It is an explanation for the findings presented in the passage.
- E It counters the main conclusion of the passage.

22 Which of the following is an unstated assumption made in drawing the main conclusion?

- A The elderly and middle aged who exercise have done so throughout their lives.
 - B Those people who walk for exercise do so vigorously.
 - C Being overweight reduces lifespan.
 - D It is the exercising rather than other factors which increases longevity.
 - E Exercise delays the onset of heart disease.
-

- 23** A code for transmitting binary signals at night is devised which assigns an ordered combination of red and blue flashes to each letter of the alphabet. In order to keep transmissions short, the shortest possible 'strings' of red and blue flashes are assigned first:

One red flash for A
 One blue flash for B
 Two red flashes for C
 One red followed by one blue flash for D

And so on, introducing longer strings as necessary.

Given that flashes will be transmitted once a second and a one second gap will be left in between letters, how many seconds would it take to transmit the entire alphabet of 26 letters?

- A** 82 seconds
- B** 85 seconds
- C** 98 seconds
- D** 107 seconds
- E** 123 seconds

- 24** "Young British competitors today are too friendly, and this is affecting their chances of winning major championships. They are all too close, all the current generation are having lunch together and then going off to play for a million dollars.

In the past competitors had to win over and over again to become well known and create a future and a pension plan. These guys now have a future in a year. You can be a millionaire now in six months without even winning. They've got their own clothing lines, they advertise drinks and sportswear, and even have management companies guaranteeing them a signing-on fee for playing in a tournament. In the past it was necessary to play well just to be invited to top events. They started out with little or nothing and were lucky to receive £100 as expenses in one week. But look at what they achieved!"

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

- A** The standard of play in Britain has declined over the years due to commitments outside the sport.
- B** Nowadays, British players are more interested in money than players from other countries.
- C** British players in the past were not on friendly terms with opponents.
- D** Nowadays, players can make more money from appearances and outside commitments than they do from winning competitions.
- E** Nowadays, it is much harder for British players to win a major championship due to commitments outside the sport.

- 25** In a particular country there are two political parties, the Red Party and the Blue Party. Prior to last week's General Election the Red Party had $2\frac{1}{2}$ times as many representatives in the parliament as the Blue Party. The Red Party's lead has been reduced by 56 as a result of the General Election, but it now has $1\frac{1}{2}$ times as many representatives as the Blue Party.

How many seats are there in the parliament?

- 26** Suggestions that there should be a national database storing DNA samples from all citizens should be resisted. At present the police take DNA samples from everyone who has been arrested, and they store the samples regardless of whether the suspect is subsequently convicted. This database has provided evidence for the arrest and conviction of rapists and murderers. However, the database should contain the DNA only of those convicted of a sexual or violent crime. To store the DNA of innocent people is an infringement of the right to privacy of those who have never committed a crime. Moreover it is unnecessary, since the police need access to the DNA only of those convicted of a serious offence in order to solve cases of sexual and violent crime.

Which of the following identify/identifies a weakness in the above argument?

- 1** Some cases of sexual and violent crime are first offences.
 - 2** Some people who are found not guilty of a crime may have committed it.
 - 3** Some cases of sexual and violent crime are solved without DNA evidence.
- A** 1 only
 - B** 2 only
 - C** 3 only
 - D** 1 and 2
 - E** 2 and 3
 - F** 1, 2 and 3

- 27** An army convoy is 1 km long. The General at the front wants to send a message to the rearmost vehicle, so he tells a motorcycle courier to go to the back, hand over the message and return. The courier hands over the message while the rearmost vehicle is moving, and returns immediately. It takes him half a minute to get to the back and 3 minutes to return to the front.

If the convoy and courier travel at constant speeds, how fast does the courier travel?

- A** 34 km/hr
- B** 50 km/hr
- C** 70 km/hr
- D** 120 km/hr
- E** 140 km/hr

- 28** Many areas of Britain have been subject to serious flooding in recent years. People who own homes in flooded areas already find it very difficult to sell their houses. With the pace of climate change set to increase, more areas will be at risk of flooding. We are, therefore, facing a future of limited geographic mobility which will have social and economic consequences.

Which of the following statements are assumptions underlying the above argument?

- 1** Climate change is the cause of flooding.
- 2** No effective action will be taken to prevent homes being flooded.
- 3** People will not want to move to areas at risk of flooding.

- A** 1 and 2 only
- B** 1 and 3 only
- C** 2 and 3 only
- D** None of the above
- E** All of the above

- 29** In the main draw of the National Lottery six different numbers between 1 and 49 inclusive are selected at random live on television. My sister and I both buy a ticket every week. Whenever one of us is not able to watch the draw the other texts the numbers the instant the sixth one is revealed.

e.g. 15, 46, 20, 31, 5, 22

One week however, my sister forgot to leave gaps between the numbers and I received the following:

3437427337

Luckily, upon closer scrutiny, I could see that there was only one arrangement possible.

What was the highest of these six lottery numbers?

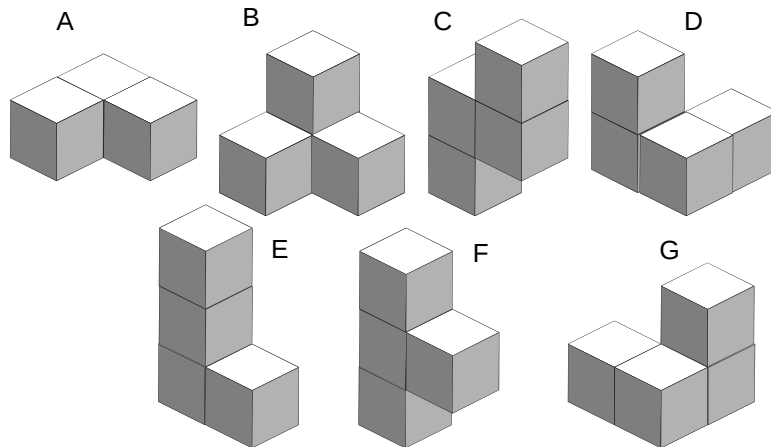
- A** 33
- B** 34
- C** 37
- D** 42
- E** 43

- 30** The implementation this year of more random speed traps to prevent accidents is absurd. Figures published earlier this year showed that only 6 % of accidents are caused by speeding. But half the deaths on the roads are caused by drivers under 25. The road safety campaigners should turn their attention to finding ways of helping young people to drive safely while they are gaining experience, instead of advocating the pursuit of safe and responsible drivers for technical infringements of arbitrary limits.

Which of the following could be flaws in the argument?

- 1** The writer ignores the fact that the introduction of more random speed traps, though not focusing on the most common cause of accidents, is still designed to prevent them.
 - 2** The writer ignores the fact that a percentage of deaths caused by drivers under the age of 25 will be due to speeding.
 - 3** The writer fails to appreciate the fact that safe and responsible driving includes obeying the speed limit.
- A** 1 only
- B** 2 only
- C** 3 only
- D** 1 and 2 only
- E** 1 and 3 only

- 31** The picture below shows the pieces of a puzzle called the Soma Cube which may be assembled to make a $3 \times 3 \times 3$ cube.



Which other piece, along with pieces F and G, can be used to make a $3 \times 2 \times 2$ cuboid?

- A** Piece A
- B** Piece B
- C** Piece C
- D** Piece D
- E** Piece E

Questions 32 - 35 refer to the following information:

Section 1: Cycling level - facts

According to the 2005 National Travel Survey (NTS) cycling is a relatively rare means of travel in the UK, and is declining.

- Cycling accounts for 1% of all trips*, and 2% of trips of less than 2 miles, including those that are made on foot.
- The average person makes 14 cycle trips per year and cycles a distance of 36 miles.
- When asked how often they ride a bike, 15% of the population say at least once a week, and a further 8% say at least once a month. Over two thirds (69%) of people say they cycle less than once a year or never.
- Those who do cycle average 5 trips a week by bicycle and travel 13 miles in a week. Cycling accounts for a fifth (22%) of all trips by cyclists†.

* For the purposes of the survey a 'trip' is a one-way journey having a single main purpose – e.g. going to work.

† A 'cyclist' is someone who cycles once a week or more.

Section 2: Charts

Chart 1: Cycle trips per person per year, by sex and age:

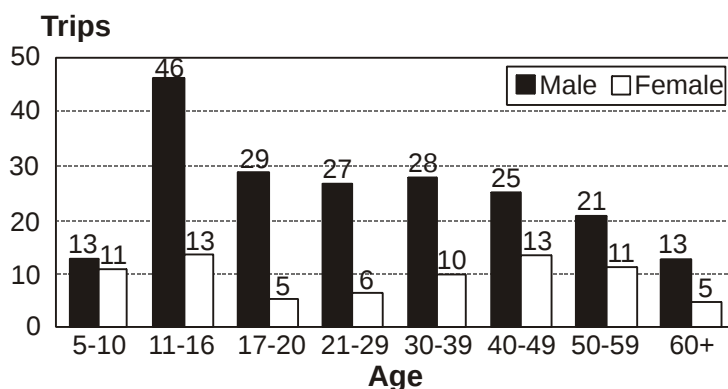
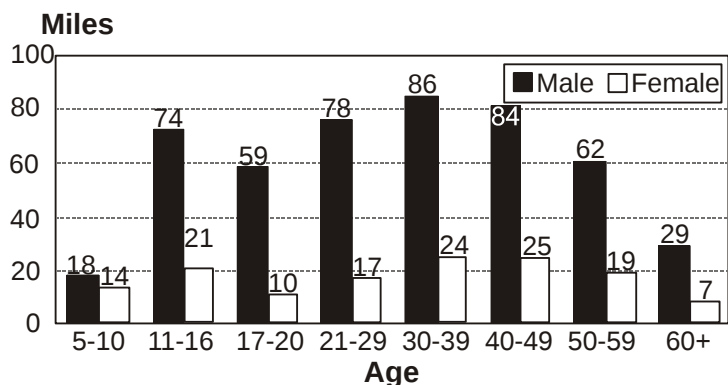


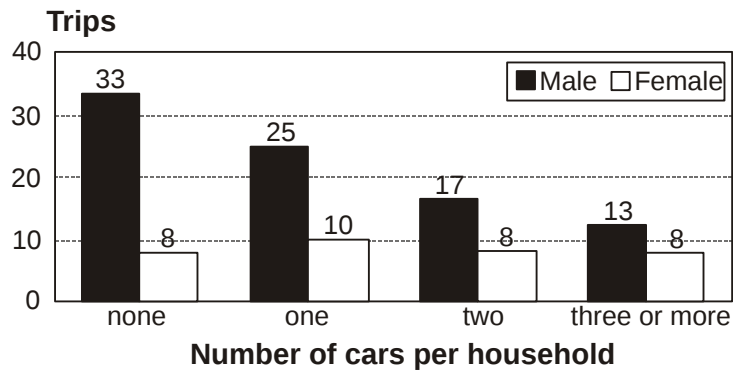
Chart 2: Distance travelled by bicycle per person per year, by sex and age:



Section 3: Cycling, income and car-ownership

People living in households with lower levels of income make, on average, fewer bicycle trips and travel shorter distances by bicycle than those in higher income households. Those in the highest income quintile (top 20%) cycle 49 miles per person per year compared with 29 miles among people in the lowest income quintile. The poorest fifth, despite being the least likely to own a car, are also the least likely to cycle.

Chart 3: Cycle trips, by car ownership



[Source: Department for Transport.]

- 32** Which of the following is the best estimate of the average number of trips by all modes of travel made per person per week?
- A** 10
 - B** 13
 - C** 20
 - D** 25
 - E** 27
- 33** Which one of the following can safely be inferred from Section 1 of the fact sheet?
- A** 85% of the population cycle less than 1 mile a week.
 - B** Less than one trip per month is made by bicycle for every UK resident.
 - C** More miles are walked than cycled in the UK.
 - D** 8% of the population cycle between 1 and 11 times a year.

- 34** Referring to Section 3 "Those in the highest income quintile (top 20 %) cycle 49 miles per person per year compared with 29 miles among people in the lowest quintile."

The relationship shown in Chart 3 between car ownership and cycling seems to contradict the data on cycling and income.

Which of the following, if true, would adequately explain this seeming contradiction?

- A** Among males, trip rates by bicycle decrease as car ownership increases.
- B** Among females there is no correlation between car ownership and cycling.
- C** A significant number of people with average or above average incomes do not own cars.
- D** The main reason for cycling among all income groups is leisure rather than work.

- 35** Which of the following statements is supported by the data in charts 1 and 2?

- 1** Males between 21 and 29 cycle more than twice as far per trip as males between 11 and 16
 - 2** Males between 11 and 16 cycle more often than males between 17 and 20 but average fewer miles per trip
- A** 1 but not 2
 - B** 2 but not 1
 - C** Both 1 and 2
 - D** Neither 1 nor 2
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