PROVE UFFICIALI DEGLI ANNI PASSATI

IMAT

2014

A B C D E

FAC-SIMILE DA SVOLGERE

Risposte in ordine casuale e foglio delle risposte

WHAT'S IN THIS DOCUMENT

Prova di ammissione IMAT 2014, pubblicata dal Ministero dell'Università e della Ricerca (accessoprogrammato.mur.gov.it). Versioni, soluzioni e commenti di TestBuddy, che non è collegata al Ministero.

- The questions laid out by TestBuddy, with the answers in random order
- The answer sheet
- The answer key

General Knowledge and Logical Reasoning	26 questions
Biology	13 questions
Chemistry	8 questions
Physics and Mathematics	8 questions
Total	**55 questions**

This version has **55 of the 60 questions** of the paper, the ones with our explained solution; the full paper is in the «official paper» file.

HOW TO USE IT

1 · TIMED

Give yourself about a minute and a half per question, no notes, as in the exam.

2 · CHECK

Mark the wrong answers and read why each one is wrong, not only the right one.

3 · REVIEW

Go back to the topics where you made most mistakes and redo the questions in the app.

GENERAL KNOWLEDGE AND LOGICAL REASONING

1 **Research reveals that, in a given period of the 20th century, top footballers (defined as those who had played for their country's team) lived, on average, almost 5 years longer than middle ranking footballers. We can conclude therefore that for the top footballers, success had a beneficial effect on their lifespan.**

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

A It assumes that the longer lifespan could not be explained by other factors.
B The study was limited to footballers in a given period of time.
C Living longer is not necessarily a good thing.
D Playing football regularly may have health benefits which contribute to longer lifespan.
E Life expectancy increased generally in the 20th century.

2 **One of the foolish but persisting fantasies of the Olympic movement is that the Games are, or were, or will be, or even ought to be, completely free of politics. It is difficult to understand how this foolish belief continues, but the facts are these: the nations lining up to host the games are motivated not by unattainable ideals but by a legitimate desire to promote the excellence of their citizens; and the nations who have boycotted the games in the past have done so to make genuine political points.**

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

A Just because the Olympic games have been politicised, it doesn't mean that they should be.
B National interests are ruining the Olympics.
C If some countries use the Olympic movement to further their own ends, they are guilty only of exposing a myth.
D We should do everything possible to ensure that the Olympics do not become further politicised.
E Although everyone knows the Olympics are caught up in politics, no one is brave enough to admit it.

3 **There is concern at the moment about the way in which football referees are treated by players during games. The Football Association and the Referees' Association feel that there is too much verbal (and physical) abuse directed at referees. Various solutions have been suggested such as only allowing the captain of each team to approach and talk to the referee. The major difficulty is how such new rules should be introduced. The preferred suggestion seems to be that the rules should be changed first in the amateur game, the aim being to improve discipline in the game from the bottom upwards, until the whole game is improved.**

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

- A Not many professional players start out in the amateur leagues.
- B Amateur players are more likely to abuse referees than are professionals.
- C Referees in the amateur game are less proficient than those in the professional games.
- D Referees should use their existing powers to control abusive players.
- E By introducing it first to amateur players, it reaches those who spend the least time playing football.

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4 **The purpose of an election is to decide what policies are supported by the people. However, in elections the concept of 'tactical voting' is becoming increasingly common.**

The argument is a simple one: Party X will never be beaten by party Y but party Z could win with a few extra votes. Therefore, you should transfer your vote from party Y to party Z to make sure that party X is beaten.

This reasoning is perfectly sound if your main objective is to vote a party out. Unfortunately, if you support party Y then there is no guarantee that party Z will support the same principles.

Which one of the following is the conclusion that could best be drawn from the above passage?

- A Tactical voting will not achieve the purpose of an election.
- B Party X policies are not popular.
- C Tactical voting is an important part of the electoral process.
- D Elections are often thought of in terms of voting for or against the party in office, rather than as voting for your preferred party.
- E It is important that party X does not win the election.

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5 **Despite much opposition to the idea, modern musical trends such as hip hop have a place in the world of opera. Traditional opera is a powerful musical experience. However, modern musicians should not necessarily stick with the traditional form. Modern musical forms which fuse staged drama, singing and contemporary or ethnic trends in music are also powerful musical experiences. Glydebourne's youth operas 'Misper' and 'Zoe', and its Mozart hiphopera, 'School 4 Lovers', enjoyed critical and box office success and attracted hip hop audiences. Moving away from the snobbery of tradition gives a much wider audience access to transformative musical experience.**

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

- A Musicians are entitled to fuse new forms and old to create exciting musical experiences.
- B Creating new operatic performances allows more people to access this exciting art form.
- C Contemporary music has a place in the musical world in addition to traditional operatic performances.
- D Contemporary music forms have a place in performances of opera.
- E Hip hop is as powerful and dramatic as opera.

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6 **Over 30 years ago, the smallpox virus was eradicated (removed) from the natural environment, but examples of it are still preserved in two laboratories. It is planned, however, to destroy these remaining viruses. Given that this will be the first example of a deliberate destruction of an entire species, we should think again before destroying these viruses. Years ago we thought we had the right to kill as many creatures as we liked, but now we realise we have no such right. Furthermore, we cannot know the future; we cannot justify destroying something that could be of enormous value to us one day, valuable in ways we cannot even think of now. And anyway, what possible harm can captive viruses do to us?**

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

- A We do not have the right to destroy the smallpox virus.
- B Captive smallpox viruses are not going to harm us.
- C The planned destruction of the smallpox virus should be given more thought.
- D We cannot justify destroying something which may one day be valuable to us.
- E The deliberate destruction of an entire species should never be allowed.

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7 **When driving, if the car in front of you brakes suddenly, you need to be able to stop without crashing into it. The easiest rule of thumb is the two second rule. You choose a reference point that the vehicle in front of you is passing then say aloud: 'Only a fool breaks the two second rule'. If you reach the reference point before you have finished the saying you need to pull back. This works at all speeds. However, when there are adverse road conditions or the road is narrow you need to double your braking distance. These practices will enable you to avoid such crashes.**

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

A Most crashes are caused by cars running into the car in front.
B It will not take less than two seconds to repeat the saying.
C Those who do not use the rule do not value road safety.
D Adopting the 'two second rule' will avoid all accidents.
E Some drivers brake more suddenly than others.

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8 **If for a number of hours each day you're having experiences on the computer where there are no consequences, that may have an implication for antisocial behaviour. In real life you can't undo something; you can't bring someone back to life once you've stabbed them. On a computer you can play the game again. It may be that for people who spend most of their time playing computer games involving killing others, real bleeding to death has no meaning. Studies of brain activity show that there is less pre frontal cortex activity in the brains of screen obsessed teenagers than in the brains of those who spend little time on computer games. The pre frontal cortex area of the brain is where we process ideas of sequence, consequences and empathy.**

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

A People who spend a lot of time playing computer games are the main culprits in knife crime.
B Young people cannot distinguish the difference between fantasy and reality.
C Brain structure is altered by environmental factors.
D There may be a link between use of computer games and violence.
E Computer games should not be available for children under 18 years of age.

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9 **We constantly split our attention between the people we are with and what's happening on our mobile phone screens. On screen multi tasking makes us less efficient as well as less emotionally engaged with others. It takes 64 seconds to recover our train of thought after interruption by a message (that's 8.5 hours a week wasted if we check our screens every five minutes) and when we've sent an email or SMS text message, the brain goes through a series of semi conscious calculations as we wonder when and how the recipient will reply. The result is that we're not 'present' for several minutes afterwards. In order to function effectively in the workplace, we need to switch off our communication hardware.**

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

- A It may only be the younger workers who use mobile phone technology to excess.
- B In many work environments you may not be allowed to use personal mobile phones.
- C Without the means to send and receive information instantly, our effectiveness may be compromised.
- D We may need to have some 'down time' in order to recharge our mental batteries.
- E People may be unwilling to make less use of their mobile phones.

10 **If the media give publicity to certain types of crime, it may encourage criminals to carry out 'copy cat' offences. If, however, they were forbidden to divulge details of crimes, this would amount to censorship. The freedom of speech of the media is too important to sacrifice, so the media should be free to report crime even if this means some crimes are committed which would not otherwise be committed.**

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

- A Publicity about crimes can encourage others to commit similar offences.
- B Freedom of speech is a right that is too important to give up.
- C The media should not report all the details of a crime.
- D Censorship of the media would reduce the crime rate.
- E The media should be permitted to report crimes even if other crimes sometimes result from this reporting.

11 **Smoking cigarettes causes a speeding up in the rate of blood flow, which in turn increases the risk of heart disease. It was thought that this speeding up of blood flow was caused solely by the gas carbon monoxide, which is absorbed during smoking, and not by nicotine, which is also absorbed from the smoke in the lungs. However, tests have shown that using nicotine patches (from which nicotine is absorbed through the skin) or chewing nicotine gum also causes the rate of blood flow to increase. This shows that the nicotine in cigarettes is also responsible for the increased risk of heart disease among smokers.**

Which one of the following is not an assumption of the argument in the passage above?

A The effect of nicotine on the body does not depend on the way in which it was absorbed.
B Carbon monoxide is not absorbed from nicotine patches and nicotine chewing gum.
C Carbon monoxide would not produce a rise in the rate of blood flow in the absence of nicotine.
D There is nothing else in nicotine patches and chewing gum which might cause an increase in the rate of blood flow.
E Any differences between the amount of nicotine absorbed from smoking and the amount absorbed from nicotine patches and chewing gum can be disregarded.

12 **In many countries shocking images of the damage smoking can do to the body are displayed on cigarette packets. Images of rotting teeth, mouth tumours and cancerous lungs are among the grim pictures. A review concluded that shocking pictures of the damage smoking can do are a cost effective way to help smokers to quit and discourage others from starting. All countries should introduce these kinds of images to discourage smoking.**

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

A Smokers are likely to die younger than non smokers.
B Governments receive a significant amount of revenue from taxes on tobacco products.
C The USA is planning to display shocking images on cigarette packets.
D In countries using the images there are high taxes on tobacco and a ban on advertising.
E Pictures that arouse emotions are especially effective.

13 **There is a special offer on jars of coffee this week. Customers who buy two jars at the normal price have the option to buy up to four more jars at one quarter of the normal price.**

For customers buying coffee this week, which of these bar graphs shows how the average cost per jar (as a percentage of the normal cost) varies with the number of jars bought?

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B <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Faucashcjzxhucqsuh1.png?alt=media&token=d61c4641-f6f3-43d8-9140-a005b60781b5<i>

C <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fe1x8saxmzmmzz.png?alt=media&token=dbd685e9-6f54-42a6-97cf-bfd81dc827ed<i>

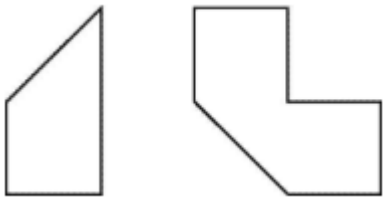
D <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fcvcmvcnm1dmskadmsdk.png?alt=media&token=b45d141e-484d-47a0-8282-f149f43bf717<i>

E <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fsad8s8a8c8c8c.png?alt=media&token=76e4b317-e3ba-4f3f-8f83-032bb291deeb<i>

14 **During a recent storm the plastic company logo fell off the outside of the office building of Fleesam Ltd. and broke cleanly into the two pieces shown below:**

A junior clerk took the two pieces to a signmaker to show what had happened, and asked him to make a new logo. Unfortunately after the clerk had left, the signmaker realised that he didn't know how the two pieces had fitted together originally.

Which one of the following could not be Fleesam's logo?



A <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fdfe288feu8f8vevu.png?alt=media&token=cd4c4619-0bfe-4f76-b258-e18f6e9c4fa0<i>

B <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fx2e1s9a9sqc.png?alt=media&token=56f672ac-51f3-42f4-a573-4b093d845226<i>

C <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fx12eusudususdfc.png?alt=media&token=164c8429-1949-47b5-a060-91d10fe815e5<i>

D <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fx12ekaskskss.png?alt=media&token=97925e9d-63f5-4463-a142-8f01ea1c7bb5<i>

E <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fd12d8s88dsdc8.png?alt=media&token=89dfe418-fb92-47c5-8d43-dd44e8b16989<i>

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15 **A golf tournament is played over 10 rounds, on successive Saturdays. The winner of each round scores 3 points and the player finishing second scores 1 point. The tournament is won by the competitor with the most points over the 10 rounds. Alan Vinci, Barry Durand, Carl Johansson and Daniel and Eric Lim were the participants in this year's tournament. All five won at least one round, but either Barry, Daniel or Eric finished second on each occasion. The 1 2 finishing order was different every round, and the Lim brothers didn't both score points in the same round at any time.**

Who won this year's tournament?

A Alan Vinci

B Daniel Lim

C Barry Durand

D Eric Lim

E Carl Johansson

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16 **The owner of a hotel needs to decorate 20 rooms. He has found prices for four different types of interior wood paint and calculated the volume of paint he needs for each room. He will use the same type of paint for all the rooms.**

What is the least amount he needs to spend on paint?

Type of paint	*375 ml*	*750 ml*	*1.25 l*	*2.5 l*	*Volume needed per room*
Non Drip Gloss	€4.50	€8.00	€10.00	€16.00	1.4 litres
Satinwood	€5.00	€8.00	€11.00	€20.00	1.1 litres
Quick Dry Gloss	N/A	€10.00	N/A	€20.00	1.0 litres
Once Gloss	€4.50	€8.00	€12.00	€18.00	0.8 litres

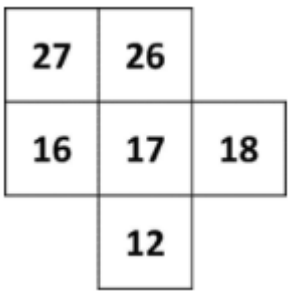
A 108
B 112
C 116
D 120
E 126

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17 **The diagram below shows the layout of a game playing board with the square board numbered as indicated. The numbers on the board start with 1 on the bottom left and finish with 25 at the top right. A larger, square playing board is numbered in a similar way and divided into pieces which fit together to make the whole board.**

21	22	23	24	25
20	19	18	17	16
11	12	13	14	15
10	9	8	7	6
1	2	3	4	5

One piece of this larger board is shown below: How many squares are there on this larger board?



A 81
B 64
C 25
D 121
E 49

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18 **Sally owns a small business which produces hand crafted jewellery. The materials used to create a necklace cost €1.50 on average. She pays her staff €5.40 an hour. For a standard piece of jewellery she charges 70% more than it costs to produce.**

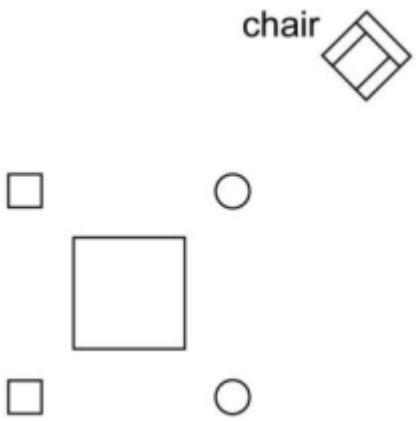
To make a particular Italian style glass necklace it takes 30 minutes. How much does she sell this single necklace for?

A €7.14
B €5.40
C €11.73
D €2.94
E €11.34

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19 **The diagram below is a plan of the raised flower beds and a chair in my garden.**

Which one of the following can not be a view of the raised beds from my chair?



A <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2F1xu2euxueus.png?alt=media&token=f0326ed4-9eed-4d33-ad2a-aa9e17d7daae<i>
B <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fsaicsucu11ucu.png?alt=media&token=0313a445-80ef-4d9e-a4a2-7d40a84bd89c<i>
C <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fx1e221uu21e1uedcc.png?alt=media&token=0fb2bc3c-8104-4d2f-8a1f-f64640855f9a<i>
D <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fasdasisikmm.png?alt=media&token=48730b40-a950-441f-ba26-26b534cb685f<i>
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20 **Last month Karl walked from Starton to Endham, raising money for charity. His target, successfully achieved, was to complete the walk in ten days. He started later than intended and had only completed 12 km by the end of the first day. However, he walked 45 km on each of the second, third and fourth days, and after the fifth day he was exactly half way. Poor weather on the sixth day restricted his progress, but 41 km on both the seventh and eighth days meant that he had completed exactly three quarters of the walk with two days left. On the ninth day he covered three fifths of the remaining distance, completing the last 36 km on the tenth day.**

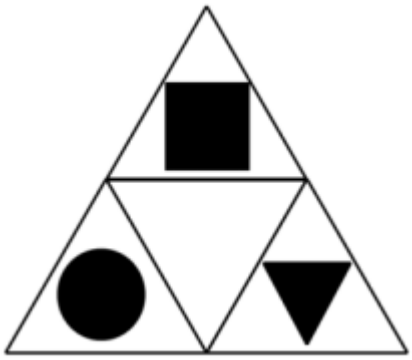
How far did Karl walk from Starton to Endham?

A 384 km
B 294 km
C 240 km
D 328 km
E 360 km

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21 **The net shown can be folded to make a tetrahedron with each of the shapes showing on the outside.**

Which one of the following nets can be folded to make a tetrahedron identical to the one shown above?



A <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fx28e218x8e2121thhh.png?alt=media&token=4ad23d9f-cc10-41a2-b119-463b63d0e7a5<i>

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22 **Tessa makes bracelets. She works five days each week, from Monday to Friday. Her contract requires her to make a minimum of 150 bracelets every working day, for which she is paid a basic wage of $320 per week. She can also earn a bonus of $3 per bracelet for everyone above 175 that she makes on any particular day.**

Last week, Tessa earned $515 in total. On Friday she made 205 bracelets, the most she has ever made in one day.

What is the minimum number of bracelets that Tessa made last week?

- A 940
- B 805
- C 865
- D 815
- E 890

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23 **15 runners took part in this year's Marathon of Marathons (eight marathon races on consecutive days). Points were awarded to the first seven to finish in each race, as follows:**

Winner 11 points
Second 8 points
Third 6 points
Fourth 4 points
Fifth 3 points
Sixth 2 points
Seventh 1 point

All 15 runners finished in the first three at least once, but only Philip, who was the overall winner with a total of 61 points, finished in the first three every time.

How many of the eight races did Philip win?

- A 5
- B 4
- C 2
- D 3
- E 1

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24 **William Harvey, who wrote the book commonly referred to as 'De Motu Cordis' is famous for his description:**

- A of how anaemia can be caused by a lack of iron
- B of the different forms of blood cells and platelets
- C of the circulation of the blood
- D of how blood plasma carries heat and urea as well as carbon dioxide
- E of the interaction between antigens and antibodies

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25 **Which popular website was founded in 2004 by Mark Zuckerberg?**

A Twitter
B Wikipedia
C YouTube
D eBay
E Facebook

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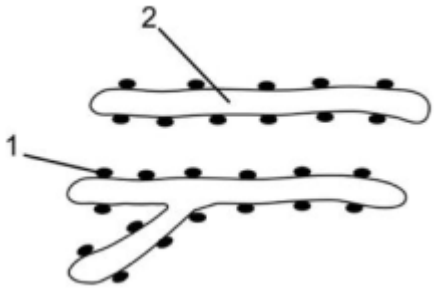
26 **The artists Claude Monet and Pierre Auguste Renoir were associated with which art movement?**

A Abstract expressionism
B Pointillism
C Cubism
D Impressionism
E Fauvism

BIOLOGY

28 **The diagram shows a section of rough endoplasmic reticulum (RER).**

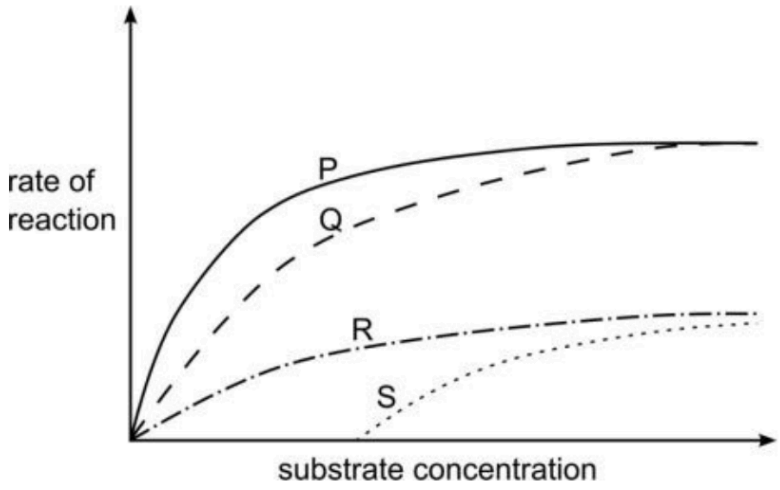
Which answer correctly identifies the substances associated with structures 1 and 2?



A 1: amino acids; 2: tRNA
B 1: phospholipids; 2: mRNA
C 1: tRNA; 2: polypeptide
D 1: DNA; 2: carbohydrate
E 1: proteins; 2: DNA

30 **Which curves show the results of calculating the initial rate of reaction of an enzyme:**

when the substrate concentration is varied, under optimal conditions and without an inhibitor;
when the substrate concentration is varied, under optimal conditions and fixed, low concentration of a competitive inhibitor?



A (1) curve R; (2) curve P
B (1) curve R; (2) curve S
C ((1) curve P; (2) curve Q
D 1) curve P; (2) curve S
E (1) curve Q; (2) curve R

31 **In cells of winter wheat (Triticum aestivum), the fluidity of the cell membrane can be varied by the plant, depending upon the environmental temperature.**

As the weather becomes colder, the cell membrane changes to maintain its fluidity.

Which type of bond would be more common in cell membranes of winter wheat plant cells as their growing conditions become colder?

A C-C
B C-N
C C-O
D C-H
E C=C

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32 **The transmission of nerve impulses at a synapse is unidirectional.**

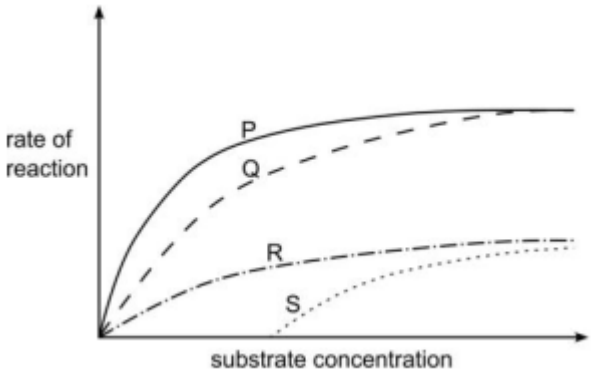
Which of the features of the transmission of nerve impulses given below have a role in maintaining the unidirectional transmission?

1. Exocytosis of neurotransmitter at the presynaptic membrane
2. Neurotransmitter hydrolysing enzyme found on the post synaptic membrane
3. Neurotransmitter receptors found on the post synaptic membrane
4. Sodium gated channels on the post synaptic membrane

A 2 and 4 only
B 1, 2 and 4 only
C 1, 3 and 4 only
D 1 and 4 only
E 1, 2 and 3 only

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33 **Which one of the following names the structure, in humans, that directly detects a change in blood glucose level and then the structure that responds to the change?**



- **A** Liver and adrenal gland
- **B** Pancreas and pancreas
- **C** Pituitary gland and liver
- **D** Hypothalamus and pituitary gland
- **E** Adrenal gland and pancreas

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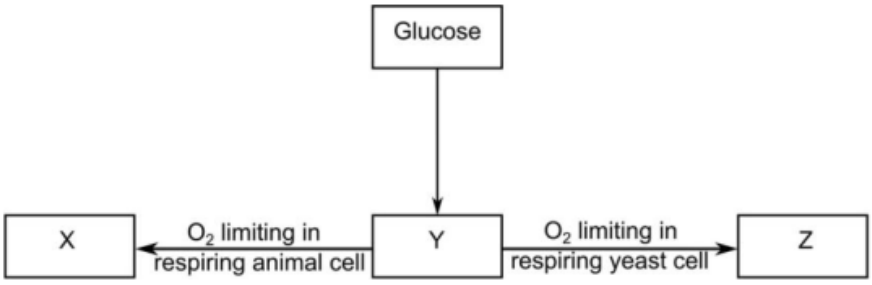
34 **One set of semi lunar valves in the human heart closes when:**

- **A** the blood pressure is greater in the left ventricle than in the aorta
- **B** the oxygen level in blood decreases at the respiring tissues
- **C** the blood pressure in the aorta is greater than in the vena cava
- **D** another set of semi lunar valves opens
- **E** the blood pressure in the right ventricle is less than in the pulmonary artery

---

35 **The diagram shows the respiration process in the cytoplasm of a yeast cell or an animal cell when O_2 is limiting:**

Which option correctly identifies substances X, Y and Z?



- **A** X = lactate; Y = pyruvate; Z = ethanol
- **B** X = pyruvate; Y = ethanol; Z = lactate
- **C** X = pyruvate; Y = lactate; Z = ethanol
- **D** X = lactate; Y = ethanol; Z = pyruvate
- **E** X = ethanol; Y = pyruvate; Z = lactate

---

37 **Which of the following molecules are associated with the Human Immunodeficiency Virus (HIV)?**

1. DNA
2. RNA
3. Phospholipids
4. Reverse transcriptase

A 2, 3 and 4 only
B 1, 2, 3 and 4
C 1 and 2 only
D 2 and 3 only
E 1, 2 and 4 only

---

38 **A circular bacterial plasmid consists of 1000 base pairs (bp).**
A specific restriction enzyme has three recognition sites within this plasmid. The sites are at 150 bp, 250 bp and 950 bp.

After complete restriction, what size are the fragments?

A 100 bp, 150 bp, 200 bp only
B 50 bp, 100 bp, 150 bp, 200 bp and 700 bp
C 100 bp, 200 bp and 700 bp only
D 50 bp, 100 bp and 700 bp only
E 50 bp, 100 bp, 150 bp and 700 bp only

---

39 **Which of the following can produce vesicles?**
1. RER
2. Golgi
3. Cell surface membrane

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

---

40 **Two disease free cells, P and Q, were studied. Which option correctly identifies cell P as a typical plant cell and cell Q as a typical prokaryote?**

	Cell P	*Cell Q*
Row 1	Gene for RuBisCo is present	Susceptible to penicillin
Row 2	Plasmids present	Centrioles found as a pair
Row 3	Outermost layer is selectively permeable	SER present
Row 4	Glycogen can be present	Cell wall is present
Row 5	Organelle with grana present	Nucleolus may be present

- A Row 3
- B Row 4
- C Row 1
- D Row 2
- E Row 5

---

41 **The diagram shows a sequence of bases on a DNA template:**
CAC GTT CGC ATA GAC

Which one of the following shows the sequence of bases on the complementary mRNA strand with one substitution mutation?

- A CUC GTT CGC UTT GUC
- B GTG CAA GGG TAT CTG
- C GTG CAA GCG TAT CTG
- D GUG CAA CCG UAU CUG
- E GUG CAA GCG UAU GUC

---

42 **Which one of the following statements about both asexual and sexual reproduction is correct?**

- A Mitosis leads to sperm formation in asexual reproduction and sexual reproduction
- B Only the gametes (and not body cells) undergo meiosis in sexual reproduction compared with
- C Variation is only required for sexual reproduction and not for asexual reproduction
- D Some organisms can carry out both asexual and sexual reproduction
- E Mutations only occur in sexual reproduction and not in asexual reproduction

---

CHEMISTRY

43 **A battery has lead plates dipped in sulfuric acid.**
When charged, the positive plate is covered with PbO_{2-}.
After discharge both plates are covered with $PbSO_{4-}$

Which option below correctly describes the overall change in the oxidation number of the lead involved in the chemical reaction during discharge?

- A Positive plate: 4 → 2; Negative plate: 0 → 2
- B Positive plate: 4 → 0; Negative plate: 0 → 2
- C Positive plate: 4 → 1; Negative plate: 1 → 0
- D Positive plate: 4 → 1; Negative plate: 0 → 1
- E Positive plate: 4 → 2; Negative plate: 2 → 0

45 **How many of the following compounds are acidic, alkaline or amphoteric (react with both acids and alkalis)?**

Al_2O_3	Cl_2O_7	CO_2	HCl	H_3PO_4	K_2O	KOH
MgO	Na_2O	NO_2	P_4O_{10}	SiO_2	SO_2	

- A Acidic = 6; Amphoteric = 1; Alkaline = 6
- B Acidic = 8; Amphoteric = 1; Alkaline = 4
- C Acidic = 7; Amphoteric = 1; Alkaline = 5
- D Acidic = 10; Amphoteric = 2; Alkaline = 4
- E Acidic = 9; Amphoteric = 2; Alkaline = 2

46 **The following are some compounds that can be made from ethene:**

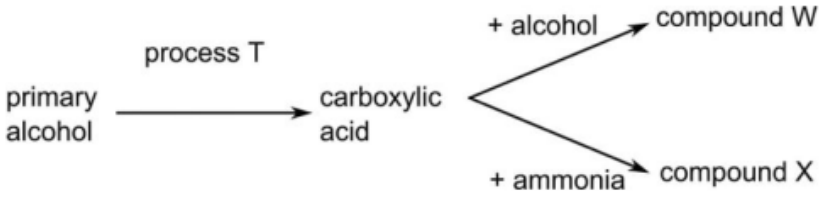
$$C_2H_4 : C_2H_6, C_2H_5Br, C_2H_5OH, CH_2BrCHCHr_2, -(CH_2CH_2)_n-$$

Which one of the compounds is made by oxidising ethene?

- A CH_2BrCH_2Br
- B C_2H_5Br
- C C_2H_5OH
- D $-(CH_2CH_2)_n-$
- E C_2H_6

47 **The reaction scheme below shows some reaction conversions of organic molecules.**

Which is the correct combination of process and compounds for this scheme?



- **A** process T: reduction; compound W: ketone; compound X: amide
- **B** process T: reduction; compound W: ketone; compound X: nitrile
- **C** process T: oxidation; compound W: ester; compound X: amide
- **D** process T: reduction; compound W: ester; compound X: amide
- **E** process T: oxidation; compound W: ester; compound X: nitrile

---

48 **The atomic numbers of five atoms are given below.**

Which atom would have an electronic configuration ending in a p^5?

- **A** 5
- **B** 9
- **C** 7
- **D** 8
- **E** 6

---

49 **The relative molecular mass of calcium carbonate is 100.**

What is the minimum volume of 2.0 M hydrochloric acid that would be needed to completely react with 2.0 g of calcium carbonate?

- **A** 10 cm^3
- **B** 40 cm^3
- **C** 30 cm^3
- **D** 20 cm^3
- **E** 5 cm^3

---

50 **What is the pH of 0.1 M HCl?**

$$\mathrm{pH} = -\log_{10}[\mathrm{H}^+]$$

A -0
B -1
C 1
D 0.1
E -0.1

---

51 **A student carried out an experiment to find the rate of decomposition of hydrogen peroxide into water and oxygen gas.**
The student used 100 cm^3 of a 1M solution of hydrogen peroxide at 25°C and 1 atm pressure.

1 g of powdered MnO_2 as a catalyst was added and the solution was constantly stirred.
The student 2 measured the total volume of oxygen produced.

The procedure was repeated, but this time using 100 cm^3 of 2M hydrogen peroxide, under identical conditions.

Which option below shows the effect on (R) the rate of reaction, (V) the total volume of oxygen collected, by using the 2M solution compared to the 1M solution?

A R: No effect; V: No effect
B R: No effect; V: Doubled
C R: Doubled; V: Halved
D R: Doubled; V: No effect
E R: Doubled; V: Doubled

PHYSICS AND MATHEMATICS

53 **Evaluate:**

$\frac{8\times10^{-5}}{\sqrt{1.6\times10^{7}}} \times \left(1.2 \times 10^{3}\right)^{2}$

A 2.88×10^{-5}

B 2.88×10^{-3}

C 2.88×10^{4}

D 2.88×10^{-2}

E 2.88×10^{-1}

54 **Four individual spheres have radii:**

$\frac{r}{2}, r, 2r$ and $3r$

What is the sum of their surface areas?

A $58\,\pi r^2$

B $26\,\pi r^2$

C $57\,\pi r^2$

D $169\,\pi r^2$

E $25\,\pi r^2$

55 **What is the equation of the straight line which passes through (–6, 2) and is perpendicular to 4y + 3x = 8?**

A 3y – 4x = 18

B 4y – 3x = 26

C 3y + 4x = 30

D 3y – 4x = 30

E 3y + 4x = –18

56 **A computer game is on sale for €32.00.**
The price ticket shows that this cost is a reduction of 20% of the original price.
What was the original price?

A €33.60

B €52.00

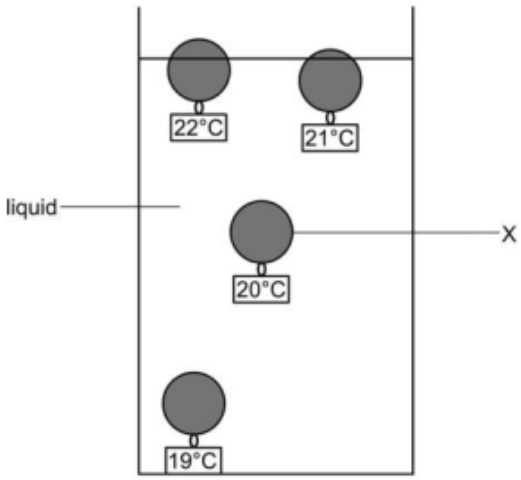
C €38.40

D €40.00

E €25.60

57 **An ornamental thermometer, commonly known as a Galileo thermometer, contains a number of spheres of hollow coloured glass, representing different temperatures, immersed in a column of ethanol. A particular sphere (X) rises from the bottom to the top of the column of liquid when the temperature falls below the value it represents.**

Which statement best explains why the sphere rises when the temperature falls?

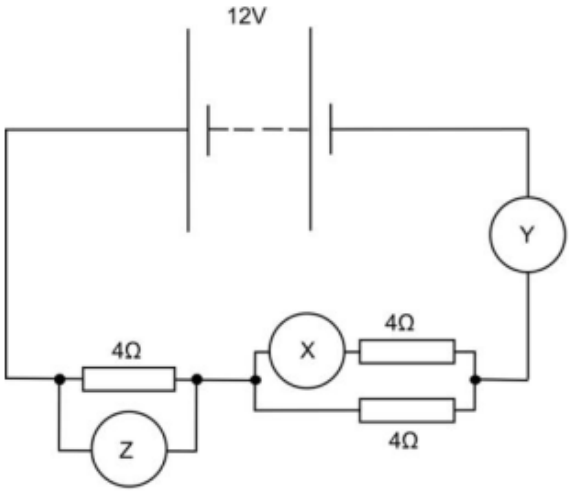


A The mass of the sphere has decreased
B The density of the liquid has increased
C The temperature of the sphere is different from that of the liquid
D The pressure exerted by the liquid has decreased
E The volume of gas inside the sphere has increased

58 **The circuit shown contains three identical resistors, two ammeters X and Y, and a voltmeter Z. The internal resistance of the battery is negligible.**

Which option shows the readings on the three meters?

[Assume the ammeters have negligible resistance, and negligible current flows through the voltmeter.]



A X = 1.0 A; Y = 0.0 A; Z = 12 V
B X = 3.0 A; Y = 6.0 A; Z = 12 V
C X = 1.0 A; Y = 2.0 A; Z = 8.0 V
D X = 1.0 A; Y = 2.0 A; Z = 6.0 V
E X = 2.0 A; Y = 0.0 A; Z = 4.0 V

---

59 **A book of mass 0.40 kg rests on a horizontal surface with which it has a coefficient of dynamic friction of 0.50.**

If this book is now pushed by an external horizontal force of 10 N, what will be its acceleration immediately after it has started to move?

[Assume the gravitational field strength is $10\mathrm{Nkg}^{-1}$, that air resistance is negligible and that the orientation of the book does not change.]

A $12.5\ \mathrm{ms}^{-2}$
B $50.0\ \mathrm{ms}^{-2}$
C $20.0\ \mathrm{ms}^{-2}$
D $25.0\ \mathrm{ms}^{-2}$
E $15.0\ \mathrm{ms}^{-2}$

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60 **An earthed magnet is near a bar of material which is seen to be repelled by the magnet.**

What could the bar of material be?

[The system is isolated and no currents are induced.]

- (A) A bar of magnetised steel
- (B) A bar of electrostatically charged aluminium
- (C) A bar of electrostatically charged copper
- (D) A bar of unmagnetised cobalt
- (E) A bar of unmagnetised soft iron

ANSWER SHEET

Fill in one box per question, as in the exam. The key is on the next page.

1	A B C D E	20	A B C D E	42	A B C D E
2	A B C D E	21	A B C D E	43	A B C D E
3	A B C D E	22	A B C D E	45	A B C D E
4	A B C D E	23	A B C D E	46	A B C D E
5	A B C D E	24	A B C D E	47	A B C D E
6	A B C D E	25	A B C D E	48	A B C D E
7	A B C D E	26	A B C D E	49	A B C D E
8	A B C D E	28	A B C D E	50	A B C D E
9	A B C D E	30	A B C D E	51	A B C D E
10	A B C D E	31	A B C D E	53	A B C D E
11	A B C D E	32	A B C D E	54	A B C D E
12	A B C D E	33	A B C D E	55	A B C D E
13	A B C D E	34	A B C D E	56	A B C D E
14	A B C D E	35	A B C D E	57	A B C D E
15	A B C D E	37	A B C D E	58	A B C D E
16	A B C D E	38	A B C D E	59	A B C D E
17	A B C D E	39	A B C D E	60	A B C D E
18	A B C D E	40	A B C D E		
19	A B C D E	41	A B C D E		

ANSWER KEY

Valid for this TestBuddy version: the answers are in a different order from the official paper.

1	A	20	E	42	D
2	C	21	C	43	A
3	A	22	E	45	B
4	A	23	E	46	A
5	D	24	C	47	C
6	C	25	E	48	B
7	B	26	D	49	D
8	D	28	C	50	C
9	C	30	C	51	E
10	E	31	E	53	D
11	C	32	C	54	C
12	D	33	B	55	D
13	E	34	E	56	D
14	D	35	A	57	B
15	C	37	A	58	C
16	D	38	C	59	C
17	E	39	C	60	A
18	A	40	C		
19	E	41	D		

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