PROVE UFFICIALI DEGLI ANNI PASSATI

IMAT 2011

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 2011, 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	35 questions
Biology	15 questions
Chemistry	10 questions
Physics and Mathematics	10 questions
Total	**70 questions**

This version has **70 of the 80 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 **Which of the following states is NOT a permanent member of the UNSecurity Council?**

A USA
B France
C United Kingdom
D Japan
E China

2 **Which ancient Greek is referred to as the father of Western medicine?**

A Aristotle
B Hippocrates
C Plato
D Aristophanes
E Socrates

3 **Amnesty International (AI), a non-governmental organisation for the protection of human rights enshrined in the Universal Declaration of Human Rights, opposes the death penalty.**

Which one of the following reasons for opposing the death penalty is inconsistent with the principles of AI.

A The death penalty can be carried out on an innocent person
B The death penalty is not a deterrent against crime
C The death penalty is cruel, inhuman and degrading
D The death penalty, once carried out, cannot be reversed
E The death penalty is contrary to theological principles

4 **Three red balls, three yellow balls and one green ball are placed in a bag and the bag is shaken. I place my hand in the bag and pull out a red ball followed by a green ball. I do not replace either ball.**

Which one of the following statements is true?

A At least one of the next three balls must be red
B The next ball will definitely be yellow
C At least one of the next three balls must be yellow
D The next two balls cannot both be red
E The next ball could be any one of red, yellow or green

5 **My friend has three children, Alice, George and Hannah and I need to buy two presents for them to share. I want to buy two different toys and I want to make sure that Alice, George and Hannah will each like at least one of them. I don't want the toys to have small parts.**

How much am I going to pay in total?

Toy	*Small Parts?*	*Liked by Alice?*	*Liked by George?*	*Liked by Hannah?*	*Price*
Jigsaw	Yes	No	Yes	Yes	€12
Building bricks	Yes	Yes	Yes	No	€9
Car	No	No	No	Yes	€12
Bear	No	Yes	No	Yes	€7
Train	No	No	Yes	No	€8

A 16
B 20
C 19
D 24
E 15

7 **The polis is the most important institutional expression of the classical Greek way of life.**

What type of state is it?

A A monarchical state
B A tyrannical state
C A city state
D A federal state
E A modern state

8 **Which set of statements about Dante Alighieri is correct?**

A he was from Florence, wrote poetry, died before 1400
B he was from Tuscany, wrote poetry, was the son of Giulia Beccaria
C he was from Milan, was the son of Giulia Beccaria, wrote poetry
D he was of noble family, was born in the fourteenth century, wrote tragedies
E he was from Milan, was born in the thirteenth century, died before 1400

9 **Which of the following is NOT true of the Enlightenment?**

A It was a cultural trend that highlighted all the social and economic inequalities, and paved the way for the French Revolution.

B It was a cultural trend that was based on the exaltation of reason that, eliminating any irrational element of knowledge, by itself, revealed the truth without the help of the transcendental realm. In France this lead to materialism and atheism.

C It was a cultural trend, according to which the only real art was rational, understandable by all, and identified itself with Greek and Roman art.

D It was a cultural trend that spread across Europe, which emphasised the sovereignty of the people, as a carrier of values.

E It was a cultural trend that spread across Europe, mainly in France, in the early 1700s.

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10 **Two security guards, Dave and Geoff, are patrolling an airbase. Dave passes the front gate every 8 minutes. Geoff passes the front gate every 15 minutes. They have just set off on their individual routes at the start of their shift.**

How long will it be before they meet up at the front gate again?

A 1h 30mins

B 2h 30mins

C 1h 00mins

D 2h 00mins

E 3h 00mins

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11 **Employees at a printing company are paid a basic rate of €11 per hour during the day Monday to Friday. During weekday evenings and on Saturdays they are paid at one and a half times the basic rate and on Sundays they are paid at double the basic rate.The table below shows the hours worked by employees last week: Which employee earned most last week?**

	Mon-Fri daytime	Mon-Fri evenings and Saturdays	Sundays
Alice	32	8	6
Ben	27	8	8
Chetan	36	8	2
Daniel	30	8	6
Ellen	35	8	4

A Daniel

B Ellen

C Chetan

D Ben

E Alice

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12 **A teacher in a school for children from 11 to 16 years old sets a code number to unlock his classroom door. He has a method for remembering his code.**

He uses:
- the 2 digits of his birth month reversed (for example, February would be 02 reversed to 20);
- then the age of the children in his class at the start of the year with the digits reversed;
- and finally, the date of his birthday in the month, also reversed.

Which one of the following could not be the code to unlock his door?

A 903121
B 701131
C 215150
D 602124
E 115191

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13 **It has long been thought that birds are much less intelligent than humans and apes. But now it seems that some species of birds have the same kind of thinking skills as apes. Crows can create and use tools and are socially sophisticated when finding and protecting food. So how can a bird with a walnut-size brain be capable of such achievements? The answer is that both crows and apes have much bigger brains than you would expect from the size of their bodies. The same pattern is found in humans, parrots and chimps - all intelligent animals.**

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

A Animals that cannot create tools are not intelligent.
B It could be argued that birds are as intelligent as apes.
C Relative brain size is a better indicator of intelligence than absolute brain size.
D Apes are not as similar to humans as had been thought.
E Crows are more intelligent than other species of birds.

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14 **There is a higher than average risk of death or injury to young drivers and their passengers. In 2007, 32 per cent of car driver deaths and 40 per cent of car passenger deaths were people aged between 17 and 24. Young male drivers were much more likely to be killed or seriously injured than young female drivers. So in order to reduce the number of road accidents and the numbers of people killed or injured, young people should not be allowed to drive until they reach the age of 24.**

Which one of the following is an assumption on which this argument depends?

A Most of the accidents involving young people were the fault of the young drivers.
B Young people would not accept the raising of the legal driving age.
C The driving test does not effectively test the skill of drivers.
D The majority of drivers aged between 17 and 24 drive dangerously.
E Amongst drivers aged between 17 and 24 there are more male drivers than female drivers.

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15 **Some disabled people find it difficult to gain access to some of our older public buildings because the entrances have steps. The problem is most often solved by installing ramps. All public buildings must be accessible to everyone therefore they must all install ramps. Which one of the following identifies the flaw in this argument?**

A It is unreasonable to suggest that disabled people should be able to access all public buildings.
B Disabled people must have access to all buildings not just public ones so all buildings should have ramps.
C Some older public buildings without ramps may be accessible to disabled people.
D Installing ramps in all public buildings would be extremely expensive.
E Inaccessible public buildings should be replaced by buildings accessible to all.

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16 **A street of houses is numbered starting on one side with 1,2,3,4. At the far end the numbers continue down the other side in the opposite direction so the largest number is opposite number 1. The houses are of identical widths so each house has another directly opposite it. If number 17 is directly opposite number 56, how many houses are there in the street?**

A 37
B 39
C 73
D 36
E 72

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17 **A courier starts the day in London and makes two round trips to Prague in the day. When she arrives at either airport, she takes the next available flight back.**

How long is the courier's day from first take-off to last landing?

London depart	Prague arrive	Prague depart	London arrive
06 : 30	09 : 30	10 : 10	11 : 20
09 : 45	12 : 45	13 : 25	14 : 35
12 : 30	15 : 30	16 : 40	17 : 50
15 : 45	18 : 45	19 : 55	21 : 05

A 11 hours 20 minutes
B 4 hours 50 minutes
C 14 hours 35 minutes
D 8 hours 20 minutes
E 8 hours 5 minutes

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18 **My three local supermarkets all currently have offers on my favourite breakfast cereal as follows:**

1. Buy one standard pack get a second half price
2. Price of a standard pack reduced by 1/3
3. Normal price of a standard pack, pack contains 25% extra

Which of the offers are equivalent in terms of price per unit amount of cereal?

- (A) 1, 2 and 3
- (B) 1 and 2 only
- (C) 2 and 3 only
- (D) 1 and 3 only
- (E) none

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20 **87% of the world population are right-handed. The human world is organised to make success in life easier for the majority. Left-handed people should therefore be considered as having a disability and receive appropriate support.**

Which one of the following, if true, weakens this argument?

- (A) Left-handed people have poorer spatial skills which makes them more likely to have car crashes and other serious accidents.
- (B) Hand tools, musical instruments and scissors are designed for use by the majority.
- (C) Amongst top scientists, sportsmen, actors, musicians and politicians the percentage of left-handed people is much higher than 13%.
- (D) Left-handed people are more likely to have health problems such as allergies, depression, epilepsy and sleeping disorders.
- (E) Many left-handed people were forced to write with their right hand when they were at school.

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21 **In North America in the 1800s, arguments were often settled by gunfights, in which two people stood face to face a distance apart and tried to shoot one another. Recent experiments on human response times have shown that people act more quickly when responding to an action than when they are the first to move. This supports the view that our brain uses different routes in our nervous system to send messages for intentional and reactive movements.**

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

- (A) Gunfighters are best advised to wait for their opponents to move to fire.
- (B) Gunfighters who wait for their opponent to move first would always win.
- (C) Humans can be trained to react more quickly.
- (D) Brains cannot control our reactive movements.
- (E) Scientific experiments produce interesting findings.

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22 **A taxi driver charges €1.00 per kilometre for the first 3 kilometres of a journey, and 70c per kilometre for the rest of the journey. I travel home from the train station by taxi. I pay the taxi driver €10.00 including a tip of 70c.**

How far is my house from the station?

A 10 kilometres
B 14 kilometres
C 9 kilometres
D 13 kilometres
E 12 kilometres

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25 **"If more workers worked for only four days each week there would be fewer commuters, and therefore less traffic congestion and less pollution. Also, fewer people would be unemployed because there would be more work to go around. There is evidence that part-time workers are absent from work less often than full-time workers, so a person working a four-day week would be more productive. Less work means less pressure, which means less stress and people would be happier."**

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

A The government should enforce a four-day working week.
B There would be less pressure on the health services if most workers were on a four-day week.
C There would be many benefits to working a four-day week.
D People choosing to work a four-day week would have to take a 20% pay cut.
E The economy would be more competitive if people worked more productively.

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26 **Migratory birds which are unable to fly long distances without resting have to use the shortest distance over water in their flights to and from Africa, and so they cross at the Straits of Gibraltar. It is essential for these birds, some of which are very rare, that the route remains open. For that reason, it is important that plans to build electricity-generating wind farms on the hills surrounding the Straits of Gibraltar do not go ahead.**

Which one of the following is an assumption on which this argument depends?

A Electricity-generating wind farms have to be built on hills.
B There are no plans to build wind farms at other places along the coast.
C The birds that migrate across the Straits of Gibraltar are close to extinction.
D Other species of bird can fly further and can thus use other routes in their migration.
E The planned wind farms will make it dangerous for migratory birds to use their route.

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27 **When mobile phones were introduced there were concerns about the microwaves produced and the effects that these could have on the brain, given that phones would be held close to the ear when being used. These concerns have been shown to be mistaken since mobile phones are used for sending text messages far more than for making phone calls. Sending a text message does not require the phone to be anywhere near to the brain so it cannot cause any problems.**

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

- A It does not consider other technology such as wireless internet which could cause similar problems.
- B It ignores evidence suggesting that text messaging is only popular in certain age groups.
- C It ignores research showing that microwaves from the phones cannot penetrate far enough to reach the brain.
- D It does not consider uses of mobile phones other than making phone calls and sending text messages.
- E It ignores the possible effects of the phone calls that are made.

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28 **I have two cousins. One was born the year before me, on June 3rd. The other was born the year after me, on April 28th.**

My birthday is May 15th.

For how many days each year am I the same age as one or other of my cousins?

- A 35
- B 36
- C 39
- D 37
- E 38

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29 **The table shows the number of people aged 20-35, 36-50 and 51-65 who participated in given sports at a leisure centre on a Sunday morning:**

In which of the other sports was the proportion of participants in the three age ranges closest to that for swimming?

Sport	$20-35$	$36-50$	$51-65$
Swimming	31	42	59
Squash	26	30	44
Aerobics	10	21	30
Tennis	40	35	32
Bowls	6	8	11
Table Tennis	28	32	46

A Aerobics
B Tennis
C Squash
D Bowls
E Table Tennis

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30 **Apples cost 30c each, bananas cost 40c each and oranges cost 50c each. Daniel spends exactly €2 buying fruit.**

Which of the statements below are correct?

1. He cannot have exactly 3 apples
2. He must have at least one banana
3. He has 4, 5 or 6 fruits
4. If he has all 3 types of fruit, he must have fewer apples than bananas and oranges combined

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

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31 **A comparison has been made between fast food restaurants and factories. This is not as unrealistic as it might first appear. Fast food is mass-produced, as heavily processed as any other factory product, and restaurant workers have jobs which are just as routine and boring as those in manufacturing. So not only does fast food taste the same everywhere, but all workers involved are on low wages and have little power to improve their conditions.**

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

- A It is not unrealistic to compare fast food restaurants with factories.
- B All fast food tastes the same because it is heavily processed.
- C Mass production in factories leads to poor working conditions.
- D Workers who do routine and boring jobs are often poorly paid.
- E Working in a fast food restaurant is no different from working in a factory.

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32 **Recent research suggests that people are becoming less inclined to follow medical advice about how to prevent ill-health. They say that there is too much advice and it is often contradictory. However the general population is living longer and is healthier. This suggests that people are more aware of what is good for their own health and wellbeing than the medical profession is.**

Which one of the following, if true, weakens this argument?

- A Advances in medicine have meant that doctors give advice on a wider range of issues.
- B People now have easy access to websites giving information on health.
- C Doctors prefer to give advice rather than medication.
- D People believe that they know better than doctors how to improve their own health and wellbeing.
- E The health improvements are in areas that exactly match the medical advice given by doctors.

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33 **Over the last twenty years the number of people, including children, classed as overweight, and therefore at risk of serious health problems, has risen alarmingly. This trend could be caused by an increase in the amount people eat or by a decrease in the amount of exercise they take. Most of us exercise less than people did twenty years ago, and the average number of calories consumed per person is now less than it was twenty years ago. So the increase in the number of overweight people is clearly caused by lack of exercise. Thus the government does not need to worry about trying to change people's diets.**

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

- A Some people may exercise more than the average.
- B Some individuals may have increased their calorie intake.
- C The government may need to worry about costs to the health service.
- D Children may use up more calories through exercise than adults.
- E Some individuals may have health problems which cause an increase in weight.

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34 **In 2005, Peter's age was exactly four times that of his son, Quentin. In 2021, Peter will be exactly twice Quentin's age.**

What is the difference between their ages?

A 20
B 24
C 16
D 28
E 36

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35 **I have far too much small change in my pocket: 6 x 1c coins, 3 x 2c coins, 2 x 5c coins, 3 x 10c coins and 2 x 50c coins.**

I want to buy a chocolate bar for 37c using as many coins as possible.

What is the largest number of coins I can use to pay the exact price?

A 12
B 9
C 14
D 5
E 10

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37 **The general public cannot understand laws and legal documents unless they are written in clear and simple language. Therefore, the traditional style in which laws and legal documents are written must change. Citizens in a democracy must be able to understand what their legal rights and duties are.**

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

A If citizens can understand laws and legal documents, they will be able to play their proper role in a democracy.
B It is necessary in a democracy for citizens to know their legal rights and duties.
C There must be a change in the style in which laws and legal documents are written.
D Many laws and legal documents are written in old-fashioned and complicated language.
E The general public can fully understand only those laws and documents written in simple language.

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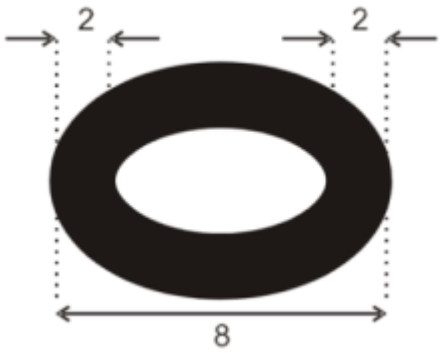
38 **Many countries spent billions on vaccines in response to advice that a virus had the potential to kill millions. These countries are now trying to sell the stockpiles of vaccines which they do not need. There is concern that advice given by officials may have been influenced by pharmaceutical companies. Clearly, such companies would have an interest in making sure that governments spent large quantities of money on vaccines that they produced. It is essential that an investigation into this matter takes place as soon as possible so that those responsible can be held to account.**

Which one of the following is an assumption on which this argument depends?

- A Groups with financial interests do not advise officials in other areas of decision making.
- B It will not be possible for the stockpiles of vaccines to be sold.
- C The advice given by officials was not appropriate.
- D The pharmaceutical companies influenced the advice given by officials.
- E The pharmaceutical companies misjudged the dangers of the virus.

39 **A chain link has the following dimensions:**

If you join six of these links together, and stretch the chain to its full extent, what is the total length of the chain?



- A 30
- B 28
- C 32
- D 36
- E 24

40 **Consider the following statements:**

1. There are fewer rats than people
2. There are not more people than rats
3. There are at least as many rats as people
4. There are not more rats than people

Which two of the above statements are equivalent?

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

BIOLOGY

41 **In a DNA sample, the percentage of guanine present was 28%. What is the percentage of thymine in the sample?**

- A 0.22
- B 0.44
- C 0.54
- D 0.27
- E 0.28

42 **Which property of water is most important when heat is lost from human skin?**

- A water density is greatest at 4°C
- B high specific heat capacity
- C latent heat of vaporisation
- D boiling point of water
- E dipole properties so salts can dissolve in sweat

44 **Which of the features below may be present in both prokaryotic cells and eukaryotic animal cells?**
(Consider features of the cell as a whole, and for DNA consider the main chromosomal DNA rather than organelle DNA.)

1. glycogen
2. a cell wall
3. DNA in loops
4. cytoplasm containing ribosomes

- A 1 and 4 only
- B 1, 2 and 3 only
- C 1 and 2 only
- D none
- E 1 only

45 **Which is likely to contain the most mitochondria?**

- A red blood cell
- B epidermal cell
- C lymphocyte (white blood cell)
- D cheek cell
- E cardiac muscle cell

47 **A food item was burned in pure oxygen and released 830 kJ of energy.**
An identical food item of the same mass was found to produce 8 ATP's in respiration.

Assuming it takes 31 kJ to produce one ATP molecule, estimate the efficiency of respiration.

A 0.3
B 0.45
C 0.5
D 0.25
E 0.1

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48 **The statements below show three stages in glycolysis.**

1. 2 x 3 carbon compounds
2. 6 carbon compound
3. phosphorylated 6 carbon compound

The correct sequence is:

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

---

49 **During vigorous exercise a variety of products will be generated in muscle cells.**

Which answer correctly lists some of the products?

A water, sweat, heat and lactic acid
B carbon dioxide, lactic acid and ethanol
C useable energy (ATP), heat, glycogen and carbon dioxide
D usable energy (ATP), carbon dioxide and oxygen
E water, lactic acid, heat and carbon dioxide

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50 **Haemophilia is caused by a recessive allele carried only on the X chromosome. A carrier female and a non-haemophiliac male decide to have a child.**

Which of the following four statements are correct?

1. they have a 25% chance of producing a haemophiliac son
2. they have a 25% chance of producing a haemophiliac daughter
3. they have a 25% chance of producing a carrier son
4. they have a 25% chance of producing a carrier daughter

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

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51 **Cross over values (COV's) can be considered as the relative distance between genes and are used to help construct chromosome maps. Four genes, called P, Q, R and S, are found on the same chromosome. Use the following COV's to work out the sequence of the four genes.**

P to Q = 33
Q to R = 8
R to S = 15
P to S = 10
P to R = 25

The sequence of the genes is

A P S R Q
B R S P Q
C Q S R P
D S P Q R
E P Q R S

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52 **In a dihybrid cross between two heterozygous individuals, which is the most likely combination in their offspring?**

A AaBb
B aaBb
C AABB
D aaBB
E AaBB

---

53 **The base sequence of a section of DNA is shown below.**

C A T G C A C A T C G T G C C C A A

The maximum number of different amino acids this section codes for is:

A 4
B 18
C 6
D 9
E 5

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54 **Which of the components of DNA listed below are found on the outside of a DNA double helix?**

1. Pentose sugar
2. Phosphate
3. Purine bases
4. Pyrimidine bases

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

---

55 **Which of the following organisms are subject to natural selection?**

1. prokaryotes that reproduce asexually
2. single-celled eukaryotes that reproduce sexually
3. organisms living in a changing environment
4. organisms living in a stable environment

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

---

56 **Which adaptation cannot help increase the speed of transmission in a motor neurone?**

A greater axon diameter
B presence of an insulating myelin sheath
C nodes of Ranvier
D synapse
E long axon

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57 **In the process of ventilation the following occur:**

1. pressure in thorax increases
2. volume of thorax increases
3. diaphragm goes down
4. rib-cage goes down

Which of these occur during inhalation?

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

CHEMISTRY

60 **How many nitrogen electrons are involved in bond formation in $HONO_2$?**

- A 5
- B 4
- C 3
- D 6
- E 7

61 **Which one of the following compounds can be made from ethanol using only a substitution reaction?**

- A Ethoxyethane
- B Ethene
- C Bromoethane
- D Ethanal
- E Ethanoic acid

62 **An aromatic compound consists of two benzene rings joined together.**

Which of the following could be its formula?

1. $C_{10}H_8$
2. $C_{10}H_{10}$
3. $C_{10}H_{12}$
4. $C_{12}H_{10}$
5. $C_{12}H_{12}$

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

63 **8.0 g of copper oxide is reduced to 5.6 g of copper using hydrogen gas. [relative atomic mass: Cu=64, O=16]**

$$CuO + H_2 \rightarrow Cu + H_2O$$

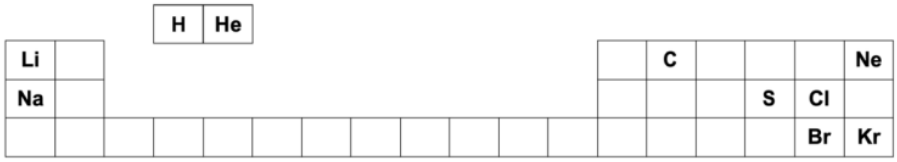
What is the yield of copper as a percentage of the theoretical maximum?

- A 87.5%
- B 14.3%
- C 70.0%
- D 56.0%
- E 43.9%

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

Which two of the elements shown react most energetically with each other?



- A C and He
- B Na and Cl
- C Li and Kr
- D Ne and Na
- E Li and Br

---

65 **Which one of the following is not an acid/base reaction?**

- A $HNO_3 + HClO_4 \rightarrow H_2NO_3^+ + ClO_4^-$
- B $CH_4 + H(SbF_6) \rightarrow CH_5^+ + SbF_6^-$
- C $2NH_3 \rightleftharpoons NH_2^- + NH_4^+$
- D $FeCl_3 + 6H_2O \rightarrow Fe(H_2O)_6^{3+} + 3Cl^-$
- E $Al(H_2O)_6{}^{3+} + H_2O \rightarrow Al(H_2O)_5(OH)^{2+} + H_3O^+$

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66 **What is the total number of electrons in an ammonium ion, NH_4^+?**

- A 11
- B 8
- C 12
- D 9
- E 10

---

67 **One group of elements in the Periodic Table contains, in descending order, boron, aluminium, gallium, indium and thallium.**

Which of the following are correct about these elements?

1. Indium forms the oxide $\ln_2 O_3$
2. Boron is the least reactive element in the group
3. Gallium forms the sulphate $GaSO_4$

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

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68 **Sodium chloride (relative molecular mass = 58.5) has a solubility of** $36.0\,g$ **per** $100\,g$ **of water. The density of the solution is** $1.13\,g/mL$**.**

Which of the following calculations would give the solubility in moles per litre?

- A $36.0 \times 1000/(58.5 \times 1.13)$
- B $36.0 \times 1000 \times 1.13/(58.5 \times 136)$
- C $36.0 \times 10 \times 1.13/(58.5 \times 136)$
- D $36.0 \times 10/58.5$
- E $36.0 \times 10 \times 1.13/58.5$

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69 **Which one of the following is not an oxidation/reduction reaction?**

- A $2Fe + 3Cl_2 \rightarrow 2FeCl_3$
- B The electrolysis of sodium chloride solution
- C $KClO_4 \rightarrow KCl + 2O_2$
- D $Cl_2 + H_2O \rightarrow HCl + HClO$
- E $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$

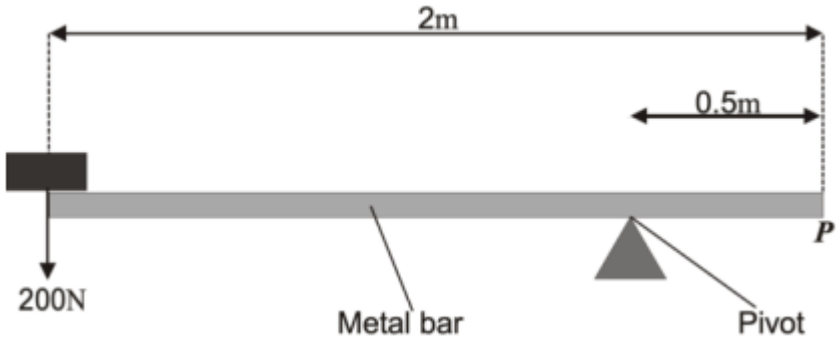
PHYSICS AND MATHEMATICS

70 **Which one of the following is not an example of simple harmonic motion?**

- A The motion of the Moon around the Earth as observed from Mars
- B The motion of a ball bouncing on the floor
- C A vibrating violin string
- D The ripples produced when a stone is dropped into a tank of water
- E A weight moving up and down at the end of a spring

71 **A uniform bar of length 2.0 m and weight 1000 N has its centre of gravity at its centre. The bar is pivoted in the position shown, and supports a weight of 200 N in the position shown in the diagram.**

What weight is needed at position P to balance the bar?



- A 600 N
- B 1800 N
- C 800 N
- D 1000 N
- E 1600 N

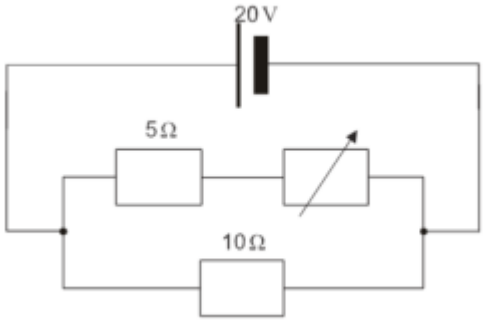
72 **Which of the following systems has an overall entropy closest to zero?**

- A The evaporation of ether at room temperature
- B An object in free fall when it has reached terminal velocity
- C A satellite in orbit 25 000 km above the Earth
- D A weight moving up and down on a spring
- E A metal object being rapidly electroplated

73 **Three resistors are connected to a 20 V battery with a constant supply.**
One of the resistors is a variable resistor.

The resistance of the variable resistor is gradually increased from zero to 5 Ω.

Which graph shows how the current from the battery varies with the resistance (R) of the variable resistor?



A <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fdw1818d1ju8d.png?alt=media&token=71d7b9e1-69a4-4fce-b9cf-0af8d97b3d9c<i>

B <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2F3d19ccvcvc.png?alt=media&token=6a4a425e-1ea9-4af9-920d-021dee90eb1a<i>

C <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fw81uc1jdc.png?alt=media&token=9a79c306-ca8a-4d48-bd34-90e660ad458b<i>

D <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2F1w9iwsc19ic91.png?alt=media&token=75f2c95a-9d20-485c-a871-99ad6a896614<i>

E <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fs81yc818c1.png?alt=media&token=464de176-6f29-4e33-a119-a0e7771da45d<i>

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74 **An object of mass 50 g just floats in a liquid of density 2.5 g/ml.**

When the object is placed in a liquid of density 2.0 g/ml, it sinks to the bottom of the container.

What is the force that the object exerts on the bottom of the container?

$[g = 10\ \mathrm{m/s^2} = 10\ \mathrm{N/kg}]$

A 0.1 N

B 10 N

C 0.4 N

D 400 N

E 40 N

---

76 David has two boxes containing shapes.

In box A there are 4 stars and 2 hearts
In box B there are 2 stars and 1 heart

David takes, at random, a shape from box A and puts it into box B. He then takes a shape from box B.

What is the probability that this shape is a star?

A $\frac{3}{4}$
B $\frac{4}{3}$
C $\frac{4}{9}$
D $\frac{2}{3}$
E $\frac{1}{12}$

---

77 Which of the expressions below has the largest value for 0 < x < 1? 1

A $\frac{1}{\sqrt{x}}$
B $\sqrt{x}$
C $\frac{1}{(1+x)}$
D $\frac{1}{x}$
E x^2

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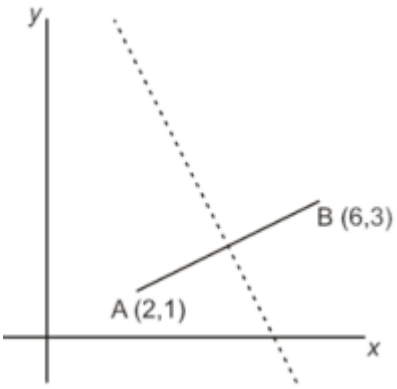
78 How many different integers, n, are there such that the difference between $2\sqrt{n}$ and 7 is less than 1?

A 4
B 2
C 0
D 6
E 8

---

79 **The graph below shows the line joining A (2,1) and B (6,3), and its perpendicular bisector (shown dashed ----------).**

Which of the following is the equation of the dashed line?

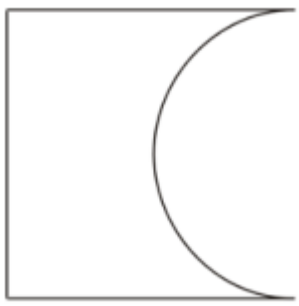


A y = 10 – 2x
B y = 2x – 10
C y = 2x – 6
D y = 4 – 2x
E $y = 4 - \frac{x}{2}$

---

80 **A square piece of metal has a semicircular piece cut out of it as shown.**
The area of the remaining metal is 100 cm^2.

Which of the following is a correct expression of the length of the side of the square in cm?



A $10\sqrt{\frac{2}{4-\pi}}$
B $10\sqrt{\frac{1}{8-\pi}}$
C $20\sqrt{\frac{2}{8-\pi}}$
D $20\sqrt{\frac{2}{8+\pi}}$
E $20\sqrt{\frac{1}{4-\pi}}$

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	29	A B C D E	56	A B C D E
2	A B C D E	30	A B C D E	57	A B C D E
3	A B C D E	31	A B C D E	60	A B C D E
4	A B C D E	32	A B C D E	61	A B C D E
5	A B C D E	33	A B C D E	62	A B C D E
7	A B C D E	34	A B C D E	63	A B C D E
8	A B C D E	35	A B C D E	64	A B C D E
9	A B C D E	37	A B C D E	65	A B C D E
10	A B C D E	38	A B C D E	66	A B C D E
11	A B C D E	39	A B C D E	67	A B C D E
12	A B C D E	40	A B C D E	68	A B C D E
13	A B C D E	41	A B C D E	69	A B C D E
14	A B C D E	42	A B C D E	70	A B C D E
15	A B C D E	44	A B C D E	71	A B C D E
16	A B C D E	45	A B C D E	72	A B C D E
17	A B C D E	47	A B C D E	73	A B C D E
18	A B C D E	48	A B C D E	74	A B C D E
20	A B C D E	49	A B C D E	76	A B C D E
21	A B C D E	50	A B C D E	77	A B C D E
22	A B C D E	51	A B C D E	78	A B C D E
25	A B C D E	52	A B C D E	79	A B C D E
26	A B C D E	53	A B C D E	80	A B C D E
27	A B C D E	54	A B C D E		
28	A B C D E	55	A B C D E		

ANSWER KEY

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

1	D	29	D	56	D
2	B	30	E	57	B
3	E	31	A	60	A
4	C	32	E	61	C
5	E	33	B	62	E
7	C	34	B	63	A
8	A	35	A	64	B
9	D	37	C	65	D
10	D	38	C	66	E
11	E	39	B	67	E
12	D	40	C	68	B
13	C	41	A	69	E
14	A	42	C	70	B
15	C	44	A	71	E
16	E	45	E	72	C
17	A	47	A	73	A
18	E	48	C	74	A
20	C	49	E	76	D
21	A	50	E	77	D
22	E	51	A	78	D
25	C	52	A	79	A
26	E	53	E	80	C
27	E	54	E		
28	B	55	D		

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