PROVE UFFICIALI DEGLI ANNI PASSATI

IMAT 2019

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 2019, 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	22 questions
Biology	17 questions
Chemistry	12 questions
Physics and Mathematics	8 questions
Total	**59 questions**

This version has **59 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 **A study involving a brain-training exercise was carried out on more than a thousand adults aged 65 and over, some of whom later developed dementia. Results showed that the benefits of the five-week mental agility course undertaken by some of the adults lasted for at least five years. This led to an improvement in everyday activities such as money management and the ability to do housework. If those with trained brains developed dementia, they did so later than those in the control group. The results also showed that, for those people in the study who developed dementia, after the diagnosis their mental decline occurred faster than for those who had not undertaken the training.**

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

- (A) People do a decreasing amount of housework as they grow older.
- (B) It is preferable to have swift mental decline once dementia develops.
- (C) Older people do not perform mentally challenging tasks unless forced to do so.
- (D) All over-65s who undertake brain training live for at least five years afterwards.
- (E) Keeping the mind active delays the onset of dementia.

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2 **Once again it has become fashionable for householders to replace their carpets with wooden floors. Sales of laminate and solid floors, such as oak, have seen a massive increase in the last ten years. This trend seems more in tune with our eco-friendly aspirations: carpets are often plastic-based and use vast quantities of underlying material, or underlay, made from petrochemicals. For this reason, it seems unlikely that wooden floors will go out of fashion in the near future.**

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

- (A) Not all wooden floors need a layer of underlay.
- (B) Carpets can harbour dust mites and allergens.
- (C) Wooden floors may look longer-lasting but can be more easily damaged than carpets.
- (D) Sales of carpets made of synthetic materials have decreased in the last ten years while woollen carpets have seen an increase.
- (E) Most types of laminate and wood floors use petrochemicals in their manufacture.

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3 **According to the current mainstream scientific view, Near Death Experiences (NDEs) are explicable in purely physiological terms. Specifically, they are caused by cerebral anoxia (oxygen deficiency in brain tissue), which occurs in a dying brain. On the other hand, recent research on hundreds of successfully resuscitated cardiac patients found that only twenty per cent reported NDEs. If NDEs had purely medical causes then most of the patients should have experienced them, since they had all been clinically dead and experienced cerebral anoxia. NDEs therefore do not have purely physiological causes.**

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

- A NDEs are caused by oxygen deficiency in the brain.
- B NDEs are a physical property of the human brain.
- C Not all successfully resuscitated cardiac patients have NDEs.
- D Not all clinically dead patients have NDEs.
- E NDEs are not necessarily caused by physical events alone.

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4 **Increasingly, the quality of a teacher, and of his or her lessons, is to be judged by feedback from their pupils. This is dangerous, as pupils have a tendency to focus too much on whether or not they enjoyed the lesson, in other words, on how much 'fun' they found it. The purpose of education, however, is not to keep children entertained; it is not to make their lives more fun. Arguably, it is not even to make them happier, per se. The purpose of schools is to make their pupils better, more educated people. This is all that matters, and therefore it is whether the teacher succeeds at this – not at being a children's entertainer – that counts.**

Which one of the following is a flaw in the above argument?

- A It fails to consider that enjoying lessons could result in pupils ending up better educated.
- B It doesn't specify precisely what it means by making someone a better, more educated person.
- C It patronises young people by thinking that their judgement will be based solely on how much fun they found the lesson.
- D By simply asserting that the purpose of education is not even to make people happier, the argument rests on a questionable contention.
- E The comparison with being a children's entertainer is an unfair exaggeration of what a teacher tries to do by making lessons more fun.

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5 **Researchers have tried to establish reasons for a recent drop in the catch of marlin near the Madeira coast. This drop cannot be explained by environmental conditions; there was no significant change in the temperature or composition of the region's water. Nor could one blame the human factor, because the size of the fishing fleet, catch quotas and pollution levels have been strictly observed. The environmentalists then analysed the records of the fishing catch of marlin over the last six centuries. This research identified that regular five-year periods of significant decrease in the catch alternated with fifteen-year periods of gradual growth of the catch. In view of this, the study concluded that the current drop in the marlin catch is part of a long-term cycle related to fish migration and food-chain balance.**

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

A The change in fishing technology has affected the change in the fishing catch.

B The fishing catch of marlin around Madeira does not depend on the condition of the water around the island.

C The records provide accurate information about the catch of marlin off the Madeira coast.

D Climate change did not affect the temperature of ocean water off the Madeira coast.

E There is no correlation between the fishing catch today and the deep-sea stock of marlin in the sixteenth century.

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6 **A student packs books into a box which is 20 cm high, 30 cm wide, and 40 cm long. She ties string around the box in the pattern shown. A further 20 cm of string is needed for a knot.**

What length of string is needed to tie up her box?



A 3.8 m

B 2.0 m

C 5.4 m

D 2.9 m

E 2.6 m

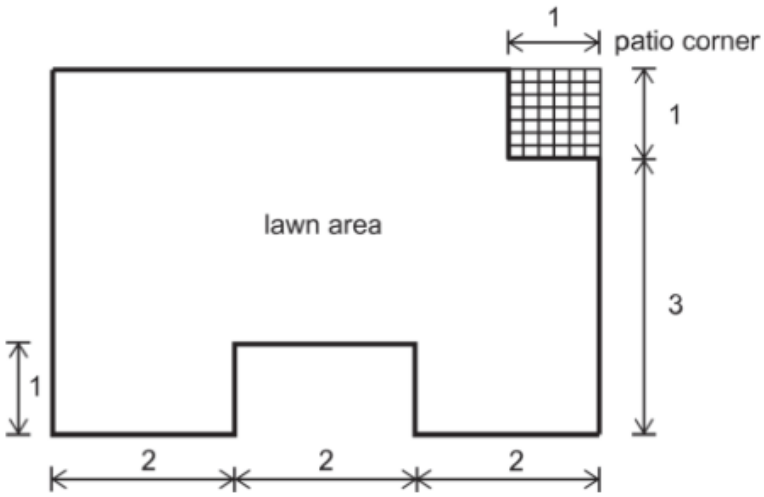
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7 **The plan of a domestic lawn with dimensions in metres is shown below.**

The lawn area is to be reseeded. Seed must be applied at the rate of 50 grams per square metre.

Grass seed packet prices
1.6 kg = £20.00
1.2 kg = £16.50
1.0 kg = £14.00
500 g = £8.00
200 g = £3.00
100 g = £2.00

Appropriate grass seed is available only in the following quantities:
What is the least amount of money that needs to be spent to buy sufficient seed to reseed the lawn?



A £16.00
B £22.00
C £14.00
D £13.50
E £16.50

8 **Five girls competed in five events at their sports day. The following scoring system was used for each event:**

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Before the events started, each girl nominated the event in which they wished to play their joker card – this doubled the number of points gained in that event. The table below shows the results of each event and the athletes' final points scores:

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How many of the girls won the event in which they had elected to play their joker?

A 4
B 3
C 1
D 2
E 5

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9 **At the Shawilde Theatre, tickets are priced as follows:**

Front stalls £35
Centre stalls £28
Rear stalls £20

Every row in the theatre contains 30 seats. Last night's performance was a sell-out and the ticket sales were £21 000. Exactly 60% of this income came from tickets for the centre stalls, and the rest was split equally between the front stalls and the rear stalls.

How many rows of seats make up the centre stalls at the Shawilde Theatre?

A 11
B 22
C 19
D 15
E 26

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10 **Four of the following five pieces can be fitted together to make the above pattern. Which one of the pieces is NOT needed?**



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B <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2F12xe81e1885855.png?alt=media&token=ab265a6c-66f9-47dc-890c-79e817fde35c<i>

C <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fx12e121812821e.png?alt=media&token=077c453f-8fdb-40ae-a47d-7aac9227f4c7<i>

D <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fc8128e218eu2je1.png?alt=media&token=b32e7e14-84ab-4b5b-b505-cf9555c0f1cb<i>

E <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2F1x2e1287181ije.png?alt=media&token=cb0b46e2-f71e-4610-81fd-480c14d571ce<i>

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11 **Which one of the following literary works does NOT originate in the corresponding country?**

A The Divine Comedy – Italy

B The Tale of Genji – Japan

C Oedipus Rex – Greece

D The Poems of Rumi – China

E Don Quixote – Spain

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12 **Which one of the following composed the opera Madama Butterfly?**

A Richard Wagner

B Giuseppe Verdi

C Gioachino Rossini

D Georges Bizet

E Giacomo Puccini

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13 **Which one of the following plays by William Shakespeare is NOT set in Italy?**

A The Taming of the Shrew
B A Midsummer Night's Dream
C Othello
D Romeo and Juliet
E Much Ado About Nothing

14 **Which one of the following writers is the author of the novel To Kill a Mockingbird?**

A Iris Murdoch
B Georges Simenon
C Elena Ferrante
D Harper Lee
E Ernest Hemingway

15 **The 'prisoner's dilemma' is a common example analysed in the field of**

A Game theory
B Network theory
C Quantum theory
D Chaos theory
E Asymptotic theory

16 **Who was the first woman to be awarded a Nobel Prize?**

A Doris Lessing
B Selma Lagerlöf
C Grazia Deledda
D Marie Curie
E Mother Teresa

17 **Which one of these events in world history happened most recently?**

A The October Revolution in the Russian Empire
B The fall of the Western Roman Empire
C The building of the Taj Mahal
D The crowning of Charlemagne
E The Taiping Rebellion in China

18 **Which one of the following religions is NOT considered to have been revealed to or founded by an individual?**

A Buddhism
B Islam
C Christianity
D Confucianism
E Hinduism

19 **The governance of modern states is often based on the separation of which three powers?**

A Regulatory – executive – judicial
B E Legislative – elective – executive
C Electoral – regulatory – jurisprudential
D Legislative – executive – judicial
E Legislative – elective – jurisprudential

20 **The Constitution of the Italian Republic was enacted on 22 December 1947 by**

A The Government
B The Ministry of Defence
C The Supreme Court
D The Constituent Assembly
E The Ministry of Justice

21 **Which one of the following is NOT a stated purpose of the United Nations?**

A To be a center for harmonizing the actions of nations
B To encourage peaceful trade between nations
C To achieve international co-operation in solving international problems
D To develop friendly relations among nations
E To maintain international peace and security

22 **Which one of the following countries did NOT adopt the coins and banknotes of the Euro as its currency on 1 January 2002?**

A Sweden
B Austria
C Luxembourg
D Finland
E Portugal

BIOLOGY

23 **Which of the following rows are correct about these naturally occurring biological molecules?**

	biological molecule	presence of carboxylic acid groups	presence of 2 or more hydroxyl groups
row 1	ALL amino acids	yes	no
row 2	glucose	no	yes
row 3	glycerol	no	no
row 4	ALL fatty acids	yes	no

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

24 **Which of the following is/are tissues?**

1. cartilage
2. skin
3. endothelium

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

25 **Which of the following statements about the metabolism of plants is/are correct?**

1. CO_2 is produced during the day.
2. CO_2 is produced at night. 2
3. The CO_2 produced can be used by the plant. 2

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

26 **Which one of the following occurs during anaphase of mitosis in a healthy human liver cell?**

A Centrioles migrate to opposite poles of the cell and help to assemble the spindle fibres.
B Sister chromatids are pulled by the spindle fibres towards opposite poles of the cell.
C DNA replicates so that each chromosome is made up of two sister chromatids.
D Chromosomes move towards the equator of the cell and attach to the spindle fibres.
E Chromatin condenses so that the chromosomes are visible under the microscope.

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27 **Which row shows a correct component of each of the three structures listed?**

	viral envelope	capsid	genetic material
row 1	glycogen	glycosidic bonds	adenine
row 2	glycosidic bonds	glycogen	ester bonds
row 3	phosphodiester bonds	hydrogen bonds	amino acids
row 4	fatty acids	amino acids	phosphodiester bonds
row 5	phosphate	phosphodiester bonds	cytosine

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

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29 **If a cell divides by mitosis ten times, what is the number of cells at the end of the process?**

[Assume that all cells remain alive.]

A 10
B 64
C 100
D 1024
E 11

---

30 **Familial hypercholesterolaemia (FH) is an inherited disease caused by a dominant allele. People with FH have high concentrations of cholesterol in the blood, which can lead to an increased risk of coronary heart disease.**

The family tree shows the inheritance of this disease in one family.

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Which row shows the number of individuals in the family tree with each genotype?

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

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31 **The diagrams show some pathways between the central nervous system and effector organs in a healthy human.**

Which pathway is a possible route for impulses passing along a parasympathetic neuron?

- A <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fx12e18e18e8a8a.png?alt=media&token=f5381795-a181-4442-a200-9ae6ad62ce51<i>
- B <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fx12e128a88aa.png?alt=media&token=55758227-b56c-401e-b4c9-19dfc4f62568<i>
- C <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2F1x2e8a888q82.png?alt=media&token=5d23bec0-6149-4671-8e9a-a08ba78022e5<i>
- D <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2Fx12e288x1888ss.png?alt=media&token=9e660e9c-c461-4cfa-996a-baa20a00f9f7<i>
- E <i>https://firebasestorage.googleapis.com/v0/b/e2-ms01.appspot.com/o/Assets%2FImages%2FQuizzes%2F21exx9812e28ak.png?alt=media&token=7ccb5ac3-2e44-42a5-bca5-c8ad898b790c<i>

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32 **An electron microscope (EM) was used to view a cell.**

The maximum dimension of the cell was observed at a magnification ×30 000.

The image on the EM screen showed a maximum length of 30 mm.

Which of the following mature healthy cells was being magnified?

- A one mature human red blood cell
- B one palisade cell from a wheat plant
- C one lymphocyte from a human
- D one coccus bacterium in a Staphylococcus cluster
- E one sensory neuron from a human

---

33 **Which statement about an enzyme involved in genetic modification is correct?**

- A A restriction enzyme causes phosphodiester bonds to be broken.
- B A ligase causes H-bonds to form between sticky ends only.
- C A restriction enzyme causes only H-bonds to be broken.
- D A restriction enzyme causes H-bonds to form between sticky ends.
- E A ligase causes phosphodiester bonds to be broken.

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34 **Which statement is correct in healthy humans?**

- A Increasing the partial pressure of oxygen makes it more likely that haemoglobin will release its oxygen.
- B In active tissues where the carbon dioxide concentration is high, haemoglobin has a low affinity for oxygen.
- C At a low partial pressure of oxygen, myoglobin is less saturated with oxygen than haemoglobin.
- D Blood leaving active muscles that are respiring aerobically will contain hydrogencarbonate ions and raised levels of lactic acid.
- E The majority of carbon dioxide transported in the blood is in the form of carbaminohaemoglobin.

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35 **Which of the following regions within a sarcomere remain UNCHANGED in length when a healthy human muscle cell contracts?**

1. A-band
2. I-band
3. H-zone/band

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

---

36 **Which row is correct for the three given features of typical human B lymphocytes?**

Key:

✓ correct
x incorrect

	formed from bone marrow stem cells	processed in the thymus	contain genes coding for antibodies
row 1	✓	✓	✓
row 2	✓	✓	×
row 3	✓	x	✓
row 4	x	✓	✓
row 5	x	✓	×

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

---

37 **Which of the following processes involve ions?**
1. contraction of a muscle
2. transmission of a nerve impulse across a synapse
3. transfer of light energy into chemical energy in photosynthesis
4. oxidative phosphorylation in a mitochondrion

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

---

38 **An animal has a coat that has some patches of white hair and some patches of black hair. Cells that make up a hair follicle form a single hair, which is either white or black.**

Assume that there are no mutations following formation of the zygote. A student wrote the following statements:

1. The cells in all the hair follicles contain the same genes.
2. The alleles in a hair follicle forming a white hair are different from the alleles in the hair follicle forming a black hair.
3. Each white hair follicle cell contains two recessive alleles.

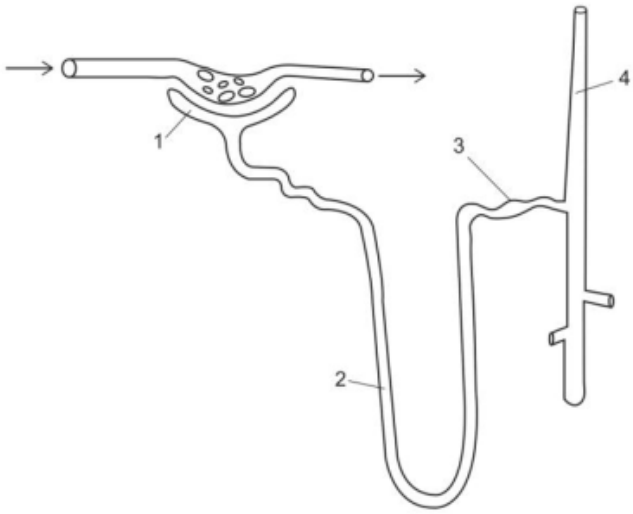
Which statement(s) is/are correct?

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

---

39 **The diagram shows a nephron with collecting duct from a healthy human.**

Which of the regions (1-4) contain a liquid with no urea?



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

---

40 **The same section of an allele coding for five amino acids from two different individuals, P and Q, is shown.**

P ATTCCGGGATTCCCT
Q ATTCCGGATTGCACT

Which of the following types of mutation could explain the differences between P and Q?

1. addition
2. deletion
3. substitution

A 2 and 3 only
B 1, 2 and 3
C none of them
D 1 only
E 1 and 3 only

CHEMISTRY

41 **Which statement about a positive ion explains why it is positively charged?**

A The ion has more electrons than neutrons.
B The ion has the same number of protons and neutrons.
C The ion has more protons than neutrons.
D The ion has more protons than electrons.
E The ion has more electrons than protons.

42 **A few drops of universal indicator solution were added to exactly 50 mL of sodium hydroxide solution, NaOH, of concentration 1 mol/L. Exactly 50 mL of hydrochloric acid, HCl, of concentration 1 mol/L, was added drop by drop to the sodium hydroxide solution containing the universal indicator solution.**

What colour changes would be observed as the hydrochloric acid was added?

A violet → blue → green → yellow → orange → red
B violet → blue → green
C blue → red
D red → orange → yellow → green → blue → violet
E red → orange → yellow → green

43 **A student observed that when powdered sugar at –1 °C was added to ice at –1 °C all of the ice melted.**

Which of the following statements explain this observation?

1. Sugar has given the water molecules energy.
2. The melting point of the mixture is higher.
3. The melting point of the mixture is lower.

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

44 **Which of the following pairs of structural formulae represent structural isomers?**

1. CH_3CH_2OH and CH_3OCH_3
2. $CH_3CH(CH_3)CH_2CH_2CH_3$ and $CH_3CH_2CH_2CH(CH_3)CH_3$
3. $CH(OH) = CHCH_2OH$ and CH_3CH_2COOH

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

---

45 **Element Z reacts with water at room temperature and hydrogen gas is released.**

The oxide of element Z is a solid at room temperature and does not conduct electricity.

The oxide reacts with acids and has the formula ZO.

To which group/part of the Periodic Table does element Z belong?

- **A** Group II
- **B** Group I
- **C** Group III
- **D** Group VII
- **E** Transition metals

---

46 **Which of the following equations represent(s) a redox reaction?**

1. $4LiH + AlCl_3 \rightarrow 3LiCl + LiAlH_4$
2. $N_2O_3 + 3H_2O \rightarrow 2H_3O^+ + 2NO_2^-$
3. $NH_4NO_3 \rightarrow 2H_2O + N_2O$

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

---

47 **Which of the following molecules have an overall permanent dipole moment?**

1. CO_2
2. H_2O
3. NH_3

[C is in Group IV, N is in Group V, O is in Group VI]

- **A** 2 and 3 only
- **B** 1 and 3 only
- **C** 1, 2 and 3
- **D** none of them
- **E** 1 and 2 only

---

48 **Why does hydrogen iodide (HI) have a higher boiling point than hydrogen bromide (HBr)?**

[Atomic numbers: bromine = 35; iodine = 53]

- **A** The induced dipole-induced dipole (dispersion) forces between HI molecules are stronger than those between HBr molecules.
- **B** The iodide ions in HI are larger than the bromide ions in HBr
- **C** The H–I covalent bond is stronger than the H–Br covalent bond.
- **D** The permanent dipole-permanent dipole forces between HI molecules are stronger than those between HBr molecules.
- **E** There are hydrogen bonds between HI molecules but not between HBr molecules.

---

49 **What is the minimum mass of sulfur dioxide needed to make 500 mL of a solution of concentration 3.0 mol / L?**
[A values: O = 16; S = 32]

- **A** 384 g
- **B** 96 g
- **C** 32 g
- **D** 192 g
- **E** 48 g

---

50 **A compound consists of carbon, hydrogen and oxygen only.**

8 g of this compound contains 3 g of carbon and 1 g of hydrogen.

Which one of the following could be the molecular formula of the compound?

[A_r values: C = 12; H = 1; O = 16] r

A C_2H_8O
B C_3HO_4
C CH_2O
D C_2H_4O
E CH_4O

---

51 **Hydrogen has a radioactive isotope called tritium. Tritium atoms have two neutrons.**

The most abundant naturally occurring isotope of hydrogen has a relative atomic mass of 1.0.

What is the value for the relative atomic mass of a sample of hydrogen gas that has an equal amount of these two isotopes of hydrogen?

A 1.5
B 1.0
C 4.0
D 3.0
E 2.0

---

52 **Consider the following reversible reaction at temperature T.**

$$A + 2B \rightleftharpoons 2C + D$$

At equilibrium, there are 0.5 moles of A, 0.2 moles of B, 0.5 moles of C and 0.8 moles of D, all in a vessel of volume V.

Using the equilibrium-constant expression for this reaction, what is the value of K at this temperature?

A 2
B 4
C 10
D 0.25
E 0.1

PHYSICS AND MATHEMATICS

53 **Which of the following expressions is equal to $\frac{8^{2n} \times 4^n}{2^n}$ for all integers n?**

A 2^{6n+1}
B 2^{14n}
C 2^{7n}
D 2^{2n+5}
E 2^{6n}

---

54 **The mean mass of three babies is 2.1 kg. The range of their masses is 0.7 kg. The lightest baby has a mass of 1.8 kg.**

What is the median mass of the three babies?

A 1.95 kg
B 2.3 kg
C 2.0 kg
D 2.1 kg
E 2.15 kg

---

55 **What is the highest common factor of 360, 500 and 700, given as the product of powers of its prime factors?**

A $2^3 \times 5^3$
B $2^2 \times 3^2 \times 5 \times 7$
C $2^3 \times 3^2 \times 5^3 \times 7$
D 2 × 5
E $2^2 \times 5$

---

56 **What is the sum of the solutions to the equation $\frac{3}{x} + \frac{2}{x-2} = 1$, where x is a real number and $x \neq 0$ and $x \neq 2$?**

A 2.4
B 7
C -7
D -3
E 5

---

57 **A car, which is initially stationary, accelerates for 5.0 seconds at 4.0 m/s^2 along a straight road. It then continues in the same direction for 20 seconds at a constant speed.**

What is the maximum speed of the car, and what is the distance travelled by the car in the final 20 seconds of its motion?

A maximum speed = 20 m/s; distance = 400 m
B maximum speed = 24 m/s; distance = 480 m
C maximum speed = 9.0 m/s; distance = 200 m
D maximum speed = 20 m/s; distance = 80 m
E maximum speed = 9.0 m/s; distance = 180 m

---

58 **A stone of density 5.20 g/cm^3 and volume 200 cm^3 is completely submerged in a liquid of density 1.20 g/cm^3.**

What is the magnitude of the upthrust acting on the stone?

[gravitational field strength = 10.0 N/kg]

A 10.4 N
B 8.00 N
C 2.00 N
D 6.40 N
E 2.40 N

---

59 **Two charged particles P and Q are 0.10 m apart. The charge on P is $1.50 \times 10^{-7} C$ and the charge on Q is 1.50×10^{-7}. Particle P experiences an electrostatic force of magnitude F because it is near to the charge on particle Q.**

The distance between the two particles is increased to 0.20 m.
The charge on P is increased to 4.50×10^{-7} and the charge on Q is increased to $6.00 \times 10^{-7} C$.

What is the magnitude of the force that particle P experiences now?

A 6F
B $\frac{3F}{4}$
C $\frac{F}{4}$
D 12F
E 3F

---

60 **A fixed mass of an ideal gas is compressed at constant temperature.**
The pressure is recorded continuously as the volume decreases.
The pressure (y-axis) and volume (x-axis) are plotted on a linearly scaled graph.
Which statement describes the plotted line?

- A a straight line parallel to the volume axis
- B a curved line of increasing positive gradient starting at the origin of the graph
- C a straight line parallel to the pressure axis
- D a curved line with negative gradient of decreasing magnitude
- E a straight line of positive gradient starting at the origin of the graph

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	21	A B C D E	42	A B C D E
2	A B C D E	22	A B C D E	43	A B C D E
3	A B C D E	23	A B C D E	44	A B C D E
4	A B C D E	24	A B C D E	45	A B C D E
5	A B C D E	25	A B C D E	46	A B C D E
6	A B C D E	26	A B C D E	47	A B C D E
7	A B C D E	27	A B C D E	48	A B C D E
8	A B C D E	29	A B C D E	49	A B C D E
9	A B C D E	30	A B C D E	50	A B C D E
10	A B C D E	31	A B C D E	51	A B C D E
11	A B C D E	32	A B C D E	52	A B C D E
12	A B C D E	33	A B C D E	53	A B C D E
13	A B C D E	34	A B C D E	54	A B C D E
14	A B C D E	35	A B C D E	55	A B C D E
15	A B C D E	36	A B C D E	56	A B C D E
16	A B C D E	37	A B C D E	57	A B C D E
17	A B C D E	38	A B C D E	58	A B C D E
18	A B C D E	39	A B C D E	59	A B C D E
19	A B C D E	40	A B C D E	60	A B C D E
20	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	E	21	B	42	B
2	E	22	A	43	B
3	E	23	E	44	A
4	A	24	D	45	A
5	C	25	E	46	E
6	A	26	B	47	A
7	A	27	D	48	A
8	B	29	D	49	B
9	D	30	C	50	E
10	B	31	A	51	E
11	D	32	D	52	C
12	E	33	A	53	C
13	B	34	B	54	C
14	D	35	A	55	E
15	A	36	E	56	B
16	D	37	C	57	A
17	A	38	D	58	E
18	E	39	C	59	E
19	D	40	B	60	D
20	D	41	D		

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