



Ministero dell'Istruzione, dell'Università e della Ricerca

02MI70800

**ADMISSION TEST FOR THE DEGREE COURSE IN MEDICINE AND SURGERY**

**Academic Year 2017/2018**



**Cambridge Assessment**  
Admissions Testing

1 I have a tin of chocolates to share with some friends. In the tin are four types of chocolate – one type in red wrappers, one type in blue, one type in green and one type in yellow, with equal numbers of each.

The tin is passed around in turn from friend to friend. When the tin gets to them:

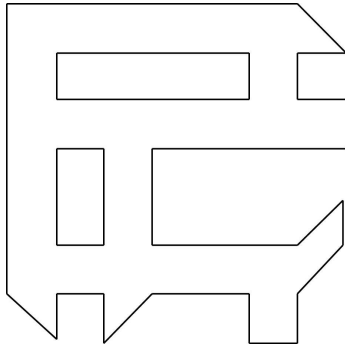
- John always takes three red chocolates.
- Peter always takes one of each colour.
- Jane always takes one yellow chocolate.
- I always take two green chocolates.

After six passings around of the tin, half of the chocolates remaining in the tin are blue.

How many chocolates were there in the tin when it was full?

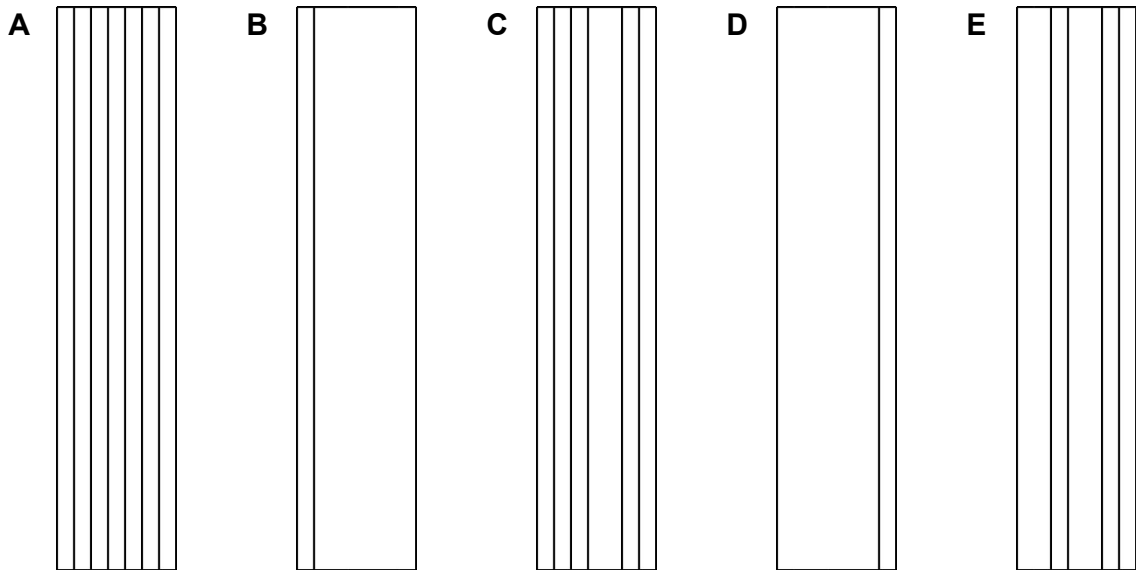
- |          |    |
|----------|----|
| <b>A</b> | 48 |
| <b>B</b> | 24 |
| <b>C</b> | 72 |
| <b>D</b> | 96 |
| <b>E</b> | 60 |

- 2 This is a view of a cross section of part of an aluminium window frame.



The cross section is uniform throughout its length.

Which one of the following is NOT a possible side view of this part of the aluminium window frame?



- 3 Sheelagh runs a business from London with regional headquarters located in seven cities – Jakarta, Nairobi, Prague, Ottawa, Moscow, Canberra and Hong Kong. The company also has plants in other cities shown in the table. Her senior managers at regional headquarters work from 8am to 5.15pm local time and constantly check their emails between these hours but are not available outside these hours. All her staff have an international time chart displayed at their place of work.

At 12 noon in London it is:

8 pm	Beijing
10 pm	Canberra
8 pm	Hong Kong
8 pm	Jakarta
1 pm	Lisbon
3 pm	Moscow

3 pm	Nairobi
2 pm	Nicosia
7 am	Ottawa
1 pm	Prague
7 am	Quebec
5 pm	Rawalpindi

3 pm	Riyadh
9 am	Rosario
8 am	Santiago
1 pm	Stockholm
4 am	Vancouver
6 am	Winnipeg

At 3pm in London she sends an urgent email to all her senior managers at her regional headquarters.

What is the longest possible interval between the first and last of her senior managers reading the email?

- A 9 hours
- B 14 hours
- C 17 hours
- D 16 hours
- E 7 hours

- 4 I recently received a publications list and order form. I want to order seven items from the list. However, I noticed that the structure of the postage and packaging charges was very strange, as shown in the table below:

<i>number of items</i>	<i>cost of postage and packaging</i>
1	55p
2	70p
3	95p
4	£1.30
5	£1.60
6 or more	£3.30

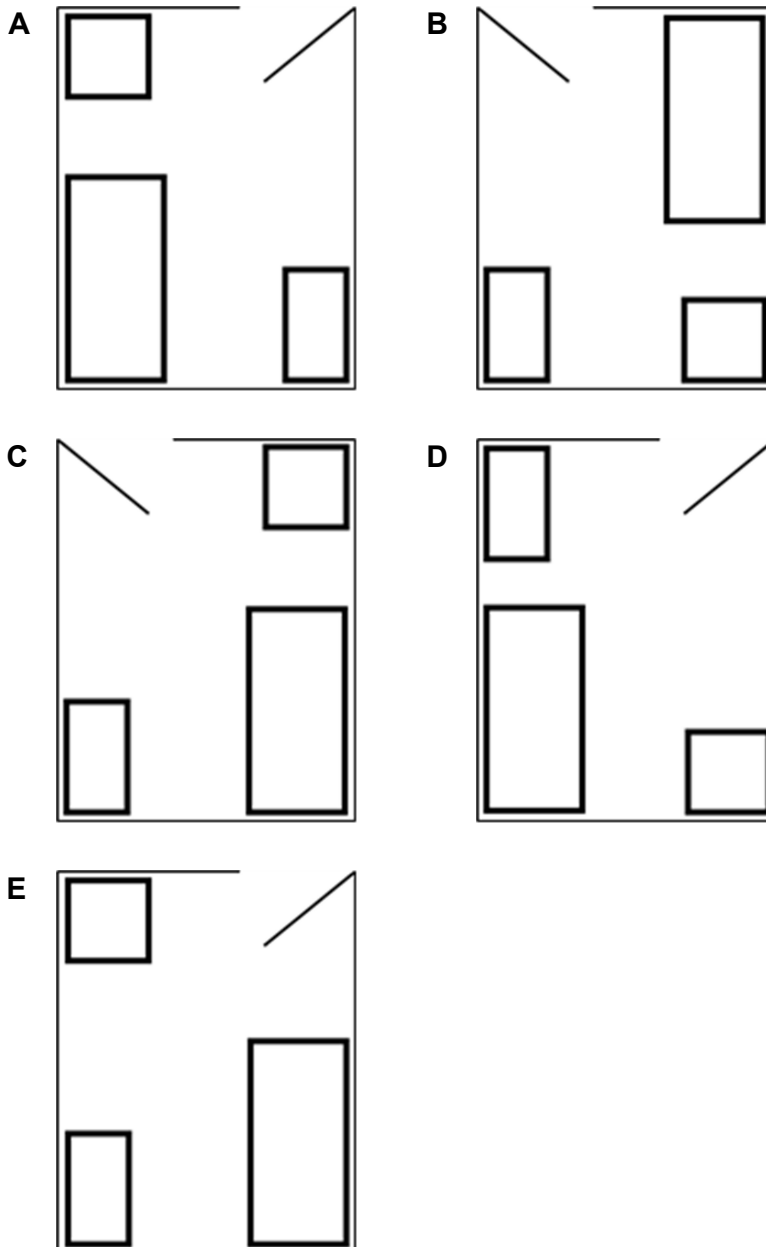
I have decided that I will ask them to pack my order in the number of parcels that will have the lowest postal charge.

What is the lowest postal charge for my seven items?

- A £1.90
- B £2.45
- C £3.30
- D £2.35
- E £2.25

- 5 Alex's bedroom is rectangular. If you stand at the doorway looking into the room, there is a square wardrobe on your right hand side in the corner. The bed is on the same side of the room as the wardrobe and is over half the length of the room. There is a desk along the other wall.

Which one of these aerial views is the view of Alex's bedroom?





8 Though relatively few people know it by name, palm oil is found in over fifty per cent of processed supermarket goods, from soaps to snacks. This vegetable oil, which is taken from the fruit of the oil palm tree, causes a great deal of environmental concern. The clearing of tropical forests to grow oil palm plantations threatens the survival of orangutans and other endangered species. The land conversion often happens on carbon rich peat soils in a process which releases significant greenhouse gas emissions. Yet even some environmental organisations warn that alternative vegetable oil crops may require much larger areas of forest to be converted to agricultural land.

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

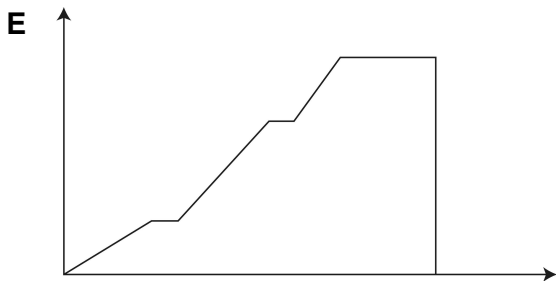
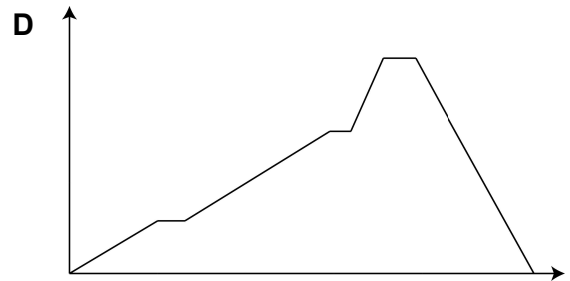
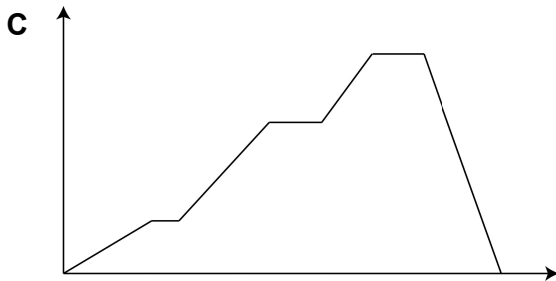
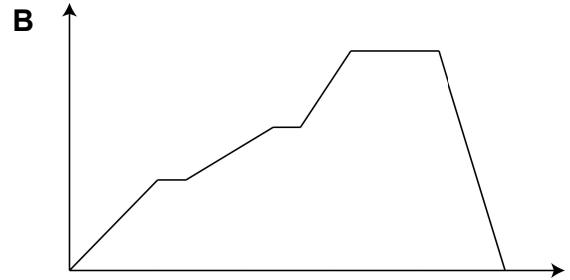
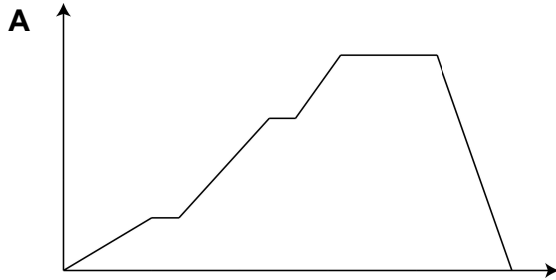
- A** A ban on palm oil alone would not solve all of the environmental problems associated with vegetable oil production.
- B** If farmers stopped clearing tropical forests for oil palm plantations, endangered orangutan populations would recover.
- C** The environmental risks associated with oil palm plantations are not well understood in tropical countries.
- D** To produce the most profitable crops, oil palm plantations must be grown on carbon rich peat soils.
- E** There is no motivation for manufacturers to stop using palm oil in their products.



- 9 The distance from Ardale to Banby is 16 km and from Banby to Carston is a further 8 km in the same direction.

David leaves Ardale at 11.00 and runs for an hour at 6 km/h. He rests for 20 minutes and then completes the rest of the distance to Banby at an average speed of 10 km/h. He chats with some friends in Banby for 20 minutes and then borrows a bicycle from one of them and cycles to Carston at an average speed of 16 km/h. David leaves Carston at 15.00 and cycles back over his route, arriving home at 15.50.

Which one of the following correctly shows David's distance from Ardale as a function of time?





- 12** The recently-appointed captain of the national football team has been publicly accused of adultery with several women, including the girlfriend of a former teammate. The newspapers have made a great deal of his extramarital activities and it has become a scandal. His behaviour has led him to be the subject of crude jokes. He has now been suspended from his duties. It is right that he has been removed from his position so that the team can start to pull together and have the best possible chance of winning the World Cup.

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

- A** The new captain's actions have weakened team morale.
- B** This new captain should not have been appointed.
- C** If the new captain is fired, the national team will win the World Cup.
- D** The national team will not win the World Cup.
- E** Newspapers have the right to report on people's personal lives.

- 13** Luke walks his puppy to a nearby park and lets the puppy off the lead.

As Luke starts walking along the path, the puppy runs on ahead, until it has gone 100 metres. The puppy then turns and runs back to Luke, who in that time has walked 50 metres. The puppy then goes on ahead again, turns after running 100 metres and runs back to Luke who has now walked another 50 metres.

This routine continues until Luke has walked 1 km.

If it takes 12 minutes for Luke to walk 1 km in the park, what is the puppy's average running speed during the same time?

- A** 12 km / h
- B** 5 km / h
- C** 10 km / h
- D** 14 km / h
- E** 15 km / h

**14** Over the last ten years there has been a huge increase in the number of television programmes involving the work of forensic scientists. This media attention has been matched by a massive increase in the number of courses and qualifications available in this field. Although this new attention has led to greater public awareness, it has not led to the creation of more jobs in this field. The work of forensics professionals has continued unchanged. Therefore, those who choose to study these courses will find that there is fierce competition for difficult and unpleasant work.

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

- A** Each year around 1500 graduates in forensic science compete for 200 jobs in the sector.
- B** Many students of forensic science go on to pursue careers in other areas.
- C** New technologies have brought about a decrease in the number of forensics staff required in laboratories.
- D** The number of university courses in forensic science has grown at an unprecedented rate.
- E** Salaries for forensic scientists compare well with those in other scientific fields.







- 20** I leave Victoria at 8:07 and arrive at Three Bridges at 8:41. I need to catch a train from Three Bridges at 8:45 to either Arundel or Chichester. I want to spend at least four hours in Chichester and four hours in Arundel. I have no preference in which order I will visit the towns. I then need to return to Victoria.

The tables below show extracts from the train timetables:

Depart	Three Bridges	8:45	Three Bridges	8:45
Arrive	Arundel	9:32	Chichester	9:34

Depart	Arundel	13:02	13:29	14:02	14:29
Arrive	Chichester	13:24	13:50	14:24	14:50

Depart	Chichester	12:25	12:41	13:25	13:41	14:25
Arrive	Arundel	12:46	13:12	13:46	14:12	14:46

Depart	Arundel	17:12	17:46	18:13	18:52
Arrive	Victoria	18:47	19:18	19:47	20:20

Depart	Chichester	17:13	17:21	17:43	18:13	18:37
Arrive	Victoria	18:47	19:15	19:18	19:47	20:20

What is the earliest possible time I can arrive back at Victoria?

- A** 19:18
- B** 20:20
- C** 19:47
- D** 19:15
- E** 18:47



- 21** Which one of the following introduced the metaphor of the 'invisible hand' in relation to a free trade economy?
- A** David Ricardo
  - B** Thomas Robert Malthus
  - C** Karl Marx
  - D** Vilfredo Pareto
  - E** Adam Smith
- 22** Which one of the following theories was publicly announced to the Prussian Academy of Science on 25<sup>th</sup> November 1915?
- A** String theory
  - B** Quantum theory
  - C** The Big Bang theory
  - D** Dalton's atomic theory
  - E** Einstein's general theory of relativity

**23** Which of the following occurs in a healthy human testis cell before it undergoes meiosis?

1. DNA content of the nucleus doubles
2. spindle fibres form the spindle
3. crossing over

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

**24** Which of the following components of a human immunodeficiency virus (HIV) contain peptide bonds?

1. capsid
2. envelope
3. reverse transcriptase

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

- 25** The pathway shows some of the cells produced during oogenesis in the ovary of a healthy human female.

Which of the following cells in the pathway are diploid?

1. germinal epithelial cells in the ovary



2. oogonia



3. primary oocyte



4. secondary oocyte

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

- 26** Which of the following statements is/are correct for all enzyme inhibitors?

1. They alter the shape of the active site.  
2. They denature the enzyme.  
3. They increase the activation energy of the reaction.  
4. They reduce the rate of the enzyme catalysed reaction.

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

- 27** Which one of the following statements about unmutated nucleic acids is correct?
- A** rRNA has anticodons which bind to tRNA.
  - B** Prokaryotic DNA is a single strand which forms a loop.
  - C** tRNA is made up of one phosphate-sugar backbone and may have adenosine and thymine bases.
  - D** mRNA is made up of a single nucleotide with a codon of uracil, cytosine and guanine bases.
  - E** Bases in DNA may form hydrogen bonds with uracil bases.
- 28** Which of the following statements is/are correct in a healthy human?
1. During inspiration, the pressure within the chest cavity is lower than outside the body.
  2. During ventricular systole, the pressure in the atrium is lower than in the ventricles.
  3. During ventricular systole, the pressure in the aorta is lower than the pressure in the atrium.
- A** 1 only
  - B** 3 only
  - C** 2 and 3 only
  - D** 2 only
  - E** 1 and 2 only

**29** Which of the following could be a consequence of a reduction in pituitary function in an otherwise healthy human?

1. more urine produced in a male or female
2. infertility in a female
3. infertility in a male

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

**30** The following structures are found in plant cells:

1. cell wall
2. cell membrane
3. nucleolus
4. mitochondrion

Which cell structures might contain molecules containing carbohydrate monomers?

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

**31** Two adjacent healthy human cells, X and Y, contain the two molecules Q and R.

The concentration of molecule Q in cell X is 4 arbitrary units (a.u.) and in cell Y it is 6 a.u.

The concentration of molecule R in both cell X and cell Y is 7 a.u.

Which of the following statements about the net movement of ONLY molecules Q and R between cells X and Y could be correct?

1. Molecules of Q move by facilitated diffusion from cell X.
2. Molecules of Q move by active transport into cell Y.
3. Molecules of R move into and out of both cell X and cell Y.

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

**32** A person was admitted to hospital suffering from a loss of memory.

Which part of the central nervous system is most likely to have been affected?

- A** cerebellum
- B** spinal cord
- C** medulla
- D** cerebrum
- E** hypothalamus

- 33** Four students, 1, 2, 3 and 4, recorded different structures that they thought were found in a healthy animal kidney cell and a typical bacterial cell.

<i>student</i>	<i>animal cell</i>	<i>bacterial cell</i>
1	DNA found in a nucleus	70S ribosomes present
2	cell wall present	mitochondria present
3	70S ribosomes present	DNA found in a nucleus
4	circular DNA	plasmids present

Which students gave totally correct answers?

- A** students 2 and 3 only
- B** students 1 and 2 only
- C** students 1, 2, 3 and 4
- D** students 2 and 4 only
- E** students 1 and 4 only
- 34** A short section of the DNA strand that codes for a protein has the sequence:

CAT TGG GCA TCG

Which of the following statements about this section of the sequence is/are correct?

1. There are a total of 29 hydrogen bonds between this section of DNA and its complementary strand.
  2. There are 12 phosphodiester bonds present within this section of DNA.
  3. The unmutated tRNA molecules used to translate this sequence contain a total of 3 uracil bases.
- A** 2 and 3 only
- B** 1 and 2 only
- C** 1 and 3 only
- D** 2 only
- E** 3 only

- 35** A mother and a father, neither of whom has cystic fibrosis, conceive a child who has the condition.

What is the likelihood that the same parents will have another child who is a boy without cystic fibrosis?

- A** 1 in 4
- B** 3 in 4
- C** 1 in 2
- D** 3 in 8
- E** 1 in 8

- 36** Which of the following molecules is/are directly produced during BOTH glycolysis and pyruvate decarboxylation in a healthy human cell?

- 1. ATP
- 2. carbon dioxide
- 3. reduced NAD

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



- 37** Which one of the following most accurately describes the structure of a human haemoglobin molecule that can bind four oxygen molecules to form oxyhaemoglobin?
- A** It has a primary, tertiary and quaternary structure only.
  - B** It has a primary, secondary and tertiary structure only.
  - C** It has a primary and secondary structure only.
  - D** It has a primary, secondary, tertiary and quaternary structure.
  - E** It has a primary, secondary and quaternary structure only.
- 38** Which of the following processes take place during the establishment of a resting potential in the axon of a healthy human neuron?
- 1. active transport
  - 2. facilitated diffusion
  - 3. respiration
- A** 1, 2 and 3
  - B** 2 only
  - C** 1 and 3 only
  - D** 1 and 2 only
  - E** 2 and 3 only

- 39** Which one of the following is a correct outline of some main events in photosynthesis in a healthy wheat plant?
- A** Carbon dioxide combines with an acceptor compound which breaks into two and each is reduced by hydrogen split from water by light.
  - B** Light splits water and the resulting hydroxyl group combines with a compound which has reacted with carbon dioxide.
  - C** In the presence of light, oxygen reacts with a carbohydrate to produce water and carbon dioxide.
  - D** Light splits carbon dioxide and the resulting carbon then combines with oxygen and hydrogen obtained from water.
  - E** Light joins carbon dioxide to an acceptor compound which is then reduced by hydrogen obtained from water.

- 40** Which combinations of DNA could be present in a transgenic organism?

1. invertebrate animal DNA in mammal DNA
2. prokaryotic DNA in plant DNA
3. plant DNA in animal DNA

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

- 41 Which one of the following statements correctly describes the type of mixture and the most appropriate method used to separate the specified component from the mixture?
- A salt from salt solution – homogeneous; paper filtration
  - B water from salt solution – heterogeneous; simple distillation
  - C chlorophyll from a solution of different plant pigments – homogeneous; chromatography
  - D red blood cells from blood – homogeneous; centrifuge
  - E gasoline/petrol from crude oil – heterogeneous; simple distillation
- 42 Which one of the following options gives the correct electron structure of the particle  $^{16}_8\text{O}^{2-}$ ?
- A  $1s^2 2s^2 2p^6 3s^2 3p^4$
  - B  $1s^2 2s^2 2p^4$
  - C  $1s^2 2s^2 2p^2$
  - D  $1s^2 2s^2 2p^6 3s^2 3p^6$
  - E  $1s^2 2s^2 2p^6$

43 In which one of the following reactions is the underlined species acting as an oxidising agent?

- A  $\underline{\text{Cl}_2} + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2$
- B  $\underline{\text{Zn}} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$
- C  $3\underline{\text{CO}} + \text{Fe}_2\text{O}_3 \rightarrow 3\text{CO}_2 + 2\text{Fe}$
- D  $\underline{\text{H}_2\text{SO}_4} + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$
- E  $2\underline{\text{Mg}} + \text{O}_2 \rightarrow 2\text{MgO}$

44 A solution of hydrochloric acid has a concentration of 1.0 mol / L. If 10 mL of this acid is added to water and made up to a total volume of 1.0 L, what is the pH of the resulting solution?

- A 9
- B 2
- C 5
- D 6
- E 0

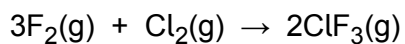
45 Which one of the following samples of gases contains the most particles?

All gases are at 0°C and 1 atm pressure, when 1 mole of gas has a volume of 22.4 L.

[Relative atomic mass,  $A_r$ : H = 1, He = 4, C = 12, O = 16, Cl = 35.5]

- A 33.6 L of chlorine gas
- B 66.0 g of carbon dioxide gas
- C 22.4 L of hydrogen gas
- D 10.0 g of helium gas
- E 64.0 g of oxygen gas

- 46 In an experiment involving the reaction shown below, 150 cm<sup>3</sup> of F<sub>2</sub> reacts with 100 cm<sup>3</sup> of Cl<sub>2</sub>.



On completion of the reaction, what is the final gaseous volume at the same temperature and pressure?

- A 250 cm<sup>3</sup>
  - B 100 cm<sup>3</sup>
  - C 350 cm<sup>3</sup>
  - D 200 cm<sup>3</sup>
  - E 150 cm<sup>3</sup>
- 47 Which one of the following molecules is a structural isomer of methylcyclopentane?
- A hexane
  - B cyclohexene
  - C hex-2-ene
  - D 2,2-dimethylbutane
  - E 2-methylpentane

**48** Consider the following list of particles:

1. molecules
2. ions
3. single atoms

Which one of the following options correctly describes the particles that are present in an aqueous solution of sodium chloride?

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

**49** The solubility of potassium nitrate in water increases with temperature.

A saturated solution of potassium nitrate at 80°C is cooled to 25°C in a closed container.

Which of the following statements is/are correct?

1. The mass of undissolved potassium nitrate will increase.
2. The concentration of the potassium nitrate solution remains the same.
3. The total mass of solvent present remains the same.

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

**50** Element X is a grey solid.

It combines with chlorine to form a polar molecule with the formula  $\text{XCl}$ . In this compound, element X has an oxidation state of +1.

In potassium iodide solution, it dissolves to form a coloured solution.

At  $500^\circ\text{C}$ , it becomes a coloured vapour.

What is the identity of element X?

- A** manganese
- B** fluorine
- C** iodine
- D** carbon
- E** lithium

**51** Which option correctly describes the following features of a silane (silicon tetrahydride) molecule?

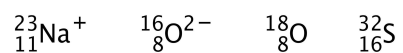
- number of bonding pairs (bp) of electrons
- number of lone/non-bonding pairs (lp) in the valence shell of the silicon atom
- bond angle

[Atomic number: Si = 14; H = 1]

- A** 3 bp; 1 lp;  $107^\circ$
- B** 3 bp; 1 lp;  $109.5^\circ$
- C** 4 bp; 0 lp;  $109.5^\circ$
- D** 4 bp; 2 lp;  $90^\circ$
- E** 4 bp; 0 lp;  $90^\circ$

52

Which one of the following statements about the four atoms/ions below is correct?



- A**  $^{16}_8\text{O}^{2-}$  and  $^{18}_8\text{O}$  have exactly the same number of protons and electrons but not neutrons.
- B** Out of the four atoms/ions, only  $^{23}_{11}\text{Na}^+$  has two more electrons than  $^{18}_8\text{O}$ .
- C**  $^{16}_8\text{O}^{2-}$  has the same number of electrons but four fewer neutrons than  $^{23}_{11}\text{Na}^+$ .
- D**  $^{32}_{16}\text{S}$  has twice the number of neutrons that  $^{18}_8\text{O}$  has but only four more than  $^{23}_{11}\text{Na}^+$ .
- E** Both  $^{16}_8\text{O}^{2-}$  and  $^{32}_{16}\text{S}$  each have an equal number of protons, neutrons and electrons.



- 53** A car starts at point X. It travels 3.0 km due east, then 4.0 km due south, then 6.0 km due west and finally 8.0 km due north.

How far away is the car from point X when it has reached the end of this journey?

[Assume that all distances moved are on a flat horizontal surface, and that point X is on the equator. You may ignore any curvature of the Earth.]

- A** 5.0 km
- B** 21.0 km
- C** 10.0 km
- D** 7.0 km
- E** 2.0 km

- 54** A resistor has a resistance of  $5.0\ \Omega$ . There is a direct current of 10 A in the resistor.

What is the power dissipated by the resistor?

- A** 50 W
- B** 2500 W
- C** 20 W
- D** 250 W
- E** 500 W

**55** Which one of the following is an expression for the mean of  $\frac{x}{3}$ ,  $x$ , and  $x+6$ ?

**A**  $\frac{7x+6}{9}$

**B**  $7x+2$

**C**  $\frac{7x+6}{3}$

**D**  $\frac{7x+18}{9}$

**E**  $7x+18$

**56** What is the gradient of the straight line passing through the points with coordinates  $(2, -3)$  and  $(-1, 6)$ ?

**A**  $-1$

**B**  $-9$

**C**  $-3$

**D**  $-\frac{1}{9}$

**E**  $-\frac{1}{3}$

57 Given that

$$\log_{10} 7 = x$$

$$\log_{10} 2 = y$$

$$\log_{10} 3 = z$$

What is  $\log_{10} \left( \frac{14}{3} \right)$  expressed in terms of  $x$ ,  $y$ , and  $z$ ?

A  $xy - z$

B  $\frac{xy}{z}$

C  $x + y - z$

D  $xy + z$

E  $\frac{x+y}{z}$

58 A solid wooden cube has sides of length  $a$ . The density of the wood is  $\rho$ .

The cube is completely immersed in a beaker of oil, which has a density  $\sigma$ . The top surface of the cube is horizontal. The gravitational field strength is  $g$ .

What is the upward force (upthrust) on the cube due to the oil?

[Assume that no oil is absorbed by the wood.]

A  $(\sigma - \rho)a^3g$

B  $\rho a^3g$

C  $\sigma a^3$

D  $\sigma a^3g$

E  $\rho a^3$





















IMAT 2017

Answer key

Question	Answer
1	D
2	E
3	B
4	E
5	A
6	A
7	E
8	A
9	A
10	E
11	E
12	A
13	E
14	B
15	E
16	C
17	D
18	D
19	E
20	C
21	E
22	E
23	D
24	C
25	A
26	A
27	E
28	E
29	D
30	D

Question	Answer
31	A
32	D
33	E
34	E
35	D
36	D
37	D
38	A
39	A
40	A
41	C
42	E
43	A
44	B
45	D
46	E
47	C
48	A
49	B
50	C
51	C
52	C
53	A
54	E
55	D
56	C
57	C
58	D
59	B
60	E