SOUTH AFRICAN AGENCY FOR SCIENCE AND TECHNOLOGY ADVANCEMENT

14th NATURAL SCIENCE OLYMPIAD
GRADES 7 - 9
2025
INSTRUCTIONS

Please read the instructions carefully before answering the questions

This is a multiple-choice paper. Please answer all the questions on the answer sheet provided. Each question is followed by answers marked A, B, C, and D. Only one answer is correct. Choose the correct answer and shade the corresponding circle on the answer sheet completely, using an HB pencil.

NB! The answer sheets are marked electronically – do not make any other dots or marks on the answer sheet. Select only one answer for each question or your answer will be discarded. **Ensure that you shade your selection clearly**.

Note that the question numbers on the answer sheet moves from **top to bottom** in several columns. Ensure that the number of your selection on the answer sheet corresponds with the number of the question in your examination paper. Should you make a mistake, please erase the incorrect answer completely

The use of non-programmable electronic calculators is permitted.

To avoid disqualification - You are required to complete all the information requested on the answer sheet**. Please complete the information in script, as well as shade the corresponding blocks**. *If the corresponding blocks are not shaded appropriately, your results will be returned without a name and you will be disqualified*. Do not fold the answer sheets.

Two hours are allowed to answer the questions**.**

1. The table below shows the average testosterone levels of males of different age groups.

Group	Age (years)	Average testosterone level (n/M)
I	0–10	less than 5
II	11–15	15
III	16–20	19

Which one of the following is an explanation for the difference in testosterone levels between the age groups?

Testosterone levels are higher in …

A. Group **I** than Group **III** due to the start of puberty.
B. Group **II** than Group **I** due to the start of puberty.
C. Group **III** than Group **I** because it is needed to inhibit the growth of long bones.
D. Group **I** than Group **II** because it is needed to inhibit the growth of long bones.

2. Indicate whether the description in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II.

COLUMN I	COLUMN II
A structure of the human female reproductive system.	A: Scrotum B: Urethra

A. A only
B. B only
C. Both A and B
D. None

3. Which one of the following is a contact force?

A. Gravity
B. Electrostatic force
C. Magnetic force
D. Friction

4. Hyperaldosteronism is a disorder caused by the over secretion of aldosterone and has been linked to high blood pressure in humans. Scientists investigated the influence of increased aldosterone levels on blood pressure.

The procedure was done as follows:

- The healthy participants' blood pressure was measured and recorded before the start of the investigation.
- The participants were injected with (I) <u>different doses of aldosterone</u> in the morning and their (II) <u>blood pressure was measured</u> every hour for 12 hours.
- This procedure was (III) <u>followed over four days for each of the 1 520 individuals and the average blood pressure was calculated</u>.
- All (IV) <u>participants followed the same diet</u> during the period of the investigation.

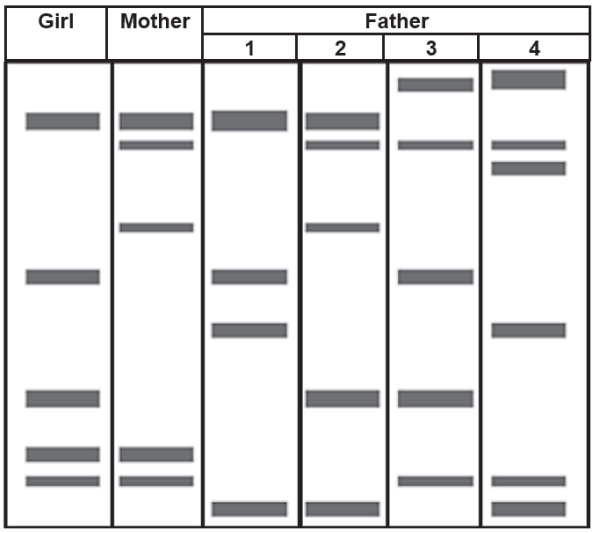
Which of the underlined phrases (I to IV) above best correspond with the phrases in the following table?

	INDEPENDENT VARIABLE	DEPENDENT VARIABLE	CONTROLLED VARIABLE	ACCURATE RESULTS
A	IV	II	I	III
B	I	II	IV	III
C	II	I	IV	III
D	I	II	III	IV

5. Which one of the following gases do not form diatomic molecules?

A. Oxygen
B. Nitrogen
C. Hydrogen
D. Neon

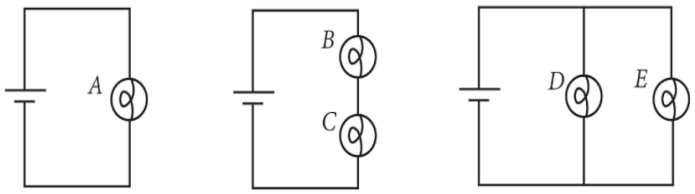
6. The diagram below shows the DNA profiles of a girl, her mother and four males.



Which letter represents the DNA profile of the girl's father?

A. 1
B. 2
C. 3
D. 4

7. In these three circuits all the batteries are identical, and all the light bulbs (A to E) are identical.



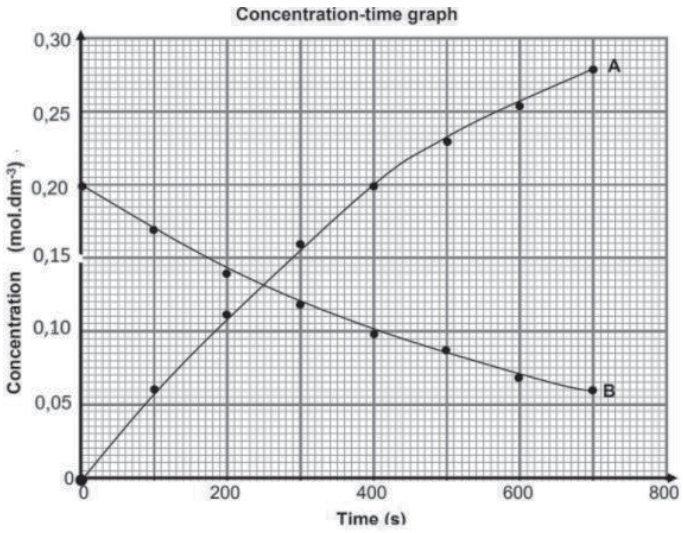
Which of the following correctly indicates the brightness of the light bulbs?

A. A = B = C > D = E
B. A > B = C > D = E
C. A = D = E > B = C
D. D = E > A > B = C

8. Consider the following decomposition reaction that takes place in a sealed container:

$$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$$

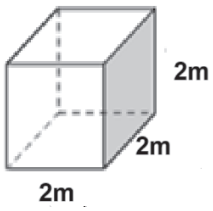
The graph below shows how the concentrations of some of the reactants and/or products change with time.



Which concentrations are represented in the graph above?

	Substance A	Substance B
A	O_2	N_2O_5
B	N_2O_5	O_2
C	NO_2	N_2O_5
D	N_2O_5	NO_2

9. The following cube has a volume of ...

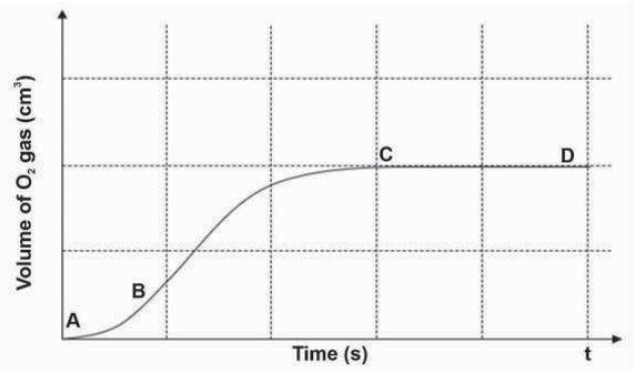


A. 20 dm^3
B. $8x10^3$ dm^3
C. 8 cm^3
D. $8x10^3$ cm^3

10. A sample of H_2O_2 decomposed as shown in the reaction equation given below:

$2\ H_2O_2 \rightarrow 2H_2O + O_2$

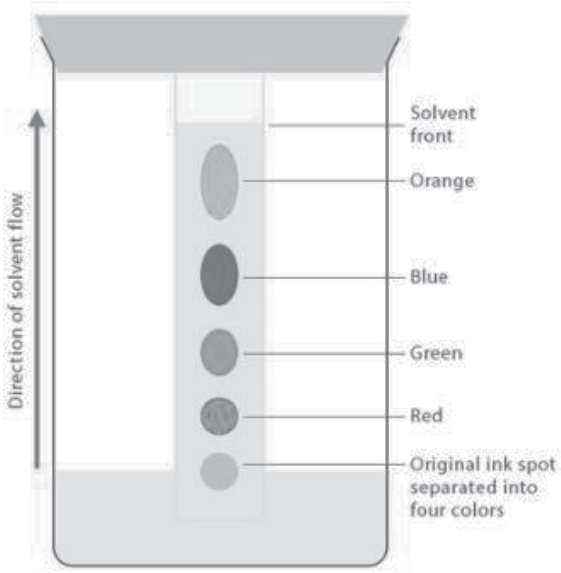
The O_2 gas produced was collected in a gas syringe. The following graph shows the volume of gas collected against time.



In which interval(s) does the shape of the graph show an increasing rate of decomposition of H_2O_2?

A. AB
B. BC
C. CD
D. AB and BC

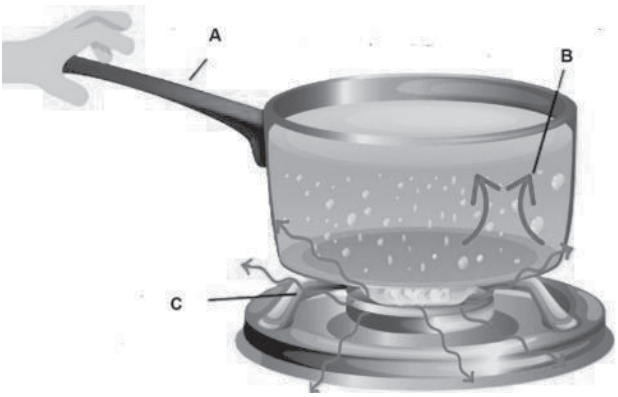
11. The diagram below shows separation of dyes in black ink.



The correct property and method used for the separation above is …

	Property	Method
A	Physical	Filtration
B	Physical	Chromatography
C	Chemical	Distillation
D	Chemical	Evaporation

12. The letters A, B and C represent three types of heat transfer.



Which of the following shows the correct type of heat transfer for A, B and C?

	A	B	C
A	Convection	Conduction	Radiation
B	Radiation	Convection	Conduction
C	Conduction	Radiation	Convection
D	Conduction	Convection	Radiation

13. Which of the following is applicable to veins?

I. Carry blood towards the heart
II. Carry oxygenated blood
III. Located close to the skin

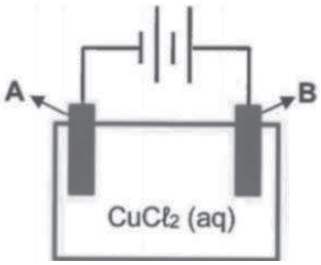
A. I, II and III
B. I and II only
C. I and III only
D. II and III only

14. The sizes of four copper wires (A to D) are given below:

Which of the wires will have the biggest resistance when used in an electric circuit?

	LENGTH (cm)	DIAMETER (mm)
A	200	3
B	300	3
C	200	8
D	300	8

15. **The diagram shows the decomposition (electrolysis) of copper chloride**.



A. Chlorine gas will form at anode B
B. Chlorine gas will form at cathode A
C. Chlorine gas will form at anode A
D. Chlorine gas will form at cathode B

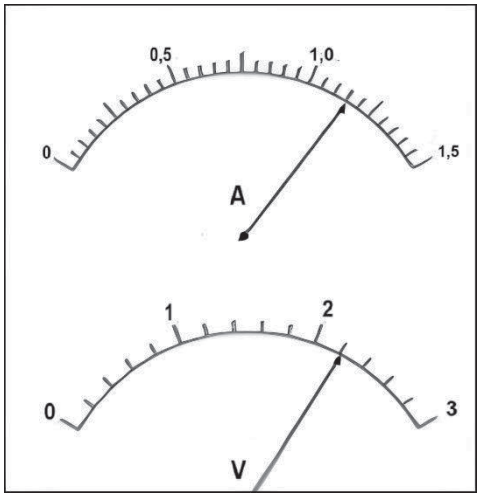
16. Which of the following indicates an incorrect name for the compound?

A	CO_2	Carbon dioxide
B	NaCl	Sodium chloride
C	$MgCl_2$	Magnesium dichloride
D	NO	Nitrogen oxide

17. Which of the following is the correct formula for Iron (III)oxide?

A. FeO
B. Fe_2O_3
C. Fe_3O_2
D. Fe_3O

18. The readings on the ammeter and voltmeter respectively are …



A. 1,3 A and 2,2 V
B. 1,3 A and 2,1 V
C. 1,15 A and 2,2 V
D. 1,15 A and 2,1 V

19. Which of the following has a higher density than water?

A. Ice
B. Oil
C. Air
D. Table salt

20. A ball is dropped from a high building. As the ball moves downwards, …

A. both its kinetic energy and potential energy increase
B. both its kinetic energy and potential energy decrease
C. its kinetic energy increases and its potential energy decreases
D. its kinetic energy decreases and its potential energy increases

21. Which of the following gases makes up 78% of the air in our atmosphere?

A. Oxygen
B. Nitrogen
C. Carbon dioxide
D. Hydrogen

Consider the information given below and answer questions 22 to 23.

A group of learners conducts an investigation during which they want to determine the relationship between the length of a conductor and the current strength through the conductor. They use different lengths of the same type of conductor and measure the current strength of the conductors.

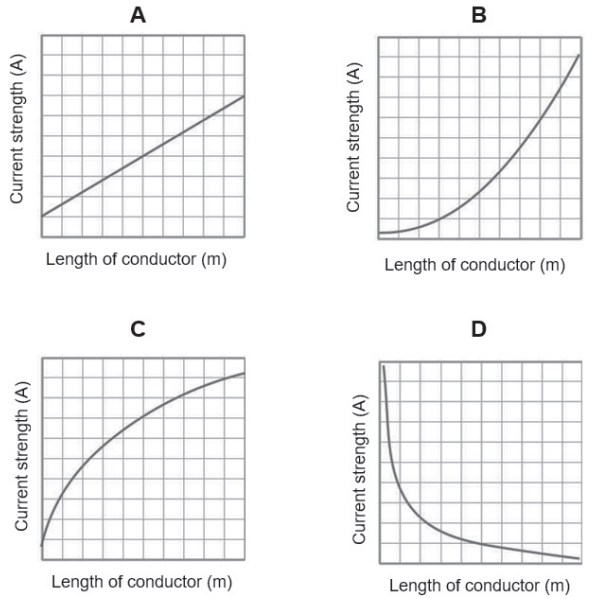
The following table shows the results of their investigation:

Length of conductor (m)	Current strength (A)
0,1	0,43
0,2	0,36
0,3	0,30
0,4	0,24
0,5	0,18

22. Which of the following are the correct variables for the investigation?

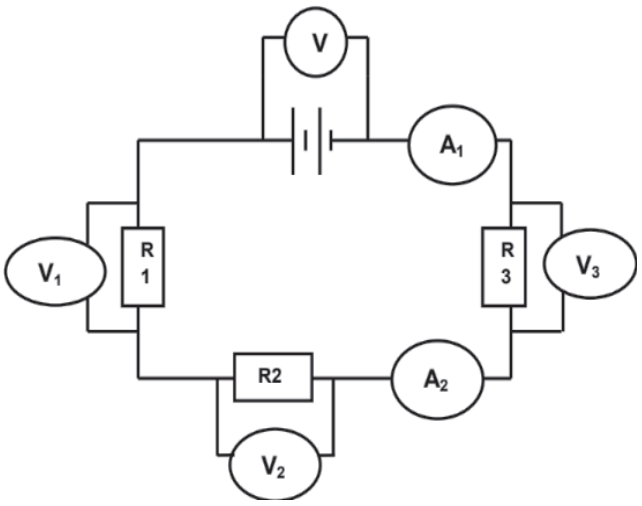
	Independent variable	Constant variable	Dependent variable
A	Length of conductor	Current strength	Type of conductor
B	Length of conductor	Type of conductor	Current strength
C	Current strength	Type of conductor	Length of conductor
D	Type of conductor	Current strength	Length of conductor

23. Which of the following sketch graphs is a correct presentation of the data in the table?



Consider the information given below and answer questions 24 to 25.

The circuit diagram below shows a battery, three resistors in series (R_1, R_2 and R_3), and two ammeters (A_1 and A_2). There is a voltmeter connected across the battery, as well as across each of the three resistors. The reading on ammeter A_1 is 2 A. The potential difference across R_1 and R_3 is 1 V each.



24. The reading on ammeter A_2 will be …

A. 0,5 A
B. 1 A
C. 2 A
D. 2,5 A

25. If the reading on the voltmeter across the battery is 4 V, the reading on the voltmeter across resistor R_2 will be …

A. 1 V
B. 1,33 V
C. 2 V
D. 4 V

26. Which electromagnetic rays from the sun or artificial sources is a major risk factor for developing skin cancer.

A. Microwaves
B. Infra-red waves
C. Ultra-violet waves
D. Gamma rays

27. The following table gives the power rating for household appliances that Thabo has in his house:

Appliance	Power rating (W)
Television	150
Toaster	1 250

On a certain day, Thabo uses his toaster for 10 minutes and his television for 4 hours.

Formula:

Cost = Power rating x Number of hours x Unit price. The unit price is R2,05 per kWh.

The total cost of electric power usage for the two appliances is …

A. R 1,66
B. R 16,60
C. R 26,86
D. R 99,43

28. Which one of the following is applicable to the layer of the atmosphere known as the troposphere?

(i) includes a band of ozone gas (O_3)

(ii) the temperature decreases as the distance from the surface increases

(iii) weather occurs in this layer

A. (i) and (ii) only

B. (i) and (iii) only

C. (ii) and (iii) only

D. (i), (ii) and (iii)

29. Which one of the following is an optical telescope located in the Northern Cape town of Sutherland?

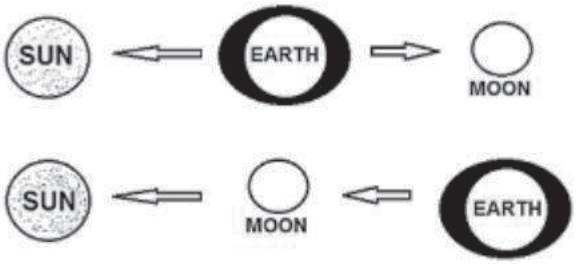
A. SKA

B. SALT

C. Meerkat

D. Hubble Space

30. The following diagram shows the position of the earth relative to the sun and moon.



Which of the following regarding the tide represented above is correct?

	TIDE	EFFECT
A	Spring tide	Higher high tides and lower low tides
B	Neap tide	Lower high tides and higher low tides
C	Spring tide	Lower high tides and higher low tides
D	Neap tide	Higher high tides and lower low tides

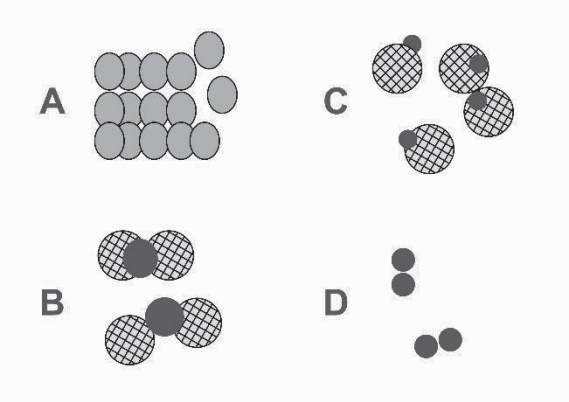
31. Density is defined as the mass per volume of a substance.

The mass of 1 cm^3 of water is 1 g.

Which substance (A, B, C or D), will float on water?

Substance	Mass (g)	Volume (cm^3)
A	25	30
B	8	5,5
C	100	60
D	250	120

32. Which one of the substances in the following diagrams represent a diatomic molecule?



33. Samantha rides her bicycle to school. It takes her 15 minutes to cover the distance of 3km.

Speed is the distance travelled per unit of time. **Samantha's average speed is …**

A. 0,2 km/h

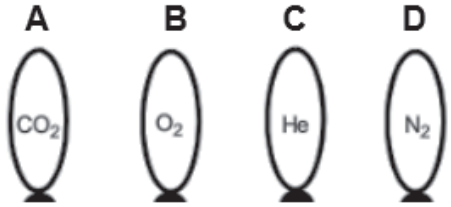
B. 12 km/h

C. 200 m/s

D. 5 m/s

34. The four balloons shown below are each filled with the same volume of a different gas, as indicated in the diagram, at a temperature of 25 °C and a pressure of 1 atm.

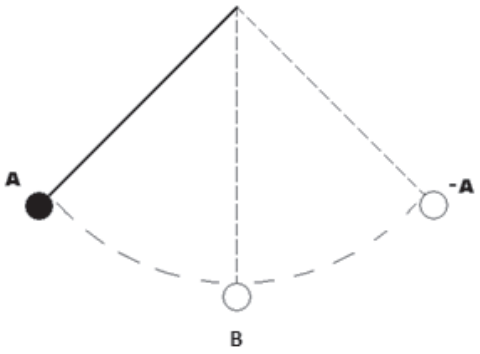
    After ten hours, all the balloons have decreased in size. **Which balloon will be the smallest?**



35. Which one of the following metals is the least valuable?

A. Silver
B. Gold
C. Platinum
D. Copper

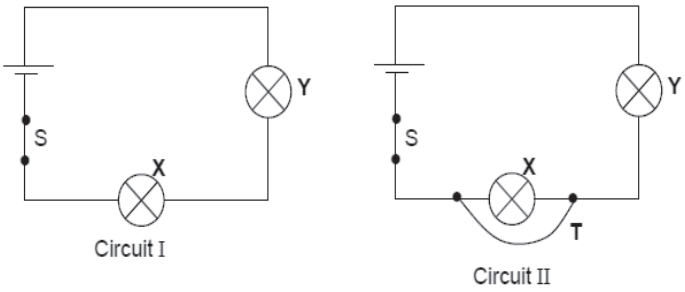
36. The type of energy that a simple pendulum possesses when it is at position B, is….



A. Kinetic energy
B. Potential energy
C. Potential and kinetic energy
D. Chemical energy

37. Circuit I shows two identical lamps X and Y connected to a cell of negligible internal resistance. Switch S is closed.

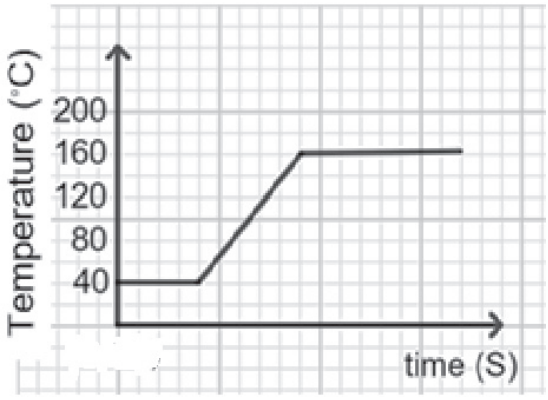
A wire T, of negligible resistance, is now connected across X as shown in Circuit II.



Which one of the statements below best describes how the brightness of the lamps has changed after T had been connected?

	X	Y
A	Does not light up	Dimmer
B	Brighter	Dimmer
C	Brighter	Brighter
D	Does not light up	Brighter

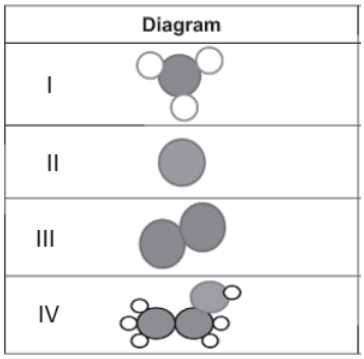
38. The graph shows the heating curve of a substance that boils at 160 °C.



Which one of the following correctly indicates processes that can occur at 160° C?

A. melting and boiling
B. melting and evaporation
C. condensation and evaporation
D. condensation and freezing

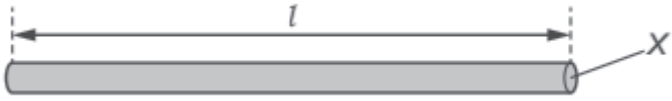
39. Study the following diagram.



Which one of the above diagrams represent a compound?

A. II & III
B. I & IV
C. I only
D. IV only

40. The diagram shows a wire of length l and cross-sectional area X.



Which two changes will increase the resistance of the wire?

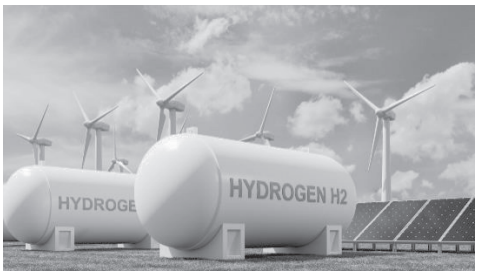
A. decrease l and decrease X
B. decrease l and increase X
C. increase l and decrease X
D. increase l and increase X

41. Thandile's new hair dryer has only two wires connected to a three-pin plug**. A possible reason for this is that ...**

A. there is something wrong with the hair dryer.
B. all hairdryers have only two wires.
C. the hair dryer has a plastic cover.
D. none of the above-mentioned

READ THE FOLLOWING PARAGRAPH AND ANSWER QUESTIONS 42 TO 44.

By working together, South Africa could realise its potential to produce six million to 13-million tons of green hydrogen and derivatives a year by 2050.



It takes energy to produce hydrogen. The source of energy and the production method used to make hydrogen determines whether it's classified as grey hydrogen, blue hydrogen, or green hydrogen. Hydrogen can be made from natural gas, coal, or biomass, but these energy sources have associated greenhouse gas emissions. Hydrogen can also be made using an electrolysis process to split water into oxygen and hydrogen. Fuel cells that run on hydrogen that reacts with oxygen, are used in cars, power plants, cell phones, and computers.

42. Which one of the following is the correct overall reaction of a hydrogen-oxygen fuel cell?

A. $2H_2O \rightarrow 2H_2 + O_2$
B. $2H_2 + O_2 \rightarrow 2H_2O$
C. $H_2 + O_2 \rightarrow H_2O_2$
D. $O_2 + 2H_2O \rightarrow 4OH^-$

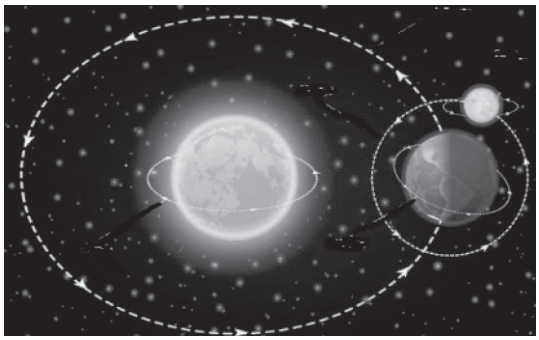
43. Which of the following is sources of energy suitable to produce green hydrogen?

A. Coal and natural gas
B. Biomass & wind
C. Solar and wind
D. Natural gas and biomass

44. The production of … will have the greatest effect on the reduction of global warming?

A. both blue and grey hydrogen
B. grey hydrogen
C. blue hydrogen
D. green hydrogen

45. The diagram illustrates the rotation of the sun, earth and moon.



Which one of the following indicates the correct rotational times?

	Earth around the sun	Moon around the earth	Earth around its axis
A	28 days	28 days	365 days
B	28 days	24 hours	365 days
C	365 days	28 days	24 hours
D	365 days	24 hours	28 days

46. Two forces, **F1** and **F2**, are applied on a crate lying on a frictionless, horizontal surface, as shown in the diagram below.

The magnitude of force **F1** is greater than that of force **F2**.

The crate will …

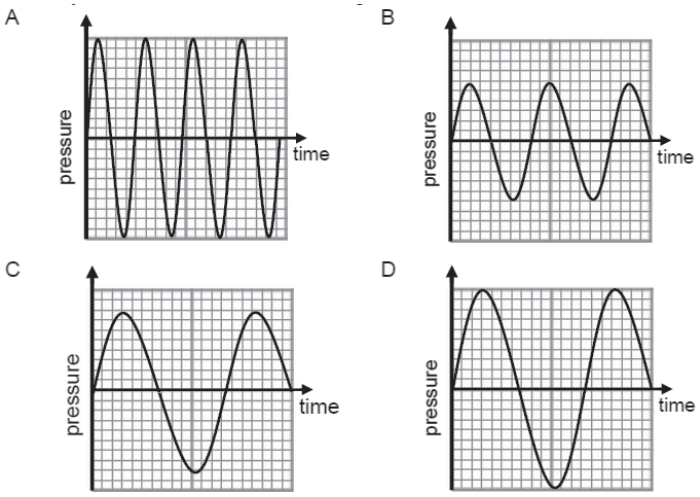
A. accelerate towards the east.
B. accelerate towards the west.
C. move at a constant speed towards the east.
D. move at a constant speed towards the west.

47. The speed of a bicycle increases from 2 $m \cdot s^{-1}$ to 8 $m \cdot s^{-1}$. ($E_k = ½ mv^2$).

Its kinetic energy increases by a factor of …

A. 4 **B**. 6 **C**. 8 **D**.16

48. The pressure versus time graphs below represents a sound wave in air emitted by a stationary source. **Which one of the following graphs best represents the sound wave with the highest frequency and the loudest sound?**



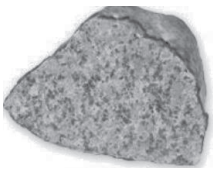
49. The sequence in which food moves along the alimentary canal is ...

A. Oesophagus, stomach, large intestine, small intestine.
B. Oesophagus, small intestine, large intestine, stomach.
C. Oesophagus, stomach, small intestine, large intestine.
D. Oesophagus, small intestine, stomach, large intestine.

50. A possible effect of global warming is ...

A. shorter nights.
B. a rise of the sea level.
C. cooler temperatures.
D. longer days.

51. Which one of the following is formed from melted rock deep inside the earth and is classified as igneous rock?

A. Marble 	**C. Granite** 
B. Chalk 	**D. Sandstone** 

52. The planets in our galaxy with multiple moons are …

A. Saturn and Venus
B. Jupiter and Earth
C. Jupiter and Saturn
D. Jupiter and Venus

53. Which layer of the Earth is primarily composed of iron and nickel?

A. Crust
B. Mantle
C. Outer Core
D. Inner Core

54. What is the primary cause of the Earth's seasons?

A. The Earth's distance from the Sun changes throughout the year
B. The tilt of the Earth's axis
C. The rotation of the Earth on its axis
D. The gravitational pull of the Moon

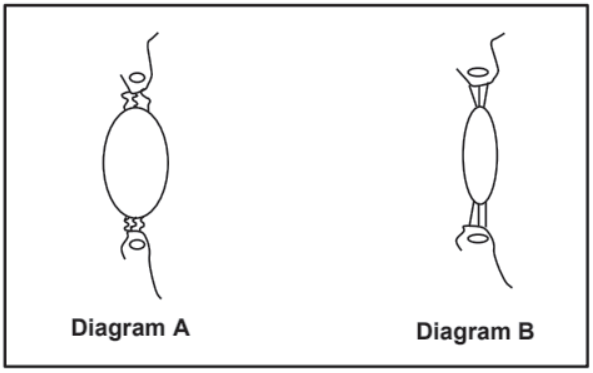
55. How do vaccines primarily provide immunity to infectious diseases?

A. By killing the pathogens directly
B. By stimulating the immune system to produce antibodies
C. By providing nutrients that boost overall health
D. By altering the DNA of the host

56. Which one of the following best explains the process of natural selection?

A. Random mutations that occur in an organism's lifetime
B. The survival and reproduction of organisms best adapted to their environment
C. The intentional breeding of organisms by humans
D. The migration of species to new environments

57. Diagram A and diagram B below represent the same part of the same human eye under different conditions.



Which diagram, with a corresponding reason, represents a person looking at an object 10 metres away?

A. Diagram B because the suspensory ligaments are tight, and the lens is less convex.
B. Diagram B because the lens is more convex, and the suspensory ligaments are slack.
C. Diagram A because the lens is more convex, and the suspensory ligaments are slack.
D. Diagram A because the suspensory ligaments are tight, and the lens is less convex.

58. The table below compares the rate of extinction of mammal species over two different time periods.

TIME PERIOD (YEARS)	RATE OF EXTINCTION (PER 100YEARS)
1500 – 1900	4,5
1900 - 2000	90

What is the ratio between the rate of extinction from 1500 to 1900 compared to the rate of extinction from 1900 to 2000?

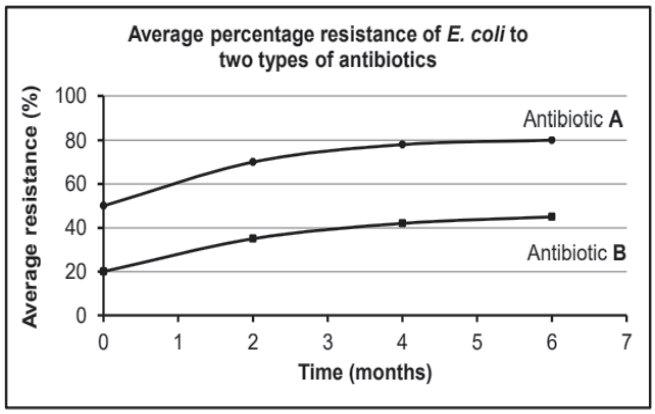
A. 1 : 20
B. 1 : 2
C. 2 : 1
D. 20 : 1

USE THE FOLLOWING INFORMATION TO ANSWER QUESTIONS 59 TO 60.

The E. coli bacterium lives in the intestines of pigs where they reproduce rapidly. Certain strains of E. coli cause diarrhea in young pigs (piglets).

Scientists carried out an investigation using 100 piglets to determine the resistance of E. coli to two antibiotics, A and B over a period of six months.

The results are shown in the graph below.



59. The independent variable in this investigation is the …

A. average resistance (%) of E. coli
B. time (in months)
C. type of antibiotic
D. number of piglets used for the investigation

60. The results show that …

A. antibiotic A is more effective than antibiotic B.
B. antibiotic B is more effective than antibiotic A.
C. Both antibiotic A and B were ineffective after 6 months.
D. It took 6 months for the antibiotics to become effective.

NOTES:

NOTES: