OUNDLE
School

13+ Non-Common Entrance
2025

Science

Time allowed: 60 minutes

Name: _____

Instructions

- There are **THREE** sections. You should attempt the questions in all sections.
- There is a Periodic Table on the last page for your use in the Chemistry section.
- Calculators are allowed.
- Answer on the paper.
- You are expected to write clearly and accurately throughout each of your answers.
- You should leave some time towards the end of the examination to check your work carefully.
- The maximum number of marks for this paper is 83

SECTION ONE: BIOLOGY
[*29 marks*]

Multiple Choice Section

Circle the letter that you believe is the correct one. If you wish to change your mind, then place a cross through your original answer and then circle another letter.

1. **What is the function of the nucleus in a cell?**

   A To store nutrients
   B To control the activities of the cell
   C To produce energy
   D To break down waste

2. **Which of the following nutrients is mainly used by the body for growth and repair?**

   A Carbohydrates
   B Vitamins
   C Fats
   D Proteins

3. **What is the main product of photosynthesis?**

   A Oxygen
   B Glucose
   C Carbon dioxide
   D Water

4. **Which of these best describes a consumer in a food chain?**

   A An organism that produces its own food
   B An organism that decomposes dead material
   C An organism that eats other organisms
   D An organism that provides energy to the ecosystem

5. **Where does fertilization usually occur in the human body?**

   A Uterus
   B Ovary
   C Vagina
   D Fallopian tube

6. What is the word equation for aerobic respiration?

A Glucose → Lactic acid + Energy
B Glucose + Oxygen → Carbon dioxide + Water + Energy
C Carbon dioxide + Water → Glucose + Oxygen
D Oxygen + Energy → Glucose + Water

7. Camels are adapted to desert environments. Which of the following is one of their adaptations?

A Large ears to release heat
B Wide feet to prevent sinking in sand
C Thin fur to stay cool
D Brightly colored skin for camouflage

8. Which type of microorganism is responsible for causing athlete's foot?

A Bacteria
B Virus
C Fungus
D Protozoa

9. What is the correct order of biological classification from largest to smallest?

A Kingdom, Phylum, Class, Order, Family, Genus, Species
B Species, Genus, Family, Order, Class, Phylum, Kingdom
C Genus, Species, Family, Order, Class, Phylum, Kingdom
D Family, Order, Class, Phylum, Kingdom, Genus, Species

10. What causes variation within a species?

A Only environmental factors
B Only genetic factors
C Both genetic and environmental factors
D Neither genetic nor environmental factors

(Total for section = 10 marks)

Written Answer Section

11. Frances is a dancer.

a. When Frances dances her arms and legs are moved by pairs of antagonistic muscles.

How do antagonistic muscles pairs work?

Write the correct letter in the box.

A Both muscles contract at the same time

B One muscle is big and one muscle is small

C As one muscle contracts, the other muscle relaxes

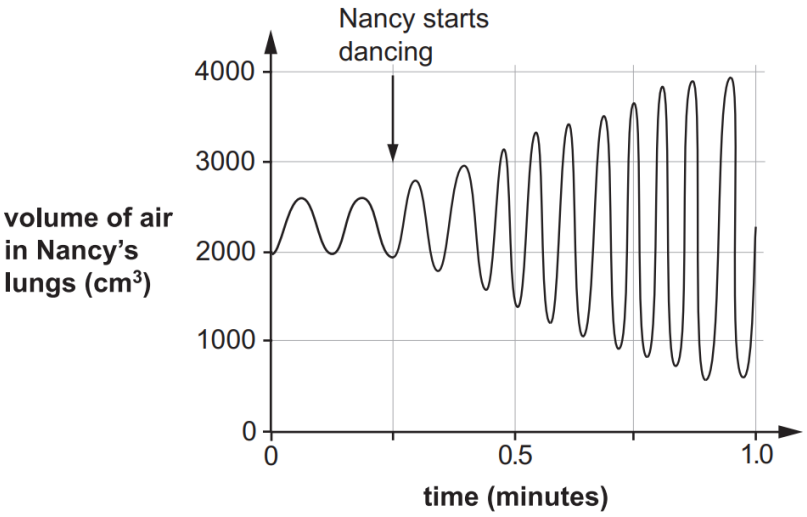
D One muscle is strong and the other muscle is weak

E Both muscles relax at the same time

Write your answer in the box.

b. As Frances dances her breathing changes because she needs more oxygen.

The graph below shows how the volume of air in her lungs changes when she dances.



From the graph, give **two** ways her breathing changes when she dances.

i. _____

ii. _____

c. Frances' muscle cells produce carbon dioxide as she dances.

Which of the following shows how the carbon dioxide is removed from Frances' body?

Write the correct letter in the box.

A muscle cells → bloodstream → windpipe → lungs → nose

B muscle cells → windpipe → lungs → bloodstream → nose

C muscle cells → windpipe → bloodstream → lungs → nose

D muscle cells → bloodstream → lungs → windpipe → nose

Write your answer in the box.

(Total for question = 4 marks)

12. A science class is investigating the behaviour of centipedes.

The photograph below show a centipede.

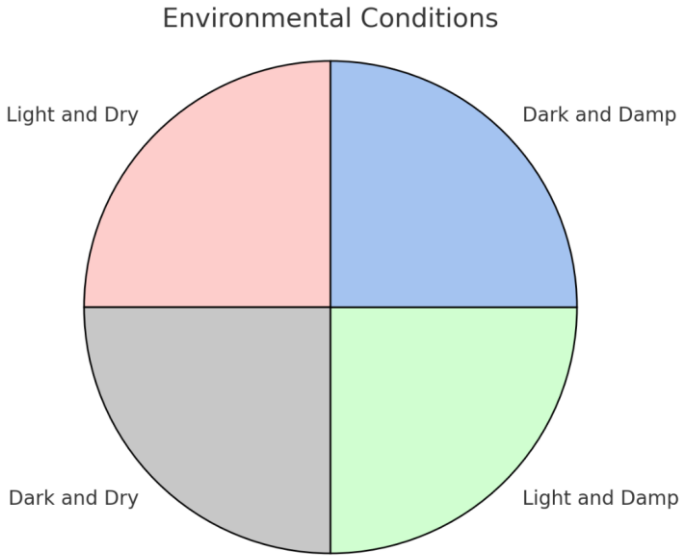
Centipedes are arthropods.

a. Give two characteristics of an arthropod.

i. _____

ii. _____

b. 60 centipedes were put into a choice chamber with four different environments.



After 15 minutes, the number of centipedes in each chamber was counted.

The class repeated the experiment four times.

The results for each of the four experiments are shown in the table below.

Experiment number	Numbers of centipedes in each environment			
	Light and dry	Dark and dry	Light and damp	Dark and damp
1	0	0	4	56
2	1	4	8	47
3	2	2	7	49
4	1	2	5	52
Total		8		204
Mean	1	2		

Calculate the missing numbers to complete the table

c. Describe the results of the experiment

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

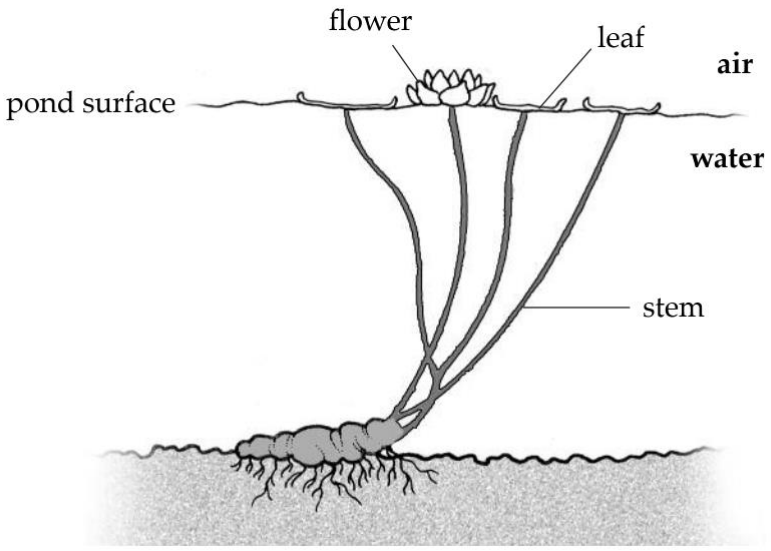
d. Suggest why it is helpful to repeat the experiment four times.

_____

_____

(Total for question = 9 marks)

13. The diagram below shows a water lily plant.



a. Water lilies do **not** grow well in moving water.

Suggest a reason for this.

_____

_____

b. During the winter, many water lily plants do not grow new leaves.

Suggest one reason why the plants do not grow new leaves in the winter

_____

c. Lilies are adapted to live in water.

i. Give one way water lily plants are adapted to live in water.

_____

ii. Explain how this adaptation helps the water lily to grow in water

_____

_____

_____

d. In the summer, water lilies produce large yellow flowers.

The flowers float on the surface of the pond.

Suggest one way these colourful floating flowers help the water lily to reproduce.

_____

e. When water lilies cover the pond surface with leaves, the pond does not get as hot during the day.

Explain why the pond does not get as hot.

_____

_____

(Total for question = 6 marks)

END OF SECTION

SECTION TWO: CHEMISTRY
[24 *marks*]

Multiple Choice Section

Circle the letter that you believe is the correct one. If you wish to change your mind, then place a cross through your original answer and then circle another letter.

1. Which of the following is an example of a mixture?

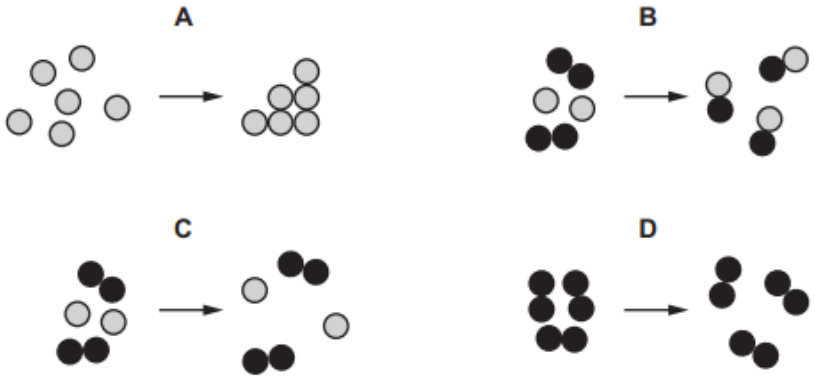
   A Water
   B Carbon dioxide
   C Salt water
   D Iron

2. Iron(III) oxide is reduced by carbon monoxide to produce iron and carbon dioxide.

   What is the balanced equation for this reaction?

   A $Fe_2O_3 + 2CO \rightarrow 2Fe + 2CO_2$
   B $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
   C $2Fe_2O_3 + 6CO \rightarrow 2Fe + 6CO_2$
   D $2Fe_2O_3 + 3CO \rightarrow 4Fe + 3CO_2$

3. Which diagram represents a chemical change?



4. A pure substance has a melting point of -100°C and a boiling point of -4°C.

   What state is the substance is at -25°C?

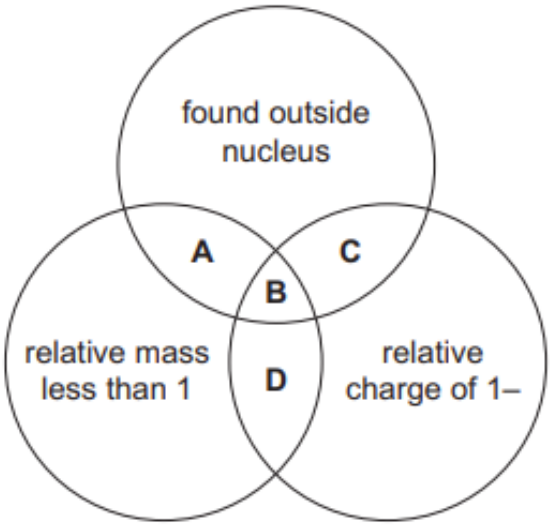
   A solid
   B liquid
   C gas
   D it's not possible to tell

5. Which row about elements in the Periodic Table is correct?

	Statement 1	Statement 2
A	two elements in the same group have similar chemical properties	metals are on the left of the table
B	two elements in the same group have similar chemical properties	metals are on the right of the table
C	two elements in the same period have similar chemical properties	metals are on the left of the table
D	two elements in the same period have similar chemical properties	metals are on the right of the table

6. The diagram shows some properties of particles in an atom.

   To which labelled part of the diagram do electrons belong?



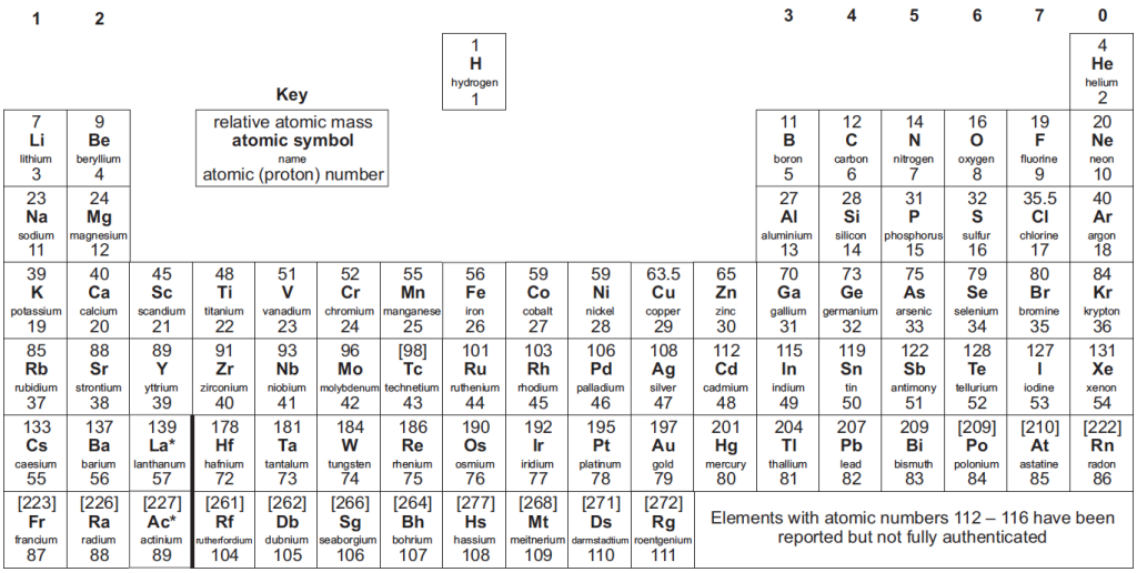
7. When a salt dissolves in water, what is the salt known as?

   A solute
   B solvent
   C solution
   D saturation

8. A gas turning directly into a solid when cooled is called:

   A Freezing
   B Sublimation
   C Dissolving
   D Deposition

9. The picture below shows the periodic table.



1	2											3	4	5	6	7	0
							1 H hydrogen 1										4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111							

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

Elements with atomic numbers 112 – 116 have been reported but not fully authenticated

Which statement is correct?

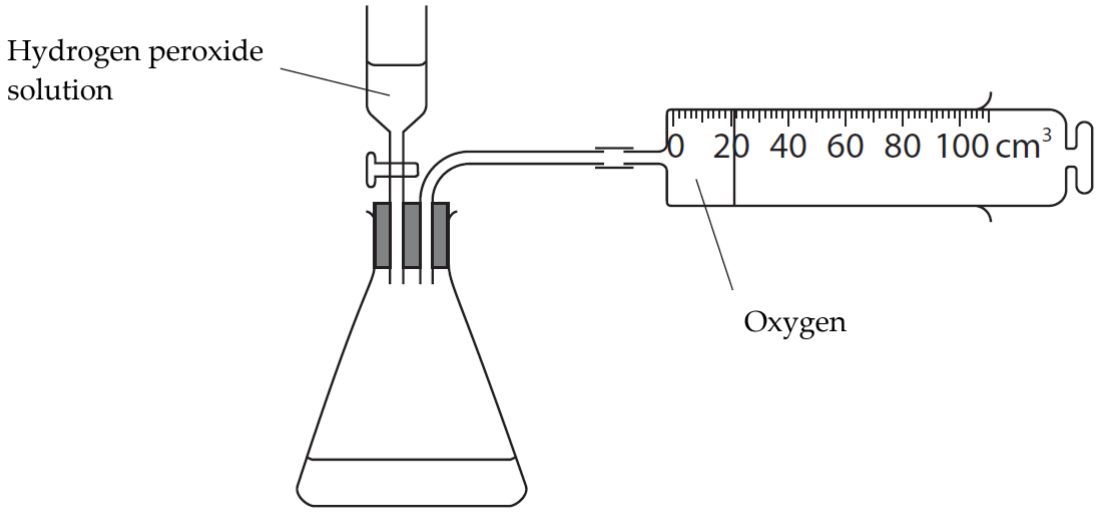
A The elements are organised in increasing relative atomic mass
B The symbol for the element in Group 1 and Period 3 is K
C Chlorine is a non-metal solid that is yellow
D An element that is used in the manufacture of steel is carbon

10. Which of the following is a characteristic of a liquid?

A It flows and takes the shape of its container.
B Its particles are tightly packed in a fixed arrangement.
C Its particles are far apart and move freely.
D It can be compressed easily

Written Answer Section

11. Harsha is using the apparatus below to make and collect oxygen gas.



The equation for the reaction is:

$$2H_2O_2(l) \rightarrow 2H_2O(l) + O_2(g)$$

a. Give a reason why the oxygen collected is not pure oxygen.

_____

b. Harsha wishes to speed up the rate of the production of the oxygen gas.

Which of the following processes should she use?

A Decrease the concentration of the hydrogen peroxide
B Increase the temperature of the room
C Stir the hydrogen peroxide
D Increase the surface area of the solution

Write your answer in the box.

c. Name the type of reaction that is happening when hydrogen peroxide changes to oxygen and water.

_____

d. Harsha's teacher tells her that catalysts also speed up the rate of the production of the oxygen gas.

Harsha wishes to determine which of three substances is the best catalyst.

She uses:

Liver
Manganese dioxide, MnO_2
Lead oxide, PbO_2

Describe a method that Harsha could use to find out which of the three substances is the best catalyst.

In your method, you should refer to the independent, dependent and control variables that Harsha should use.

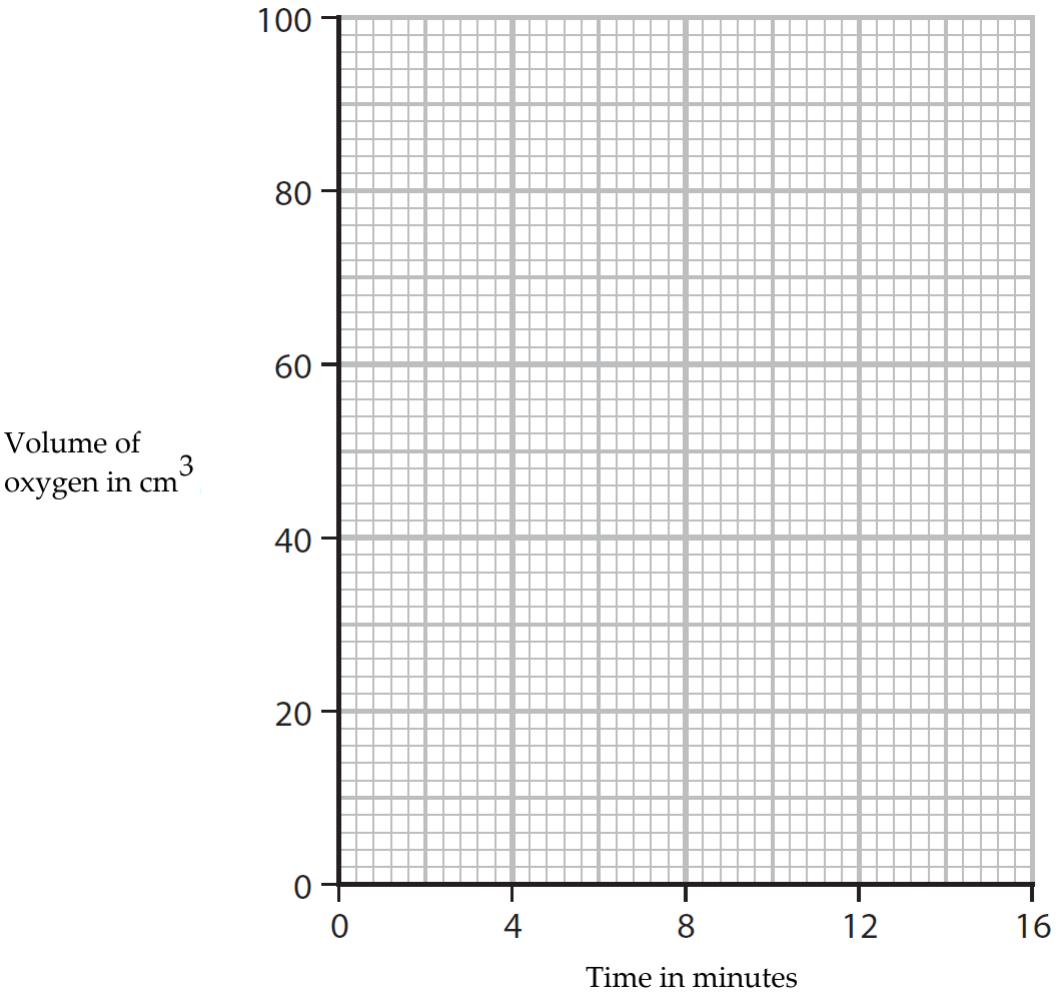
e. Harsha records the amount of oxygen produced every 2 minutes for 16 minutes.

The table shows her results.

i. Plot Harsha's results on the grid

ii. Draw a circle on the grid around the anomalous result.

iii. Draw a curve of best fit through the points, ignoring the anomalous result.



iv. Suggest a mistake that the student might have made to cause the anomalous result.

_____

_____

f. Determine the volume of oxygen collected during the first 3 minutes.

Show on your graph how you obtain your answer.

volume of oxygen = _____cm^3

(Total for question = 14 marks)

END OF SECTION

SECTION THREE: PHYSICS
[30 *marks*]

You may find these equations and data useful

$Weight = mass \times g$

$Voltage = Current \times Resistance$

$Moment = Force \times perpendicular\ distance\ from\ the\ pivot$

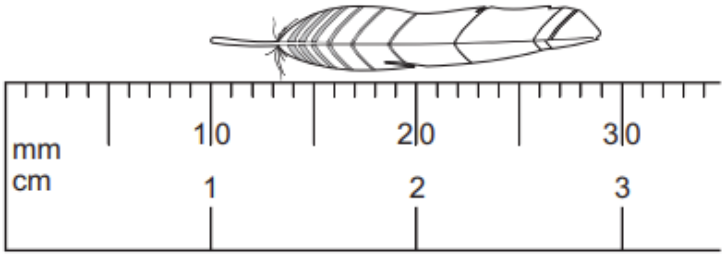
$Force = mass \times acceleration$

$Charge = current \times time$

Multiple Choice Section

Circle the letter that you believe is the correct one. If you wish to change your mind, then place a cross through your original answer and then circle another letter.

1. The diagram shows an enlarged drawing of the end of a metre ruler. It is being used to measure the length of a small feather.



What is the length of the feather?

A 19mm
B 29mm
C 19cm
D 29cm

2. What is the name of the process by which heat is transferred through a metal rod?

A Radiation
B Conduction
C Convection
D Evaporation

3. A measuring cylinder contains 40cm^3 of water.

A solid metal ball is dropped into the water and the water level rises to 56cm^3.

The mass of the ball is 80g.

What is the density of the metal from which the ball is made?

A 0.20g/cm^3
B 1.4g/cm^3
C 2.0g/cm^3
D 5.0g/cm^3

4. What is the role of friction in motion?

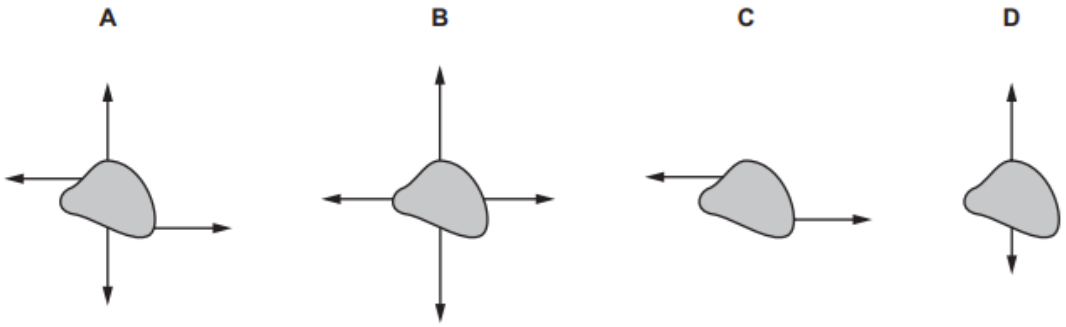
   A It helps objects move faster.
   B It resists the motion of objects.
   C It causes objects to heat up.
   D It changes the shape of objects.

5. What happens to light when it passes through a prism?

   A It slows down and becomes invisible.
   B It gets absorbed by the prism.
   C It bends and splits into different colors.
   D It speeds up and stays a single color.

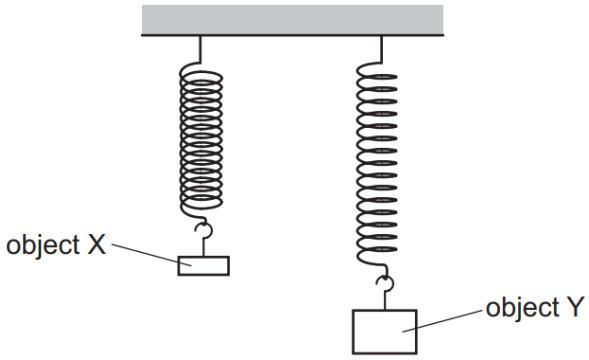
6. Forces are applied to four identical objects. The length of each arrow indicates the magnitude of the force.

   Which object is in equilibrium?



7. The diagram shows two objects, X and Y, suspended from identical springs.

   The extension of each spring is different.



   Which row compares the mass and the weight of the two objects?

	mass	**weight**
A	both objects have the same mass	both objects have the same weight
B	both objects have the same mass	the weight of X is less than the weight of Y
C	the mass of X is less than the mass of Y	both objects have the same weight
D	the mass of X is less than the mass of Y	the weight of X is less than the weight of Y

8. A note with a pitch lower than middle C has a smaller

   A amplitude
   B frequency
   C speed
   D wavelength

9. How is a temperature in degrees Celsius (°C) converted to a temperature in kelvin (K)?

   A Add 273 to the temperature in °C
   B Divide the temperature in °C by 273.
   C Multiply the temperature in °C by 273.
   D Subtract 273 from the temperature in °C

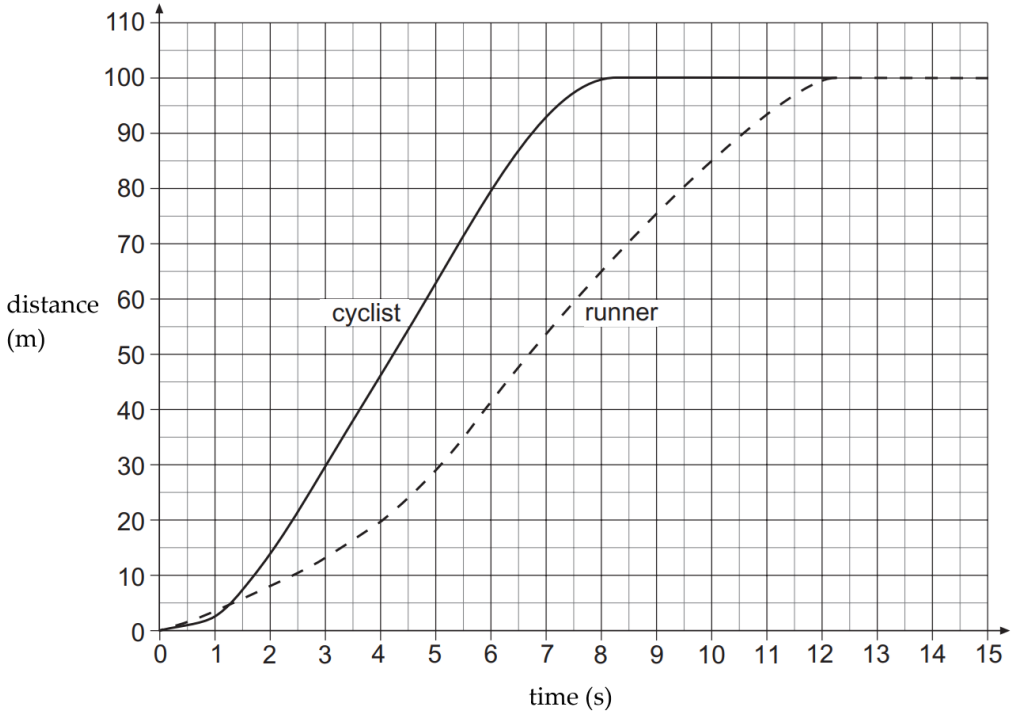
10. The planet in our solar system next closest to the Sun after Earth is:

A the moon
B Mars
C Mercury
D Venus

Written Answer Section

11. A cyclist and a runner have a race.

The distance-time graph for the race is shown below.



a. Use the graph to answer the following questions

i. How much time did it take the cyclist to travel 100 m?

_____ s

ii. When the cyclist finished the race how far behind was the runner?

_____ m

iii. How much more time did the runner take compared with the cyclist to complete the race?

_____ s

b. The cyclist is travelling at a constant speed between 3 seconds and 6 seconds.

How does the graph show this?

_____

_____

c. When the race started, a walker set off at a steady speed of 2 m/s.

Draw a line on the graph to show the distance covered by the walker in the first 15 seconds.

Use a ruler.

d. Calculate how much time it will take for the walker to walk 100m.

Show your working

_____

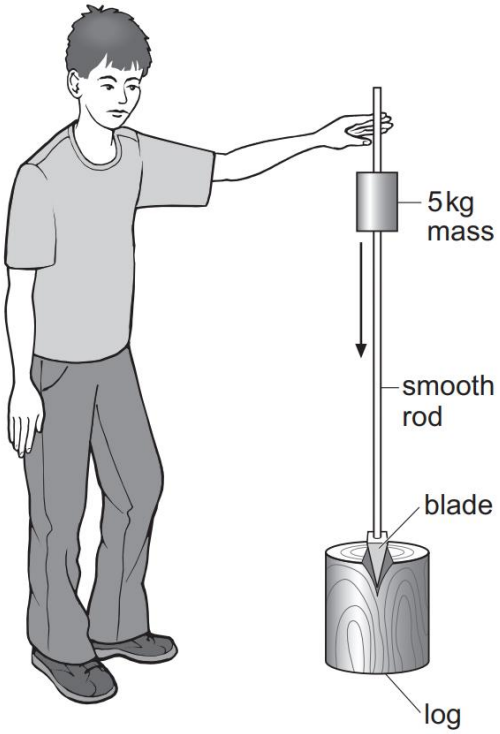
_____ s

(Total for question = 6 marks)

12. Yang uses a falling mass to split wooden logs.

The 5 kg mass slides down the rod and hits the metal blade.

The force on the blade splits the log.



a. To lift the mass Yang uses energy stored in his muscles.

What energy transfer occurs when Yang's muscles lift the mass?

_____ energy in his muscles

_____ energy of the mass

b. Yang lifts the mass. The mass gains 50 J of gravitational potential energy. The falling mass changes this energy into kinetic energy.

i. As it falls, what is the maximum amount of energy the mass can change from gravitational potential energy to kinetic energy?

_____ J

c. Not all the gravitational potential energy is transferred to kinetic energy as the mass falls.

Give one reason for this.

_____

_____

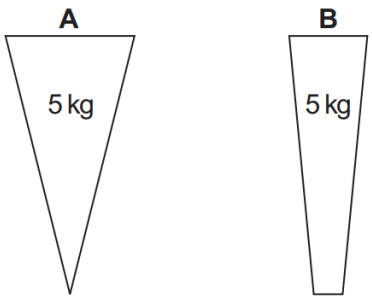
d. Give two ways Yang can increase the kinetic energy of the mass just before it hits the blade.

1. _____

2. _____

e. Yang can use a different blade to split the logs.

The diagram below shows two different blades A and B



f. Explain which blade puts more pressure on the log.

Show your working.

_____

_____

_____

_____

(Total for question = 6 marks)

13. The owner of a small factory suggests installing solar panels to generate some of the electricity needed by the factory.

    a. Give one **environmental** reason for using solar panels.

_____

    b. Discuss **three** of the factors that the owner will need to consider when deciding whether to install a solar panels.

_____

_____

_____

_____

_____

_____

_____

_____

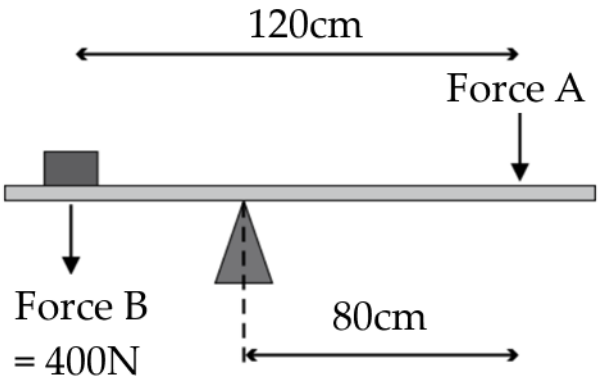
_____

_____

(Total for question = 5 marks)

14. What is the size of the moment created by Force B in the diagram?

Moment = force (in N) x perpendicular distance (in metres)



Show your working.

_____Nm

(Total for question = 3 marks)

END OF SECTION

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.*

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.