Science Spring Diagnostic Assessment 2023-24

Year 9 - Section A

Time allowed: 30 minutes

Total 30 marks

Materials

- a black or blue pen

Information

- There are a total of 30 multiple-choice questions
  - There are 10 biology, 10 chemistry and 10 physics questions
- Each question has 4 options: A, B, C or D
- You can make notes and show workings on the paper
- There is a periodic table on page 2

Instructions

- Circle the letter of the **one** correct option for each of the multiple-choice questions as shown in this example

Q2. What should you always bring to science exams?

A. A glue stick
B. A calculator
C. A highlighter
D. Paper clips

- If you make a mistake, draw a cross through the mistake and draw a circle around your answer. If this looks unclear, write the letter next to question

Surname: _____

Forename(s): _____

Class and teacher: _____

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	[285] **Cn** copernicium 112	[286] **Uut** ununtrium 113	[289] **Fl** flerovium 114	[289] **Uup** ununpentium 115	[293] **Lv** livermorium 116	[294] **Uus** ununseptium 117	[294] **Uuo** ununoctium 118

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

* The Lanthanides (atomic numbers 58 – 71) and the Actinides (atomic numbers 90 – 103) have been omitted.

Relative atomic masses for **Cu** and **Cl** have not been rounded to the nearest whole number.

Science Mastery

BIOLOGY

Q1. Biodiversity is…

A. the interaction of the biotic and abiotic factors in a particular area.
B. the variety of characteristics in a population.
C. the variety of all the different species in an ecosystem.
D. the different populations in a community.

Q2. Four students had different ideas about biodiversity.

Choose which student is correct.

A. Biodiversity is not affected by pollution
B. Humans are not affected by biodiversity, only animals and plants are affected
C. The use of peat in compost increases biodiversity because compost is used to grow different crops
D. Biodiversity maintains ecosystems because it reduces the need for one species to rely on another for survival

Q3. Choose the option that is **not** an effect of poor waste management.

A. Quarrying of land causing reduction in biodiversity
B. Toxic chemicals in landfill waste
C. Acidic gases in the atmosphere
D. Pollutants killing plants

Q4. Choose which is an example of human-produced water waste.

A. Clean water that fills toilets
B. Water used to make new materials
C. Dirty water produced in farming and factories
D. Watering your house plants

Q5. In a class of 25 students, their height varied from 145 cm to 170 cm.

This variation in height is …

A. caused by differences in quality of diet and amount of exercise.
B. because each student is the average height of their parents' heights.
C. caused by a combination of inherited characteristics and environmental factors.
D. because each student inherits different characteristics from their parents.

Q6. Choose the population that would be the most important to protect in order to maintain biodiversity in a Chinese mountainous ecosystem.

A. Giant panda
B. Aedes Mosquito
C. Chinese jumping mouse
D. The giant panda, the aedes mosquito and the Chinese jumping mouse are all equally important to protect

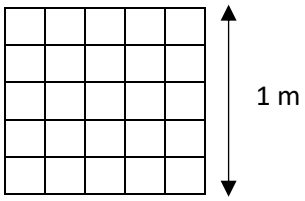
Q7. Choose the true statement about selective breeding (artificial selection).

A. Selective breeding is only used in animals, for example for pets and for farming
B. Breeding closely related animals can cause genetic disease to become more common in the population
C. Selective breeding is when animals in nature reproduce and have particular characteristics
D. Selectively bred organisms can always survive normally in the wild

Q8. Choose the biotic factor that would **decrease** the number of individuals in a population of bees.

A. A decrease in the temperature
B. Decrease in the number of predators eating bees
C. Increase in the availability of water
D. A new disease that kills bees

Q9. Below shows a diagram of a quadrat.



The length of one side is 1 metre.

Choose the correct total area of the quadrat.

A. 4 m^2
B. 1 m^2
C. 25 m^2
D. More information is needed about the lengths of the other sides of the quadrat

Q10. Choose the option that best describes an approach we can take to increase biodiversity.

A. Growing hedgerows on farmland where only one crop was previously growing
B. Increasing deforestation to create more farmland for growing crops
C. Selective breeding to make the most efficient crops for growing food
D. Grow more crops for food to feed a growing population

CHEMISTRY

Q1. Choose the correct order of steps when making a soluble salt from an acid and an insoluble metal oxide.

A. Filtration → neutralisation reaction → evaporation → crystallisation
B. Filtration → neutralisation reaction → crystallisation → evaporation
C. Neutralisation reaction → filtration → evaporation → crystallisation
D. Neutralisation reaction → filtration → crystallisation → evaporation

Q2. Choose the correct conversion from 12 dm^3 to cm^3.

A. 1200 cm^3
B. 0.012 cm^3
C. 12,000 cm^3
D. 120 cm^3

Q3. Calculate the relative formula mass (M_r) of lead nitrate $Pb(NO_3)_2$

Relative atomic masses (A_r):

N = 14 O = 16 Pb = 207

A. 269
B. 297
C. 490
D. 331

Q4. The following hazard symbol can be found on some bottles in a chemistry laboratory.

This hazard symbol can be found …



A. only on acidic solutions.
B. only on alkaline solutions.
C. on both acidic and alkaline solutions.
D. on all solutions in the laboratory.

Q5. Below shows a method to compare the pH of two different solutions.

- Use an indicator that will tell you the pH
- Put the solutions in a container
- Add the indicator
- Write down your observations

Choose the statement which best describes how this method could be improved.

A. Repeat the method 3 times and then calculate the mean

B. Use specific names of equipment and chemicals

C. Add numbered steps rather than bullet points

D. Add in a results table so the observations are properly recorded

Q6. Choose the option that describes a chemical change.

A. Two colourless liquids are mixed to form a blue liquid

B. A liquid is heated up in a test tube until bubbles are seen

C. A lump of a solid compound dissolves in a colourless liquid to form a colourless solution

D. A colourless gas becomes a liquid when the temperature decreases by 20°C

Q7. Heating calcium carbonate causes thermal decomposition, producing calcium oxide and carbon dioxide.

100g calcium carbonate thermally decomposes into 56g calcium oxide and what mass of carbon dioxide?

A. 0 g because gases don't have mass

B. 156 g

C. 44 g

D. 56 g

Q8. 2.5 dm^3 of sodium chloride solution was used in an investigation.

The concentration of the sodium chloride solution was 0.1 g/dm^3.

What mass of sodium chloride is in 2.5 dm^3 of this solution?

A. 25 g
B. 0.25 g
C. 0.1 g
D. 0.04 g

Q9. Choose the symbol equation that is correctly balanced.

A. $Fe + H_2SO_4 \rightarrow Fe_2(SO_4)_3 + H_2$
B. $2\ Fe + H_2SO_4 \rightarrow Fe_2(SO_4)_3 + H_2$
C. $2\ Fe + 3\ H_2SO_4 \rightarrow Fe_2(SO_4)_3 + 3H_2$
D. $Fe + 3\ H_2SO_4 \rightarrow Fe_2(SO_4)_3 + 3H_2$

Q10. A student tested some gas that they had collected in a test tube.

They inserted a burning splint into the gas and heard a squeaky pop.

Choose which gas was present in the test tube.

A. Carbon dioxide
B. Oxygen
C. Calcium hydroxide
D. Hydrogen

PHYSICS

Q1. A material that is a thermal insulator...

A. only allows heat to travel through slowly.
B. allows heat to travel through quickly.
C. doesn't change temperature.
D. has a shiny, silver surface.

Q2. Which of the following will have the **most** internal energy?

A. 1 kg of steam
B. 1 kg of water
C. 1 kg of ice
D. Steam, water and ice have the same internal energy because they are the same substance in different states

Q3. 1527 kJ energy was transferred to water at 100°C.

The specific latent heat of vaporisation of water is 2.26×10^6 J/kg.

Calculate the mass of water changed into a gas at 100°C.

A. 3.45×10^9 kg
B. 0.68 kg
C. 1.48 kg
D. 675.67 kg

Q4. A metal block had a mass of 1.25 kg.

The specific heat capacity of the metal was 950 J/kg °C.

Calculate the change in thermal energy when the temperature of the metal block increased from 20 °C to 50 °C.

A. 35.6 kJ
B. 35.6 J
C. 59.4 kJ
D. 59.4 J

Q5. The specific heat capacity of a substance is …

A. the temperature in degrees Celsius needed to increase the energy of 1 kg of the substance by 1 kJ.
B. the specific amount of heat needed to raise the energy of 1 kg of the substance by 1 kJ.
C. the amount of energy needed to raise the temperature of 1 kg of the substance by one degree Celsius.
D. the amount of mass in kg, that increases by one degree Celsius when the substance gains 1 kJ thermal energy.

Q6. Choose the correct words that complete the blanks below.

The particles in a gas are in constant random motion.

When the temperature of the particles in a gas is increased, the particles have more _____1_____ energy and gas pressure _____2_____ .

A.	1 = thermal	2 = increases
B.	1 = thermal	2 = decreases
C.	1 = kinetic	2 = increases
D.	1 = kinetic	2 = decreases

Q7. Why does a battery in a phone need to be recharged?

A. The store of power has been reduced
B. The store of chemical energy has been reduced
C. The store of kinetic energy has been reduced
D. The store of thermal energy has been reduced

Q8. Choose the best description of **temperature**.

A. The total energy of all the particles moving inside an object
B. How hot or cold something is. This is related to the average energy of its particles
C. A type of substance that causes something to heat up
D. A type of energy measured in joules

Q9. A light bulb has 500 J of energy.

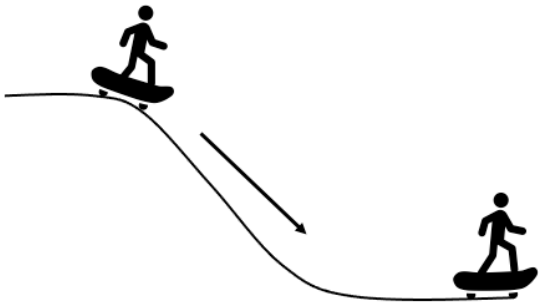
450 J is transferred out into the surroundings by radiation (light).

50 J of energy is transferred by heating.

Calculate the percentage efficiency of this energy transfer.

A. 10%
B. 11 %
C. 90 %
D. 100 %

Q10. A skateboarder travels from the top of a slope to the bottom, shown in the diagram below. As the skateboarder travels down the slope, energy is transferred.



Which statement is correct?

A. All gravitational potential energy is transferred to the kinetic store
B. All kinetic energy is transferred to the gravitational potential store
C. Some heat energy is created because of friction with the ground
D. Some energy is wasted as heat because of friction

End of Science Assessment