2020 Year 10 Science Topic Tests Information Sheet

2020 Year 10 Science Topic Tests is a set of structured test questions and their solutions.

The covered topics are

- Biological sciences
- Chemical sciences
- Earth and space sciences
- Physical sciences

Each of these tests consist of:

Section A: Multiple choice questions section (10 questions)
Section B: Short answer section (4-5 questions)

Please also note the following information.

Distribution
We will email zipped copies to you

File format
MS Word docx format (compatible with word 2007/2010/2013/2016)

Sample
We have attached sample questions below

Release date
1st of March 2020

Price
$120

2020 Year 10 Biological Sciences Topic Test

Time allowed: 1 hour
Total marks: 35 marks

SECTION A – MULTIPLE CHOICE (1 mark each)

Question 1
How many different types of nitrogenous bases are there in a DNA molecule?
A. 3
B. 4
C. 8
D. 23
E. 46

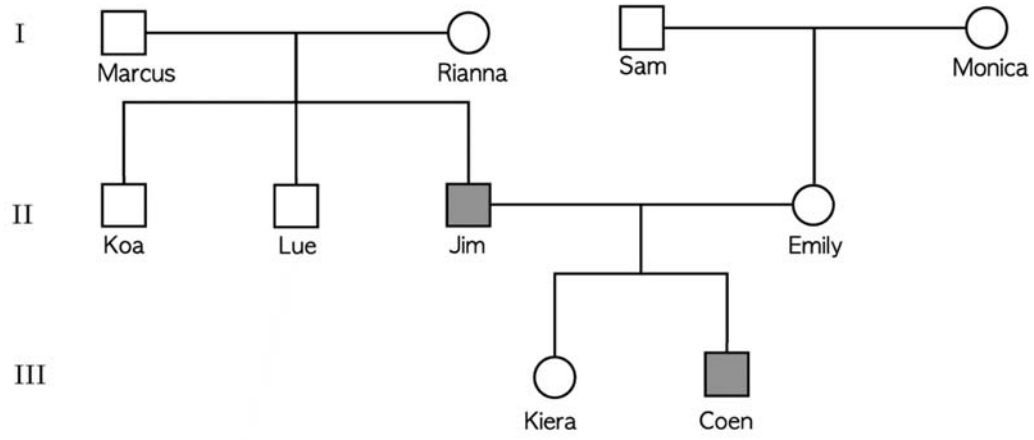
Question 2
Which of the following sentences best describes a chromosome?
A. a complementary copy of ribonucleic acid
B. a homozygous pair of genes
C. a type of cell division
D. a DNA molecule tightly wound around small proteins
E. an organism's reproductive cell

Question 3
Gregor Mendel is widely regarded as the 'father of genetics.'
Which of the following sentences best describes Mendel's principle of independent assortment?
A. a gamete must be haploid
B. somatic cells divide by mitosis
C. cytoplasm must be separated from the nucleus
D. yellow peas cannot be interbred with green peas
E. genes are inherited independently of each other

Question 4
Which of the following sentences is correct regarding RNA molecules?
A. RNA molecules are produced via DNA transcription
B. RNA molecules are the building blocks for proteins
C. RNA molecules are confined to the nucleus
D. RNA molecules are identical copies of DNA molecules
E. RNA molecules are structured in double helix form

Question 3 (5 marks)

Red-green colour blindness is an X-linked recessive trait. A pedigree chart of a family with affected members is shown below.



(a) In terms of genetics, what is a carrier? 1 mark

(b) List the names of *all* carriers of red-green colour blindness in the pedigree above. 2 marks

(c) If Coen marries a woman with no red-green colour blindness gene, what would be the chance of their son being red-green colour blind? 2 marks

Question 5

According to solubility rules, which one of the following salts is *insoluble* in water?

A. KCl

B. $LiNO_3$

C. Na_2CO_3

D. NH_4NO_3

E. $PbBr_2$

Question 6

What are the substances present at the start of a chemical reaction called?

A. products

B. catalysts

C. precipitates

D. reactants

E. ingredients

Question 7

Nitric acid + Magnesium → Magnesium nitrate + _____

Which one of the following is missing from the word equation above?

A. hydrogen

B. water

C. carbon dioxide

D. oxygen

E. nitrogen

Question 8

Which sentence best describes elements that belong to Group 15 of the periodic table?

A. they have identical electron configurations

B. they have the same atomic number

C. they have an identical number of electrons in their valence shell

D. they have the same number of neutrons

E. they have identical chemical properties

Question 9

Which type of reaction is demonstrated in the equation below?

$$AgNO_3(aq) + KCl(aq) \rightarrow AgCl(s) + KNO_3(aq)$$

A. a single displacement reaction

B. a precipitation reaction

C. a neutralisation reaction

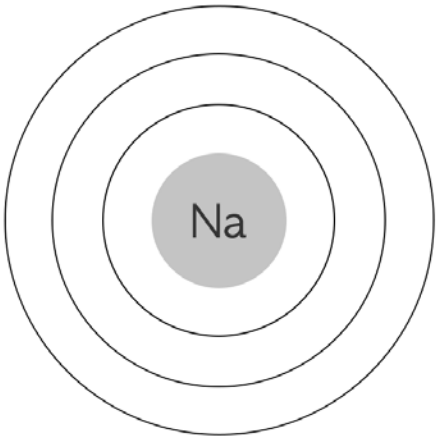
D. a decomposition reaction

E. a combustion reaction

SECTION B – SHORT ANSWERS (5 questions, total 25 marks)

Question 1 (6 marks)
Sodium is an element with the symbol Na and an atomic number of 11.

(a) Fill in the simple shell diagram below to show the correct arrangement of electrons in a sodium atom. 1 mark



(b) If the above sodium atom loses all the electrons from its valence shell, what would be its net ionic charge? 1 mark

_____

(c) Write the correct symbol for the sodium ion. 1 mark

_____

(d) Sodium ions and carbonate ions form the compound sodium carbonate, also known as washing soda (as the compound is frequently used to aid laundry). 2 marks
Explain why sodium ions bond to carbonate ions in terms of ionic charges.

_____

_____

(e) The chemical formula for sodium carbonate is Na_2CO_3. 1 mark
What must be the net charge of a single carbonate ion?

_____

_____

Question 5

Which of the following sentences correctly describes a star with high absolute magnitude and low apparent magnitude?

A. The star is in close proximity to the Earth and appears bright.

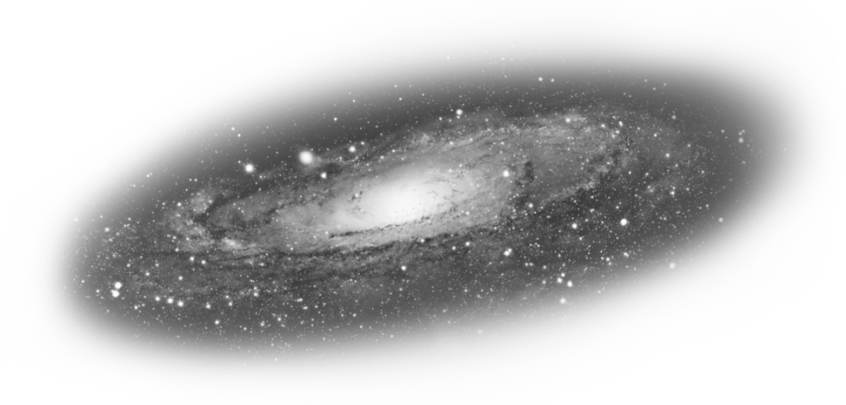
B. The star is far away from the Earth and has a low luminosity.

C. The star is nearing the end of its natural life cycle.

D. The star has a high surface temperature but a relatively lower core temperature.

E. The star has a high luminosity but does not appear bright.

Question 6



What are huge groups of stars, gas, and dust held together by gravity called?

A. planetary nebulae

B. galaxies

C. stellar parallax

D. supernovas

E. constellations

Question 7

What is the process in which plants remove carbon from the atmosphere to make their food?

A. photolysis

B. precipitation

C. photosynthesis

D. decarbonification

E. geosequestration

Question 8

What is air movement caused by pressure differences called?

A. radiation

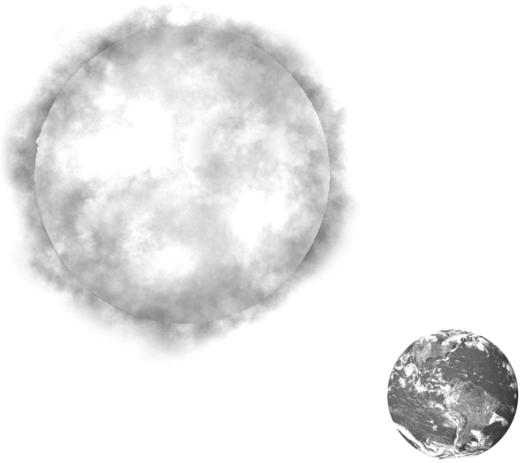
B. conduction

C. wind

D. precipitation

E. convection

Question 4 (6 marks)
The Sun is a star that provides light and heat which are essential to support life on Earth.



(a) What is the reaction that causes the Sun and other stars to emit energy in the form of light and heat? 1 mark

_____

(b) Give a concise description of how new stars are formed. 2 marks

_____

_____

_____

_____

_____

(c) In approximately 5 billion years, the Sun will greatly expand, swallowing up the Earth. What is a star in this state called ? 1 mark

_____

(d) The Sun is **not** a heavy star. Using this information, name what the Sun is expected to become in the final two stages of its death, in chronological order. 2 marks

i)_____

ii)_____

Question 5

Which statement best describes a soccer ball slowing down on a level ground?

A. a positive acceleration is acting on the ball
B. no net force is acting on the ball
C. a small upwards force is acting on the ball
D. the force of friction is changing the ball's speed
E. a large downwards force is decelerating the ball

Question 6

Which of the following is best explained by Newton's second law?

A. a bicycle will slow down on a level road when the rider stops pedalling
B. a passenger without a seatbelt will be thrown forward when the car halts suddenly
C. a rocket will move forward in space by burning the fuel and forcing out the exhaust gas
D. a moving toy car will bounce backwards upon colliding with a stationary toy train
E. a big cat weighs more than a small cat

Question 7

What does the term 'work' mean in physics?

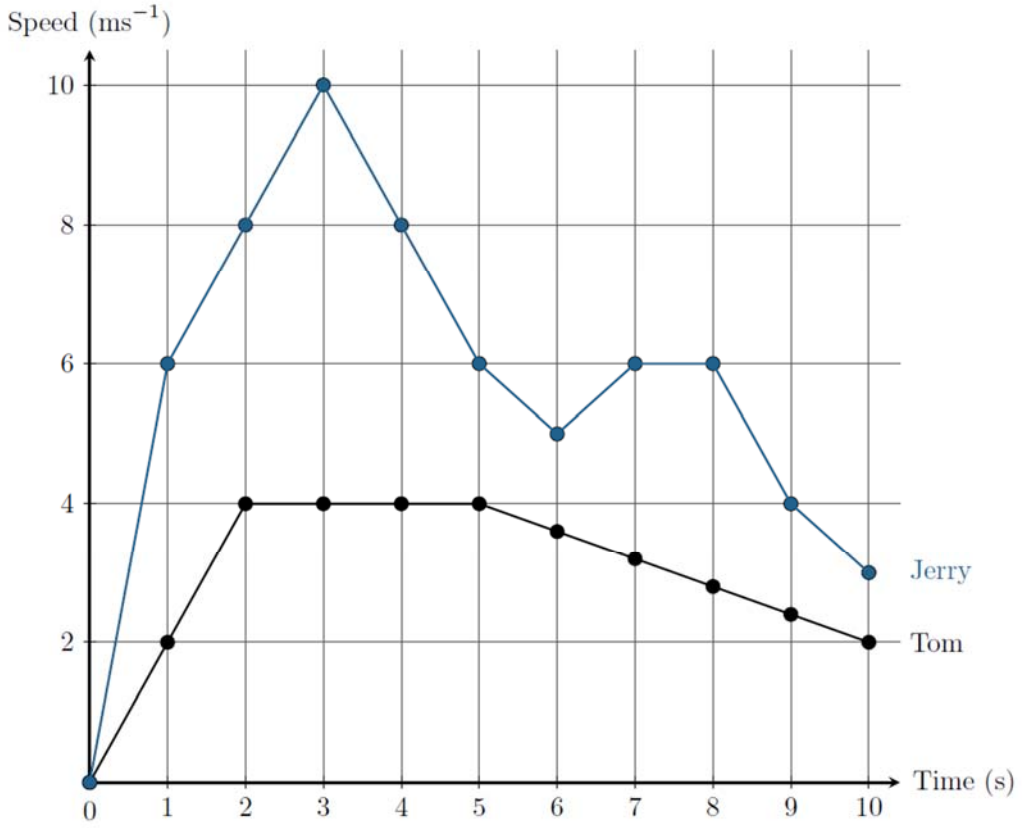
A. the distance travelled per unit of time
B. the amount of force required to accelerate an object
C. a measure of the energy transferred into moving or rearranging an object
D. the product of the mass and velocity of an object
E. any force acting on an object other than gravity

Question 8

What is thermodynamics?

A. the study of the transfer and transformation of thermal energy
B. a quantity of matter with potential thermal energy
C. a transfer of thermal energy that involves physical movement of the material
D. the study of thermal energy possessed by compressed or stretched objects
E. the amount of thermal energy in a closed system no longer available to be transformed

Question 2 (6 marks)
Below is a speed-time graph showing the motions of Tom chasing Jerry.



(a) Based on the graph, describe the motion of Tom throughout these 10 seconds, using the correct numbers and units. 2 marks

(b) What does the area under a speed-time graph represent? 1 mark

(c) What does the gradient of a speed-time graph indicate? 1 mark

(d) Based on the graph, who ran faster during the first two seconds? 1 mark

(e) What is Jerry's maximum speed shown on the graph? Answer in the correct unit. 1 mark

YEAR 10 PHYSICAL SCIENCES FORMULA SHEET

$$s = \frac{d}{t} \qquad d = v \times t \qquad v = \frac{d}{t}$$

$$v = u + at \qquad a = \frac{v - u}{t} \qquad a = \frac{F}{m}$$

$$F = m \times a \qquad w = F \times d \qquad p = m \times v$$

$$KE = \frac{1}{2} \times m \times v^2 \qquad v = \sqrt{\frac{2 \times KE}{m}} \qquad GPE = m \times g \times h$$

Where:

s = speed t = time d = distance

a = acceleration v = final velocity u = initial velocity

F = force m = mass p = momentum w = work

KE = kinetic energy GPE = gravational potential energy

g = gravity (9.8 ms^{-2}) h = height

Question 5
Non-disjunction of a chromosome pair during meiosis causes trisomy.

Answer is **C**.

Question 6
The Lamarckian theory claims that acquired characteristics can be passed onto offspring.

Answer is **C**.

Question 7
Environmental challenges such as scarcity of food encourage evolutionary adaptation through natural selection.

Answer is **E**.

Question 8
Organisms of similar lineage found in adjacent continents, such as similar lungfish species living in both Australian and African waters, is the best example of modern organisms' distribution supporting the continental drift theory. Ants were spread across different continents via human cross-continental trading.

Answer is **A**.

Question 9
Speciation is an evolutionary process that results in the formation of a new species.

Answer is **D**.

Question 10
Artificial selective breeding for ornamental traits such as brighter colour and larger fin size led to the domesticated guppy fish having different fins compared to wild guppies.

Answer is **B**.

Question 4 (6 marks)

(a) vestigial structures 1 mark

(b) Give one mark for any widely accepted example of vestigial structures, such as: 1 mark

- human wisdom teeth
- human appendix
- human coccyx
- human body hair
- nipples in mammalian male
- pelvis and hindlimb buds of snakes
- vestigial hind legs of whales
- vestigial eyes of blind cavefish

● Give 0 marks if the example given is vestigial wings of other flightless bird species such as kiwi, cassowary, rhea, ostrich, etc.

(c) vestigial structures support the theory of evolution by providing evidence of ancestral forms which have once used these structures to perform tasks no longer required in the modern derivative organisms. Thus, in these modern derivatives, the anatomical structures that no longer serve a purpose are going through the evolutionary process of being selected against as it uses additional resources to be fully developed. 4 marks

● Full 4 marks to be granted for outlining the underlined point.

Question 5 (8 marks)

(a) Transitional fossils are intermediary fossils that display characteristics of both ancestral organisms and the derived descendent (accept: modern or evolved) organisms. 2 marks

(b) The two methods are relative dating and absolute dating. 2 marks

● Give one mark for each correct answer.

(c) Relative dating is an approximate dating, as older fossils are generally found in deeper layers of sedimentary rocks than younger fossils. Absolute dating is a more modern and accurate form of dating that measures the level of radioactivity in rocks or fossils containing radioisotopes, determining how many half-lives of a radioactive element have passed. 4 marks

● Give 2 marks for stating relative dating being a less accurate method than absolute dating.
● Give 2 marks for correctly describing the different mechanisms of relative and absolute dating: using the depth of sedimentary rock layers for relative dating and using radioactivity in rocks and fossils for absolute dating.

2020 Year 10 Chemical Sciences Topic Test Answers

Total marks: 35 marks

SOLUTIONS

SECTION A – MULTIPLE CHOICE (10 questions, 1 mark each)

Question	Answer
1	A
2	D
3	E
4	B
5	E
6	D
7	A
8	C
9	B
10	C

Question 1

Neutral atoms have an equal number of protons and electrons. The atomic number is the number of protons, therefore the numbers of protons and electrons in this atom are both 24.

Mass number is the total number of protons and neutrons in an atomic nucleus.
52-24=28, therefore the number of neutrons in this atom is 28.

Answer is **A**.

Question 2

Ionic bonding involves strong electrostatic forces that hold the component ions firmly together in the lattice. Therefore, ionic compounds have a high melting point and are usually a brittle solid at room temperature. An ionic compound is not a metal so the solid should not be malleable.

Answer is **D**.

Question 3

Oxygen must be present in all combustion reactions as a reactant.

Answer is **E**.

Question 4 (4 marks)

(a) $\underline{2}\ C_2H_6 + \underline{7}\ O_2 \rightarrow \underline{4}\ CO_2 + \underline{6}\ H_2O$ 1 mark

(b) $\underline{2}\ KOH + CO_2 \rightarrow K_2CO_3 + H_2O$ 1 mark

(c) $S_8 + \underline{24}\ F_2 \rightarrow \underline{8}\ SF_6$ 1 mark

(d) $\underline{2}\ Ag + H_2S \rightarrow Ag_2S + H_2$ 1 mark

● Give one mark for each correct answer.

Question 5 (7 marks)

(a) In any order: 5 marks
i) appears lustrous (accept: shiny)
ii) conducts heat
iii) conducts electricity
iv) malleable (accept: can be beaten/bent into a different/new shape)
v) ductile (accept: able to be pulled into a wire)
(accept: - high melting/boiling point
- high density)

● Give one mark for each correct answer.

(b) A metal alloy is a mixture of two or more metals. 1 mark

(c) Give one mark for stating any of the below beneficial properties of metal alloys: 1 mark
- increased durability
- increased corrosion resistance
- increased ductility/malleability
- better conductivity for heat and/or electricity

Question 4

Water vapour, methane, carbon dioxide, nitrous oxide are well-known greenhouse gases. Oxygen is not commonly accepted as a greenhouse gas.

Answer is **A**.

Question 5

A star with high absolute magnitude has high luminosity value, and low apparent magnitude means the star's apparent brightness is low (when observed from the Earth). This is due to factors such as distance from the Earth.

Answer is **E**.

Question 6

Groups of stars, gas, and dust held together by gravity are called galaxies.

Answer is **B**.

Question 7

Plants make their own food while removing carbon from the atmosphere in the form of carbon dioxide during the process of photosynthesis.

Answer is **C**.

Question 8

Air movement due to pressure difference is commonly called wind.

Answer is **C**.

Question 9

A neutron star is formed from the remaining core of a large star exploding in novas or supernovas.

Answer is **B**.

Question 10

Distances in space are measured in light-years.

Answer is **E**.

(c) Give one mark each, total three marks, for listing three of the accepted examples below: 3 marks

- geosequestration (accept: burying liquid carbon dioxide in the earth/depleted oil wells)
- carbon farming (accept: planting more trees)
- implementing carbon tax
- decreasing consumption of meat/animal products
- reducing waste production (accept specific examples such as recycling and reusing items)
- decreasing fossil fuel use (accept specific examples, such as increasing utilisation of public transport, buying local produce, etc.)
- reducing deforestation (accept specific examples, such as using recycled paper, reducing paper use, implementing sustainable forestry, etc.)
- using renewable energy (accept specific examples such as using solar panels, wind power, hydropower, etc.)

Question 3 (6 marks)

(a) The Big Bang is a theory that describes how the universe expanded from a small dense singularity (accept: from a high-density state, or similar descriptions). 2 marks

(b) Give one mark for providing a piece of acceptable scientific evidence (underlined parts of the list below), and give three more marks for correctly explaining how the evidence supports the Big Bang Theory. 4 marks

- Red shift (accept: Doppler shift or Hubble's Law) of absorption spectra of galaxies indicate they are moving away from the Earth, and the more distant the galaxy is, the faster it is moving away from the Earth. This supports the Big Bang Theory of the universe expanding.
- The presence of cosmic microwave background radiation provides evidence of leftover energy from the Big Bang existing as background radiation.
- Cosmic temperature fluctuations (accept: fluctuations in cosmic microwave background radiation) correlating with the formation of nearby matter such as hydrogen and stars, shows the energy from the Big Bang having been converted to matter.
- Light from distant galaxies arriving Earth providing timeline comparison between our own galaxy/Milky Way that supports galaxy formation model consistent with the Big Bang.

Year 10 Physical Sciences Test Answers 2020

Total marks: 35 marks

SOLUTIONS
SECTION A – MULTIPLE CHOICES (10 questions, 1 mark each)

Question	Answer
1	B
2	A
3	B
4	D
5	D
6	E
7	C
8	A
9	E
10	C

Question 1
Velocity is a vector measurement of both the speed and direction of a motion.

Answer is **B**.

Question 2
A scalar quantity is a physical quantity that only has magnitude and no other characteristics such as direction.

Answer is **A**.

Question 3
Displacement describes the final position and direction of an object in relation to its starting point. Therefore, a puppy returning to the same starting position after movement is an example of a motion with zero displacement.

Answer is **B**.

Question 4 (10 marks)

(a) 3 marks

$$GPE = m \times g \times h$$
$$= 55 \times 9.8 \times 4$$
$$= 2156 \text{ J}$$

Koa's gravitational potential energy just before riding the flying fox is 2156 J.

- Give one mark for choosing the correct formula, one mark for correct answer, and one mark for answering in the correct unit.

(b) According to the law of conservation of energy, energy cannot be created or destroyed, only changed from one form to another. Therefore, Koa's kinetic energy at the bottom of the ride will be identical to his gravitational potential energy at the beginning of the ride, which is 2156 J. 3 marks

- Give 2 marks for the correct answer, and 1 mark for using the correct unit.

(c) Koa's velocity at the bottom of the ride is 8.85 ms^{-1} 4 marks

$$v = \sqrt{\frac{2 \times KE}{m}}$$
$$= \sqrt{\frac{2 \times 2156}{55}}$$
$$= 8.85 \text{ ms}^{-1}$$

- Give one mark for choosing the correct formula, one mark for correct steps in calculation, one mark for the correct answer, and one mark for using the correct units and rounding to the correct number of decimal places.