



## MYP 4&5 Physics - 2 - copy

Subject	Grade	Points
Physics	MYP 5	<div>A 25</div> <div>B 25</div> <div>C 25</div> <div>D 25</div>

### Question 1

#### Knowing and understanding

This task (questions 1 to 2) addresses the key concept of **relationships** and focuses on **criterion A** (Knowing and understanding).

Static electricity is the accumulation of electric charges on the surface of an object, causing it to attract or repel other charged objects.

Video 1

## Vande Graff Generator



00:00/00:45

Q 1.1 In a Van de Graaff generator, the metal sphere is negatively charged. **Determine** the direction in which the electrons will travel.

A 2

Words: 0

Q 1.2 **Explain** why the electric field will pull the electrons and the nuclei of air molecules in different directions in a Van de Graaff generator.

A 3

Words: 0

Q 1.3 The presence of a negatively charged metal sphere in a Van de Graaff generator causes nearby objects, such as the ground, to acquire a positive charge through the process of induction. **Explain** how this works.

A 5

Words: 0

## Question 2

Isotopes of an element exhibit similar chemical properties due to their identical electron configurations and the dominance of electron interactions in chemical reactions.

As a general rule, waves can only be used to see objects that are larger than the wavelength of the waves. Since the wavelength of visible light is about a thousand times larger than an atom, an optical microscope cannot be used to see individual atoms.

Q 2.1 **Compare** and **contrast** the characteristics of transverse waves and longitudinal waves.

A 4

Words: 0

Q 2.2 If the wavelength of a wave is  $1.5 \times 10^{-10}$  m, **calculate** the frequency of the wave.

A 3

Words: 0

Q 2.3 An electron wave has a frequency of  $1.2 \times 10^{15}$  Hz. **Calculate** the time period of the wave.

A 1

Words: 0

Q 2.4 The target nucleus in an experiment is carbon-12 (C-12), which has an atomic number of 6. **Write down** the atomic symbol of this atom.

A 1

Words: 0

Q 2.5 A different isotope of carbon, carbon-14 (C-14), has a mass number of 14. **Explain** what is meant by an isotope and how these nuclei differ from the carbon-12 nuclei?

A 3

Words: 0

Q 2.6 **Discuss** the reason behind carbon-12 and carbon-14 isotopes exhibiting similar chemical properties?

A 3

Words: 0

## Question 3

### Investigation skills

This task (questions 3 to 5) addresses the key concept of **change** and focuses on **criterion B** (Inquiring and designing) and **criterion C** (Processing and evaluating). In this task you will investigate different changes in physics.

Forces are interactions between objects that cause changes in their motion or shape.

Friction is a force that opposes the relative motion or tendency of motion between two surfaces in contact. It arises due to irregularities and interlocking between the surfaces.

#### Video 1

Motion of a Ball on Different Surfaces, Class 8 Physics | Smart Class



00:00/00:22

An MYP student is interested in learning about the effects of different surfaces on motion.

Q 3.1 **State** a question that would be examined and answered through this research.

B 1

Words: 0

Q 3.2 **Identify** the variables for this investigation.

B 4

Independent Variable:

Dependent variable:

Control variable 1:

Control variable 2:

Words: 0

The student proposed that, "Increasing the friction between a rolling ball and the surface it rolls on will result in a decrease in its rolling distance."

Q 3.3 **Present** the given data from the video in a tabular form.

C 2

Words: 0

Q 3.4 **Evaluate** the validity of the proposed hypothesis.

C 2

Words: 0

Q 3.5 **Evaluate** the validity of the method used.

C 2

Words: 0



## Question 4

The drag force acting on an object moving through a fluid can decrease its efficiency by increasing the energy required to overcome the resistance of the fluid.

Engineers who create fast transportation systems, like airplanes and trains, must pay attention to the impact of drag. At high speeds, drag can decrease efficiency, leading to increased fuel consumption and even destabilization of the vehicle.

To study the effects of drag, you will watch the video and answer the following questions based on your observation.

### Video 1

#### Terminal Velocity of Ball Bearings Experiment



00:00/00:38

Q 4.1 **Identify** the independent, dependent and control variables.

B 4

Independent Variable:

Dependent Variable:

Control Variable 1:

Control Variable 2:

Words: 0

Q 4.2 **Formulate** a hypothesis for the investigation.

B 3

When (independent variable) \_\_\_\_\_ is changed  
the (dependent variable) \_\_\_\_\_ will change by  
\_\_\_\_\_.

This is because \_\_\_\_\_.

Words: 0

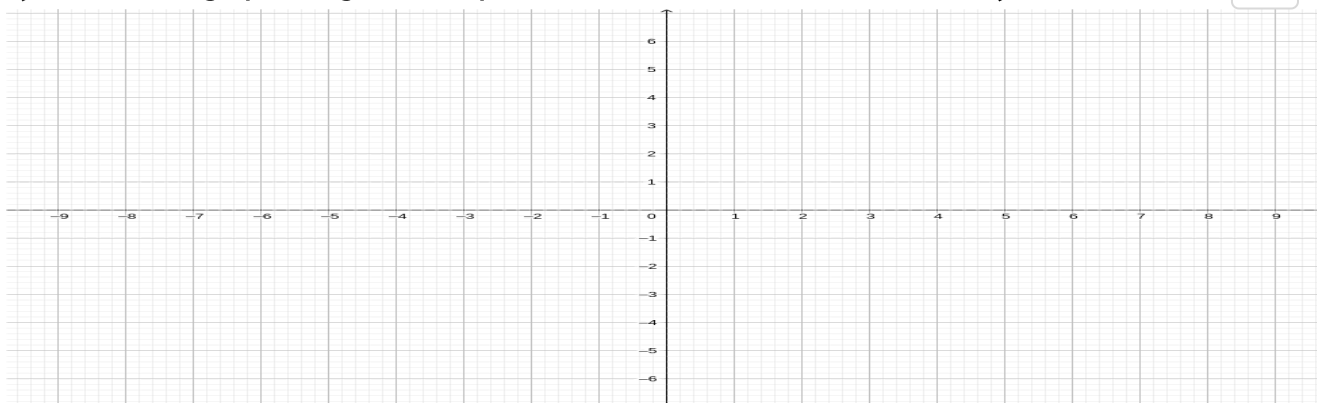
Q 4.3 **Organize** and **present** the data table using the readings observed in the video.

C 4

Words: 0

Q 4.4 **Plot** a graph using the data provided in the observation table from Q 4.3.

C 6



Q 4.5 **Interpret** the graph and **comment** on the observations.

C 3

Words: 0

Q 4.6 **Identify** the anomalous values in the data collected. **Suggest** a reason for this anomaly.

C 3

Words: 0

Q 4.7 **Evaluate** the validity of the method used.

C 2

Words: 0

Q 4.8 **Suggest** an extension to this investigation.

C 1

Words: 0

## Question 5

An MYP student decided to investigate the relationship between the shape of an object and the time taken by it to reach the bottom of the cylindrical jar containing liquid.

Q 5.1 **Design** an investigation to help him understand the relationship between the shape of the object and the time taken by it to reach a particular distance through a liquid.  
In your answer you should include:

B 13

- A research question
- A hypothesis to be investigated
- Equipment needed for the investigation
- The variables involved in the investigation
- The method you will follow.

Words: 0

## Question 6

### Applying science

The global context is **identities and relationships**. This task (questions 6 to 7) addresses the key concept of **systems** and assesses **criterion D** (Reflecting on the impacts of science).

Systems play an important role in astrophysics, as the universe is a vast and complex system made up of countless smaller systems.

The quest to locate exoplanets has resulted in the discovery of numerous planets that bear resemblances to Earth. This discovery has sparked curiosity as to whether these planets may also sustain life. The data for some of these planets is presented in the table below.

Planet name	Orbital radius (AU)	Orbital period (days)	Planet mass (Earth masses)	Planet radius (Earth radii)	Planet temperature (K)	Host star mass (Solar masses)	Host star temperature (K)
Earth	1	365.25	1	1	287	1	5,730
HD 38283b	1.02	363.2	108	?	?	1.08	5,998
Kepler-952b	0.5	130.4	?	7.6	347	0.99	5,730
HD 142245b	2.77	1,299	604	?	288	1.69	4,878
Trappist-1d	0.02	4.05	0.41	0.772	288	0.08	2,559

Q 6.1 Astronomers are interested in investigating whether other planets have life.

D 5

**Discuss** and **evaluate** if it is a wise decision to search for extraterrestrial life when humans are still finding new species deep in the ocean.

Words: 0

Q 6.2 **Describe** the advantages and disadvantages of the environments of these planets for supporting life.

D 8

Words: 0

## Question 7

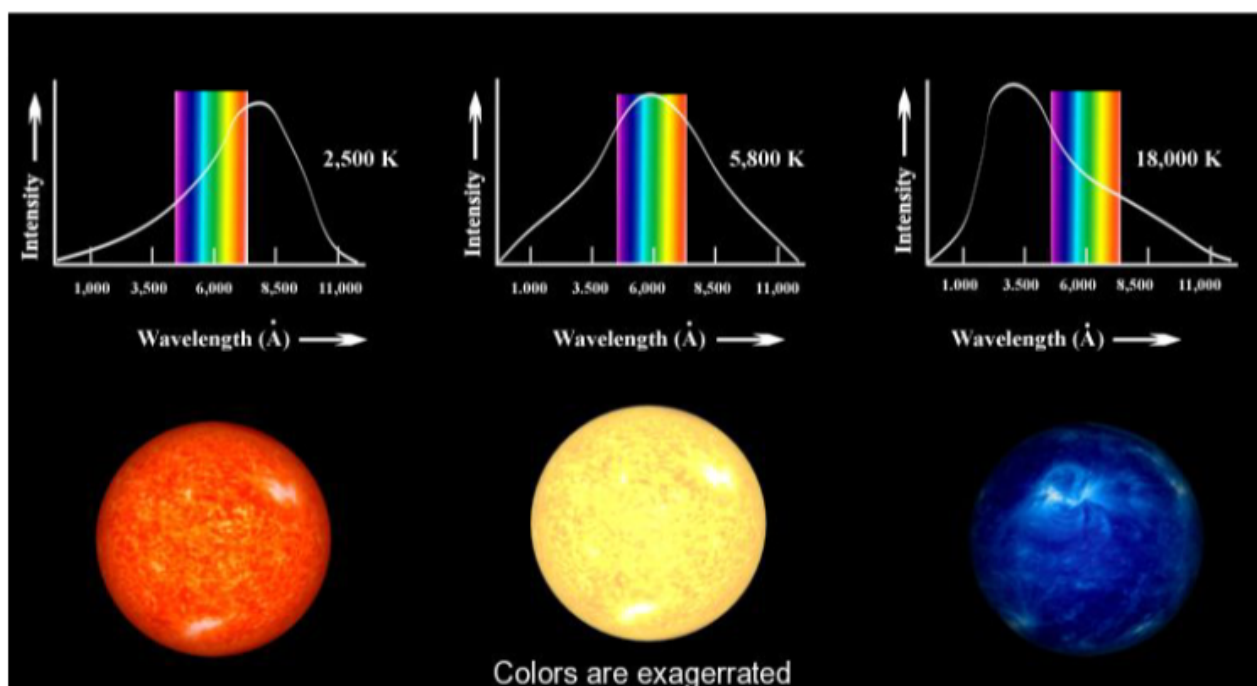
Astronomers determine a star's temperature by analyzing its spectrum using a spectroscope.

Astronomers can determine the temperature of the star by identifying the spectral lines and comparing their strength with the spectra of stars of known temperature. The temperature of a star can be determined by analysing its spectrum using the following steps:

**Obtain the spectrum:** To obtain the spectrum of a star, astronomers use a device called a spectroscope. The light from the star is passed through a prism, which separates the light into its component colours. This produces a spectrum, which shows the different wavelengths of light that the star is emitting.

**Identify the spectral lines:** The spectrum of a star contains dark lines or bands, which correspond to specific wavelengths of light that have been absorbed by the elements in the star's atmosphere. By comparing these lines with the known spectra of elements on Earth, astronomers can identify the elements present in the star.

**Determine the temperature:** The temperature of a star can be determined by analysing the strength of the spectral lines. The strength of these lines depends on the temperature of the star's atmosphere. Hotter stars have stronger spectral lines than cooler stars. By comparing the strength of the lines in a star's spectrum with the spectra of stars of known temperature, astronomers can determine the temperature of the star.





Q 7.1 **Describe** the working of a spectroscope.

D 2

Words: 0

Q 7.2 **Explain** the formation of spectral lines.

D 3

Words: 0

Q 7.3 **Justify** the relation of spectral lines strengths to the temperature of a star.

D 3

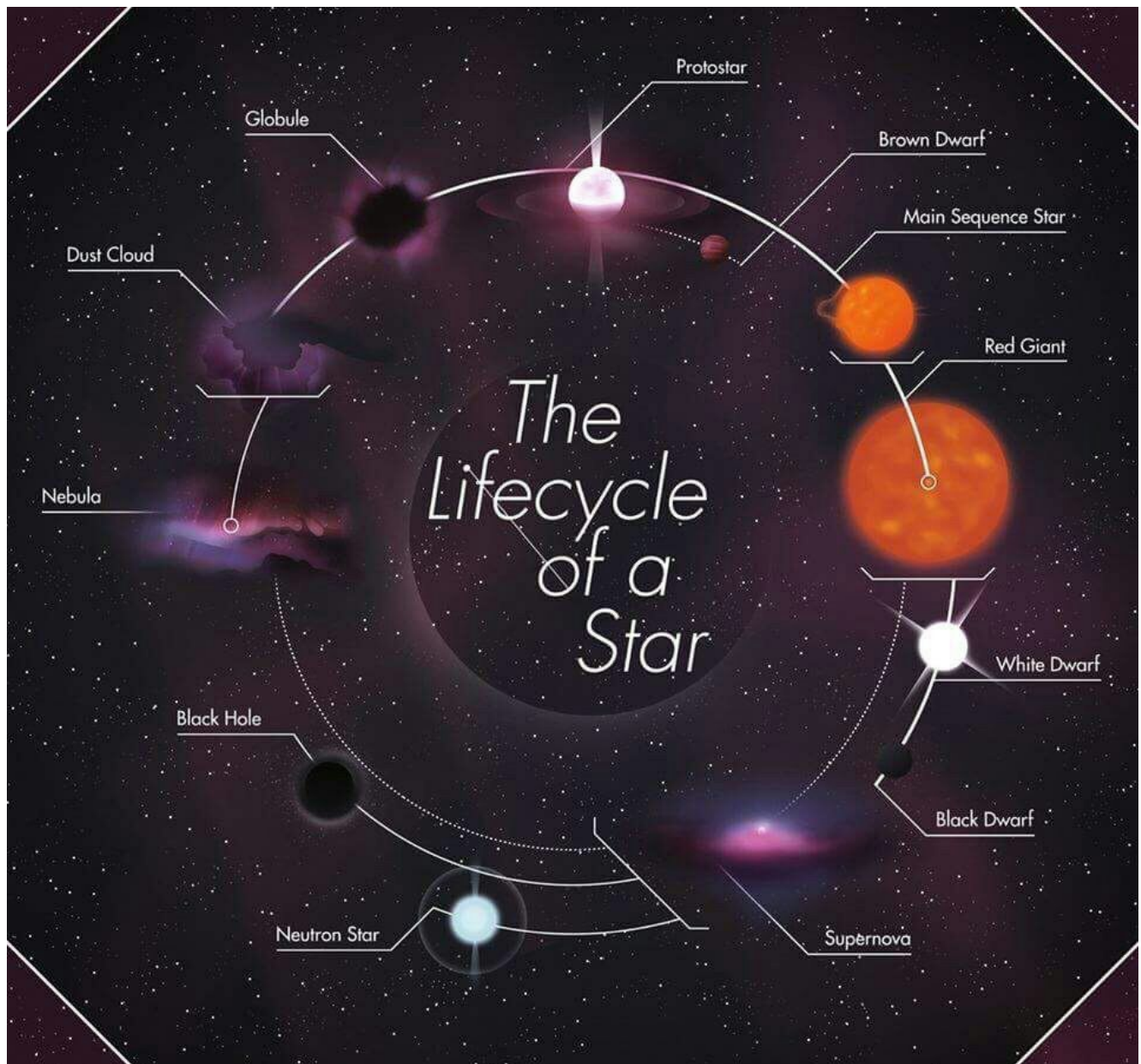
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Stars are massive, luminous spheres of plasma held together by their own gravity. They form from clouds of gas and dust in space called nebulae, which collapse under the force of gravity to form protostars. As protostars continue to collapse and heat up, they eventually begin to undergo nuclear fusion reactions in their cores, which cause them to become full-fledged stars.

Most stars spend the majority of their lives in a phase known as the main sequence, where they are fusing hydrogen in their cores to create helium. However, as they begin to run out of fuel, they will begin to expand and cool, becoming red giants. Eventually, red giant stars will shed their outer layers into space and become planetary nebulae, leaving behind a white dwarf that will slowly cool down over billions of years. More massive stars will undergo a more violent end to their lives, exploding in a supernova and either becoming a neutron star or a black hole depending on their original mass.

## Life cycle of a star

Image 1



Q 7.4 **Explain** the formation of a star and the end of the life cycle of the massive star.

D 4

Words: 0

