

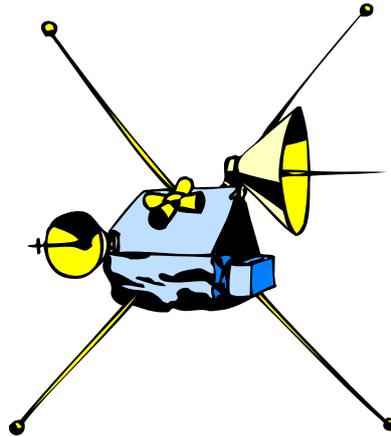
# *Standard Grade Physics*

*North Berwick high School*  
*Physics Department*

## **UNIT 10**

### **Space Physics**

#### **PUPIL PACK**



**Homework Sheets**

# SPACE PHYSICS

## *Working at Home*

### TO THE PUPIL

Each day you have physics at school, you should set aside time for work at home. By this stage you should be accepting more responsibility for your own learning and should undertake the following tasks on a regular basis:

- Tackle the supplied homework sheets as each section of work is completed in class.
- Check your own progress in the homework sheets by referring to the homework answer files available in class. Discuss any difficulties that arise with your class teacher.
- Complete any formal homework tasks that your teacher may issue from time to time and hand them in on the due date for marking.
- Revise the work you have covered in class activities by referring to your classwork jotters.

### TO THE PARENT

Your co-operation would be appreciated in ensuring that pupils are encouraged to complete homework. It would be helpful if you could talk over the work given for homework and sign the homework record sheet on this page after they have completed each exercise.

The physics department hopes that this record of your child's achievement will be of interest to you, and we would welcome any comments on this or other areas related to the work of the department.

*Please sign here to confirm that you have seen the homework record sheet:* \_\_\_\_\_

### HOMEWORK RECORD SHEET

HOMEWORK	SECTION OF WORK	MARK	CHECK	PARENTAL SIGNATURE
10.1	Signals from Space 1			
10.2	Signals from Space 2			
10.3	Space Travel 1			
10.4	Space Travel 2			

Some questions in the pack are marked with symbols to give you specific information. Here is the key:

CR

Credit Level question. This relates directly to the Credit Level learning outcomes.

PS

Problem Solving question. This puts the knowledge you have gained into new contexts.

# SPACE PHYSICS

## *Homework Exercises*

### Homework 10.1 – Signals from Space I

1. Match the following explanations with the appropriate space term, and then write them in your homework jotter. (3)

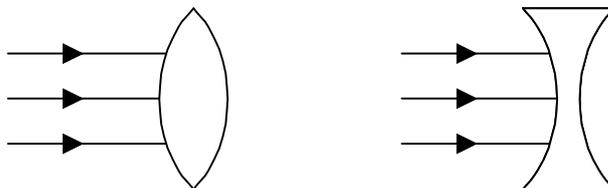
TERM	EXPLANATION
Moon	A massive object in space, consisting mainly of very hot gases, and producing vast amounts of energy.
Planet	The nearest star to Earth.
Sun	A huge cluster of stars.
Star	The Sun and the nine planets that orbit it.
Solar System	This moves around a star, held by its gravitational field. There are nine in orbit around the sun.
Galaxy	This is a natural satellite of a planet. The Earth only has one, but some planets have many.

2. Copy and complete the following table: (1½)

SOURCE	TIME TAKEN FOR LIGHT TO REACH US ON EARTH
Sun	
Next nearest star	
Edge of our Galaxy	

- CR 3. (a) What is the definition of a light year? (1)  
 (b) The next nearest star to Earth after the sun is Proxima Centauri, about 4.3 light years away. How far is this in kilometres? (1)

4. (a) Draw a diagram of a refracting telescope and label it. (1½)  
 (b) Copy and complete the following diagrams to show what happens to the rays of light after passing through each lens: (1)



- (c) Name each type of lens. (1)

**Total 10 marks**

# SPACE PHYSICS

## *Homework Exercises*

### Homework 10.2 - Signals from Space II

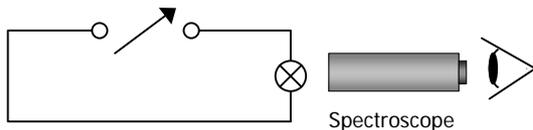
1. (a) Use a diagram to show how white light can be split to form a spectrum. (1)
- (b) Name the piece of equipment used for this. (1)
- (c) List the three primary colours of light in order of increasing wavelength. (1)

**PS**

2. When a substance is strongly heated, a whole range of wavelengths is given out in the form of a continuous spectrum. The proportion of each colour depends on how hot the object is. When it starts to glow, an object is red hot. Eventually it may become white hot.

Metal workers can judge the temperature of steel by noting its colour. Astronomers can judge the temperature of the surface of stars by noting the colour of the stars.

- (a) The experiment below was carried out to study the effect of temperature on colour. The voltage was adjusted, and the colour of the light produced by the 6 V bulb examined at 2 V, 4 V and 6 V. Copy the table, and predict the colours that would be observed. The first one has been given to you. (1)

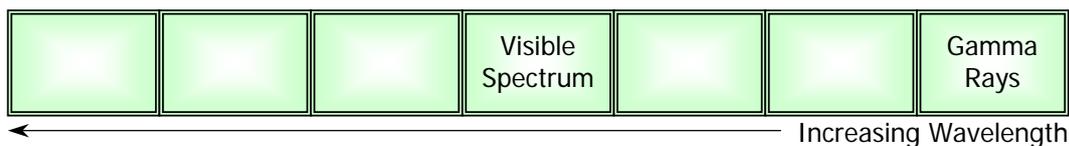


VOLTAGE	BRIGHTEST COLOUR
2 V	Red
4 V	
6 V	

- (b) Study the following list, and put the stars in order of increasing surface temperature: (1)  
 BETELGEUX (*orange-red*)    RIGEL (*bluish-white*)    THE SUN (*yellow*)    BARNARD'S STAR (*red*)
- (c) Explain how metal workers can judge the temperature of steel by noting its colour. (1)

**CR**

3. (a) Copy and complete the electromagnetic spectrum diagram below using these words: (2½)  
 VISIBLE LIGHT, INFRARED, X-RAYS, ULTRAVIOLET, RADIO & TV, MICROWAVES, GAMMA RAYS
- (b) On the diagram, mark the direction of increasing frequency. (½)



**CR**

4. (a) Reflecting telescopes are used to look at light from stars. What are radio telescopes used for? (½)
- (b) What detector is used to pick up infrared waves? (½)

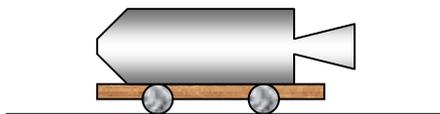
**Total 10 marks**

# SPACE PHYSICS

## Homework Exercises

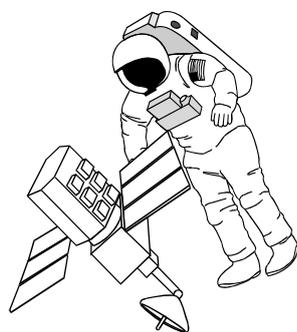
### Homework 10.3 – Space Travel I

1. A rocket engine is being tested by allowing it to drive a wagon along a track. The mass of the rocket, wagon and fuel is 1000 kg to start with. The effects of friction can be ignored.



- (a) If the engine provides a thrust of 40 000 N, calculate the initial acceleration of the truck. (2)  
(b) What will be the new acceleration when 600 kg of fuel has been used up? (2)

2.



A spacecraft is deep in space. An astronaut leaves the spacecraft to go to a small artificial satellite nearby. She has a jetpack strapped to her back.

The astronaut and her equipment have a mass of 120 kilograms and the jets can exert a constant thrust of 24 N when switched on.

- (a) Calculate her acceleration when she uses the jetpack. (1)  
(b) Describe her motion once the jetpack is switched off. (1)  
Explain your answer. (1)

3. A young boy writing a project for primary school writes “a rocket is pushed upwards because of the gases pushing against the ground”. His older brother, a physics student, points out that this is wrong. What should his project say? (1)

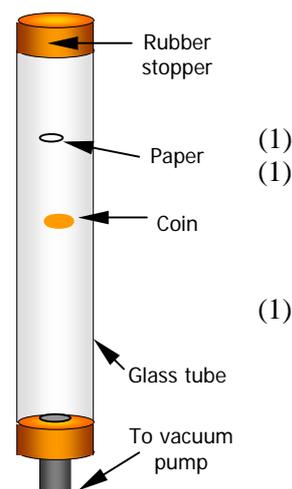
PS

4. A teacher shows her class an experiment with a coin and a small piece of paper sealed in a glass tube. When the tube is turned over, the coin drops quickly to the bottom of the tube whilst the feather drops more slowly.

- (a) Explain why the two objects fall at different rates.  
(b) What is likely to have been the coin's acceleration?

In a second experiment, the teacher then uses a vacuum pump to remove all the air from the glass tube. When the experiment is repeated now, the results are different.

- (c) What happens to the coin and the piece of paper now? Explain why this happens.



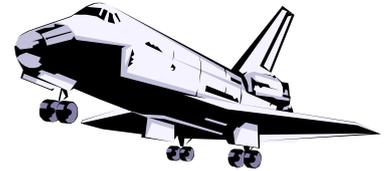
**Total 10 marks**

# SPACE PHYSICS

## Homework Exercises

### Homework 10.4 - Space Travel II

1. Why is the underside of the space shuttle fitted with special heatproof tiles? (1)

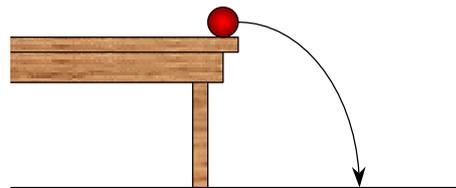


2. A distress line is fired from the top of a high cliff to a boat in the sea below with a horizontal speed of 50 m/s.

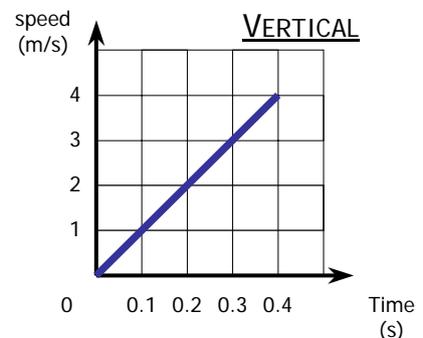
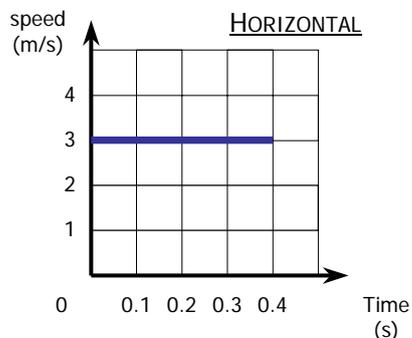
- (a) What is the horizontal speed of the line 2 seconds later? (1)  
 (b) What is the initial vertical speed of the line? (1)  
 (c) Sketch the path taken by the line. (½)  
 (d) Explain why the path is this shape. (½)

CR

3. A ball is projected from the top of a table as shown.



Two graphs are produced for this motion; one for the horizontal speed, and one for the vertical speed. These are shown below.



- (a) How far out from the table did the ball land? (1)  
 (b) How high is the table? (1)

CR

4. A space shuttle returning to Earth has a mass of 75 000 kg. It is travelling at 7000 m/s.

- (a) What is the shuttle's kinetic energy? (2)  
 (b) If the tiles that make up the shuttle's outer skin have a mass of 3000 kg, calculate the rise in temperature of the tiles. Assume that no energy is lost to the surroundings. (2)  
 (Specific heat capacity of the tiles = 1040 J/kg°C)

PS

**Total 10 marks**