Space Physics Answers – NAT 5

1) Definitions

a) Moon – An object that orbits a planet.

b) Planet – An object that orbits a star.

c) Sun – A star that produces an enormous amount of heat and light energy.

d) Star – A ball of very hot gas produced by nuclear fusion.

e) Solar System – The sun and the **eight** planets which orbit it.

f) Exoplanet – Planet outside of the solar system.

g) Galaxy – An immense system of stars, dust and gas.

h) Universe – The whole of space, everything.

2) Cosmology – The study of the universe.

3) a) The distance that light travels in a year.

b) 9.46×10^{20} m.

c) 1.37×10^{8} s = 4.33 years.

4) a) A planet that orbit the sun.

b) Moon.

c) Solar System.

5) (**AU** – Astronomical units)

Planet	**Distance from the Sun(AU)**	**Scale distance (m)**
Mercury	0.4	1.2
Venus	0.7	**2.1**
Earth	1.0	**3.0**
Mars	1.5	**4.5**
Jupiter	5.2	15.6
Saturn	9.5	**28.5**
Uranus	19	57.0
Neptune	30	**90**

b) 1.44×10^{11} m.

c) 8×10^{13} s = 2.54×10^{6} years.

d) 7.8×10^{11} m.

e) i) 5.1×10^{11} m.

ii) 10.2

6) a)

Wave	**Detector**
Radio	Aerial and Radio Receiver
Television	**Aerial and television receiver**
Microwaves	**Aerial and microwave receiver**
Infrared	**Photodiode and meter and a thermometer**
Visible Light	**Eye and Photographic film**
Ultraviolet	**Fluorescent materials**
X-Rays	Photographic film
Gamma Rays	Photographic Film and a Geiger counter

b) i) Gamma Rays

ii) Radio Waves

iii) As the wavelength increases the frequency decreases and vice-versa.

7) a) Light coming from distant objects.

b) Objective lens.

c) To produce an image.

d) To magnify the image.

e) A brighter image would be formed.

8) a) Different detectors are required for different types of radiation.

b) X-Rays, Visible Light and Infrared.

c) Photographic Film.

9) a) After the Big Bang cooling and expansion led to the formation of elements of small mass such as Hydrogen and Helium.

b)

- The first stars were formed when hydrogen and Helium atoms collected together under gravitational forces.
- The formation of stars and galaxies continue to move outwards as part of the Big Bang process.

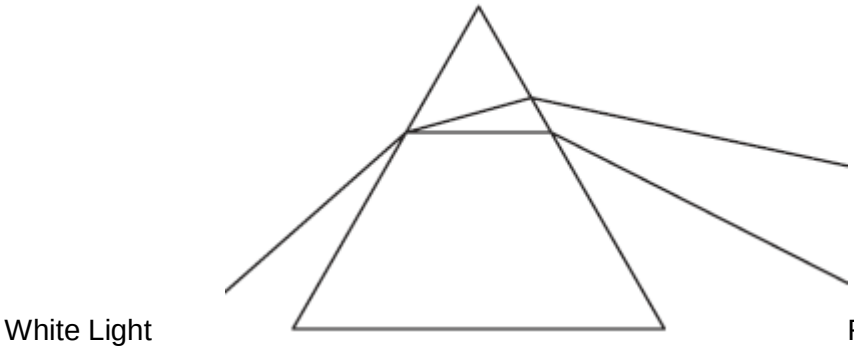
10) a) An area of space not too close or far away from the sun where life can exist.

b) Water and a temperature where life can exist.

11) Re-entry involves a quantity of kinetic energy converting into heat energy. The spacecraft requires an external shield with a material which will absorb the heat energy and re-radiate it back into the atmosphere. This will stop the spacecraft from burning up.

12) a) i) Triangular prism. (or spectroscope or spectrometer)

ii) White light enters the prism and the colours come out in the order **ROYGBIV** from the **top to the bottom**.



b) i)

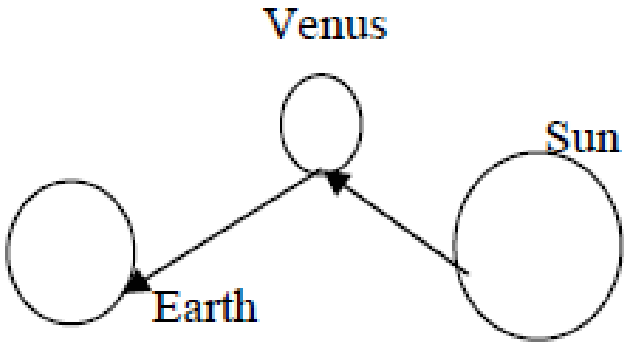
Star	**Colour of peak wavelength in visible spectrum**
Rigel	Blue
Sun	Green
Betelgeuse	Red

ii) Rigel.

iii) The Sun is hotter than Betelgeuse.

c) Information about the atoms or elements or the age, temperature, speed, type of star or distance to the star.

d) The rays are joined from the Sun to Earth via Venus.



13) a) i) Force of friction between the spacecraft and the Earth's atmosphere produces heat energy.

ii) 1300 $^{\circ}$C.

iii) Some heat energy generated is lost to the surroundings.

b) Weighs less in space.

14) a) Radio waves have a longer wavelength than visible light.

b) Different detectors are required for different types of radiation.

c) The radiation is absorbed as it reaches the Earth's atmosphere.

15) Cadmium and Mercury.

16) a) $3x10^{8}ms^{-1}$

b) i) Triangular prism.

ii) Refraction.

iii) X – Red, Y- Green and Z – Blue.

iv) $4.41x10^{14}$Hz.

17) a) Jupiter and Saturn.

b) Jupiter.

c) Mercury.

18) The Radioastron space telescope has a greater orbital height as it has a greater period of orbit.