

## Chapter 12

### Multiple choice and quick questions

1. Three types of radiation within the electromagnetic spectrum are:

X infra-red

Y radio

Z X-rays

Which one of the following lists the radiations in order of increasing frequency?

**A** XYZ      **B** XZY      **C** YZX      **D** YXZ      **E** ZXY

2. A suggested design for a spacecraft intended to travel directly away from the Sun includes a very large reflecting 'sail'. The sail would be silvered and be perpendicular to the direction of intended travel. Photons from the Sun would strike the sail and reflect back so propelling the spacecraft away from the Sun.

Which one of **A** to **D** below will be the force on the sail?

**A** the rate of change of momentum of the photons as they reflect from the sail

**B** the rate of change of kinetic energy of the photons as they reflect from the sail

**C** the rate of change of velocity of the photons as they reflect from the sail

**D** the rate of change of acceleration of the photons as they reflect from the sail

3. The Voyager 2 spacecraft passed by the planet Neptune on August 24<sup>th</sup> 1989 when the distance between the Sun and Neptune was 30 times greater than that between the Sun and the Earth.

Which of the following statements about the situation is/are correct?

1 Signals sent from the spacecraft to the Earth on August 24<sup>th</sup> 1989 took approximately thirty times as long to reach the Earth as did light from the Sun.

2 Pictures were taken with sunlight falling on Neptune which was one-thirtieth of the intensity of that falling on the Earth.

3 The Sun exerts thirty times the gravitational force on each kilogram of the Earth's mass compared with that on each kilogram of the mass of Neptune.

**A** 1 only      **B** 2 only      **C** 1 and 3 only      **D** 2 and 3 only

**E** 1, 2 and 3

4. In 1772 the Astronomer Royal (Maskelyne) chose a mountain in Scotland called Schiehallion to use for his experiment. He took a long pendulum up to the mountain to the same horizontal level as the centre of mass of Schiehallion. The pendulum no longer hung vertically and Maskelyne was able to measure the angle of deflection.

DATA

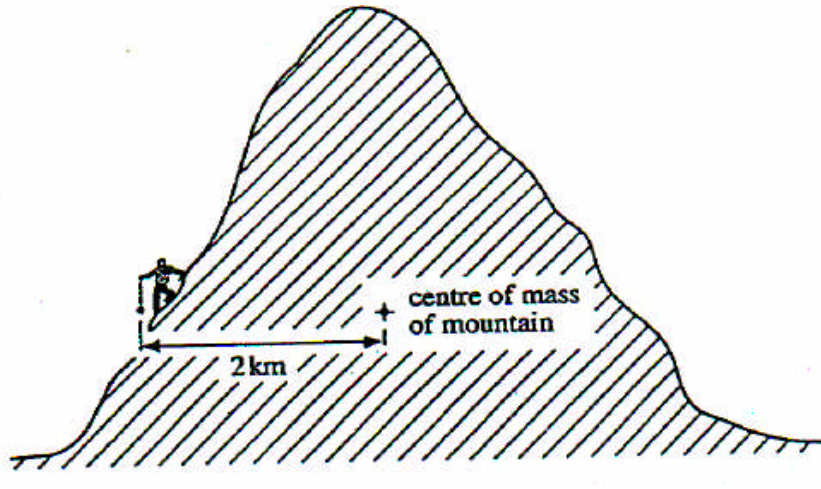
Distance between pendulum and centre of mass of mountain = 2km

Angle of deflection of pendulum from vertical =  $1.5 \times 10^{-5}$  radian

Earth's gravitational field strength,  $g = 10 \text{ N kg}^{-1}$

Mass of pendulum = 2kg

Mass of mountain =  $1 \times 10^{13} \text{ kg}$



- (i) Why does the pendulum hang at an angle to the vertical?
- (ii) Draw a diagram to show the forces acting on the mass at the end of the pendulum. Label the forces.