



# **GCSE Physics**

## **Solar System**

### **Mark Scheme**

**Time available: 60 minutes**

**Marks available: 53 marks**

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## Mark schemes

- 1.**
- (a) Milky Way 1
- (b) distance =  $300\,000 \times 500$  1
- $d = 150\,000\,000$  (km) 1
- an answer of 150 000 000 scores 2 marks*
- (c) 3 1
- (d) accept any number greater than 1.0 and less than 12.0 1
- (e)  $\frac{9}{0.6}$  1
- 15 1
- an answer of 15 scores 2 marks*
- [7]**
- 2.**
- (a) (force of) gravity causes the satellite to accelerate (towards the Earth)  
*allow satellite is (constantly) accelerating* 1
- the acceleration causes a change in direction  
*acceleration causes a change in speed negates this mark point* 1
- velocity changes because direction changes 1

(b) length of orbit taken from graph = 42 100 (km)

1

$$42\,100 = 7.73 \times \text{time}$$

or

$$\text{time} = \frac{42\,100}{7.73}$$

allow

$$\text{their distance} = 7.73 \times \text{time}$$

1

$$\text{time (1 orbit)} = 5446(\text{s})$$

allow a value consistent with their distance

1

$$\text{number of orbits} = \left( \frac{24 \times 3600}{5446} \right)$$

$$= 15.86$$

$$\text{allow } \left( \frac{24}{1.51} \right) = 15.86$$

allow a value consistent with their distance

1

$$\text{number of orbits} = 15$$

allow a value consistent with their distance

an answer of 16 scores 4 marks

1

or

$$\text{length of orbit taken from graph} = 42\,100 \text{ (km) (1)}$$

$$7.73 = \frac{\text{distance}}{24 \times 3600} \text{ (1)}$$

$$\text{distance} = 667\,872 \text{ (km) (1)}$$

$$\text{number of orbits} = \left( \frac{667\,872}{42\,100} \right)$$

$$= 15.86 \text{ (1)}$$

allow a value consistent with their two distances

$$\text{number of orbits} = 15 \text{ (1)}$$

allow a value consistent with their two distances

up to full marks can be awarded for a method calculating velocity in km/h and time in hours

an answer of 15 scores 5 marks

(c) the predicted data is very close to the actual data

1

- (d) supported the prediction (made by Bode)  
*allow predicted and actual values are very close* 1

so provides evidence that the equation is true / correct / works / accurate  
*allow proves for provides evidence*

1  
[11]

**3.**

- (a) dwarf planet

1

- (b) nebula

*correct order only*

1

gravity

1

- (c) (becomes a) red giant

1

- (d) the greater the distance (from the Sun) the greater the time taken to orbit the Sun

1

- (e) any value between 3 and 7 inclusive

1

- (f) because some planets do not fit the pattern

1

named planet that does not fit pattern

*eg Venus*

1

reason why named planet does not fit pattern

*its temperature is higher than expected*

**or**

*Uranus: its temperature is lower than expected*

**or**

*Neptune: its temperature is higher than expected*

**or**

*Mercury: its temperature is lower than expected*

1

[9]

- 4.** (a) any **one** from:
- Earth is at the centre (not the Sun)
  - there are fewer planets  
*accept there is no asteroid belt shown*  
*accept there are only 5 planets (and not 8)*  
*accept other planets have no moons shown*
- 1
- (b) Shows the moon in orbit around the Earth  
*accept the planets have circular orbits*
- 1
- (c) circular  
*accept elliptical*
- 1
- (d) gravity
- 1
- (e) Mira is much more massive
- 1
- [5]**
- 5.** (a) gas  
*correct order only*
- 1
- gravity
- 1
- protostar  
*accept correct word circled in box provided no answer given in answer space*
- 1
- (b) the explosion of a massive star
- 1
- (c) The telescopes and measuring instruments were not sensitive enough.
- 1
- [5]**

6. (a) (i) (enough) dust and gas (from space) is pulled together  
*accept nebula for dust and gas*  
*accept hydrogen for gas*  
*accept gas on its own*  
*dust on its own is insufficient*  
*mention of air negates this mark* 1
- by:  
 gravitational attraction  
**or**  
 gravitational forces  
**or**  
 gravitaty  
*ignore any (correct) stages beyond this* 1
- (ii) joining of two (atomic) nuclei (to form a larger one)  
*do not accept atoms for nuclei* 1
- (iii) more sensitive astronomical instruments / telescopes  
**or**  
 infrared telescopes developed  
*accept better technology*  
*more knowledge is insufficient* 1
- (b) (i) (other) planets / solar systems  
*do not accept galaxy*  
*moons is insufficient* 1
- (ii) provided evidence to support theory  
*accept proves the theory* 1
- (c) elements heavier than iron are formed only when a (massive) star explodes  
*accept materials for elements*  
*accept supernova for star explodes*  
*accept stars can only fuse elements up to (and including) iron* 1

[7]

7.

(a) hydrogen

1

(b) supernova

1

(c) red super giant

1

(d) any **four** from:

- fusion takes place within stars
- hydrogen formed into helium
- fusion continued and formed larger elements
- elements heavier than iron were formed in supernova
- (heavy) elements were scattered by the supernova explosion.

*accept light elements formed*

4

[7]