3.8 Space Physics: 30-minute Pack

AQA 8463 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State what is meant by the term 'galaxy'.

(a) State the meaning of 'galaxy'. **(1)**

(Total for Question 1 is 1 mark)

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2 You are asked to model the relative sizes and distances of the Sun and planets using a classroom strip of paper 10 m long. Suggest a simple method that would represent the relative distances from the Sun to Earth and to Jupiter on the paper, and state one variable you would control to make the model fair.

(a) Suggest a method to place Earth and Jupiter on a 10 m strip to represent their relative distances, and name one control variable. **(3)**

(Total for Question 2 is 3 marks)

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3 Explain the difference between a planet's rotation and its orbit.

(a) Explain how rotation is different from orbit. **(2)**

(Total for Question 3 is 2 marks)

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4 A small asteroid takes 5.0 days to complete one rotation. Convert this rotation period into seconds. Show your working.

(a) Convert 5.0 days into seconds. 1 day = 24 hours, 1 hour = 3600 s. **(2)**

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(Total for Question 4 is 2 marks)

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5 The life cycle of a star with a similar mass to the Sun passes through several distinct stages.

(a) Put the following four stages in the correct order, starting with the earliest: main sequence star, protostar, red giant, white dwarf. **(3)**

(b) State what a white dwarf eventually becomes, once it has cooled completely and stopped glowing. **(1)**

(c) State the process that keeps a star stable and glowing during the main sequence stage. **(1)**

(Total for Question 5 is 5 marks)

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6 Give three brief statements that describe the main stages in the life cycle of a sun-like star.

(a) Give three statements describing the main stages of a sun-like star. **(3)**

(Total for Question 6 is 3 marks)

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7 Red-shift is often explained by comparison with the Doppler effect for sound.

(a) State what red-shift tells us about the motion of a distant galaxy relative to the Earth. **(1)**

(b) Almost all distant galaxies show red-shift, and more distant galaxies show greater red-shift. Explain what this suggests about the universe as a whole. **(2)**

(Total for Question 7 is 3 marks)

8 The observation of red-shift provides evidence for a particular theory of the origin and evolution of the universe.

(a) Name this theory. **(1)**

(b) Describe the main features of this theory, in terms of the initial conditions of the universe and how it has changed since. **(3)**

(Total for Question 8 is 4 marks)

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Mark scheme · 3.8 Space Physics: 30-minute Pack

Question 1

(a) a very large group of stars, gas and dust held together by gravity (for example, the Milky Way), oe **B1**

(a) Answer: A very large group of stars, gas and dust held together by gravity.

Question 2

(a) method: scale real distances down to the 10 m strip and mark positions from one end as the Sun, oe **B1**

(a) example calculation or statement of scale, e.g. choose scale so Earth is at 10 cm and Jupiter at 52 cm (or another plausible scaled values) showing calculation or clear scaling idea, oe **B1**

(a) control variable: keep the same scale for all planets or control choice of reference point on the paper, oe **B1**

(a) Answer: Method: choose a scale to reduce real distances to fit 10 m and mark the Sun at 0 m then mark Earth and Jupiter at their scaled distances. Control variable: use the same scale for all planets (keep scale fixed).

Question 3

(a) rotation is a spin of the planet about its own axis, oe **B1**

(a) orbit is the movement of the planet around another object, e.g. around a star, oe **B1**

(a) Answer: Rotation is the spin of a planet about its own axis; orbit is the movement of the planet around another body such as a star.

Question 4

(a) converts days to seconds: 5.0 x 24 x 3600 shown **M1**

(a) 432000 s cao **A1**

(a) Answer: 432000 s

Question 5

(a) protostar placed before main sequence star **B1**

(a) main sequence star placed before red giant **B1**

(a) red giant placed before white dwarf **B1**

(a) Answer: protostar, main sequence star, red giant, white dwarf

(b) black dwarf **B1**

(b) Answer: Black dwarf.

(c) nuclear fusion of hydrogen (into helium) in the star's core **B1**

(c) Answer: Nuclear fusion of hydrogen into helium.

Question 6

(a) formation from a cloud of gas and dust (protostar) or similar phrasing **B1**

(a) main sequence where hydrogen fusion occurs in the core, oe **B1**

(a) red giant phase followed by shedding outer layers and forming a white dwarf (with planetary nebula), oe **B1**

(a) Answer: Any three of: formation from a cloud of gas and dust (protostar); main sequence where hydrogen fuses in the core; red giant phase; sheds outer layers and becomes a white dwarf with a planetary nebula.

Question 7

(a) the galaxy is moving away from the Earth (receding) **B1**

(a) Answer: The galaxy is moving away from the Earth.

(b) galaxies are moving apart from each other/from us in every direction **B1**

(b) this suggests that the whole universe is expanding, oe **B1**

(b) Answer: It suggests that the whole universe is expanding.

Question 8

(a) the Big Bang theory (model) **B1**

(a) Answer: The Big Bang theory.

(b) the universe began from a very small region/point that was extremely hot and dense **B1**

(b) the universe has been expanding ever since (and is still expanding today) **B1**

(b) the universe has been cooling as it has expanded, oe **B1**

(b) Answer: The universe began from a very small, extremely hot, dense region, and has been expanding and cooling ever since.

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