6. Space physics

6.1 Earth and the solar system

Paper 3 and 4

Answer Key

Paper 3

Q1.

Question	Answer	Marks
(a)	1 Mercury 2 Mars 3 Jupiter 4 Saturn	**B2**

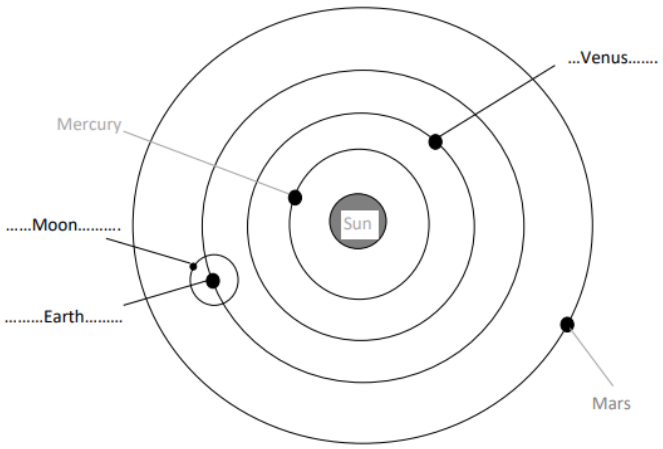
Q2.

Question	Answer	Marks
(a)(i)	planet X: Venus	**B1**
	planet Y: Uranus	**B1**
(a)(ii)	1. Mercury rocky **or** Jupiter gaseous	**B1**
	2. Mercury small **or** Jupiter large	**B1**
(a)(iii)	gases	**B1**
	(force of) gravity	**B1**
	the Milky Way	**B1**
(b)(i)	days	**B1**
(b)(ii)	month	**B1**
(b)(iii)	light-years	**B1**

Q3.

Question	Answer	Mark
(a)(i)	Earth has greater mass ORA	**B1**
(a)(ii)	243 (Earth days)	**A3**
	5832 ÷ 24	(C2)
	idea that one rotation on its axis equals one day	(C1)
(a)(iii)	360 (s)	**A4**
	$108.2 \times 10^9 \div 3.0 \times 10^8$	(C3)
	speed = distance ÷ time **OR** (t =) $s \div v$	(C1)
	conversion 1 km = 1000 m	(C1)
(b)	distance	**M1**
	travelled (in space) by light in one year owtte	**A1**

Q4.

Question	Answer	Mark
(a)		B1 B1 B1
(b)	Hydrogen and	B1
	Helium (answers maybe in either order)	B1
	visible (light) and	B1
	Ultraviolet (answers maybe in either order)	B1
(c)	100 000 (light-years)	B1

Q5.

Question	Answer	Marks
(a)	at least 4 named	M1
	all 5 in correct order	A1
(b)	any **two** from: minor / dwarf planets / Pluto asteroids comets moons / natural satellites	B2
(c)	Mercury is rocky AND small. (answers maybe in either order)	B1
	Jupiter is gaseous AND large. (answers maybe in either order)	B1

Q6.

Question	Answer	Marks
(a)	Earth rotates / spins (on its axis)	M1
	(once) every 24 hours / day **OR** daily	A1
(b)	Mercury Venus Earth Mars	
	3 correct planets	M1
	in correct order	A1
(c)	hydrogen	B1
	helium	B1
(d)	Milky Way	B1

Q7.

Question	Answer	Marks
(a)	Mercury Venus Earth Mars	
	3 correct planets	M1
	in correct order	A1

Paper 4

Q8.

Question	Answer	Marks
(a)(i)	Earth / Mars / Jupiter / Saturn / Uranus / Neptune	**B1**
(a)(ii)	Mercury	**B1**
(b)	3.6×10^4 (m / s)	**A3**
	(T =) $220 \times 24 \times 60 \times 60$ **OR** (T =) 1.9×10^7 (s)	C1
	(v =) $\frac{2\pi r}{T}$ **OR** (v =) $\frac{2\pi \times 1.1 \times 10^{11}}{220 \times 24 \times 60 \times 60}$	C1
(c)	The further away from the Sun the slower the orbital speed / ORA	**B1**
(d)	1 *any **one** from:* • comet has an elliptical orbit • speed of comet is faster when it closer to the Sun • speed of comet is slower when it is further away from the Sun	**B1**
	2 *any **one** from:* • (conservation of energy requires that) transfers between kinetic and gravitational stores (as comet changes speed) • total energy remains constant • energy cannot be created or destroyed	**B1**
	3 as radius of orbit decreases, gravitational energy decreases and kinetic energy increases ORA	**B1**

Q9.

Question	Answer	Marks
(a)	any **two** from: • minor planets **OR** dwarf planets • comets • asteroids	**B2**
(b)	elliptical	**B1**
(c)	kinetic energy (store) decreases **AND** potential energy (store) increases (as object moves from A to B)	**B1**
	energy is conserved	**B1**
(d)	2.6×10^3 s	**A2**
	$v = s / t$ **OR** $(t =) s / v$ **OR** $7.8 \times 10^{11} / 3.0 \times 10^8$	C1

Q10.

Question	Answer	Marks
(a)	Venus	**B1**
(b)	The larger the mass (of the planet), the larger the gravitational field strength (at the surface)	**B1**
(c)	orbit of planets is elliptical / is not circular owtte	**B1**
(d)	correct conversion of T into seconds i.e. $365.2 \times (24 \times 60 \times 60)$ **OR** 3.2×10^7	**B1**
	$(v =) \{2\pi r\} / T$	**B1**
	$2\pi \times 149.6 \times 10^6 / 365.2 \times 24 \times 60 \times 60$	**B1**

Q11.

Question	Answer	Marks
(a)(i)	(speed) decreases (from X to Y) and then increases (from Y to X)	**B1**

(a)(ii)	any **three** from: • gravitational (potential) energy (GPE) transfers to kinetic energy (KE) or vice versa • KE transfers to GPE from X to Y **AND** GPE transfers to KE from Y to X • speed decreases as KE decreases / ORA • most GPE at Y **OR** least GPE at X • total (of GPE + KE) energy is constant	**B3**
(b)(i)	–230 (°C)	**B1**
(b)(ii)	(white surface) is a poor absorber / good reflector / poor emitter of IR / radiation **OR** black / other surface is a good absorber / poor reflector / good emitter of IR / radiation	**B1**
	any **one** from: • (the white surface) increases in temperature **less** when facing the Sun • (the white surface) decreases in temperature **less** when facing away (from Sun) • the black / other surfaces increases in temperature **more** when facing the Sun • the black / other surface decreases in temperature **more** when facing away (from Sun) • less variation in temperature on white surface (during one whole rotation)	**B1**