Revision Sheet 复习练习卷

A-Level Physics · Unit 3 Dynamics

11 vocabulary items · 27 marks of exam questions (9 questions)

Part 1 · Vocabulary review answer key. Section A wants the exact English spelling.

Question	Answer	Marks
1	resultant force	1
2	collision	1
3	kinetic energy	1
4	gravitational field	1
5	viscous	1
6	drag	1
7	gravitational potential energy	1
8	conservation of momentum	1
9	elastic collision	1
10	relative speed	1
11	inelastic collision	1

Question 12 (Answer: **A**)

- At t_1 and t_3 she is at terminal velocity, so the drag equals her weight at both – statement 2 holds.
- The graph is steepest just after the parachute opens, so the acceleration peaks at t_2 – statement 1 holds.
- The drag is largest at t_2, not t_1, so statement 3 fails.

Question 13 (Answer: **C**)

- Mass is the quantity of matter in the object and does not depend on where it is.
- Weight is mg, and g on the Moon is about one sixth of its value on Earth.
- So the mass is the same and the weight is different.

Question 14 (Answer: **B**)

- For an elastic collision the relative speed of approach *equals* the relative speed of separation.
- Written as speeds both are positive, so their sum cannot be zero – their difference is.
- A, C and D are all correct statements about the collision.

Question 15 (Answer: **C**)

- In an elastic collision the total kinetic energy is unchanged, not reduced.
- A reduction in kinetic energy is exactly what makes a collision inelastic.
- A, B and D are all true of an elastic collision.

Question 16 (Answer: **B**)

- A third-law pair swaps the two bodies and reverses the direction.
- The wheel pushes backwards on the road, so the road pushes forwards on the wheel.
- D balances the driving force on the *same* body, which makes it a first-law balance, not a third-law pair.

Question 17 (Answer: **D**)

- The stone starts with only its weight acting, so the acceleration begins at g.
- As it speeds up the drag grows, so the resultant force – and the acceleration – falls.
- At terminal velocity the acceleration is zero, so the graph starts at g and decays towards zero.

Multiple Choice Answers

Q18: C

19(a)	product of mass and velocity
19(b)	change in momentum = (–1.4) – (+2.8) = (–) 4.2 kg m s^{-1}
19(c)	$F = \Delta p / (\Delta)t$ **or** F = gradient = 4.2 / 12
	= 0.35 N
19(d)	constant / uniform (rate of) decrease (of speed to zero).

19(e)	• The (resultant) force is constant / does not decrease • air resistance would vary / decrease / not constant • the force is not zero when speed / velocity is zero / at 8 s Any two of the above 3 marking points (1 mark each, max 2)
19(f)	line from origin with decreasing positive gradient
	gradient changes from positive to negative at 8.0 s
	after t = 8.0 s the line has a negative gradient of increasing magnitude and a positive value of d at t = 12 s

Worked explanations 解析

Question 19(a)

- Momentum 动量 is the product of mass and velocity, $p = mv$.
- Velocity is a vector, so momentum is too, and its sign carries the direction.

Question 19(b)

- Change in momentum is final value minus initial value, keeping the signs from the graph.
- $\Delta p = (-1.4) - (+2.8) = -4.2$ kg m s^{-1}; the minus sign says the change is opposite to the original motion.

Question 19(c)

- The resultant force is the rate of change of momentum, which is the gradient of this graph.
- $F = \Delta p / \Delta t = 4.2/12 = 0.35$ N. The question asks for the MAGNITUDE, so the sign is dropped.

Question 19(d)

- The momentum falls at a constant rate and the mass does not change, so the speed falls at a constant rate too.
- It decreases uniformly to zero at $t = 8.0$ s.

Question 19(e)

- Air resistance 空气阻力 gets smaller as the object slows, so the force it produces could not stay constant — but the graph has a constant gradient, so the force IS constant.
- Air resistance is also zero when the object is at rest, yet at $t = 8.0$ s the gradient is still non-zero, so a force is still acting.
- Either of those two points earns the marks; both are stronger.

Question 19(f)

- Displacement is the AREA under a velocity–time graph, and momentum here is proportional to velocity, so the shape follows the same rule.
- From $t = 0$ to 8.0 s the velocity is positive but falling, so d rises with a decreasing gradient and turns over at $t = 8.0$ s.
- After 8.0 s the velocity is negative and growing in size, so the curve falls with an increasingly steep negative gradient — but d is still positive at $t = 12$ s.

20(a)	change in displacement / time (taken)
20(b)(i)	(displacement =) area under graph
	(at t = 4.0 s) v = (–) 2.4
	height = ½ × 2.5 × 4.0 – ½ × 1.5 × 2.4 = 3.2 m
20(b)(ii)	change in momentum = 7.5 (–4.0 – 2.4)
	= (–) 48 N s
20(b)(iii)	$W = \Delta p / (\Delta)t$ **or** $\Delta mv / (\Delta)t$
	= 48 / 4.0 = 12 N
	or
	$W = ma$ **or** mg **or** $m(v – u) / t$
	= 7.5 × 1.6 **or** 7.5 × (4 + 2.4) / 4.0 = 12 N
20(c)	speed/velocity decreases so viscous force decreases
	viscous force decreases (and weight constant) so resultant force decreases