

Brett Robbins Academic Consulting

Physics 20 Practice Test

Unit C: Circular Motion, Work & Energy

25 Questions

Original practice questions written to the Alberta curriculum, in the style of past diploma examinations. Work through each question, then check your answers with the key at the end.

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Question 1

A stone is whirled in a horizontal circle at the end of a string.

The centripetal force that keeps the stone moving in the circle is provided by

- A) the force of gravity
- B) the tension in the string
- C) the normal force
- D) air resistance

Question 2

A car travels at a constant speed of 16 m/s around a flat curve of radius 48 m.

The magnitude of the car's centripetal acceleration, in m/s^2 and to the nearest tenth, is ____

Question 3

A worker pushes a crate across a floor with a constant horizontal force of 120 N.

The crate moves 6.0 m in the direction of the force. The work done by the worker is

- | | |
|----------|-----------|
| A) 720 J | B) 20 J |
| C) 126 J | D) 7400 J |

Question 4

The kinetic energy of a 3.0 kg object moving at 4.0 m/s is

- | | |
|----------|---------|
| A) 6.0 J | B) 12 J |
| C) 24 J | D) 48 J |

Question 5

A 2.5 kg box is lifted 1.6 m at a constant speed. The gain in gravitational potential energy of the box is

- | | |
|----------|---------|
| A) 4.0 J | B) 16 J |
| C) 25 J | D) 39 J |

Question 6

An object moving in a circle completes 20 revolutions in 8.0 s.

The frequency of the motion is

- | | |
|-----------|------------|
| A) 2.5 Hz | B) 0.40 Hz |
| C) 12 Hz | D) 160 Hz |

Question 7

A 0.80 kg ball on a 1.2 m string moves in a horizontal circle at 6.0 m/s.

The magnitude of the centripetal force acting on the ball is

- | | |
|----------|----------|
| A) 3.6 N | B) 4.0 N |
| C) 24 N | D) 43 N |

Question 8

A motor does 2.4×10^3 J of work in 8.0 s.

The power output of the motor, in watts, is ____

Question 9

A spring with a spring constant of 250 N/m is stretched 0.12 m from its equilibrium position.

The magnitude of the force exerted by the spring is

- A) 3.0 N
- B) 30 N
- C) 300 N
- D) 2.1×10^3 N

Question 10

A roller coaster car starts from rest at the top of a 18 m hill.

Ignoring friction, the speed of the car at the bottom of the hill is

- A) 9.4 m/s
- B) 13 m/s
- C) 27 m/s
- D) 19 m/s

Question 11

Two objects attract each other with a gravitational force of magnitude F .

If the distance between their centres is doubled, the magnitude of the force becomes

- A) one-quarter as great
- B) one-half as great
- C) two times as great
- D) four times as great

Question 12

Two spherical objects, each with a mass of 100 kg, have their centres 2.0 m apart.

Use $G = 6.67 \times 10^{-11} \text{ N} \cdot \text{m}^2/\text{kg}^2$. The magnitude of the gravitational force

between them, expressed in the form $a.bc \times 10^{-7} \text{ N}$, has $a.bc = \underline{\hspace{2cm}}$

Question 13

A planet has a mass of 4.0×10^{23} kg and a radius of 3.0×10^6 m.

Use $G = 6.67 \times 10^{-11}$ N · m²/kg². The gravitational field strength at the surface of the planet is

- | | |
|--------------------------|-------------------------|
| A) 0.33 m/s ² | B) 8.9 m/s ² |
| C) 3.0 m/s ² | D) 27 m/s ² |

Question 14

A spring with a spring constant of 180 N/m is compressed 0.15 m.

The elastic potential energy stored in the spring, in joules and to the nearest hundredth, is ____

Question 15

A net force does 45 J of work on a 5.0 kg object that is initially at rest.

The final speed of the object is

- | | |
|------------|------------|
| A) 3.0 m/s | B) 4.2 m/s |
| C) 9.0 m/s | D) 18 m/s |

Question 16

A satellite moves in a circular orbit around Earth, with Earth's gravity providing the centripetal force.

If the radius of the orbit is increased to four times its original value, the orbital speed of the satellite will be

- A) four times as great
- B) two times as great
- C) unchanged
- D) one-half as great

Question 17

A point on the rim of a rotating disk, 0.60 m from the centre, moves in a circle with a period of 1.5 s.

The magnitude of the centripetal acceleration of the point, in m/s^2 and to the nearest tenth, is ____

Question 18

A crane lifts a 500 kg load 12 m at a constant speed in 30 s.

The power output of the crane is approximately

A) $2.0 \times 10^3 \text{ W}$

B) $2.0 \times 10^2 \text{ W}$

C) $5.9 \times 10^3 \text{ W}$

D) $5.9 \times 10^4 \text{ W}$

Question 19

A spring with a spring constant of 400 N/m is compressed 0.10 m and used to launch

a 0.050 kg ball straight upward. Ignoring air resistance, the maximum height reached by the ball, in metres and to the nearest tenth, is ____

Question 20

A pendulum bob is released from rest 0.45 m above its lowest position.

Ignoring friction, the speed of the bob at its lowest position is

A) 2.1 m/s

B) 4.4 m/s

C) 3.0 m/s

D) 6.3 m/s

Question 21

The gravitational field strength at Earth's surface is 9.81 N/kg .

A satellite is located at a distance of 2.0 Earth radii from Earth's centre.

The gravitational field strength at the location of the satellite is

- A) 4.9 N/kg
- B) 2.5 N/kg
- C) 9.8 N/kg
- D) 39 N/kg

Question 22

A satellite orbits Earth in a circular orbit with a radius of $7.0 \times 10^6 \text{ m}$.

Use $G = 6.67 \times 10^{-11} \text{ N} \cdot \text{m}^2/\text{kg}^2$ and a mass for Earth of $5.97 \times 10^{24} \text{ kg}$.

The orbital speed of the satellite is

- A) 5.7 km/s
- B) 57 km/s
- C) 11 km/s
- D) 7.5 km/s

Question 23

A spring is compressed to store elastic potential energy. If the compression of the spring is doubled, the elastic potential energy stored in the spring will be

- A) four times as great
- B) two times as great
- C) eight times as great
- D) unchanged

Question 24

A block slides 3.5 m across a floor and comes to rest. The kinetic friction force acting on the block is 12 N.

The work done by friction on the block is

- | | |
|----------|-----------|
| A) 42 J | B) -3.4 J |
| C) -42 J | D) 0 J |

Question 25

A 0.20 kg ball is thrown straight upward with an initial speed of 12 m/s.

Ignoring air resistance, the maximum height reached by the ball, in metres and to the nearest tenth, is ____

Answer Key

- | | | |
|--------|----------|---------|
| 1. B | 10. D | 19. 4.1 |
| 2. 5.3 | 11. A | 20. C |
| 3. A | 12. 1.67 | 21. B |
| 4. C | 13. C | 22. D |
| 5. D | 14. 2.03 | 23. A |
| 6. A | 15. B | 24. C |
| 7. C | 16. D | 25. 7.3 |
| 8. 300 | 17. 10.5 | |
| 9. B | 18. A | |

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