

## Kinematics

1. When a book of mass 2kg was pushed along the horizontal surface of the table, the friction force measured was 5N. When the book was pushed along the same table with a force of 9N, it moved with a constant
  - a. acceleration of  $2.0 \text{ m/s}^2$
  - b. acceleration of  $25 \text{ m/s}^2$
  - c. speed of  $2.0 \text{ m/s}$
  - d. speed of  $2.5 \text{ m/s}^2$
  
2. A balloon filled with gas has a total weight of 1800N. The balloon descends with a constant speed of 3 m/s. What is the resultant force acting on the balloon during descent?
  - a. 0N
  - b. 600N
  - c. 1800N
  - d. 5400N
  
3. A crane lifts a load of 8000N through a vertical distance of 20m in 4s. What is the average power during this operation?
  - a. 100W
  - b. 1600W
  - c. 40000W
  - d. 640000W
  
4. A toy car A moving with a speed of 30 m/s has a kinetic energy of 900J. Another toy car B has twice the mass of toy car A. If toy car B moves with a speed of 15 m/s, what is the kinetic energy of toy car B?
  - a. 450J
  - b. 900J
  - c. 1800J
  - d. 3600J
  
5. A 60W fluorescent lamp converts half the electrical energy supplied into light energy. How much light energy does it emit in 1 minute?
  - a. 30W
  - b. 60W
  - c. 1800W
  - d. 3600W
  
6. A electric motor is used to lift a 200N load through 3m in 5s. If the motor has an efficiency of 40%, what is the total electrical energy used by the motor in one second?
  - a. 48W
  - b. 300W
  - c. 1200W
  - d. 3000W

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7. A trolley of mass 1.5kg is placed on a smooth table. If a constant force of 6N acts on the trolley, the acceleration produced by the force will be

- a. 0.25 ms<sup>-2</sup>
- b. 4 ms<sup>-2</sup>
- c. 4.5 ms<sup>-2</sup>
- d. 7.5 ms<sup>-2</sup>

8. An object of mass 2kg moves with uniform velocity when a constant force of 10N acts on it. When the force is increased to 20N, the acceleration will be

- a. 4 ms<sup>-2</sup>
- b. 5 ms<sup>-2</sup>
- c. 6 ms<sup>-2</sup>
- d. 10 ms<sup>-2</sup>

9. The weight of a rocket in outer space is zero because

- a. its mass becomes zero
- b. there is no frictional force
- c. there is no gravitational force
- d. the rocket is stationary

10. A ball of mass 0.2kg is thrown to a height of 15m. What is the change in its gravitational potential energy?

(g=10N/kg)

- a. 0.3 J
- b. 3.0 J
- c. 7.5 J
- d. 30 J
- e. 75 J

11. A boy pushes a toy cart along a level road and then lets it go. As the cart is slowing down, the biggest energy change is from

- a. chemical to heat
- b. chemical to kinetic
- c. heat to kinetic
- d. kinetic to chemical
- e. kinetic to heat

12. A girl weighing 400N takes 4s to run up the stairs 3m high. What is her average speed?

- a. 0.75 m/s
- b. 0.8 m/s
- c. 1.25 m/s
- d. 1.33 m/s
- e. 12 m/s

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13. How much potential energy does she gain? (from question 12)

- a. 120 J
- b. 200 J
- c. 400 J
- d. 1200 J
- e. 2000 J

14. A block of mass 2kg slides from rest through a distance of 20m down a frictionless slope 10m high. What is the kinetic energy of the block at the bottom of the slope? ( $g = 10\text{ms}^{-2}$ )

- a. 20 J
- b. 40 J
- c. 200 J
- d. 400 J
- e. 800 J

15. What are the main energy changes in a hydroelectric power station?

- a. electrical  $\rightarrow$  kinetic  $\rightarrow$  heat
- b. heat  $\rightarrow$  electrical  $\rightarrow$  kinetic
- c. kinetic  $\rightarrow$  light  $\rightarrow$  electrical
- d. kinetic  $\rightarrow$  potential  $\rightarrow$  light
- e. potential  $\rightarrow$  kinetic  $\rightarrow$  electrical

16. An electric motor runs with a steady input of 250 V and 4 A while raising a load of 1000N. Assuming the motor and transmission to be 100% efficient, what time is taken to lift the load vertically through a distance of 10m?

- a. 1 s
- b. 1.5 s
- c. 4 s
- d. 10 s
- e. 250 s

17. No work is done by an object at rest because

- a. no force is acting on the object
- b. no distance is moved
- c. heat is not produced
- d. friction is acting on the object

18. A mass of 40g is raised vertically from the ground to a height of 50cm, the work done in lifting the mass is

- a. 0.02J
- b. 20J
- c. 0.2J
- d. 2000J

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19. During free fall, work is done by

- a. frictional force
- b. magnetic force
- c. gravitational force
- d. centripetal force

20. Kinetic energy is transformed into gravitational potential energy when

- a. a raindrop falls from the sky
- b. a rubber band is stretched
- c. a stone is thrown upwards
- d. a bullet is fired horizontally

21. A hammer of a pile-driver is lifted to a height of 2m in 0.5s. If the mass of the hammer is 500kg, the power required for the lifting is

- a. 500W
- b. 1000W
- c. 2000W
- d. 20000W

22. A car travels at a constant speed of 10m/s. What is the power of the car if the total resistant forces acting on it is 400N?

- a. 1/40 W
- b. 40W
- c. 400W
- d. 4000W

23. A known force is applied to an object on a horizontal, frictionless surface. What property of the object must be known in order to calculate its acceleration?

- a. density
- b. mass
- c. surface area
- d. volume
- e. weight

24. Which expression is used to calculate force?

- a. frequency x wavelength
- b. mass x acceleration
- c. power + time
- d. pressure x area
- e. work x distance

## Kinematics

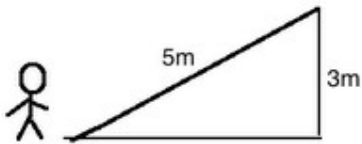
25. Which of the following is a vector quantity?

- a. energy
- b. mass
- c. temperature
- d. time
- e. velocity

26. When a force is applied to a body, several effects are possible. Which of the following effects could not occur?

- a. the body speeds up
- b. the body rotates
- c. the body changes direction
- d. the pressure on the body increases
- e. the mass of the body decreases

27. A girl weighing 400N takes 4s to run up the stairs as shown in the diagram. What is her average speed?



- a. 0.75 m/s
- b. 0.8 m/s
- c. 1.25 m/s
- d. 1.33 m/s
- e. 12 m/s

28. How much potential energy does she gain? (from qn 27)

- a. 120 J
- b. 200 J
- c. 400 J
- d. 1200 J
- e. 2000 J

29. An electric motor can lift a weight of 2000N through a height of 10m in 20s. What is the power of the motor?

- a. 10 W
- b. 1000 W
- c. 2000 W
- d. 4000 W
- e. 400 000 W

30. What are the main energy changes in a hydroelectric power station?

- a. electrical --> kinetic --> heat
- b. heat --> electrical --> kinetic
- c. kinetic --> light --> electrical
- d. kinetic --> potential --> light
- e. potential --> kinetic --> electric

## Kinematics

31. A spiral spring has a natural length of 10.0cm. When a load of 5N is placed at one end while the other end is fixed on a hook, the length of the spring becomes 11.0cm. What is the new length of the spring if the load is 20N?
- 12.0cm
  - 14.0cm
  - 20.0cm
  - 44.0cm
32. A body whose mass is 4kg, is placed on a frictionless surface. It is being pulled by a spring balance and the acceleration produced is  $1\text{m/s}^2$ . What is the reading on the spring balance?
- 4N
  - 5N
  - 36N
  - 40N
33. A body weighs 50N on earth where the acceleration due to gravity is  $10\text{m/s}^2$ . When taken to the moon, where the acceleration due to gravity is  $1.6\text{m/s}^2$ , the body would have a weight, in newtons, of
- zero
  - 8
  - 50
  - 80
34. A parachutist, whose body and equipment have a total mass of 150kg, descends vertically through the air at a steady speed of 10m/s. Taking  $g = 10\text{m/s}^2$ , the resultant force acting on him in this descent is
- 1500N upwards
  - 150N upwards
  - 0N
  - 1500N downwards
35. A man weights 600N. He runs up stairs of total height 4 metres in 3 seconds. How much power is exerted by the man?
- 450 W
  - 800 W
  - 2400 W
  - 7200 W
36. When two forces are combined, the size of the resultant depends on the angle between the two forces. Which of the following cannot be the magnitude of the resultant when forces of magnitude 3N and 4N are combined?
- 1 N
  - 3 N
  - 7 N
  - 8 N

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37. A rock of mass 20kg is travelling in space at a speed of 6m/s. What is its kinetic energy?

- a. 60 J
- b. 120 J
- c. 360 J
- d. 720 J

38. A block of mass 6kg is pulled across a rough surface by a 54N force, against a friction force  $F$ . The acceleration of the block is  $6\text{m/s}^2$ . What is the value of  $F$ ?

- a. 9 N
- b. 18 N
- c. 36 N
- d. 54 N

39. A girl of weight 500 N runs up a flight of stairs in 10 s. The vertical height of the stairs is 5 m. What is the average power developed by the girl?

- a. 50 W
- b. 100 W
- c. 250 W
- d. 1000 W

40. When a block of wood of mass 2 kg is pushed along the horizontal flat surface of a bench, the friction force is 4N. When the block is pushed along the bench with a force of 10 N, it moves with a constant

- a. speed of 3 m/s
- b. speed of 5 m/s
- c. acceleration of  $3\text{ m/s}^2$
- d. acceleration of  $5\text{ m/s}^2$

41. A person exerts a horizontal force of 600 N on a box that also experiences a friction force of 200N. If it takes 4.0s to move the box 3.0m, what is the average useful power?

- a. 150 W
- b. 300 W
- c. 450 W
- d. 600 W

42. Which of the following best describes the useful energy change that takes place inside a mobile phone when sound is being produced?

- a. electrical energy  $\rightarrow$  sound energy
- b. chemical energy  $\rightarrow$  electrical energy  $\rightarrow$  heat energy
- c. chemical energy  $\rightarrow$  heat energy  $\rightarrow$  electrical energy + sound energy
- d. chemical energy  $\rightarrow$  electrical energy  $\rightarrow$  sound energy

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43. A car is being driven up a slope at a constant speed. Which of the following describes the energy conversion of the system?

- a. chemical into kinetic
- b. chemical into potential
- c. kinetic into potential
- d. potential into kinetic

44. A car goes down a slope at constant speed. Which of the following describes the energy conversion?

- a. chemical into kinetic
- b. chemical into potential
- c. kinetic into potential
- d. potential into heat

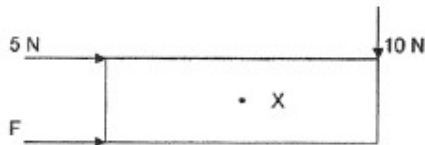
45. What is the effect of the air resistance on a falling object?

- a. the speed of the object is reduced
- b. the acceleration of the object is reduced
- c. the distance travelled by the object is reduced
- d. the direction of motion of the object is changed

46. An object is moving due east at a constant speed of 5m/s before two equal and opposite forces of 10N each act on the object at the same time. The object will

- a. move with higher speed in the same direction
- b. move with lower speed in the same direction
- c. continue to travel at the same speed in the same direction
- d. change the direction of motion and travel in the opposite direction

47. A uniform rectangular board 8m x 2m is acted on by three forces on the edges. X is a pivot at the centre of the board.



What should be the value of F such that the board remains in equilibrium?

- a. 35N
- b. 40N
- c. 45N
- d. 50N

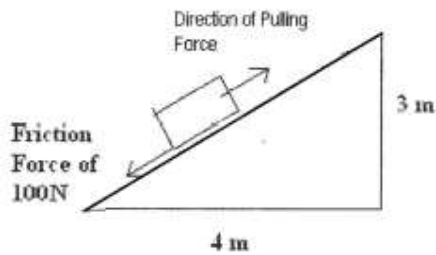
48. A man exerts a horizontal force of 500N on a box, which also experiences a frictional force of 100N. How much work is done against friction when the box moves a horizontal distance of 3m?

- a. 300J
- b. 1200J
- c. 1500J
- d. 1800J



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49. A mass of 30kg is being pulled up a slope as shown.



What is the total work done in moving the box up the slope?

- a. 500J
- b. 600J
- c. 800J
- d. 1400J

50. A force is applied to an object on a surface with a frictional force of 2.0N. It produces an acceleration of  $3\text{ms}^{-2}$ .

Which are the possible values of the applied force and the mass of the object?

- |    | Force/N | Mass/kg |
|----|---------|---------|
| a. | 15      | 5       |
| b. | 6       | 2       |
| c. | 2       | 2       |
| d. | 17      | 5       |

51. A trolley weighing 5.0N is pulled along a level bench by a horizontal force of 10N. The force of friction acting on the wheels of the trolley is 2.0N. What is the size of the resultant force causing the trolley to accelerate?

- a. 3.0N
- b. 8.0N
- c. 10N
- d. 13N

52. A bus has a total mass of 12 000kg. It moves along a horizontal stretch of road at a speed of 10m/s. It then accelerates, reaching a final speed of 30m/s after 16s. What is the size of the average resultant force acting on the bus when it is accelerating?

- a. 7500N
- b. 9600N
- c. 15000N
- d. 22500N

53. A boy pushes a toy cart along a road and then lets it go. As the cart is slowing down, the biggest energy change is from

- a. heat to kinetic
- b. kinetic to heat
- c. kinetic to potential
- d. potential to heat

### Kinematics

54. At a height of 20m above the ground, an object of mass 4.0kg is released from rest. It is travelling at a speed of 20m/s when it hits the ground. The object does not rebound and the gravitational field strength is 10N/kg. How much energy is converted into heat and sound on impact?

- a. 40J
- b. 80J
- c. 800J
- d. 1600J

55. A car moves from rest with uniform acceleration along a horizontal road. After travelling a distance of 100m, it has kinetic energy equal to 200 000J. What resultant force is acting on the car?

- a. 100N
- b. 1000N
- c. 2000N
- d. 20 000N



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Kinematics

MCQ Answers

1. a
2. a
3. c
4. a
5. c
6. b
7. b
8. b
9. c
10. d
11. e
12. c
13. d
14. c
15. e
16. d
17. b
18. b
19. c
20. c
21. d
22. d
23. b
24. b
25. e
26. e
27. c
28. d
29. b
30. e
31. b
32. a
33. b
34. c
35. b
36. d
37. c
38. b
39. c
40. c
41. b
42. d (energy is stored in the phone as chemical energy in the battery)
43. b ("constant speed" means no change in kinetic energy)



## Kinematics

44. d (as above)

45. b (air resistance can never slow down a falling object but can only cause the falling object to have acceleration smaller than  $10\text{m/s}^2$ )

46. c (when a pair of equal and opp. force acts on the object, the forces cancel each other's efforts and therefore the resultant force acting on the object is zero.)

47. c

48. a

49. d

50. d

51. b

52. c

53. b

54. c

55. c

The logo for SJUEC is displayed in a large, stylized, sans-serif font. The letters 'SJ' are colored in a light purple hue, while the letters 'UEC' are colored in a light blue hue. The letters have a slight 3D effect with a drop shadow.