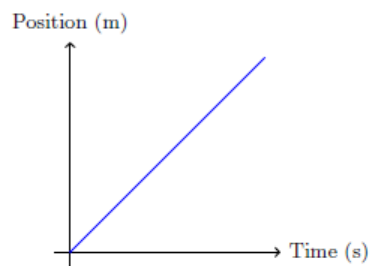
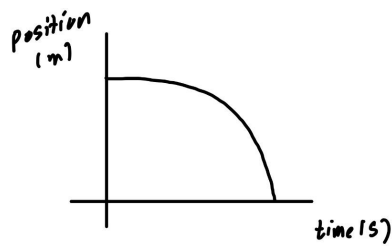


Kinematics - Graphs: Answer Key

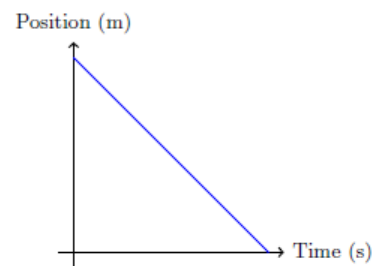
1. Position-Time Graphs



(a) Car moving forward at constant velocity

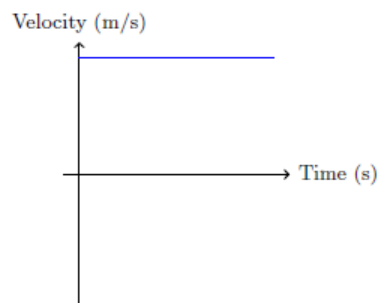


(b) Rock dropping from a cliff

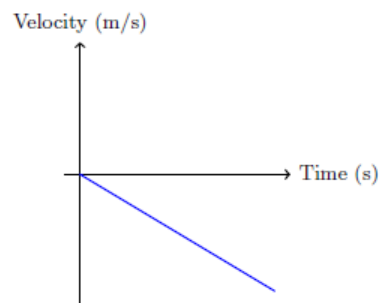


(c) Car moving backwards at constant velocity

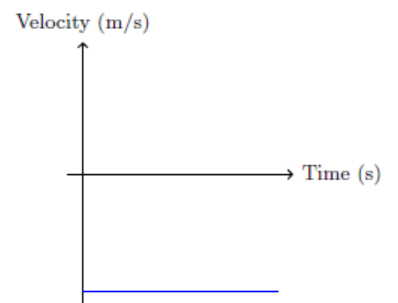
2. Velocity-Time Graphs



(a) Constant forward velocity

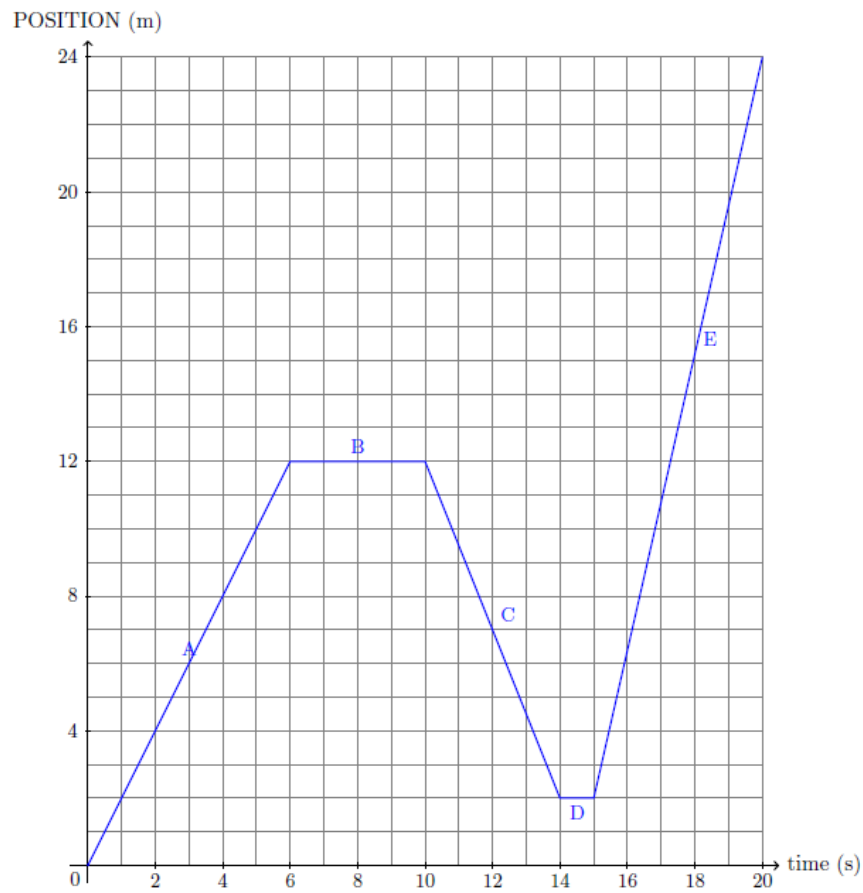


(b) Rock dropping from a cliff



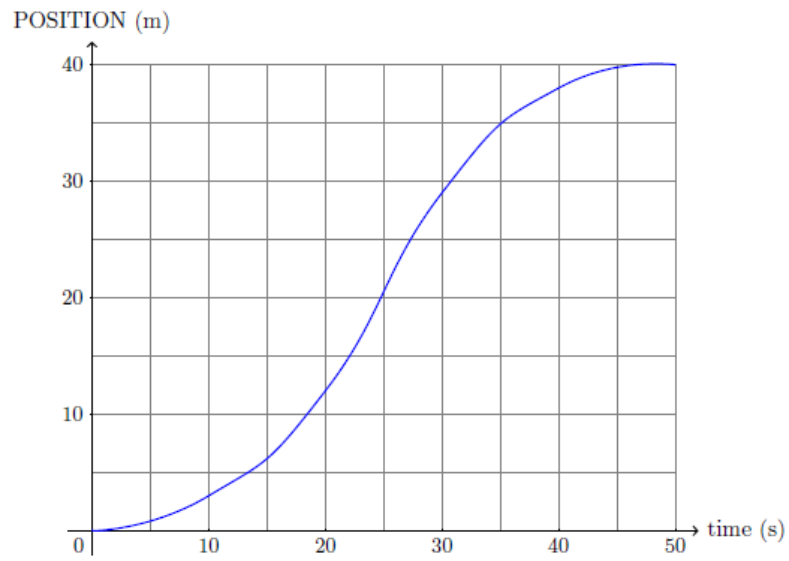
(c) Constant backward velocity

3. Answers



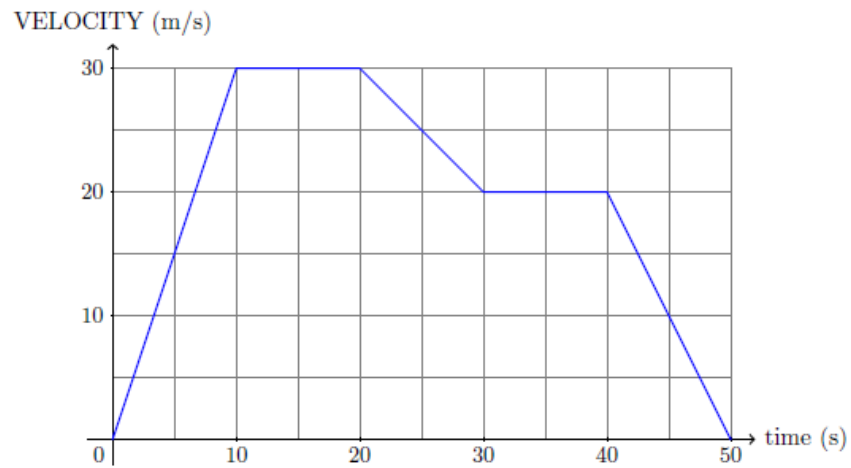
- The object is moving fastest during interval **E** (15 s to 20 s), with a speed of 4.4 m/s.
- It is moving forward during intervals **A** (0 s to 6 s) and **E** (15 s to 20 s).
- It is moving backwards during interval **C** (10 s to 14 s).
- It is not moving during intervals **B** (6 s to 10 s) and **D** (14 s to 15 s).
- The total distance travelled is $d = 12\text{ m} + 10\text{ m} + 22\text{ m} = 44\text{ m}$.
- The average velocity is $\vec{v}_{avg} = \frac{\Delta x}{\Delta t} = \frac{24\text{ m}}{20\text{ s}} = 1.2\text{ m/s}$.

4. Answers



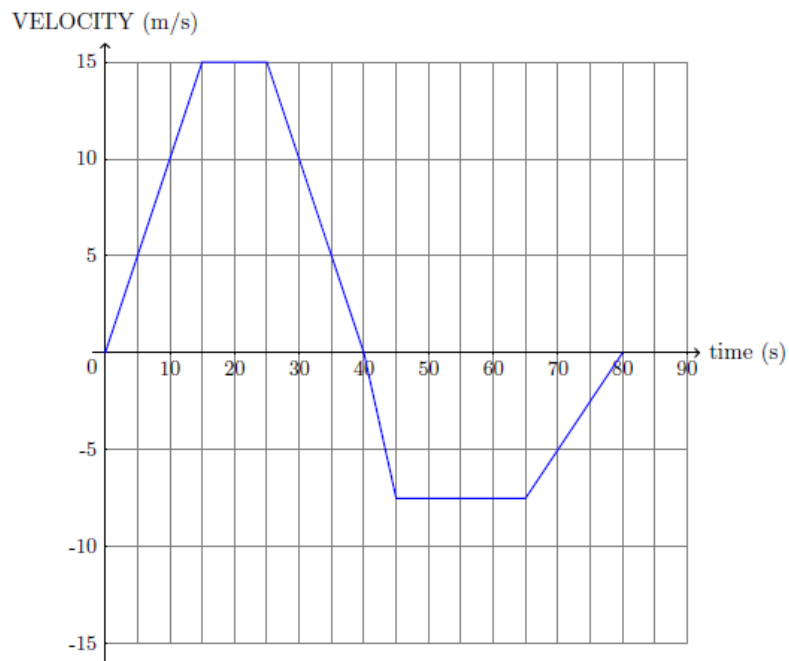
- a) The object is speeding up from **0 s to approximately 25 s**.
- b) The object is slowing down from **approximately 25 s to 50 s**.
- c) The object is always moving forward, from **0 s to 50 s**.
- d) The object is **never** moving backwards.
- e) The average velocity is $\vec{v}_{avg} = \frac{\Delta x}{\Delta t} = \frac{40 \text{ m}}{50 \text{ s}} = 0.8 \text{ m/s}$.

5. Answers



- a) The highest velocity is **30 m/s**.
- b) This occurs between **10 s and 20 s**.
- c) The lowest velocity is **0 m/s**.
- d) This occurs at **$t = 0$ s and $t = 50$ s**.
- e) The object is moving forward whenever $v > 0$, from **(0 s, 50 s)**.
- f) The object is **never** moving backwards.
- g) The object is speeding up from **0 s to 10 s**.
- h) The object is slowing down from **20 s to 30 s** and from **40 s to 50 s**.
- i) Acceleration is 0 from **10 s to 20 s** and from **30 s to 40 s**.

6. Answers



a) Qualitative description of the object's motion:

- **0 s - 15 s:** The object accelerates uniformly in the forward direction.
- **15 s - 25 s:** It moves forward at a constant velocity of 15 m/s.
- **25 s - 40 s:** It decelerates uniformly and stops momentarily at 40 s.
- **40 s - 45 s:** At 40s, it turns backwards and accelerates uniformly in the backward direction.
- **45 s - 65 s:** It moves backward at a constant velocity of -7.5 m/s.
- **65 s - 80 s:** It decelerates uniformly while moving backward, coming to a stop.