Solutions

Each answer shows the steps, then the **result**.

2.1

- turns an **alternating** voltage/current into a **one-direction** (d.c.-like) one

2.2

- **four**

2.3

- half-wave keeps **only the positive half-cycles** (with gaps)
- full-wave **inverts the negative half-cycles** too, giving a continuous run of positive humps at twice the frequency

2.4

- to **smooth** the output — reduce the ripple, giving a steadier d.c.

3.1 B

- a single diode gives **half-wave rectification**

3.2

- the diode conducts only when **forward-biased** (positive half-cycle)
- on the negative half-cycle it is **reverse-biased** and blocks the current, so only positive humps pass

3.3

- four diodes are arranged so that on **each** half-cycle a **different pair** conducts
- whichever a.c. terminal is positive, the current through the load flows the **same way**
- so every half-cycle is used, giving full-wave output

3.4

- the capacitor **charges** to the peak and **discharges** slowly through the load during the dips, filling the gaps and reducing the ripple
- a **larger** capacitance increases the time constant RC
- so it discharges more slowly and the output is **smoother** (smaller ripple)

3.5

(a) rectification is the conversion of **alternating** current into **direct** (one-directional) current

- a bridge rectifier gives **full-wave** rectification

(b) $T = 2.8\text{ s}/8 = \mathbf{0.35}\text{ s}$

(c) $V_{\text{r.m.s.}} = V_0/\sqrt{2}$

$$V_{\text{r.m.s.}} = \frac{12\text{ V}}{\sqrt{2}} = \mathbf{8.5}\text{ V}$$

(d) all humps **above** the axis — the negative half-cycles are flipped up

- **two** humps in 0.35 s, so the output period is 0.175 s
- peak value 12 V, axes labelled

(e) the output becomes a **smoothed** line that rises with each hump to 12 V and then decays gently until the next hump catches it

- the capacitor **charges** to the peak, then **discharges** through the load while the rectified voltage falls
- so the output never drops to zero and the remaining variation is the **ripple**

(f) (i) a larger capacitance stores more charge and discharges more slowly ($\tau = RC$ is longer), so the ripple is **smaller**

(ii) a smaller load resistance draws more current and shortens τ, so the capacitor discharges further between humps and the ripple is **larger**