Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

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

2.1

A: **adenoma**

B: **liposarcoma**

C: **squamous cell carcinoma**

2.2

$2^{10} \approx 10^3$, so $2^{30} \approx 10^9$

about **30** doublings

2.3

any three of: benign has a capsule, malignant invades; malignant spreads (metastasises), benign does not; malignant cells look less like normal cells; malignant often grows faster

2.4

grade: how abnormal the cells look under the microscope (differentiation)

stage: how big the tumour is and how far it has spread (TNM)

3.1

(a) T3: through the muscle into the outer layers; N1: cancer in 1–3 nearby lymph nodes; M0: no distant spread

(b) the **liver**, because blood from the bowel drains to it in the portal vein

(c) **APC**

(d) to follow treatment and look for the cancer coming back

3.2

(a) both copies of a tumour suppressor gene must be lost for the cell to escape control; in hereditary cases the first loss is inherited

(b) every retinal cell already has one hit, so a second hit in some cell is likely, early and in both eyes

(c) **one** (gain of function is dominant)

3.3

(a) HPV: **cervix**; asbestos: **mesothelioma**; *H. pylori*: **stomach**

(b) its E6 protein blocks p53, and its E7 protein blocks RB, so the cell cycle runs out of control

(c) to protect before any sexual contact and exposure to HPV

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(d) it is raised in harmless conditions such as an enlarged prostate, giving false positives; it misses some cancers and finds slow cancers that would never cause harm