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**Remote operations quiz**

Imagine going into hospital for an operation and having it performed by a surgeon who is on the other side of the world! Modern robotic and communications technology have already made this possible. Indeed, telemedicine, as it is called, is a fast-growing field. But it doesn’t stop there.

Scientists, doctors and engineers are working together on projects which will soon mean that some procedures can be carried out by autonomous robots, with no human intervention necessary at all. This will mean that surgery can be performed in environments such as remote areas, space stations or battlefields, where it was previously impossible.

Answer the questions in our Remote operations quiz below. Hint: You may find it useful to watch our Remote operations video first!

Good luck.

1. **What is telemedicine?**
2. The delivery of medical services such as carrying out a surgical procedure from a distance using modern telecommunications technology
3. Medical training courses available for study on a set of DVDs
4. The electronic equipment found in hospitals such as heart monitors or dialysis machines.
5. Medical advice services such as NHS direct which can be accessed over the telephone
6. **Fibre optic cables can be used to provide the necessary communication links which make remote surgery possible. The optical fibres which make up these cables can keep light from escaping because of a process known as…**
7. Total internal refraction
8. Total internal deflection
9. Total internal conduction
10. Total internal reflection
11. **Which of these is not a job you might currently see robots doing around a hospital?**
12. As simulated patients for trainee medical staff to practice on
13. Keeping wards and other areas clean
14. Carrying out surgery
15. Talking to and reassuring patients and their families
16. **Satellite communications are not used to carry the signals in remote surgery. This is because…**
17. Satellites are too unreliable
18. The time delay is too great
19. Satellites cannot handle the bandwidth needed for remote surgery
20. The signal fades every time the satellite disappears over the horizon
21. **One day it may be possible for tiny robots to be injected into our bodies to carry out repairs. These robots are often referred to as nanobots where the nano part of the name refers to the size of the robots. What kind of size does nano mean?**
22. One thousandth of a metre
23. One millionth of a metre
24. One billionth of a metre
25. One trillionth of a metre
26. **When engineers talk about the bandwidth of a method of communication, what do they mean?**
27. They are talking about the diameter of any cables being used
28. They are talking about the rate at which information can be transmitted
29. They are talking about the thickness of insulation of any cables being used
30. They are talking about the penetrating power of any electromagnetic radiation being used
31. **Which one of these is an advantage associated with using a medical robot like da Vinci?**
32. There is less blood loss
33. It means that surgeons are not overworked
34. Medical robots can work 24 hours a day
35. They are cheap to run
36. **Which one of these is a possible disadvantage associated with using a medical robot like da Vinci?**
37. Human surgeons could become obsolete
38. Human surgeons could lose their skills through lack of practice
39. There is very little sense of touch for the surgeon operating the robot
40. The robot cannot instruct the rest of the surgical team like a human surgeon
41. **Using the da Vinci medical robot, how big would the incisions need to be for open heart surgery?**
42. 1-2 mm
43. 1-2 cm
44. 10-20 cm
45. 20-30 cm
46. **One of the difficulties of remote surgery is the time delay involved in signals travelling to and fro between the surgeon and the robot carrying out the surgery. It is reckoned that 0.3 seconds is the maximum possible time delay, that’s 0.15 seconds each way. If this is the case and we assume that these signals travel at the speed of light (300,000,000 m/s) what would be the furthest distance by which the patient and surgeon could be separated?**
47. 18,000 kilometres
48. 45,000 kilometres
49. 90,000 kilometres
50. 45,000,000 kilometres

**Answers**

1. b
2. d
3. d
4. b
5. c
6. b
7. a
8. c
9. b
10. b