



Exam Questions

Warm-Up Questions:

1. Describe what a printed circuit board (PCB) is.
2. Describe how an AND logic gate works
3. Describe the motion produced by the cam shown on the right
4. What material are the nanoparticles made of in antibacterial fabrics?

Worked Exam Questions:

1. **Figure 1** shows a crowbar being used to remove a nail from a plank of wood. A crowbar is an example of a lever.



Figure 1

- a) What type of lever is a crowbar?

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- b) Explain why using this type of lever helps to remove the nail.

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2. A company is designing a new set of street lights that turn on and off at set times of the day.

a) Explain how a microcontroller could be used to control when the lights turn on and off.

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b) The company found that the lights were turning on too early in the summer, and too late in the winter. They decided to change the street light design so that they run on when the light levels are below a certain value.

Name a suitable device:

Reason:

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Exam Questions

1. What type of material is titanium?

- A. a modern material
- B. a smart material
- C. a composite
- D. a technical textile

2. **Figure 2** shows a push/pull linkage. The output force is the same magnitude and in the same direction as the input force



Which **one** of the following would cause the magnitude of the output force to be different to the magnitude of the input force?

- A. Increasing length A.
- B. Increasing the magnitude of the input force.
- C. Changing the position of the fixed pivots.
- D. Increasing length B and length C by the same amount.

3. A belt drive mechanism transfers rotary motion from a motor to a shaft. Details of the mechanism are given in the table.

Part of mechanism	Diameter (mm)
Motor (driver)	35
Shaft (driven)	105

Calculate the velocity ratio for this mechanism.



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4. **Figure 3** shows a pair of sunglasses.

a) State **one** smart material that could be used to make a part of this product.

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Figure 3

b) Explain how the “smart property” of the material you gave in **a)** could be useful to the user of the product.

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Revision Questions

This section is done and dusted – try these questions to see [how much](#) you can remember.

- Try these questions and [tick off each one](#) when you [get it right](#).
- When you've done [all the questions](#) for a topic and are [completely happy](#) with it, tick off the topic.

Properties of Materials

- 1) Describe what is meant by the following properties: a) Fusible b) Malleable c) Ductile
- 2) Absorbent materials soak up moisture. State two other properties of absorbent materials
- 3) Metal is used for radiators. Suggest one property that makes metal suitable for this

Paper; Board and Timber

- 4) What is the difference between paper and board?
- 5) a) State one example of a hardwood.
b) For the hardwood you gave in part a), give an example of how it is used.

Metals, Alloys and Polymers

- 6) What is a non-ferrous metal? Give an example of one.
- 7) Explain why stainless steel is useful for making products that are used outdoors.
- 8) Give two differences between thermoforming and thermosetting plastics.
- 9) Give a property of melamine formaldehyde that makes it suitable for laminating worktops.

Textiles and Manufactured boards

- 10) Give two examples of synthetic fibres, and state a property of each one.
- 11) Name the piece of equipment used for weaving.
- 12) Suggest why chipboard shouldn't be used to make bathroom furnishings.

Electronic Systems

- 13) Name the three blocks that make up a system.



- 14) a) Give three examples of types of variable resistor.
- b) For each resistor named in a), give the external factor that it can detect changes in.
- 15) Give two advantages of using microcontrollers in a system.
- 16) Name two output devices and state the type of output signal that they produce.

Mechanical Systems

- 17) State an example of a second order lever.
- 18) A pillar drill operates using a belt drive mechanism. The driver wheel has a diameter of a 32mm and spins at a speed of 1200 rpm. The driven wheel has a diameter of 128mm.
- a) Calculate the velocity ratio b) Calculate the output speed of the system
- b) Name one other product that uses a belt drive mechanism

Developments in New Materials

- 19) Name two properties of graphene.
- 20) State two uses of glass-reinforced plastic.